

# Assessing production efficiency of Islamic banks and conventional bank Islamic windows in Malaysia

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# Assessing Production Efficiency of Islamic Banks and Conventional Bank Islamic Windows in Malaysia

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**Abstract** This study presents new perspectives on performance evaluation of Islamic banking operations in Malaysia, by investigating for the first time, both cost and profit efficiency of full-fledged Islamic banks and Islamic window operations of domestic and foreign banks. The application of Data Envelopment Analysis (DEA) technique has provided several efficiency measures such as allocative, pure technical and scale efficiency that explain cost and profit efficiency differentials among banks. The findings of the study show that Islamic banking operators are relatively more efficient at controlling costs than at generating profits. The main contributor for cost efficiency of domestic and foreign banks comes from resource management and economies of scale respectively. These findings have implications on the reform process carried out in the aftermath of Asian financial crisis, particularly the Financial Sector Master Plan (FSMP).

**Keyword** Data Envelopment Analysis, allocative efficiency, technical efficiency, foreign banks

## INTRODUCTION

Interest-free banking is growing in Malaysia very quickly and widely accepted by the public, standing at an average rate of 19 percent per annum in terms of assets since 2000. By the end of 2004, total assets of the Islamic banking sector increased to RM 94.6 billion which accounted for 10.5 percent of the total assets in the banking system. The market share of Islamic deposits and financing also increased to 11.2 percent and 11.3 percent of total banking sector deposits and financing respectively (Bank Negara Malaysia, 2004). This is contributed by 2

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Islamic banks regulated and supervised under the Islamic Banking Act; 13 commercial banks, 3 finance companies and 4 merchant banks. The latter three types of interest-based banking institutions offer interest-free banking through special outfits called 'Islamic windows'. Islamic windows are departments within conventional banks set up, operating and maintaining Islamic banking operations as profit and cost entities separate from their conventional banking operations. Malaysia pioneered the implementation of Islamic widows for Islamic banking. Due to the success, the Islamic window set up serves as a model for Islamic banking systems in other countries such as Indonesia and Thailand.

The main issue is the unavailability of documented evidence on both cost and profit efficiency of Islamic banking operations. Most of the past studies focused on either cost efficiency or profit efficiency (Fare et al., 2004; Fitzpatrick and McQuinn, 2005; Akhigbe and McNulty, 2005). A study on one aspect of efficiency does not provide a comprehensive assessment of a state of efficiency of a bank. Studies by Chu and Lim (1998), Isik and Hassan (2002) and Maudos and Pastor (2003) emphasize the importance of investigating both cost and profit efficiency in the analysis of bank production efficiency. However, these studies were conducted on conventional commercial banks in Singapore, Turkey, Spain, and Australia respectively. Meanwhile, Malaysian studies conducted by Karim (2001) and Majid et al. (2005) only measured cost and technical efficiency of conventional banks. It is not possible to generalize their findings as conventional banks and Islamic banks are two different entities and are operating in different economic environment and banking systems.

The contribution to the banking sector and national economy as well the issue of cost and profit efficiency for Islamic banking is considerably as area of investigation. This study evaluates the performance of Islamic banking operations on the operations efficiency aspect; particularly, both the cost and profit efficiencies of the Islamic banks and Islamic windows of commercial banks over 1998-2004 period. A comparison has also been made to examine the efficiency of the Islamic domestic banks and locally incorporated Islamic foreign banks over the same period.

The study discuses the relevant literature reviews in the following section followed by a method section to provide the details in analyzing data. Next section analyzes and interprets the findings. Concluding section follows.

## LITERATURE REVIEW

The concept of production efficiency originated from Cobb and Douglas (1928). The study is premised on the structural relation between inputs and outputs in economic production. Berger and Humphrey (1997) extended the Cobb-Douglas model to the banking sector by focusing mainly on financial sector efficiency. Financial sector efficiency emphasizes that for fostering productivity, there has to be efficient allocations of financial resources. This means that the economy has

the opportunity to shift what it saves from the resources for more productive investments. The economy may also utilize them in future allocations.

There are two efficiency concepts used in banking performance: production efficiency (Farrell, 1957) and X-efficiency (Leibenstein, 1966). Farrell (1957) concentrates on measurement of production efficiency, while Leibenstein (1966) concentrates on explaining why firms might not be achieving maximum efficiency in their productive decisions and behavior. Production efficiency has two (2) components – allocative efficiency and technical efficiency (i.e., the components of economic efficiency). Efficiency is also highly recognized in Islam which needs to be discussed to analyze efficiency concept from the Islamic point of view. Every Muslim businessman should have a strong desire to increase efficiency (reduce cost) to benefit consumers (Affandi, 2002) by realizing the "*maqasid* (the goal of Islam)**".** Incorporated in *maqasid* is everything that is considered necessary to preserve and enrich faith, life, intellect, posterity, and wealth.

Cost and profit efficiency is related to the treatment of deposit by a bank. Heffernan (2005) indicates that deposits may be treated either as inputs or as outputs. However, the use of deposits has been used more as output than input in most bank efficiency studies that apply DEA technique, e.g., Brown and Skully (2004). Favero and Papi (1995) found that their results were not sensitive to re-specifying deposits as an output rather than as an input. Another study analyzed the influence of the choice of the treatment of deposits on efficiency results (Wheelock and Wilson, 1995; Berger et al., 1993b) and concluded that the chosen approach has an impact on the levels of efficiency scores, but does not imply strong modifications in their rankings.

A study performed by Sathye (2001) reveals that there is no comparative advantage accruing to foreign banks. However, more recent studies based on X-efficiency have found that foreign-owned banks in the United States (US) were significantly less efficient than US-owned banks (DeYoung and Nolle, 1996; Mahajan et al., 1996; and Chang et. al., 1998). Foreign-owned banks usually had to trade efficiency (both profit and cost) for rapid expansion of market share. On the other hand, the non-US studies found that foreign banks are more efficient than domestic banks; for instance, Hungarian banks (Hasan and Marton, 2001); and Turkish banks (Zaim, 1995; Isik and Hassan, 2002).

In summary, the bulk of production efficiency studies of banks have been concentrated on the conventional side; as Islam also have high regard for efficiency, studies to assess production efficiency of Islamic banking operators must also be carried out. As conventional methods of analysis will be applied, issues relating to input and output variables have to be accommodated, particularly treatment of deposits as dealt with the operations of Islamic banks. Another aspect which has to be included in the analysis is the performance comparison between domestic and foreign banks. Only then would there be sufficient scope and on level ground to compare findings of conventional and Islamic banks in terms of production efficiency.

## METHODS

This study uses only secondary data comprising financial ratios extracted from the annual reports of banks, Bank Negara Malaysia (BNM) books and serial publications, and other relevant published literature. The panel data sets are constructed using balance sheet and income statement of individual banks' audited year-end financial statements. This study covers the entire population of 14 commercial banks offering Islamic banking operations. They comprise 2 Islamic banks and 12 Islamic window divisions of commercial banks. The population size of this study is quite similar with other studies that employ DEA technique (Oral and Yolalan, 1990; Vassiloglou and Giokas, 1990; Giokas, 1991; Haag and Jaska, 1995; Yeh, 1996; Avkiran, 1999a and 1999b; Katib and Matthews, 1999; Liu and Tripe, 2002; Darrat et al., 2002; Batchelor and Wadud, 2003; Wadud and Yasmeen, 2004). The population size of these studies ranges from 7-20.

### Analytical Technique

In this study, the authors use the variable returns to scale (VRS) DEA model to define the best-practice frontier. The VRS assumption ensures that each bank is only compared to other banks of a similar size when calculating its relative efficiency. Besides technical efficiency, cost efficiency (CE) and profit efficiency (PE) are also measured.

### Cost Efficiency (CE)

The costs of an organization depend on the vector of output *y*, on the vector of the prices of the inputs used *w*, and on the level of inefficiency in costs u. Thus, the cost frontier determines the minimum cost that each firm could attain, given its output vector *y* and the input price vector w, and can be expressed as:

$$C = C(y, w, u) \qquad (1)$$

The cost efficiency for firm *j* ($CE_j$) can be calculated as follows:

$$CE_j = \frac{C_j^*}{C_j} = \frac{\sum_p w_{pj} x_{pj}^*}{\sum_p w_{pj} x_{pj}} \qquad (2)$$

where, $CE_j \leq 1$ represents the ratio between the minimum costs ($C^*_j$) which is associated with the use of the input vector ($x^*_j$) that minimizes costs and the observed costs ($C_j$) for firm j.

**Profit Efficiency**

Profit efficiency relates the profits generated with a specific production vector P to the maximum possible profit associated with that vector as determined by the frontier $P^*$. As the study applies the alternative profit efficiency, instead of taking the price vector as given, it is assumed that the possibility of imperfect competition or market power in the setting of prices exists.

Therefore, the output vector y is taken as given, but not that of output prices r. In this case the 'alternative' profit frontier under examination is:

$$P = P^a (y, w, u) \qquad (3)$$

Alternative profit efficiency is then calculated as follows:

$$APE_j = \frac{P_j}{AP_j^*} = \frac{R_j - \sum_p w_{pj} x_{qj}}{R_j^* - \sum_p w_{pj} x_{qi}^*} \qquad (4)$$

where $APE_j$ represents the ratio between the observed profits ($P_j = R_j - \sum w_{pj - x_{pj}}$) and the maximum profits ($AP_j^* = R_j^* - \sum w_{jp}.x_j^*$) associated with the maximum revenue and the input demand $x_j^*$ that maximize profits for firm j.

For cost efficiency model**,** the labor input is represented by personnel expenses (Yudistira, 2004), deposit input by total deposits, and physical capital input by premises and fixed assets; and input prices (i) price of labor, (ii) price of deposits, and (iii) price of physical capital. Outputs are (i) earning assets (includes loans, advances and financing, and securities and investments), (ii) liquid assets (includes cash and short-term funds, and deposits and placements with financial institutions), and (iii) other income (includes commission, service charges and fees).

For profit efficiency model, the inputs are: (i) personnel expenses, (ii) total deposits, and (iii) premises and fixed assets; and input prices (i) price of labor, (ii) price of deposits, and (iii) price of physical capital. The output for both models is profit before taxation and *zaka[1]t*.

**RESULTS AND DISCUSSION**

The means, standards of deviation of the input and output variables mentioned earlier used in the data envelopment efficiency estimations are

[1]Zakat means grow (in goodness) or 'increase', 'purifying' or 'making pure'. So the act of giving zakat means purifying one's wealth to gain Allah's blessing to make it grow in goodness (Source: http://www.zpub.com/aaa/zakat-def.html]

reported in Appendix A. There are enormous variations among banks in the sample. During the study period, there has been increasing preference among the public for Islamic banking and finance products and services substantiated by the growth in deposits. During the years (1998-2004), total deposits grew by 532 percent. The favorable macroeconomic indicators during the study period have also spurred higher demand for Islamic financial services and fee-based services. This has allowed Islamic banks to record asset growth and to earn higher income. Appendix A reveals that the mean earning assets increased gradually from year to year starting in 1998 to record RM 4 billion in 2004, which is the highest over the 7-year period.

Profit after taxes and *zakat* (Profit) is RM 65.6 million in 2004 compared to RM 10.4 million in 1998. This suggests that net profit swelled by more than 6 times since 1998. The growing influence of fee income on the revenue of banks is seen in the item other Income. Over the seven-year period, Other Income rises by an average of 700 percent over the study period.

**Cost Efficiency Score**

Table 1 summarizes the mean values of banks' efficiency scores of both Islamic banks and Islamic window operations over 1998-2004. The efficiency scores are decomposed into technical efficiency (TE), allocative efficiency (AE) and cost efficiency (CE). The scores reveal consistency in technical efficiency of the Islamic banking operations with an average of 0.695 over the 1998 to 2004 period. This suggests that Islamic banks and Islamic windows have achieved technical efficiency probably through the adoption of newer technology. In contrast, CE scores declined in 2000, 2001 and 2002 to 60 percent level before improving to 70 percent level in 2003, but declining again to 60 percent level in 2004.

**Table 1.** Cost efficiency score

| Year | TE | AE | CE |
|---|---|---|---|
| | | Mean | |
| 1998 | 0.975 | 0.733 | 0.714 |
| 1999 | 0.963 | 0.732 | 0.716 |
| 2000 | 0.977 | 0.632 | 0.620 |
| 2001 | 0.980 | 0.712 | 0.699 |
| 2002 | 0.991 | 0.704 | 0.698 |
| 2003 | 0.946 | 0.757 | 0.720 |
| 2004 | 0.960 | 0.717 | 0.696 |
| Mean | 0.970 | 0.712 | 0.695 |

The overall (pooled) cost efficiency estimate of 69.5 percent suggests that a typical bank wastes around 30 percent of its resources. In other words, a bank on average only employed 70 percent of the inputs to produce the same level of output. Cost inefficiency in the range of 28 percent to 38 percent experienced over the 1998-2004 study period is relatively higher than the world mean inefficiency score of 14 percent (Berger and Humphrey, 1997). This suggests that Islamic banking during the study period is twice as inefficient as a typical conventional bank in the world and the provision of resources to produce one unit of output is still far from the efficiency frontier.

The high cost efficiency score in 1999 (or lower inefficiency of 28 percent for CE and 27 percent for AE) could be due to recapitalization of banks and high non-performing loans (NPLs) clean-up following the aftermath of the 1997-98 Asian financial crisis. These reasons rather than organic expansion leads to lower cost inefficiency score (Wong et al., 2005). Another reason could be that some banks were genuinely operationally efficient. For example, Hong Leong Bank and Southern Bank did not require any NPL purchases by Danaharta (an asset management company set up in the aftermath of the Asian crisis) as of 31 December 1998 (Wong et al., 2005). In addition, capital injections into banking institutions declined from RM 7.5 billion to RM 2.1 billion as at 22 December 2001 showing stronger bank capitalization position (Wong et al., 2005). As a result of the recapitalization effort, lower provisions were charged for loan losses and there were also higher loan recoveries. All these reasons may have contributed to the modest improvement in the cost inefficiency in the 2000s.

However, the lower cost efficiency scores of Islamic banking operations compared to the conventional banks in Western countries could also be due to several reasons. First, the ratio of cost to income for banks increases following increases in both staff costs and overheads. This reflects higher remuneration packages offered to retain expertise in Islamic banking since staff shortage in Islamic banks is a real problem. Banks would have incurred greater costs in order to have greater marketing and promotional activities and higher investment in technology. Some banks might have adopted stricter provisioning and classification policies for non-performing loans to further strengthen their balance sheets.

The third reason for high cost inefficiency is that the banks experienced delay in reaping the benefits from the merger exercise due to the adjustment period, rationalization programs and standardization of operational procedures and new management information system. During this period, risk management departments were created as regulated by Bank Negara Malaysia (BNM). These infrastructural changes contributed to significant increases in operating costs and cost inefficiency.

Another important factor is that the Islamic banks, Islamic windows of local banks and foreign banks operated at smaller scale compared to their overseas or even local conventional counterparts. Thus, cost inefficiencies exist because they were not able to benefit from economies of scale, over the test period. Initial

costs of maintaining the not-fully-utilized smaller operation increases the unit costs of input resources.

The result in cost efficiency highlights that technical efficiency has been the major driver of the overall improvement in cost efficiency. There were fluctuations in the allocative efficiency scores over the test period. Thus, cost minimization is an area that requires more detailed analysis since there is (a) no declining inefficiency trend over time and, (b) two-fold higher costs compared to world average.

**Profit Efficiency Score**

Table 2 reveals that the overall profit efficiency of Islamic banking over the period 1998-2004 is 62.5 percent. This result is comparable to the world standards. On average, profit efficiency is reported to be 64 percent for US banks (Berger and Humphrey, 1997) and 72 percent for Spanish banks (Lozano, 1995). This result indicates that over the study period, Islamic banking operations on average have used 69.5 percent (CE) of the resources to generate 62.5 percent (PE) of profits. This also indicates that 31.5 percent of the resources remain inefficiently used to generate profits. Although there is still a large inefficiencies in terms of generating profit, the Islamic banking operations' profit efficiency score of 62.5 percent is closer to the US banks' profit efficiency (64 percent). Banking industry is a declining industry in the US and it has been shown to be less efficient than banks in more bank-dominant economies, e.g. Spain (Ariff and Can, 2007). However, Islamic banks need to strive to achieve higher profit efficiency.

Further analysis of Table 2 reveals that much of the profit efficiency of Islamic banking operations is derived from technical efficiency (85.3 percent) than allocative efficiency (72.4 percent). Again, it is the adoption of technology over time that is producing gains, not from efficient allocation of resources. This result appears to suggest that the management has been efficient in utilizing information technology and electronic process to improve margins. However, there is still a need to improve further in allocating resources to other sources of income such as fee-based income to generate higher profits.

**Table 2**. Profit efficiency score

| YEAR | TE | AE | PE |
|---|---|---|---|
| | | Mean | |
| 1998 | 0.860 | 0.669 | 0.570 |
| 1999 | 0.852 | 0.850 | 0.742 |
| 2000 | 0.854 | 0.731 | 0.631 |
| 2001 | 0.815 | 0.656 | 0.543 |
| 2002 | 0.770 | 0.723 | 0.552 |
| 2003 | 0.886 | 0.657 | 0.596 |
| 2004 | 0.936 | 0.779 | 0.740 |
| Mean | 0.853 | 0.724 | 0.625 |

Based on average cost efficiency score of 69.5 percent and average profit efficiency score of 62.5 percent, it seems that Islamic banking operations are relatively more efficient at controlling costs than at generating profits. This result is consistent with findings from some of the developed country banking systems (Berger and Mester, 1997; Lozano, 1997; Rogers, 1998; Maudos and Pastor, 2003; and Kasman and Yildirim, 2006). The inefficiency in generating profits could be explained only partly by an acute lack of expertise in Islamic banking and lack of Islamic banking products during the study period. This vacuum of well-qualified personnel in Islamic banking is only recently being addressed by the establishment of Islamic Banking and Finance Institute Malaysia (IBFIM) in 2002 and International Center for Education in Islamic Finance (INCEIF) in 2006. It is envisaged that a pool of Islamic banking professionals would significantly increase a pool of Islamic banking expertise.

The findings also reveals that technical efficiency in contributing to profit of Islamic banks and Islamic windows have moved further from the efficient profit frontier (technical efficiency) in 2000 to 2002. This suggests that the managers of Islamic banking operations, over the study period, are relatively efficient at choosing the appropriate input mix at given prices, but they are less efficient at utilizing all factor inputs. However, in the case of allocative efficiency, the scores exhibit a fluctuating trend over the 1998-2004 study periods. In contrast, the allocative component (AE) of cost efficiency scores show an improvement moving from 0.632 in 2000 to 0.712 in 2001 and remains at 70 percent range over the next three years from 2002 to 2004.

This pattern has an important implication for revenue efficiency. It implies that Islamic banking operators achieved high efficiency in managing costs and expenses, but are not as efficient in utilizing the inputs and resources to generate higher profit. Another implication from this result is that Islamic banking operations should make sure that the outputs (such as financing and other earning assets) are good quality assets. Hence, additional revenues could be generated from lower provision for financing loan losses and better loan recoveries. Islamic windows display consistency in the trend compared to Islamic banks.

Table 3 reports cost efficiency and profit efficiency scores of individual bank of the sample of Islamic banking operations. Apart from Bank Islam, Arab Malaysian Bank shows cost efficiency score of 1.00. Bank Islam achieved full overall efficiency measure (sourced from full TE and full AE) throughout the period of study. This is probably due to the position of Bank Islam as a full-fledged Islamic bank and has enjoyed monopolistic position and market power over the last 24 years.

Despite the constraint on size and branches, two foreign banks (such as OCBC and HSBC) achieved high cost efficiency and outperformed some of the domestic banks (i.e., Hong Leong, Public Bank, Southern Bank, Alliance Bank). These two banks have moved closer to the efficient cost frontier in terms of technical efficiency. However, they appear to be using the inputs in less optimal proportions probably due to the branch network and Islamic customer base constraints. Foreign banks are also more cost efficient than domestic banks

because their involvement in wholesale banking put them in the better position to offer competitive pricing on their banking products. However, in terms of profit efficiency, OCBC and HSBC have not been able to transform their cost efficiency into higher profits.

**Table 3.** Average cost and profit efficiency score of individual bank

| Model : Cost Efficiency | | | | Model : Profit Efficiency | | | |
|---|---|---|---|---|---|---|---|
| BANK | TE | AE | CE | BANK | TE | AE | PE |
| AFFIN | 1.000 | 0.688 | 0.688 | AFFIN | 0.828 | 0.675 | 0.565 |
| AM BANK | 1.000 | 1.000 | 1.000 | AM BANK | 1.000 | 0.961 | 0.961 |
| EON BANK | 0.991 | 0.834 | 0.828 | EON BANK | 0.853 | 0.967 | 0.829 |
| HONG LEONG | 1.000 | 0.581 | 0.581 | HONG LEONG | 0.953 | 0.580 | 0.545 |
| MAYBANK | 1.000 | 0.711 | 0.711 | MAYBANK | 1.000 | 0.840 | 0.840 |
| OCBC | 0.599 | 0.661 | 0.909 | OCBC | 0.752 | 0.661 | 0.477 |
| PUBLIC | 0.927 | 0.506 | 0.477 | PUBLIC | 0.817 | 0.496 | 0.357 |
| SOUTHERN | 0.904 | 0.575 | 0.508 | SOUTHERN | 0.714 | 0.675 | 0.466 |
| STD CHARTD | 1.000 | 0.749 | 0.748 | STD CHARTD | 0.965 | 0.792 | 0.765 |
| BANK ISLAM | 1.000 | 1.000 | 1.000 | BANK ISLAM | 0.966 | 0.831 | 0.824 |
| RHB | 0.958 | 0.515 | 0.496 | RHB | 0.663 | 0.585 | 0.366 |
| ALLIANCE | 0.799 | 0.581 | 0.536 | ALLIANCE | 0.921 | 0.804 | 0.625 |
| MUAMALAT | 0.702 | 0.709 | 0.697 | MUAMALAT | 0.221 | 0.583 | 0.614 |
| HSBC | 0.715 | 0.389 | 0.345 | HSBC | 0.901 | 0.433 | 0.391 |

On the profit efficiency side (Table 3), Arab Malaysian Bank recorded profit efficiency score of 0.961. This is the highest profit efficiency score. Malayan Banking secured the second highest profit efficiency with 0.84 score followed by Bank Islam (0.824). The profit efficiency scores of these banks are largely attributed by high efficiency in input to output utilization. This means that the profit inefficiency is in allocative efficiency.

**Technical and Scale Efficiency Score**

Managerial practices and the scale or size of operations affect technical efficiency, which is based on engineering relationships but not on prices and costs. That is why, the study has pure technical efficiency (PTE) measure that avoids the confounding effect on TE.

The results on Table 4 reveals that the pooled means for technical efficiency (TE), pure technical efficiency (PTE), and scale efficiency (SE) scores of the Islamic banking operations for the 1998-2004 study period are 93 percent, 97 percent, and 97 percent, respectively. Hence, the average technical efficiency of the Malaysian Islamic banking operations for the 1998-2004 periods is 93 percent. This is indeed favorable when US banks' average X-efficiencies is in the 50-90+ percent. A more direct comparison would be with Berg and Kim (1991) and Chu

and Lim (1998) in their study of Norwegian banks (81 percent) and Singaporean banks (95 percent), respectively.

**Table 4.** Technical and scale efficiency score

| Year | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | Mean |
|---|---|---|---|---|---|---|---|---|
| | 94.0 | 95.8 | 97.2 | 90.1 | 99.0 | 89.3 | 88.5 | 93.46 |
| TE | 62.8 | 74.6 | 60.6 | 44.0 | 37.7 | 60.2 | 63.0 | 57.56 |
| | 97.5 | 96.3 | 97.7 | 98.0 | 99.1 | 90.3 | 97.4 | 96.61 |
| PTE | 80.9 | 80.9 | 76.5 | 69.5 | 72.4 | 86.4 | 81.9 | 78.36 |
| | 96.3 | 99.3 | 99.6 | 91.8 | 99.9 | 98.8 | 90.8 | 96.64 |
| SE | 72.2 | 88.5 | 74.0 | 60.7 | 53.2 | 69.1 | 75.6 | 70.47 |

*First and second row of each type of efficiency reveals cost model and profit model respectively

These results suggest the attribution of PTE is equal to the attribution of SE as the source of overall TE. From this, it can be said that technical inefficiency is equally driven by scale-related problems and inappropriate scale of operations and underutilization or wasting of inputs. The mean TE (90.1 percent), PTE (98 percent) and SE (91.8 percent) in 2001 declined slightly from 2000 (TE (97.2 percent), PTE (97.7 percent), SE (99.6 percent) perhaps due to challenging economic conditions driven by global events that affected Malaysian national economy. For example, the much hope for the US economic turnaround in 2001 did not occur. The year 2001 also saw the completion of the consolidation program for domestic banking and financial institutions which began in July 1999 in Malaysia. This implies that the banking sector has not fully reaped the benefits of economies of scale resulting from the merger during the study period. Nevertheless, the scores of TE, PTE and SE improved in 2002 and it appears that the average PTE is close to the average SE for many of the years (e.g., 99.1 percent versus 99.9 percent in 2002).

The statistics result also indicates that many of the Islamic banking operators are operating at either at constant returns to scale (CRTS) or at increasing returns to scale (IRS). This result appears to suggest that the managers of the Islamic banking operations are relatively good at utilizing all factor inputs and taking advantage of decreased cost from IRS operations before and after the consolidation exercise. Generally, the sources of economies of scale such as technical economies; marketing economies; financial economies; and risk-bearing economies arise from large size (Harrison et al., 1992).

Berger et al. (1993a) find that profit inefficiency appears to be a bigger problem for US banks than cost inefficiency. This is also a relatively newer area of research and existing studies all use parametric methods rather than the non-parametric techniques. Table 4 shows that the average scale efficiency (profit) of the Islamic banking operations is 71 percent, which is close to 78 percent PTE score. In other words, the Islamic banking operations appear to have almost similar PTE and SE scores. Hence, the result suggests that throughout the entire period of study 1998-2004, inefficiency (profit) arises more from wrong scale of

operations than from inefficient production of profits. This conclusion is not consistent with Berger et al. (1993a) and Chu and Lim (1998).

Berger et al. (1993a) and Chu and Lim (1998) find that it is not excessive costs (i.e., technical inefficiency) or allocative inefficiency (i.e., plans that do not maximize profits); or the usual result from cost function studies that cause large banks to suffer slight scale diseconomies (scale inefficiency), but rather technical inefficiencies can be present for any or all inputs and outputs. For example, an output technical inefficiency may occur if a bank is ineffective at processing a certain type of loan and it makes fewer of these loans than would a technically competent bank that had the same goals. An input technical inefficiency occurs when management is poor at labor supervision and has to hire more workers than are technically necessary to produce the desired output levels. The results are also different from efficiency (cost) findings in that larger banks appear to be substantially more efficient than smaller banks.

**Efficiency of Domestic and Foreign Banks**

Table 5 and 6 compare the mean cost and profit efficiencies of foreign banks and domestic banks over the 1998-2004 period of study. Both of the tables reveal that, on average, domestic banks are slightly more efficient than foreign banks. This finding is consistent with the results obtained by Avkiran (1997) and Sathye (2001), both for Australian banks. Overall results indicate that cost and profit efficiency scores of Islamic foreign banks are close to the cost and profit efficiency scores of domestic Islamic banks and Islamic windows.

**Table 5**. Cost efficiency score of domestic (Dom-Bnks) and foreign (For-Bnks) banks

| Year | CE | AE | TE | PTE | SE |
|---|---|---|---|---|---|
| DOM-BNKS (Pooled) | 0.708 | 0.725 | 0.939 | 0.970 | 0.966 |
| 1998 | 0.742 | 0.743 | 0.966 | 1.000 | 0.966 |
| 1999 | 0.733 | 0.747 | 0.965 | 0.966 | 0.999 |
| 2000 | 0.654 | 0.666 | 0.972 | 0.977 | 0.995 |
| 2001 | 0.696 | 0.713 | 0.972 | 0.977 | 0.939 |
| 2002 | 0.709 | 0.712 | 0.986 | 0.995 | 0.999 |
| 2003 | 0.721 | 0.764 | 0.911 | 0.920 | 0.963 |
| 2004 | 0.704 | 0.731 | 0.860 | 0.958 | 0.903 |
| FOR-BNKS (pooled) | 0.636 | 0.664 | 0.915 | 0.957 | 0.958 |
| 1998 | 0.570 | 0.688 | 0.811 | 0.850 | 0.944 |
| 1999 | 0.629 | 0.659 | 0.916 | 0.948 | 0.964 |
| 2000 | 0.506 | 0.519 | 0.973 | 0.974 | 0.999 |
| 2001 | 0.709 | 0.709 | 0.841 | 1.000 | 0.841 |
| 2002 | 0.656 | 0.675 | 0.973 | 0.974 | 0.999 |
| 2003 | 0.716 | 0.730 | 0.949 | 0.973 | 0.974 |
| 2004 | 0.668 | 0.668 | 0.945 | 0.978 | 0.985 |

On the comparison between Islamic banks and Islamic windows, the results show that the former generally perform better in terms of cost (or profit), technical, allocative and scale efficiency as they dominate the Islamic financial scene due to their long establishment (particularly for BIMB), full support from the government and public confidence.

**Table 6**. Profit efficiency score of domestic (Dom-Bnks) and foreign (For-Bnks) banks

| Year | PE | AEP | TEP | PTEP | SEP |
|---|---|---|---|---|---|
| DOM-BNKS (Pooled) | 0.737 | 0.737 | 0.851 | 0.842 | 0.775 |
| 1998 | 0.572 | 0.640 | 0.894 | 0.856 | 0.705 |
| 1999 | 0.756 | 0.840 | 0.870 | 0.794 | 0.831 |
| 2000 | 0.651 | 0.770 | 0.828 | 0.828 | 0.797 |
| 2001 | 0.553 | 0.689 | 0.778 | 0.809 | 0.795 |
| 2002 | 0.552 | 0.760 | 0.729 | 0.753 | 0.792 |
| 2003 | 0.639 | 0.680 | 0.929 | 0.929 | 0.788 |
| 2004 | 0.735 | 0.779 | 0.926 | 0.925 | 0.718 |
| FOR-BNKS (pooled) | 0.579 | 0.685 | 0.852 | 0.804 | 0.722 |
| 1998 | 0.561 | 0.815 | 0.691 | 0.691 | 0.673 |
| 1999 | 0.670 | 0.902 | 0.762 | 0.762 | 0.925 |
| 2000 | 0.562 | 0.604 | 0.941 | 0.941 | 0.871 |
| 2001 | 0.508 | 0.533 | 0.948 | 0.948 | 0.416 |
| 2002 | 0.553 | 0.588 | 0.920 | 0.539 | 0.539 |
| 2003 | 0.438 | 0.573 | 0.728 | 0.773 | 0.773 |
| 2004 | 0.760 | 0.780 | 0.976 | 0.976 | 0.859 |

## CONCLUSION

The study shows that the overall cost efficiency (CE) estimate is 0.695. Although this score is within the range of scores found in other overseas studies, such as 55 percent in the UK, it is far from satisfactory level since it suggests that an Islamic bank wastes around 30.5 percent of its inputs relative to the best-practice bank (CE = 1.00 is full efficiency). The 0.695 score is also lower than CE of banks in bank-dominant economies such as Spain (0.909), 0.95 in France and CE of Malaysian conventional banks (0.942 over 1989-1996 period of study). However, this score is comparable to another Malaysian study of 0.698 for Islamic banks and 0.72 for conventional banks over 1993-2000 period of study. This suggests that Islamic banks in Malaysia did not improve much in their cost efficiency since 2004.

Notwithstanding the effects of slacks in the operations, the difference of about 0.30 indicates some inefficiency in inputs mobilization to produce greater outputs. The profit efficiency (PE) score for the sample of banks is 0.62. This finding supports 0.64 score achieved by US banks and 0.52 by Spanish commercial banks. The PE score of 0.62 indicates that on average, Islamic banks and Islamic

windows just earn half of the profits that the best-practice bank could make under the same conditions.

Hence, both the cost efficiency score (0.695) and profit efficiency score (0.625) show that there exists about 30–37 percent inefficiencies in the operations of Islamic banks over the test period both in terms of managing their inputs relative to their outputs. Except for Bank Islam Malaysia Berhad (BIMB) which has been in operations for 20 years, the Islamic windows and foreign bank Islamic windows are only 5 years in operation. The authors believe that being new in the Islamic banking operations, Malaysian interest-free banking need to catch up on how to manage their inputs-output based on *Syariah* principles efficiently.

The findings also show that the overall cost efficiency estimate of domestic banks is 0.708, which is higher than the overall cost efficiency estimate of foreign banks of 0.636. The main contributor for cost efficiency of domestic banks comes from pure technical efficiency (0.970). On the other hand, the cost efficiency for foreign banks is derived from scale efficiency (0.958). In terms of overall profit efficiency, the domestic Islamic banks recorded 0.737 compared to 0.579 achieved by foreign banks. Both domestic and foreign banks however show similar results in terms of technical efficiency of 0.851 and 0.852 respectively. Comparison of the efficiency performance between domestic and foreign Islamic bank operations is a fresh finding. Nonetheless, the results imply that local Islamic banks now ought to embark on more effective ways of achieving higher efficiency in the presence of close competition pose by their stronger foreign counterparts.

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# Appendix A

## Descriptive statistics of inputs and outputs of Islamic banking operations

| Year | Parameter | Earning assets | Liquid assets | Other income | Profit | Total deposits | Net fixed assets | Personnel costs | Price of deposits | Price of physical capital | Price of labor |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1998** | Min | 19166.0000 | 176.00 | 2.00 | 54.00 | 24289.00 | 39942.00 | 14.00 | 0.012 | 0.154 | 0.000 |
| | Max | 3858344.00 | 549229.00 | 8926.00 | 40960.00 | 3820584.00 | 530047.00 | 49261.00 | 0.113 | 0.521 | 0.010 |
| | Mean | 668421.00 | 96031.17 | 1471.67 | 10427.42 | 669029.58 | 178510.90 | 4785.25 | 0.042 | 0.344 | 0.004 |
| | Std Dev | 1120116.40 | 172646.54 | 2577.09 | 11843.54 | 1105108.56 | 173138.30 | 14029.09 | 0.027 | 0.112 | 0.004 |
| **1999** | Min | 99959.00 | 906.00 | 12.00 | 21.00 | 86279.00 | 33982.00 | 96.00 | 0.012 | 0.133 | 0.000 |
| | Max | 4629175.00 | 1583808.00 | 9773.00 | 57684.00 | 5712089.00 | 532223.00 | 53484.00 | 0.054 | 0.617 | 0.010 |
| | Mean | 972400.75 | 467847.42 | 1656.25 | 16052.58 | 1352389.33 | 206813.00 | 5144.75 | 0.032 | 0.318 | 0.002 |
| | Std Dev | 1301509.87 | 549983.33 | 2774.59 | 19594.73 | 1691831.35 | 187948.40 | 15246.68 | 0.011 | 0.160 | 0.003 |
| **2000** | Min | 57148.00 | 600.00 | 14.00 | 1336.00 | 44046.00 | 25806.00 | 21.00 | 0.013 | 0.128 | 0.000 |
| | Max | 5805064.00 | 2185334.00 | 20848.00 | 64178.00 | 7350497.00 | 542615.00 | 58567.00 | 0.039 | 0.784 | 0.007 |
| | Mean | 1417719.77 | 506217.92 | 3656.62 | 14093.69 | 1798111.15 | 220045.40 | 8551.54 | 0.025 | 0.361 | 0.003 |
| | Std Dev | 1661614.09 | 645470.97 | 6172.56 | 18952.35 | 2156991.69 | 190405.00 | 17800.78 | 0.007 | 0.233 | 0.003 |
| **2001** | Min | 115834.00 | 12608.00 | 79.00 | 2426.00 | 79679.00 | 22402.00 | 389.00 | 0.010 | 0.150 | 0.000 |
| | Max | 7045348.00 | 2824551.00 | 30184.00 | 132129.00 | 9027099.00 | 575063.00 | 72398.00 | 0.057 | 0.822 | 0.010 |
| | Mean | 2026085.29 | 617064.07 | 5754.07 | 28028.07 | 2301452.79 | 227708.10 | 10980.43 | 0.027 | 0.365 | 0.003 |
| | Std Dev | 2286116.81 | 805343.87 | 9846.89 | 33877.93 | 273904.57 | 182828.20 | 22951.67 | 0.011 | 0.195 | 0.003 |
| **2002** | Min | 81977.00 | 103.00 | 370.00 | 2430.00 | 62266.00 | 36116.00 | 457.00 | 0.015 | 0.109 | 0.000 |
| | Max | 8902039.00 | 2712173.00 | 27894.00 | 109629.00 | 10929881.00 | 976797.00 | 75172.00 | 0.040 | 0.741 | 0.012 |
| | Mean | 2489495.64 | 699028.71 | 6587.71 | 29664.00 | 3034557.71 | 279148.00 | 12379.79 | 0.026 | 0.325 | 0.003 |
| | Std Dev | 2951290.50 | 841995.23 | 10306.65 | 29681.21 | 3477099.60 | 257330.90 | 23486.32 | 0.007 | 0.190 | 0.003 |
| **2003** | Min | 91823.00 | 15291.00 | 315.00 | 90.00 | 149331.00 | 33479.00 | 433.00 | 0.011 | 0.111 | 0.000 |
| | Max | 11986798.00 | 2329599.00 | 35299.00 | 139431.00 | 12397134.00 | 1419973.00 | 88137.00 | 0.037 | 1012.00 | 0.009 |
| | Mean | 3249707.29 | 610127.57 | 8830.29 | 42148.21 | 3411841.43 | 311713.90 | 14101.14 | 0.023 | 0.375 | 0.003 |
| | Std Dev | 3755513.97 | 812661.43 | 12510.18 | 39956.52 | 3828343.04 | 360932.60 | 26695.31 | 0.007 | 0.267 | 0.003 |
| **2004** | Min | 888707.00 | 38958.00 | 428.00 | 181.00 | 627564.00 | 32241.00 | 1100.00 | 0.007 | 0.137 | 0.000 |
| | Max | 14233161.00 | 3214543.00 | 41943.00 | 141247.00 | 13958356.00 | 1036638.00 | 93865.00 | 0.034 | 0.864 | 0.008 |
| | Mean | 4022094.79 | 755949.14 | 11776.21 | 65584.00 | 4228731.50 | 274341.90 | 16117.21 | 0.021 | 0.387 | 0.002 |
| | Std Dev | 4061796.56 | 1020079.02 | 14593.95 | 45727.38 | 4280172.85 | 271278.30 | 28328.26 | 0.008 | 0.238 | 0.002 |
| | Min | 19166.00 | 103.00 | 2.00 | 21.00 | 24289.00 | 22402.00 | 14.00 | 0.007 | 0.109 | 0.000 |
| | Max | 14233161.00 | 3214543.00 | 41943.00 | 141247.00 | 13958356.00 | 1419973.00 | 93865.00 | 0.113 | 1,012 | 0.012 |
| | Mean | 2184339.57 | 547287.62 | 5874.70 | 30289.44 | 2465641.29 | 245002.60 | 10542.26 | 0.028 | 0.354 | 0.003 |
| | Std Dev | 2878397.57 | 751896.56 | 9992.98 | 35270.60 | 3135576.18 | 239394.80 | 21794.84 | 0.014 | 0.202 | 0.003 |
| | N | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 |