

Determinants of Revenue Efficiency in the Malaysian Islamic Banking Sector

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ABSTRACT. This paper provides new empirical evidence on the revenue efficiency in the Malaysian Islamic banking sector during the period 2006 to 2010. We also examine the internal and external factors influencing the revenue efficiency of the Islamic banks. The sample comprised of 17 domestic and foreign Islamic banks. We employ the Data Envelopment Analysis (DEA) method to compute the revenue efficiency levels. The results indicate that the domestic Islamic banks have exhibited lower revenue efficiency levels compared to their foreign bank peers. We find that capitalization, market power, and liquidity have positive and significant relationships with Malaysian Islamic banks' revenue efficiency. The results indicate that the impacts are not uniform across Islamic banks of different ownership forms.

Keywords: Islamic Banks; Revenue Efficiency; Data Envelopment Analysis; Panel Regression Analysis; Malaysia.

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1. INTRODUCTION

The Islamic banking system (IBS) is defined as a banking system of which principles underlying its operations and activities are founded on Islamic or *Syariah* principles. This means that all operations of an Islamic bank, that is, transactions involving either deposits or financing, must be based on *Syariah* principles. Such principles also cover other banking transactions such as money order transaction, letter of guarantee, letter of credit, foreign exchange, etc. The main factor that distinguishes Islamic banks from their conventional bank peers is that transactions are administered without involving elements of *Riba'*. *Riba'* is prohibited in Islam and is acknowledged by all Muslims. The prohibition of *Riba'* is clearly mentioned in the Quran, the Muslim's holy book and the traditions of Prophet Muhammad (*Sunnah*).

It is commonly agreed that *Riba'* means an increase or growth. Some insist it is the increase imposed on the debtor at the maturity of the debt in case debtor fails to pay it and want to roll it over. Most scholars believe that it covers the interest stipulated at the time of the contract in case of loans as well as the subsequent increase in the case that the loan or the debt arising from sale on credit is rolled over because the debtor does not pay it at the time stipulated in the contract (Badawi, 1964). Technically it denotes in a loan transaction, any increase or premium advantage obtained by the lender as a condition of the loan. In essence, the business management of Islamic banks is governed by the concept of justice and fairness of societies' interests a whole.

Despite its humble beginning, Islamic banks have blossomed throughout the world. The Islamic banking system has become the most competitive to the conventional banking systems. At present, Islamic banks have presence in more than 75 countries, from Malaysia to Bahrain to Europe and the U.S. International Monetary Fund (2005) reported that the number of Islamic financial institutions has quadrupled to more than 300 institutions over the past three decades. Total assets of Islamic financial institutions are estimated to be US\$250 billion and are estimated to be increasing at about 15 percent rate per year, three times the rate for conventional banks. According to Ghafour (2006), the size of the world Islamic banking industry assets is estimated to have grown in excess of \$265 billion from merely hundreds of thousands of dollars in the 1970s.

Given the rapid development of the Islamic banking sector, it is reasonable to expect that the performance of Islamic banks has become the center of attention among Islamic bank managers, stakeholders, policymakers, and regulators. Berger and Humphrey (1997) point out that studies focusing on the efficiency of financial institutions have become an important part of banking literature since the early 1990s. Furthermore, Berger *et al.* (1993) suggests that

if banks are efficient, they could expect improved profitability, better prices and service quality for consumers, and that greater amounts of funds would be intermediated.

However, little attention has been given on the efficiency of its operations. Within the context of the Malaysian Islamic banking sector, Sufian (2007) examines the efficiency of the domestic compared to the foreign Islamic banks. Sufian and Haron (2008) provide an assessment on the total factor productivity change in the Malaysia Islamic banking sector. On the other hand, empirical examination covering all three efficiency concepts namely cost, revenue, and profit efficiency is completely missing from the literature.

This paper investigates whether the environment and internal factors determines the revenue efficiency of Islamic banks operating in the Malaysia. For that purpose, we employ the non-parametric Data Envelopment Analysis (DEA) method to analyze the cost, revenue, and profit efficiencies of the universe of Malaysian Islamic banks over the period of 2006 to 2010. The preferred method allows us to distinguish between three different types of efficiency, namely cost, revenue, and profit efficiencies. Furthermore, we perform a series of parametric (*t*-test) and non-parametric (Mann-Whitney [Wilcoxon] and Kruskal-Wallis) tests to examine whether the domestic and foreign Islamic banks are drawn from the same population. Finally, we employ a panel regression analysis framework to analyze the determinants of revenue efficiency Islamic banks in the sample.

The article begins with a brief overview of the Malaysian Islamic banking sector. This is followed by section 3, where we provide a review of related studies. Section 4 discusses on the methods employed in the study and variables employed in the panel regression analysis. We present the empirical findings in section 5. The article concludes and provides discussions on the policy implications in section 5.

2. ISLAMIC BANKING IN MALAYSIA

As with other Muslim countries, Malaysia was affected by the Islamic resurgence movement among the intellectuals especially around the 1970s. There were calls from individuals and certain groups and agencies for the government to establish Islamic banks to cater to the needs of Muslims in Malaysia. During the Bumiputra Economic Congress in 1980, a resolution which required the government to allow the Pilgrimage Board (known as Lembaga Tabung Haji) to establish an Islamic bank for the purpose of collection and investing money owned by Muslims was passed. In 1981 at the National Seminar, government was urged to promulgate a special law which

would allow the establishment of banks and financial bodies whose operations would be based on Islamic principles (Haron and Azmi, 2009).

In line with these requests, the government appointed a National Steering Committee on Islamic Banking on 30 July 1981 chaired by Tan Sri Raja Mohar Raja Badiozaman. The secretarial functions were entrusted to the Pilgrimage Board. This committee studied the operations of Faisal Islamic Bank of Egypt and Faisal Islamic Bank of Sudan when preparing its report (Connors, 1988). The final report was submitted to the government on 5 July 1982 and the following recommendations were made by the committee:

i. An Islamic bank whose operations are in accordance with the *Syariah* principles should be established;

ii. The Islamic bank shall be incorporated as a company under the auspices of the Companies Act 1965;

iii. Since the Banking Act of 1973 is not applicable for the operations of Islamic banks, a new banking act, Islamic Banking Act 1982, must be introduced to license and supervise Islamic banks. The supervision and administration of this new Act shall be the responsibility of the Central Bank of Malaysia; and

iv. Islamic banks shall establish their own *Syariah* Supervisory Board whose function is to ensure that the operations of Islamic bank are in accordance with *Syariah* law.

Source: Bank Islam Malaysia Berhad (BIMB) 1984.

In order to pave the way for the establishment of Islamic banks, the Islamic Banking Act 1983 was gazetted and came into effect on 7 April 1983. This Act outlines the rules which must be conformed to by Islamic banks that wish to operate in Malaysia, as well as the powers of the Central Bank of Malaysia in supervising and regulating Islamic banks in Malaysia. At the same time, the government also passed the Government Investment Act 1983 to empower the government to issue Government Investment Certificates based on *Syariah* principles (Haron and Azmi, 2009).

The legal basis for the establishment of Islamic banks was the Islamic Banking Act (IBA) which came into effect on 7 April 1983. The IBA provides Malaysian banking authority, BNM (Bank Negara Malaysia) with powers to supervise and regulate Islamic banks, similar to the case of other licensed banks. The Government Investment Act 1983 was also enacted at the same time to empower the Government of Malaysia to issue Government Investment Issue (GII), which are government securities issued based on *Syariah* principles. As

the GII are regarded as liquid assets, the Islamic banks could invest in the GII to meet the prescribed liquidity requirements as well as to invest their surplus funds (Haron and Azmi, 2009).

The first Islamic bank established in the country was Bank Islam Malaysia Berhad (BIMB) which commenced operations on 1 July 1983. In line with its objectives, the banking activities of the bank are based on *Syariah* principles. After more than a decade in operations, BIMB has proved to be a viable banking institution with its activity expanding rapidly throughout the country with a network of 80 branches and 1,200 employees. The bank was listed on the Main Board of the Kuala Lumpur Stock Exchange on 17 January 1992 (Haron and Azmi, 2009).

In Malaysia, separate Islamic legislation and banking regulations exist side-by-side with those of the conventional banking system (Ling, 2009). The BNM introduced the 'Interest-Free Banking Scheme' in March 1993 that initiated the concept of Islamic window that allowed the existing conventional banks to produce the Islamic products and services. The IBS was established in 1999 that included the interest-free banking system and full-fledged Islamic banks involved in operating Islamic financial products and services. This dual banking system provides an interesting ground to investigate the efficiency of domestic and foreign banks.

On 1 October 1999, the second Islamic bank, namely Bank Muamalat Malaysia Berhad (BMMB) commenced operations. The vision of Bank Muamalat Malaysia Berhad is to be a strong, progressive, and modern Islamic bank offering innovative, quality and competitive products and services. Their mission is to build the bank into a modern, dynamic, and strong Islamic bank providing a viable alternative to the conventional system and contribute to the development of modern Malaysia. The establishment of BMMB was the effect of the spin-off following the merger between Bank Bumiputra Malaysia Berhad (BBMB) and Bank of Commerce (Malaysia) Berhad (BOCB). Under the merger arrangement, the Islamic banking assets and liabilities of BBMB, BOCB, and BBMB Kewangan Berhad (BBMBK) were transferred to BMMB, while the conventional operations of BBMB, BOCB, and BBMBK were transferred to BOCB accordingly. In addition, BMMB was given 40 branches of BBMB and BBMBK in various locations throughout Malaysia and a staff workforce of 1,000, migrated from BBMB, BOCB, and BBMBK (Overview of Islamic Banking).

During the year 2000, there were 2 full-fledged Islamic banks and 17 commercial banks offering Islamic window. Meanwhile there were 11 full-

fledged Islamic banks, 8 commercial banks offering Islamic window, 4 Islamic investment banks and 5 development institutions offering Islamic banking products and services in July 2007. The liberalization in Malaysia had increased the number of Malaysia Islamic bank participation and attracted the foreign banks to open their operation in Malaysia which were Kuwait Finance House, Al-Rajhi Banking & Investment, and Islamic Financial Consortium. The existing foreign banks also were also participating in IBS namely OCBC Bank Malaysia Berhad, Standard Chartered Bank Malaysia, and HSBC Bank Malaysia Berhad. The concept of Islamic banking subsidiary was also introduced by BNM to Hong Leong Islam Bank Berhad, RHB Islamic Bank, and Commerce Tijari Bank Berhad in order to be more comprehensive.

The Malaysian Islamic banking sector is currently (year of 2011) represented by 17 Islamic banking institutions comprised of 11 domestic and six foreign full-fledged Islamic banks. These Islamic banking institutions offer a comprehensive and broad range of Islamic financial products and services ranging from saving, current and investment deposit products to financing products such as property financing, working capital financing, project financing, plant and machinery financing, etc (Sufian, 2007).

As at end-2010, assets that comply with Islam's ban on interest increased to RM350.8 billion (\$116 billion) and accounted for 21 percent of the total banking system reported by BNM 2010 annual report. In term of profitability, Islamic banking institutions registered a steady and sustained income, thereby improving returns on assets and equity. The total income year-on-year of the banks increased from RM9.71 billion in 2009 to RM11.80 billion at December 2010. Similarly, net income (profit) increased from RM6.10 billion in 2009 to RM6.84 billion at end 2010.

3. LITERATURE REVIEW

Despite considerable developments in the Islamic banking sector, there have been very limited studies done focusing on the efficiency of Islamic banks. So far, there are a fair number of researches that studied banking efficiency in less developed countries (Bader *et al.* 2008). There are some documented studies that compare the performance of Islamic banks with their conventional counterparts. Nevertheless, those studies focus more on the profitability with the help of financial ratios and constrained by the time span and the number of Islamic banks (Samad and Hassan, 1999; Iqbal, 2001). The previous studies mostly concentrate on the technical, pure technical and scale efficiency in the Islamic banking sectors (Isik and Hassan, 2002; Hassan and Hussein, 2003; Yudistira, 2004). Despite the significant importance of this area, documented studies that address on cost, revenue and profit efficiency of Islamic banks are limited (Yudistira, 2004; Hassan, 2005; Brown and Skully, 2005).

3.1 Technical, Pure Technical, and Scale Efficiency

The first study that used frontier non-parametric approach (DEA) to assess the efficiency of Islamic banks was conducted by Yudistira (2004). The study discovered new evidence on the performance of 18 Islamic banks over the period 1997-2000 where the Islamic banks suffer slight inefficiencies during the global crisis 1998-1999. Indeed, 1998 and 1999 were the period of turmoil that hit the global economy. The level of inefficiency in 1998 is more attributable to pure technical inefficiency rather than scale inefficiency.

Sufian *et al.* (2008) performs an analysis on the efficiency of Islamic Banks using empirical evidence from the MENA (Middle East and North Africa) and Asian Countries. By using the Data Envelopment Analysis (DEA) method, they estimate three different types of efficiency measures, namely technical, pure technical and scale efficiency. The result shows that PTIE outweighs SIE in the Islamic bank. Although the Islamic banks have been operating at a relatively optimal scale of operations, they were managerially inefficient to exploit their resources to the fullest.

On the other hand, Hassan and Hussein (2003) study the efficiency of the Sudanese banking system during the period of 1992 and 2000. They apply a variety of parametric and non-parametric DEA techniques to a panel of 17 Sudanese banks. They discover that the Sudanese banking system have exhibited 37% allocative efficiency (AE) and 60% technical efficiency (TE), suggesting that the overall cost inefficiency of the Sudanese Islamic banks were mainly due to the technical efficiency (managerially related) rather than allocative efficiency (regulatory).

According to Sufian (2007), the results from the DEA suggest that Malaysian Islamic banks efficiency declined in year 2002 to recover slightly in years 2003 and 2004. The domestic Islamic banks were more efficient compared to the foreign Islamic banks albeit marginally. The source of inefficiency of Malaysian Islamic banks in general has been scale, suggesting that Malaysian Islamic banks have been operating at the wrong scale of operations.

3.2 Cost, Revenue, and Profit Efficiency

There are many studies had conducted the cost and profit efficiency in the conventional banks rather than Islamic banks and discovered that the different levels between cost and profit efficiency are caused by the inefficiency from the revenue side (e.g. Chu and Lim, 1998; Rogers, 1998; Berger and Mester, 2003). Revenue can be defined as how effectively a bank sells its outputs. Maximum

revenue is obtained as a result of producing the output bundle efficiently (Rogers, 1998). In fact, revenue efficiency is decomposed of technical and allocative efficiency which are related to managerial factors and is regularly associated with regulatory factors (Isik and Hassan, 2002). English *et al.* (1993) posits that in order to ascertain revenue efficiency, banks should focus on both technical efficiency (managerial operating on the production possibilities) and allocative efficiency (bank producing the revenue maximizing mix of outputs based on certain regulations).

Another way to improve the revenue efficiency proposed by several studies is for banks to produce higher quality services and charge higher prices and struggle to avoid any improper choice of inputs and outputs quantities and mispricing of outputs (Rogers, 1998). The revenue inefficiency could be well identified via the profit function because this function combines both the cost and revenue efficiency to evaluate the profit efficiency (Akhavein *et al.* 1997). The revenue efficiency would totally affect the efficiency of the profit even though the cost efficiency is high. In essence, the revenue efficiency would be the major factor that influences the efficiency on the profit efficiency. Berger and Humphrey (1997), Akhavein *et al.* (1997), and Bader *et al.* (2008) state that there have been limited studies done on revenue efficiency of banks. If these studies are narrowed down into the revenue efficiency on the Islamic banks industry, there are more paucity studies that looked into domestic and foreign Islamic banks.

The above literature reveals the following research gaps. First, the majority of these studies have mainly concentrated on the conventional banking sectors of the western and developed countries. Second, empirical evidence on the developing countries, particularly the Islamic banking sector, is scarce. Finally, virtually nothing has been published on the cost, revenue, and profit efficiency and its determinants in the Islamic banking sector. In the light of these knowledge gaps, the present paper seeks to provide new empirical evidence on the cost, revenue, and profit efficiency and its determinants in the Malaysian Islamic banking sector.

4. DATA AND METHODOLOGY

The present study gathers data from all Malaysian Islamic banks from 2006 to 2010. The primary source of financial data is the BankScope database produced by the Bureau van Dijk which provides banks' balance sheets and income statements. Data are analyzed from banks which offer Islamic banking products and services under the Islamic Banking Scheme. We collect data from 17 Islamic banking institutions comprising of 11 domestic and six foreign full-fledged Islamic banks (see Table 1).

Table (1). List of Malaysian Islamic Banks–2006-2010

Domestic		Foreign	
No	Bank	No	Bank
1	Affin Islamic Bank Bhd	1	Al Rajhi Banking & Investment Bhd
2	Alliance Islamic Bank Bhd	2	Asian Finance Bank Bhd
3	AmIslamic Bank Bhd	3	HSBC Amanah Malaysia Bhd
4	Bank Islam Malaysia Bhd	4	Kuwait Finance House (Malaysia) Bhd
5	Bank Muamalat Malaysia Bhd	5	OCBC Al-Amin Bank Bhd
6	CIMB Islamic Bank Bhd	6	Standard Chartered Saadiq Bhd
7	EONCAP Islamic Bank Bhd		
8	Hong Leong Islamic Bank Bhd		
9	Maybank Islamic Bhd		
10	Public Islamic Bank Bhd		
11	RHB Islamic Bank Bhd		

Source: Bank Negara Malaysia and Sufian (2007).

4.1 First Stage: Data Envelopment Analysis

The level of revenue efficiency is measured by using the Data Envelopment Analysis (DEA) method. The DEA method constructs a frontier of the observed input-output ratios by linear programming techniques. The linear substitution is possible between observed input combinations on an isoquant (the same quantity of output is produced while changing the quantities of two or more inputs) that was assumed by the DEA method. Charnes *et al.* (1978) were the first to introduce the term DEA to measure the efficiency of each decision making units (DMUs), obtained as a maximum of a ratio of weighted outputs to weighted inputs. The more the output produced from given inputs the more efficient is the production.

This study employs estimates efficiency under the assumption of variable returns to scale (VRS). The VRS assumption was proposed by Banker, Charnes and Cooper (1984). The BCC model (VRS) extended the CCR model that was proposed by Charnes, Cooper and Rhodes (1978) by relaxing the constant return to scale (CRS) assumption. The resulting BCC model was used to assess the efficiency of DMUs characterized by VRS assumption. The VRS assumption provides the measurement of pure technical efficiency (PTE). PTE measures the efficiency of DMUs without being contaminated by scale effects. Hence, results derived from the VRS assumption provide more reliable information on DMUs efficiency compared to the CRS assumption (Coelli *et al.* 1998).

The revenue, cost, and profit efficiency models are given in Equations (1) – (3) respectively. As can be seen, the revenue, cost, and profit efficiency scores are bounded within the 0 and 1 range.

Frontier Type	Revenue Efficiency (Eq. 1)	Cost Efficiency (Eq. 2)	Profit Efficiency (Eq. 3)
VRS	$\max \sum_{r=1}^s q_r^o \tilde{y}_{ro}$ <p>subject to</p> $\sum_{j=1}^n \lambda_j x_{ij} \leq \tilde{x}_{io} \quad i = 1, 2, \dots, m;$ $\sum_{j=1}^n \lambda_j y_{rj} \geq \tilde{y}_{ro} \quad r = 1, 2, \dots, s;$ $\lambda_j \tilde{y}_{ro} \geq 0$ $\sum_{j=1}^n \lambda_j = 1$	$\min \sum_{i=1}^m p_i^o \tilde{x}_{io}$ <p>subject to</p> $\sum_{j=1}^n \lambda_j x_{ij} \leq \tilde{x}_{io} \quad i = 1, 2, \dots, m;$ $\sum_{j=1}^n \lambda_j y_{rj} \geq y_{ro} \quad r = 1, 2, \dots, s;$ $\lambda_j \tilde{x}_{io} \geq 0$ $\sum_{j=1}^n \lambda_j = 1$	$\max \sum_{r=1}^s q_r^o \tilde{y}_{ro} - \sum_{i=1}^m p_i^o \tilde{x}_{io}$ <p>subject to</p> $\sum_{j=1}^n \lambda_j x_{ij} \leq \tilde{x}_{io} \quad i = 1, 2, \dots, m;$ $\sum_{j=1}^n \lambda_j y_{rj} \geq \tilde{y}_{ro} \quad r = 1, 2, \dots, s;$ $\tilde{x}_{io} \leq x_{io}, \tilde{y}_{ro} \geq y_{ro}$ $\lambda_j \geq 0$ $\sum_{j=1}^n \lambda_j = 1$

Source: Zhu (2009)

where

- s is output observation
- m is input observation
- r is the s^{th} output
- i is the m^{th} input
- q_r^o is the unit price of output r of DMU0 (DMU0 represents one of the n DMUs)
- p_i^o is the unit price of input i of DMU0
- \tilde{y}_{ro} is the r^{th} output that maximize revenue for DMU0
- \tilde{x}_{io} is the i^{th} input that minimize cost for DMU0
- y_{ro} is the r^{th} output for DMU0
- x_{io} is the i^{th} input for DMU0
- n is DMU observation
- j is n^{th} DMU
- λ_j is non-negative scalars
- y_{rj} is the s^{th} output for n^{th} DMU
- x_{ij} is the m^{th} input for n^{th} DMU

By calculating the three efficiency measures (e.g. revenue, cost and profit), we will be able to observe a more robust result for the domestic and foreign in Malaysian Islamic banks over the period under study. However, the present study will give greater emphasize on the revenue efficiency measure compared to the other efficiency measures (e.g. cost and profit).

4.2 The Input and Output Variables in DEA

According to Cooper *et al.* (2002), there is a rule required to be complied with in order to select the number of inputs and outputs. A rough rule of thumb which could provide guidance can be given as:

$$n \geq \max \{m \times s, 3(m+s)\}$$

where:

- n is a number of DMUs.
- m is a number of inputs.
- s is a number of outputs.

Given the underdevelopment of capital markets, the importance of banks as a financial intermediary are more prevalent in developing economies like Malaysia. Therefore, it is reasonable to assume that the efficiency of banks in terms of their intermediation functions is crucial as an effective channel for business funding. In this vein, Jaffry *et al.* (2007) points out that banks play an important economic role in providing financial intermediation by converting deposits into productive investments in developing countries. The banking sector of developing countries have also been shown to perform critical role in the intermediation process by influencing the level of money stock in the economy with their ability to create deposits (Mauri, 1983; Bhatt, 1989; Askari, 1991).

Following Bader *et al.* (2008), Isik and Hassan (2002), and Hassan (2005) among others, the present study employs the intermediation approach which views banks as an intermediary between savers and borrowers (see Sealey and Lindley, 1977). Accordingly, two inputs, two input prices, two outputs, and two output prices variables were chosen. The two input vector variables consist of x_1 : deposits and x_2 : labour. The input prices consist of w_1 : price of deposits and w_2 price of labour. The two output vectors are y_1 : loans and y_2 : income. Meanwhile, two output prices consist of r_1 : price of loans and r_2 : price of investment. The summary of data used to construct the efficiency frontiers are given in Table 2.

Table (2). Descriptive Statistics for Inputs, Inputs Prices, Outputs, and Outputs Prices

Variables	Min	Max	Mean	Std. Dev.
	(RM mil.)	(RM mil.)	(RM mil.)	(RM mil.)
x_1	41.862	35190.400	9018.061	7555.576
x_2	0.600	431.000	49.027	73.043
w_1	0.001	0.045	0.021	0.007
w_2	0.000	2.272	0.043	0.248
y_1	2.408	33410.200	6074.593	5981.695
y_2	1.650	1855.600	472.455	410.672
r_1	0.006	0.666	0.069	0.069
r_2	0.001	15.161	0.474	1.629

Note:

x_1 : Deposits (deposits and short term funding), x_2 : Labour (personnel expenses), w_1 : Price of deposits (total interest expenses/ deposits), w_2 : Price of labour (personnel expenses/ total assets), y_1 : Loans (net loans and interbank lending), y_2 : Income (gross income), r_1 : Price of loans (income on loans and other income/ loans), r_2 : Price of income (other operating income/ income)

4.3 Second Stage: Multivariate Regression Analysis

The next purpose of this study is to identify the potential bank specific and macroeconomic determinants which influence the Malaysian Islamic banking sector's revenue efficiency. To examine the relationship between the revenue efficiency of Malaysian Islamic banks and the explanatory variables, we employ a panel regression analysis defined as follows for observation (bank) i (Coelli *et al.* 1998).

$$y_{it} = \beta x_{it} + \varepsilon_{it} \quad i = 1, \dots, N, \quad (4)$$

where

y_{it} is the efficiency (cost, technical, or allocative as per case) of bank i at time t

x_{it} is the matrix of the explanatory variables (determinant)

β is the vector of coefficients

ε_{it} is a random error term representing statistical noise

i is the observation for bank i

t is the observation for year t

N is a number of observations in the data set

By using the revenue efficiency scores as dependent variable, we extend equation (4) and estimate the following regression model:

$$\begin{aligned} \theta_{jt} = & \alpha_t + \beta_{jt} (LNTA_{jt} + LLRGL_{jt} + ETA_{jt} + BDTD_{jt} + LOANSTA_{jt} + NIETA_{jt} \\ & + LNGDP_{jt} + INFL_{jt} + DD_{jt} + LNTA_{jt} * DD_{jt} + LLRGL_{jt} * DD_{jt} + \\ & + ETA_{jt} * DD_{jt} + BDTD_{jt} * DD_{jt} + LOANSTA_{jt} * DD_{jt} + NIETA_{jt} * DD_{jt} + \\ & + LNGDP_{jt} * DD_{jt} + INFL_{jt} * DD_{jt}) + \varepsilon_{jt} \end{aligned}$$

where

θ_{jt}	Revenue efficiency of the j -th bank in the period t obtained from DEA
LNTA	Log of total assets (size of bank)
LLRGL	Loan loss reserve to gross loan (asset quality)
ETA	Equity to total assets (capitalization)
BDTD	Bank's deposit over total deposit (market power)
LOANSTA	Total loan over total assets (liquidity)
NIETA	Non-interest expense over total assets (management quality)
LNGDP	Log of gross domestic product (gross domestic product)
INFL	Consumer price index (inflation)
DOM_IB	Dummy for domestic Islamic banks
j	Observation for bank j
t	Observation for year t
α	Constant term
β	Vector of coefficients
ε_{jt}	Normally distributed disturbance term

The Generalized Least Square (GLS) is used in this study rather than the Ordinary Least Square (OLS) as method of estimation to estimate the panel data regression formed. The decision is made following Gujarati's (2002) suggestion that GLS may overcome the heteroscedasticity, resulted from utilizing financial data with differences in sizes. Due to the fact that the sample employed in this study consists of small and large banks, differences in sizes of the observations are expected to be observed.

The usual practice of econometrics modelling assumes that error is constant over all time periods and locations due to the existence of homoscedascity. Nevertheless, problems could arise which lead to heteroscedasticity issues as variance of the error term produced from regression tend not to be constant, which is caused by variations of sizes in the observation. Therefore, the estimates of the dependent variable will be less predictable (Gujarati, 2002).

Using OLS estimation will solve the problem since it adopts the minimizing sum of residual squares condition. The OLS allows all errors to receive equal importance no matter how close or how wide the individual error spread is from the sample regression function. On the other hand, GLS minimizes the weighted

sum of residual squares. In GLS estimation, the weight consigned to each error term is relative to its variance of the error term. Error term that comes from a population with large variance of error term will get relatively large weight in minimizing residual sum of squares (RSS). Consequently, if a problem of non-constant error arises, GLS is able to produce estimators in Best Linear Unbiased Estimators (BLUE) version because it accounts for such a problem by assigning appropriate weight to different error terms, which in turn, produces an ideal constant variable (Gujarati, 2002).

We therefore adopt a step-wise regression model to avoid severe multicollinearity problems. Accordingly, 11 regression models are estimated to examine the relationship between Malaysian Islamic banks' revenue efficiency and the potential determinant variables.

4.4 Variables Description Used in the Panel Regression Models

Variable	Description	Note
Bank Specific		
LNTA	Natural logarithm of total assets	A proxy of bank size. This positive coefficient of size indicates positive relationship between size of banks and revenue efficiency where the larger the size of banks, the higher the revenue efficiency. This regression outcome may suggest that the large bank size is able to become more efficient due to the benefits obtained such as increasing in revenue, service quality, and higher leverage from financial capital (Akhavein <i>et al.</i> 1997; Sufian, 2009; Sufian and Habibullah, 2009).
LLRGL	Loan loss reserve over gross loan	Proxy of asset quality. LLRGL is predicted to have a negative coefficient (Sufian, 2009; Sufian and Habibullah, 2009). Kosmidou (2008) showed that the ratio of loan loss reserves to gross loans (LLRGL) indicates how much of the total portfolio has been provided for, but not charged off, and is used as a measure of bank's asset quality. The coefficient is expected to be negative because bad loans (non-performing loans) could reduce the bank's efficiency level. A better quality asset is described as having lower non-performing loans or ratio of LLRGL (Ismail <i>et al.</i> 2009). In this direction, Miller and Noulas (1997) asserted that the greater financial institutions exposure to high risk loans, the higher the accumulation of unpaid loans, and this lowers the profitability. Therefore, the asset quality will be better if the coefficient is lower. A lower coefficient contributes to a higher asset quality which can increase the revenue of the banks.
ETA	Earning over total assets	Proxy of capitalization. This coefficient is expected to be positive (Casu and Girardone, 2004; Athanasoglou <i>et al.</i> 2008; Sufian, 2009). The positive coefficient of capitalization signifies the positive relationship between capitalization and revenue efficiency where the larger the capitalization of the banks, the higher the revenue efficiency. The regression result may show that the well-capitalized banks would increase banks' revenue and profitability due to the lower expected costs of financial distress, lower expected bankruptcy costs, and lower risk of portfolio and such advantages will then be translated into high profitability (Bourke, 1989; Berger, 1995; Angbazo, 1997).
NIETA	Non-interest expense over total assets	Proxy of management quality. NIETA is applied to provide the information on variation in operating costs across the financial system. It reflects employment, total amount of wages and salaries, as well as the cost of running branch office facilities. The lower or higher cost

Variable	Description	Note
		represents a good management quality. Bourke (1989) argued that reduced expenses tend to improve the profitability of the financial institutions. Therefore, a higher ratio of NIETA is assumed to affect performance negatively because efficient banks are expected to operate at lower costs. Moreover, expenses on wages (labour) could be reduced attributed to the usage of the new technologies such as automated teller machines (ATMs) and other automated means of delivering services. Nevertheless, Molyneux and Thornton (1992) showed a contradictory finding in which they observed a positive relationship, suggesting that higher profits earned by banks that are more efficient may be appropriated in the form of higher payroll expenditures paid to more productive human capital. Therefore, the expected coefficient could be negative and may have positive relationship with revenue efficiency. Among studies that employed the similar variables are Berger (1997), Berger and DeYoung (1997), Berger <i>et al.</i> (1999), Athanasoglou <i>et al.</i> (2008), Sufian (2009a), Sufian (2009), and Sufian and Habibullah (2009).
LOANSTA	Total loan over total assets	Proxy of liquidity. Bank loans are assumed to be the main source of revenue and are expected to affect performance positively. Nevertheless, the coefficient could also be negative which indicates a negative relationship between liquidity and revenue efficiency because loan-performance relationship depends significantly on the expected change of the economy. While in a strong economy, only a small percentage of loans will default (lower percentage of unpaid loans). On the other hand, banks may be depressingly affected during a weak economy as borrowers are likely to default on their loans. Preferably, banks should capitalize on favourable economic environments and shield themselves during adverse conditions (Sufian, 2009a; Sufian, 2009; Sufian and Habibullah, 2009).
BDTD	Bank's deposit over total deposit	Proxy of market power. This coefficient is expected to show positive sign (Graeve <i>et al.</i> 2007). In this regard, the positive coefficient of market power shows the positive relationship between market power and revenue efficiency where the larger market power, the higher the revenue efficiency. The regression outcome suggests that the large market power contributes to the high bank concentration and therefore, changes both loan rates and market shares in imperfectly competitive loan markets and this will contribute to the tendency for banks to charge high loan mark-ups (Graeve <i>et al.</i> 2007).
Macroeconomics		
LNGDP	Natural logarithm of gross domestic product	Proxy of gross domestic product. Sufian (2009), Sufian and Chong (2008), and Kosmidou (2008) suggest that the coefficient of the LNGDP is expected to be positive with the bank efficiency which shows that higher LNGDP leads to the higher revenue efficiency.
INFL	Inflation	Flamini <i>et al.</i> (2009) measured the INFL based on the current period of customer prices index (CPI) growth rate. Inflation may have direct effects such as an increase in the price of labour, and indirect effects such as changes in interest rates and asset prices on bank performance (Staikouras and Wood, 2003). Sufian and Chong (2008) suggest that inflation is negatively related to bank's profitability, implying that the higher inflation will contribute to the lower profit. However, Sufian (2009) found that the inflation has positive effects on bank's profit efficiency. Perry (1992) suggests that the effects of inflation on bank performance depend on whether the inflation is anticipated or unanticipated. In the anticipated case, the interest rates are adjusted accordingly, resulting in faster increase of bank revenues than costs and subsequently gives positive impact on bank performance. In the unanticipated case, banks may be slow in adjusting their interest rates,

Variable	Description	Note
		resulting in a faster increase of bank costs than revenue; consequently, gives negative effects on bank performance.
Dummy Variable		
DOM_IB	Dummy domestic Islamic bank	DOM_IB is a binary variable that takes a value of 1 for domestic Islamic bank, and it is 0 otherwise. As expected, this coefficient is to be in positive sign which indicates that the banking sector has been relatively more revenue efficient in Malaysian domestic Islamic banks.
Interaction Variables		
LNTA* DOM_IB	Binary variable that takes a value of 1 for the domestic Islamic bank, 0 otherwise.	LNTA* DOM_IB variable is expected to have positive coefficient that indicates positive relationship between size of banks and domestic Islamic banks. The positive relationship suggests that the larger the size of banks, the higher the revenue efficiency of the domestic Islamic banks.
LLRGL* DOM_IB	Binary variable that takes a value of 1 for the domestic Islamic bank, 0 otherwise.	LLRGL* DOM_IB variable is expected to be negative because bad loans (non-performing loans) could reduce the bank's efficiency level. Therefore, the asset quality in domestic Islamic bank will be better if the coefficient is lower. This could contribute to the higher asset quality and increase the revenue to the banking sector (Kosmidou, 2008).
BDTD* DOM_IB	Binary variable that takes a value of 1 for the domestic Islamic bank, 0 otherwise.	BDTD* DOM_IB is expected to have positive coefficient that indicates positive relationship between market power of bank and domestic Islamic bank. The positive relationship explains that larger market power of the banks will increase the revenue efficiency of the domestic Islamic banks (Graeve <i>et al.</i> 2007)
LOANSTA* DOM_IB	Binary variable that takes a value of 1 for the domestic Islamic bank, 0 otherwise.	LOANSTA* DOM_IB is expected to have positive or negative coefficient that indicates positive or negative relationship between liquidity and domestic Islamic bank. The positive relationship explains that higher liquidity of the banks will increase the revenue efficiency of the domestic Islamic banking sector. The negative relationship indicates that the higher liquidity of the banks will reduce the revenue efficiency of the domestic Islamic banking sector.
NIETA* DOM_IB	Binary variable that takes a value of 1 for the domestic Islamic bank, 0 otherwise.	NIETA* DOM_IB variable is expected to be negative or positive because efficient banks are expected to operate at lower or higher costs that represent good quality management. The negative or positive coefficient indicates negative or positive relationship between the banks' cost management and domestic Islamic banks. Thus, lower expenses of banks will lead to higher revenue efficiency in the domestic Islamic banking sector (Molyneux and Thornton, 1992; Berger <i>et al.</i> 1999; Berger, 1997).
LNGDP* DOM_IB	Binary variable that takes a value of 1 for the domestic Islamic bank, 0 otherwise.	LNGDP * DOM_IB variable is expected to be positive with the bank efficiency. It shows that higher LNGDP leads to higher revenue efficiency in domestic Islamic banks.
INFL* DOM_IB	Binary variable that takes a value of 1 for the domestic Islamic bank, 0 otherwise.	INFL* DOM_IB is expected to be positive or negative with the bank efficiency which indicates that higher or lower inflation leads to higher or lower bank's revenue efficiency in domestic Islamic banks.

5. EMPIRICAL RESULTS

Before proceeding with the DEA results, as suggested by Cooper *et al.* (2002), this study first test the rule of thumb on the selection of inputs and outputs variables. Since the total number of DMUs (17 banks) in this study is more than the number of input and output variables (2 inputs x 2 outputs @ 3 [2 inputs +2 outputs]), the selection of variables is valid and allows the efficiencies of DMUs to be measured. By calculating the three efficiencies measures (e.g. revenue, cost and profit), we obtain robust results for both the domestic and foreign Islamic banks efficiency. Table 3 illustrates the revenue efficiency estimates along with the cost and profit efficiency measures for both the domestic and foreign Islamic banks.

5.1 Efficiency of Domestic Islamic Banks

Table 3 shows the mean cost, revenue, and profit efficiency for the Malaysian domestic Islamic banks of 74.5%, 71.2%, and 62.5% respectively. In other words, the domestic Malaysian Islamic banks have been inefficient in producing outputs by using the same input (revenue inefficiency) and by not fully using the inputs efficiently to produce the same outputs (cost inefficiency). Banks are said to have slacked if they fail to fully minimize the cost and maximize the revenue (profit inefficiency). The results indicate that levels of cost inefficiency, revenue inefficiency, and profit inefficiency are shown as 25.5%, 28.8%, and 37.5%.

For the cost efficiency, the results indicate that on average Malaysian domestic Islamic banks have utilized only 74.5% of the resources or inputs to produce the same level of outputs. In other words, on average, Malaysian domestic Islamic banks have wasted 25.5% of its inputs, or it could have saved 25.5% of its inputs to produce the same level of outputs. It is also worth noting that on average, Malaysian domestic Islamic banks have been more cost efficient in utilizing their inputs compared to their ability to generate revenues and profits. For revenue efficiency, the average Islamic bank could only generate 72.1% of revenues, less than what it was initially expected to generate. Hence, revenue is lost by 28.8%, indicating that the average Islamic bank loses an opportunity to receive 28.8% more revenues given the same amount of resources, or it could have produced 28.8% of its outputs given the same level of inputs.

Obviously, the inefficiency is on the revenue side, which is followed by the profits side. Similarly, the average Islamic bank could have earned 62.5% of what was available, and lost the opportunity to make 37.5% more profits from the same level of inputs. Even though the cost efficiency is reportedly highest in

the domestic Islamic banks, the revenue efficiency is found to be lower, and this led to higher revenue inefficiency. When both efficiency concepts (revenue and cost) are compared, the higher revenue inefficiency seem to have contributed to the higher profit inefficiency levels.

Table (3). Cost, Revenue, and Profit Efficiency of Domestic and Foreign Islamic Banks

Domestic Islamic Banks					Foreign Islamic Banks				
No.	Bank	VRS	VRS	VRS	No.	Bank	VRS	VRS	VRS
		CE	RE	PE			CE	RE	PE
1	Affin Islamic Bank	0.506	0.497	0.278	1	Al-Rajhi Bank	0.855	0.720	0.634
2	Alliance Islamic Bank	0.985	0.987	1.000	2	Asian Finance Bank	0.922	1.000	1.000
3	AmIslamic Bank	0.840	0.941	1.000	3	HSBC Amanah	0.956	0.935	0.919
4	Bank Islam Malaysia	0.697	0.501	0.410	4	Kuwait Finance House	0.701	0.643	0.506
5	Bank Muamalat	0.627	0.594	0.482	5	OCBC Islamic Bank	0.688	0.767	0.697
6	Commerce Tijari	0.632	0.516	0.423	6	Standard Chartered Bank	0.670	1.000	1.000
7	EON Islamic Bank	0.781	0.782	0.661					
8	Hong Leong Islamic Bank	0.600	0.586	0.358					
9	Maybank Islamic	1.000	1.000	1.000					
10	Public Bank Islamic	0.873	0.807	0.752					
11	RHB Islamic Bank	0.654	0.619	0.515					
	Mean	0.745	0.712	0.625		Mean	0.799	0.844	0.793

Note:

CE: Cost Efficiency, RE: Revenue Efficiency, PE: Profit Efficiency

5.2 Efficiency of Foreign Islamic Banks

The empirical findings presented in Table 3 seem suggest that the Malaysian foreign Islamic banks have exhibited mean cost, revenue, and profit efficiency (inefficiency) of 79.9% (20.1%), 84.4% (15.6%), and 79.3% (20.7%) respectively. Furthermore, it is interesting to note that on average Malaysian foreign Islamic banks have been found to be more efficient compared to their domestic bank peers. For revenue efficiency, the average foreign Islamic bank could generate 84.4% of revenues than it was expected to generate. Hence, the average foreign Islamic bank lost an opportunity to receive 15.6% more revenue, given the same amount of resources.

As for the cost efficiency, the results seem to suggest that the average foreign Islamic bank have utilized only 79.9% of the resources or inputs in order to produce the same level of output. In other words, on average, foreign Islamic banks have wasted 20.1% of its inputs, or it could have saved 20.1% of its inputs

to produce the same level of outputs. Therefore, there was substantial room for significant cost savings for the foreign Islamic banks if they employ their inputs efficiently. Noticeably, the highest level of inefficiency is on the cost side, followed by the profits side. Similarly, the average foreign Islamic bank could have earned 79.3% of what was available, and lost the opportunity to make 20.7% more profits when utilizing the same level of inputs.

In conclusion, the empirical findings from this study seem to suggest that the foreign Islamic banks have exhibited a higher efficiency levels for all three efficiency measures (e.g. cost efficiency (84.4% vs. 71.2%), revenue efficiency (79.9% vs. 74.5%), and profit efficiency (79.3% vs. 62.5%)). In essence, revenue efficiency seems to play the main factor leading to the lower or higher profit efficiency levels. Besides, results for the domestic Islamic banks shows that the level of cost efficiency is higher than profit efficiency due to the lower revenue efficiency level or higher inefficiency from the revenue side. Meanwhile, the level of cost efficiency is slightly higher than profit efficiency due to the higher revenue efficiency level from the revenue side for the foreign Islamic banks.

5.3 Robustness Tests

After examining the results derived from the DEA method, the issue of interest now is whether the difference in the cost, revenue, and profit efficiency of the domestic and foreign Islamic banks is statistically significant. Coakes and Steed (2003) suggest that the Mann-Whitney [Wilcoxon] is a relevant test for two independent samples coming from populations having the same distribution. The most relevant reason is that the data violate the stringent assumptions of the independent group's *t*-test. In what follows, we perform the non-parametric Mann-Whitney [Wilcoxon] test along with a series of other parametric (*t*-test) and non-parametric Kruskal-Wallis tests to obtain robust results.

Table 4 shows the robustness tests. The results from the parametric *t*-test and non-parametric Mann-Whitney (Wilcoxon) test suggest that the Malaysian domestic Islamic banks have exhibited a lower mean cost efficiency level than their foreign Islamic bank peers ($0.745 < 0.799$). Likewise, the Malaysian domestic Islamic banks have also exhibited a lower mean profit efficiency level compared to their foreign Islamic banks ($0.625 < 0.793$). The results from the parametric *t*-test are further confirmed by the non-parametric Mann-Whitney (Wilcoxon) and Kruskal-Wallis tests. Similarly, the parametric *t*-test and non-parametric Mann-Whitney (Wilcoxon) and Kruskal-Wallis tests results indicate that the domestic Islamic banks have exhibited lower revenue efficiency level compared to the foreign Islamic banks ($0.712 < 0.844$).

Based on most of the results presented in Table 4, we failed to reject the null hypothesis that the domestic and foreign Islamic banks come from the same population and have identical technologies since the revenue efficiency levels of the domestic Islamic banks is lower than foreign Islamic banks at the 0.01 levels of significance. The significant results on lower level of revenue efficiency in domestic Islamic banks indicate that, the revenue efficiency could influence the lower profitability of the banks due to the lower profit efficiency level. Therefore, the revenue efficiency represents the most important efficiency measure which in turn could lead to higher profit efficiency levels.

Table (4). Summary of Parametric and Non-Parametric Tests on Domestic and Foreign Islamic Banks.

	Test groups					
	Parametric test		Non-parametric tests			
Individual tests	<i>t</i> -test		Mann-Whitney		Kruskall-Wallis	
			[Wilcoxon Rank-Sum] test		Equality of Populations test	
Hypothesis			MedianDomestic =			
			MedianForeign			
Test statistics	$t(Prb>t)$		$z(Prb>z)$		$X^2(Prb > X^2)$	
	Mean	<i>t</i>	Mean Rank	<i>z</i>	Mean Rank	X^2
Cost Efficiency						
Domestic Islamic banks	0.745	-1.131	41.09	-0.973	41.09	0.947
Foreign Islamic banks	0.799		46.50		46.50	
Revenue Efficiency						
Domestic Islamic banks	0.712	-2.726***	37.49	-2.827***	37.49	7.992***
Foreign Islamic banks	0.844		53.10		53.10	
Profit Efficiency						
Domestic Islamic banks	0.625	-2.551**	38.46	-2.352**	38.46	5.533**
Foreign Islamic banks	0.793		51.32		51.32	

Note:

*** and **, indicates significance at the 1% and 5% levels respectively.

5.4 Determinants of Revenue Efficiency

In essence, the results from the first stage indicate that the revenue efficiency of the domestic Islamic banks has been lower compared to their foreign Islamic bank peers. In what follows, we proceed to identify the determinants which could improve the revenue efficiency in the Malaysian Islamic banking sector. To do so, we estimate 11 panel regression models which is presented in columns (1) to (11) of Table 5. For Model 1, which is the baseline regression model, the regression model includes all six basic bank specific determinant variables namely size of bank (LNTA), assets quality (LLRGL), capitalization (ETA), market power (BDTD), liquidity (LOANSTA), and management quality (NIETA).

Model 2 adds the macroeconomic control variables which are gross domestic product (GDP) and inflation (INFL), while the bank specific variables are kept in the regression model. In regression Model 3, we include a binary dummy variable (DOM_IB) to examine the relationship between revenue efficiency and the Malaysian domestic Islamic banks. Models 4 to 11 represent focused models adopted to identify the potential determinants of Malaysian domestic Islamic banks' revenue efficiency. All the bank specific and macroeconomic variables are retained in these models (Model 4 to Model 11). In addition, we include several interaction variables namely LNTA* DOM_IB, LLRGL* DOM_IB, ETA* DOM_IB, BDTD* DOM_IB, LOANSTA* DOM_IB, NIETA* DOM_IB, LNGDP* DOM_IB and INFL* DOM_IB to further examine the impact of the bank specific and macroeconomic factors on the revenue efficiency of the Malaysian domestic Islamic banks.

Table 5 shows the results from the panel regression models. The equations are based on 86 bank year observations during the period of 2006 to 2010. The results show that the relationship between revenue efficiency and bank size (LN_{TA}) is positive (statistically significant at the 1% level). The results clearly indicate that the larger Islamic banks tend to exhibit a higher level of revenue efficiency. The result is consistent with Al-Sharkas *et al.* (2008), Cornett *et al.* (2006), and Akhavein *et al.* (1997) among others. The large banks tend to report improvements in profit efficiency rather compared to their small and medium bank peers because higher costs incurred tend to be compensated by higher revenues received via quality services. Besides, large banks appear to be better able to capitalize on revenue enhancement and to have better cost cutting opportunities compared to the small and medium sized banks.

On the other hand, we find that asset quality (LLRGL) and management quality (NIETA) exert negative and significant impact on the revenue efficiency of Malaysian Islamic banks. The results clearly indicate that the lower ratio of LLRGL may increase banks' asset quality leading to higher revenue efficiency. The result is consistent with previous studies by Sufian, (2009), Sufian and Habibullah (2009), and Kosmidou (2008), supporting the argument that banks with lower LLRGL tend to exhibit higher asset quality which contributes to higher efficiency levels. Likewise, the empirical findings seem to provide support to the bad management hypotheses of Berger and DeYoung (1997). A lower NIETA ratio represents good management quality attributed to efficient bank managers in managing expenses resulting in the improvement in profitability. Low measure of cost efficiency is a signal of poor senior management practices, which apply to input-usage and day-to-day operation.

The empirical findings presented in Table 5 indicate that market power (BDTD) has positive influence in influencing the revenue efficiency of Malaysian Islamic banks, but only when we control for macroeconomic factors in the regression model. We also find that the impact of capitalization (ETA) is only significant when we control for the domestic Islamic banks (DOM_IB) and market power (BDTD) in regression Models (3) and (7). During the period under study, we do not find statistically significant impact of liquidity (LOANSTA) on the revenue efficiency of Malaysian Islamic banks.

In regression Model (2), we include macroeconomic variables as additional control variables. The results show that the impact of gross domestic product (LNGDP) is significantly positive at the 1% level, supporting the argument on the association between economic growth and financial sector performance (Sufian, 2009). During the period under study, we find that inflation (INFL) exerts negative and significant influence on Malaysian Islamic banks' revenue efficiency levels. The result clearly indicates that lower inflation leads to higher

revenue efficiency Malaysian Islamic banks. The empirical finding is consistent with the previous studies by among others Kosmidou (2008).

We include DOM_IB the variable (a dummy variable that takes a value of 1 for the domestic Islamic banks, 0 otherwise) in regression Model (3) to examine the impact of domestic Islamic banks on revenue efficiency in the Malaysian Islamic banking sector. The empirical findings in column 3 of Table 5 indicate that the coefficient of the DOM_IB variable entered the regression model with a negative sign (statistically significant at the 5% level). If anything could be infer, the results seem to suggest that revenue efficiency is significantly lower for the Malaysian domestic Islamic banks compared to their foreign Islamic bank counterparts.

5.4 Robustness Checks: Controlling for Domestic Islamic Banks

The domestic and foreign Islamic banks may react differently to the same efficiency determinants. In what precedes, we seek to identify factors which influence the revenue efficiency of the Malaysian domestic Islamic banks. To do so, we include the interactions of all the bank specific and macroeconomic determinants against the DOM_IB variable. As a result, six new bank specific interaction variables namely LNTA* DOM_IB, LLRGL* DOM_IB, ETA* DOM_IB, BDTD* DOM_IB, LOANSTA* DOM_IB and NIETA* DOM_IB are introduced in regression Models 4 to 9 respectively. Besides, two new macroeconomic interaction variables namely LNGDP* DOM_IB and INFL* DOM_IB are included in regression Models 10 and 11 respectively.

The empirical findings in column 6 of Table 5 seem to suggest a positive coefficient of the ETA* DOM_IB variable (statistically significant at the 1% level) indicating that the relatively better capitalized domestic Islamic banks tend to exhibit a higher level of revenue efficiency. Most of the previous studies (e.g. Casu and Girardone, 2004; Carvallo and Kasman, 2005; Athanasoglou *et al.* 2008) have showed similar results where the well-capitalized banks were found to lead to the higher profitability. On the other hand, the empirical findings in column 7 of Table 5 clearly indicate that market power (BDTD* DOM_IB) has negative impact on the revenue efficiency of the domestic Islamic banks. The results seem to suggest that an increase in market power tend to decrease the revenue efficiency of the domestic Islamic banks. Ariss (2010) among others points out that a higher market power does not warrant higher profitability levels for Islamic banks because the theoretical predictions and empirical evidence from previous studies have reported that greater market power tend to result in a higher bank risk. Therefore, it could be argued that greater market power may lead to higher risk levels which consequently could result in lower revenues and profitability levels among the domestic Islamic banks.

In column 8 of Table 5 we report the LOANSTA* DOM_IB result. As observed, the empirical findings seem to suggest a negative coefficient of the LOANSTA* DOM_IB. The result seems to suggest a negative relationship between the level of liquidity and the domestic Islamic banks' revenue efficiency. Sufian (2009a), Sufian (2009), and Sufian and Habibullah (2009) suggest that the loan-performance relationship depends significantly on the expected change of the economy. The revenue efficiency of the domestic Islamic banks tends to be negatively affected by borrowers which are likely to default on their loans during a weak economy environment.

6. CONCLUSIONS

The study was carried out with the main purpose to examine the revenue efficiency of the Malaysian Islamic banking sector over the period of 2006 to 2010. To date, the majority of researchers have focused more on cost and profit efficiency in banking sectors and only a few have looked on revenue efficiency. Furthermore, most of these studies are carried out on the conventional banking sectors, while empirical evidence on the Islamic banking sectors is relatively scarce. The non-parametric Data Envelopment Analysis (DEA) method is applied to distinguish between three different types of efficiency measures, namely cost, revenue, and profit. Additionally, we perform a series of parametric (*t*-test) and non-parametric (Mann-Whitney [Wilcoxon] and Kruskal-Wallis) tests to examine whether the domestic and foreign Islamic banks are drawn from the same population.

We find that there is a statistically significant difference between the domestic and foreign Islamic banks' revenue efficiency. The result of this study shows that the revenue efficiency of the domestic Islamic banks is relatively lower compared to their foreign peers due to the difference between the cost and profit efficiency levels. If anything could be infer, the empirical findings clearly indicate that better revenue efficiency could improve the level of profit efficiency and consequently contribute to a higher profit of Malaysian Islamic banks. The empirical findings from this study failed to reject the null hypothesis that the domestic banks and foreign banks come from the same population and have identical technologies since the revenue efficiency of the domestic Islamic banks is statistically significantly lower compared to the foreign Islamic banks.

We also extend the study to examine the potential determinants of revenue efficiency, particularly for the Malaysian domestic Islamic banks. To do so, we employ a panel regression analysis framework based on the Generalized Least Square (GLS) method comprising the Fixed Effect (FE) and Random Effect (RE) models. Six bank specific (internal) determinant variables are included in the regression models namely size, asset quality, capitalization, market share,

liquidity, and management quality. In addition, gross domestic products and inflation rate are included in the regression models as external factors control variables. Furthermore, in order to obtain robust results, all potential determinants are interacted with Malaysian domestic Islamic banks dummy variables.

During the period under study, we find that capitalization, market power, and liquidity have significant influence on the revenue efficiency of Malaysian domestic Islamic banks. The improvement of the revenue efficiency in Malaysian domestic Islamic banks was also influenced by the rate of inflation. However, the impact is not uniform across Islamic banks with different ownership. We find that the relatively better capitalized domestic Islamic banks tend to exhibit higher revenue efficiency levels. On the other hand, we find that market power and liquidity tend to exert negative influence on the domestic Islamic banks' revenue efficiency. We do not find any statistical significant impacts of macroeconomic conditions on the domestic Islamic banks revenue efficiency levels.

The findings of this study are expected to contribute significantly to the existing knowledge on the operating performance of the Malaysian Islamic banking sector. Nevertheless, the study has also provided further insights to the bank's specific management as well as the policymakers with regard to attaining optimal utilization of capacities, improvement in managerial expertise, efficient allocation of scarce resources, and the most productive scale of operation of Islamic banks operating in the Malaysian Islamic banking sector. This may also facilitate directions for sustainable competitiveness of the Malaysian Islamic banking sector operations in the future.

REFERENCES

- Akhavein, J.D., Berger, A.N. and Humphrey D.B.** (1997) The Effects of Megamergers on Efficiency and Prices: Evidence from a Bank Profit Function, *Review of Industrial Organization* **12**: 95-139.
- Al-Sharkas, A.A., Hassan, M.K. and Lawrence, S.** (2008) The Impact of Mergers and Acquisitions on the Efficiency of the US Banking Industry: Further Evidence, *Journal of Business Finance & Accounting* **35**: 50-70.
- Angbazo, L.** (1997) Commercial Bank Interest Margins, Default Risk, Interest-rate risk, and off-balance Sheet Banking, *Journal of Banking and Finance* **21**: 55-87.
- Ariss, R.T.** (2010) Competitive Conditions in Islamic and Conventional Banking: A Global Perspective, *Review of Financial Economics* **19**: 101-108
- Askari, H.** (1991) *Third World Debt And Financial Innovation: The Experiences of Chile And Mexico*, OECD Development Studies, Paris: OECD.
- Athanasoglou, P.P., Brissimis, S.N. and Delis, M.D** (2008) Bank-specific Industry-Specific and Macroeconomics Determinants of Bank Profitability, *Journal of International Financial Markets, Institutions and Money* **18**: 121-136.

- Badawi, I.Z** (1964) *Nazariyat al-Riba* 'l Muharram, Cairo: Al-Majils al-A'la li Ri 'ayet al-Funun wa'l-Aadab wa'l 'Ulum al-Ijtima 'iyah, *Visiting Scholars' Research Series 2*: 1-162.
- Bader, M.K.I., Mohammed, S., Ariff, M. and Hassan, T.** (2008) Cost, Revenue and Profit Efficiency of Islamic Versus Conventional Banks: International Evidence using Data Envelopment Analysis, *Islamic Economic Studies 15*: 24-76.
- Banker, R.D., Charnes, A. and Cooper, W.W.** (1984) Some Models for Estimating Technical and Scale Inefficiencies in Data Envelopment Analysis, *Management Science 30*: 8-92.
- Berger, A.N.** (1997) The Efficiency Effects of Bank Mergers and Acquisitions: A Preliminary Look at the 1990s Data, In: **Amihud, Y. and Miller, G.** (eds.), *Mergers in Financial Institutions*, Business One-Irwin, pp: 79-111.
- Berger, A.N. and DeYoung, R.** (1997) Problem Loans and Cost Efficiency in Commercial Banks, *Journal of Banking and Finance 21*: 849-870.
- Berger, A.N. and Humphrey, D.B.** (1997) Efficiency of Financial Institutions: International Survey and Directions for Future Research, *European Journal of Operational Research 98*: 175-212.
- Berger, A.N. and Mester, L.J.** (2003) Explaining the Dramatic Changes in Performance of US Banks: Technological Change, Deregulation, and Dynamic Changes in Competition, *Journal of Financial Intermediation 12*: 57-95.
- Berger, A.N., Hunter, W.C. and Timme, S.G.** (1993) The Efficiency of Financial Institutions: A Review and Preview of Research Past, Present and Future, *Journal of Banking and Finance 17*: 221-249.
- Berger, A.N., Demsetz, R.S., Strahan, P.E.** (1999) The Consolidation of the Financial Services Industry: Causes, Consequences, and Implications for the Future, *Journal of Banking and Finance 23*: 135-194.
- Berger, A.N.** (1995) The Profit – Structure Relationship in Banking: Tests of Market-Power and Efficient-structure Hypotheses, *Journal of Money, Credit and Banking 27*: 404-431.
- Bhatt, V.V.** (1989) *Financial Innovation and Credit Market Development*, Working Paper, World Bank.
- Bourke, P.** (1989) Concentration and other Determinants of Bank Profitability in Europe, North America and Australia, *Journal of Banking and Finance 13*: 65-79.
- Brown, K. and Skully, M.** (2005) Islamic Banks: A Cross-country Study of Cost Efficiency Performance, *Accounting, Commerce & Finance: The Islamic Perspective Journal 8*: 43-79.
- Carvalho, O. and Kasman, A.** (2005) Cost Efficiency in the Latin American and Caribbean Banking Systems, *International Financial Markets, Institutions and Money 15*: 55-72.
- Casu, B. and Girardone, C.** (2004) Financial Conglomeration: Efficiency, Productivity and Strategic Drive, *Applied Financial Economics 14*: 687-96.
- Charnes, A., Cooper, W.W. and Rhodes, E.** (1978) Measuring the Efficiency of Decision Making Units, *European Journal of Operations Research 2*: 429-44.

- Chu, S.F. and Lim, G.H.** (1998) Share Performance and Profit Efficiency of Banks in an Oligopolistic Market: Evidence from Singapore, *Journal of Multinational Financial Management* **8**:155-168.
- Coakes, S.J and Steed, L.G.** (2003) SPSS: Analysis without Anguish, Version 11 for Windows, Sydney: John Wiley and Sons.
- Coelli, T., Prasada-Rao, D.S. and Battese, G.E.** (1998) An Introduction to Efficiency and Productivity Analysis, Kluwer Academic Publishers, Boston.
- Connors, J.** (1988) Towards A System of Islamic Finance in Malaysia, In: **Mallat, C.** (ed.), *Islamic Law and Finance*, pp: 57-67, Publisher, Place.
- Cooper, W.W., Seiford, L.M. and Tone, K.** (2002) Data Envelopment Analysis, A Comprehensive Text with Models, Applications, References and DEA-solver Software, Kluwer Academic Publishers.
- Cornett, M.M., McNutt, J.J. and Tehranian, H.** (2006) Performance Changes Around Bank Mergers: Revenue Enhancements Versus Cost Reductions, *Journal of Money, Credit, and Banking* **38**: 1013-1050.
- English, M., Grosskopf, S., Hayes, K. and Yaisawarng, S.** (1993) Output Allocative and Technical Efficiency of the Financial Services Sector, *Journal of Banking and Finance* **17**: 349-366.
- Flamini, V., McDonald, C.A. and Schumacher, L.B.** (2009) The Determinants of Commercial Bank Profitability in Sub-Saharan Africa, *International Monetary Fund Working Paper No. 09/15*.
- Ghafour, A.P.K.** (2007) Assets of Islamic Banks Grow to \$265 billion, *Arab News*, 1st April, Available at: www.arabnews.com/page=6and section=0and article=80059and d=1and m=4and y=2006, Access Date: 13th June 2006.
- Graeve, F.D., Jonghe, O.D. and Vennet, V.** (2007) Competition, Transmission and Bank Pricing Policies: Evidence from Belgian Loan and Deposit Markets, *Journal of Banking and Finance* **31**: 259-278.
- Gujarati, D.** (2002) *Basic Econometric*, 6th Ed., New York, MacGraw Hill.
- Haron, S. and Azmi, W.N.W.** (2009) *Islamic Finance and Banking System Philosophies, Principles and Practices*, McGraw-Hill Education.
- Hassan, M.K.** (2005) The Cost, Profit and X-efficiency of Islamic Banks, Paper Presented at the Economic Research Forum, 12th Annual Conference, Cairo, Egypt.
- Hassan, M.K and Hussein, K.A.** (2003) Static and Dynamic Efficiency in the Sudanese Banking System, *Review of Islamic Economics* **14**: 5-48.
- International Monetary Fund** (2005) Islamic Finance Gears up, *Finance and Development* **42**: XX-XX.
- Iqbal, M.** (2001) Islamic and Conventional Banking in the Nineties: A Comparative Study, *Islamic Economic Studies* **8**: 1-27.
- Isik, I. and Hassan, M.K.** (2002) Cost and Profit Efficiency of the Turkish Banking Industry: An Empirical Investigation, *The Financial Review* **37**: 257-280
- Ismail, A., Davidson, I. and Frank, R.** (2009) Operating Performance of European Bank Mergers, *The Service Industries Journal* **29**: 345-366.
- Jaffry, S., Ghulam, Y., Pascoe, S. and Cox, J.** (2007) Regulatory Changes and Productivity of the Banking Sector in the Indian Sub-continent, *Journal of Asian Economics* **18**: 415-438.

- Kosmidou, K.** (2008) The Determinants of Banks' Profits in Greece during the period of EU Financial Integration, *Managerial Finance* **34**: 146-159.
- Ling, Y.P.** (2009) Islamic Banking in Malaysia: Comparative Performance of Foreign and Local Banks, paper presented at the National Conference on Islamic Economics 2009 on 10th – 11th February at University Malaya, Kuala Lumpur.
- Mauri, A.** (1983) The Potential for Savings and Financial Innovation in Africa, *Savings and Development* **7**: 319-337.
- Miller, S.M. and Noulas, A.G.** (1997) Portfolio Mix and Large Bank Profitability in the USA, *Applied Economics* **29**: 505-512.
- Molyneux, P., Thornton, J.** (1992) Determinants of European Bank Profitability: A Note, *Journal of Banking and Finance* **16**: 1173-1178.
- Perry, P.** (1992) Do Banks Gain or Lose from Inflation, *Journal of Retail Banking* **14**: 25-40.
- Rogers, K.E.** (1998) Nontraditional Activities and the Efficiency of US Commercial Banks, *Journal of Banking and Finance* **22**: 467-482.
- Samad, A. and Hassan, M.K.** (1999) The Performance of Malaysian Islamic Bank during 1984-1997: An Exploratory Study, *International Journal of Islamic Financial Services* **1**: 1-14.
- Sealey, C. and Lindley, J.T.** (1977) Inputs, Outputs and A Theory of Production and Cost at Depository Financial Institutions, *Journal of Finance* **32**: 1251-1266.
- Staikouras, C. and Wood, G.** (2003) The Determinants of Bank Profitability in Europe, paper presented at the *European Applied Business Research Conference*, Venice: 9-13.
- Sufian, F.** (2007) The Efficiency of Islamic Banking Industry in Malaysia: Foreign vs Domestic Banks, *Humanomics* **23**: 174-192.
- Sufian, F.** (2009) Assessing the Impact of Mergers and Acquisitions on Bank Profit Efficiency: Empirical Evidence from Malaysia, *International Journal Decision Sciences, Risk and Management* **1**: 258-285.
- Sufian, F.** (2009a) Determinants of Bank Efficiency during Unstable Macroeconomic Environment: Empirical Evidence from Malaysia, *Research in International Business and Finance* **23**: 54-77.
- Sufian, F. and Chong, R.R.** (2008) Determinants of Bank Profitability in A Developing Economy: Empirical Evidence from the Philippines, *Asian Academy of Management Journal of Accounting and Finance* **4**: 91-112.
- Sufian, F. and Habibullah, M.S.** (2009) Assessing the Impact of Mergers and Acquisitions on Bank Cost Efficiency, *Capital Markets Review* **17**: 21-41.
- Sufian, F. and Haron, R.** (2008) The Sources and Determinants of Productivity Growth in the Malaysian Islamic Banking Sector: A Non-stochastic frontier Approach, *International Journal of Accounting and Finance* **1**: 193-215.
- Sufian, F., Noor, M.A.M. and Majid, M.Z.A.** (2008) The Efficiency of Islamic Banks: Empirical Evidence from the MENA and Asian Countries Islamic Banking Sectors, *The Middle East Business and Economic Review* **20**: 1-19
- Yudistira, D.** (2004) Efficiency in Islamic Banking: An Empirical Analysis of 18 Banks, *Islamic Economic Studies* **12** (1): 1-19.
- Zhu, J.** (2009) Quantitative Models for Performance Evaluation and Benchmarking: Data Envelopment Analysis with Spreadsheets and DEA Excel Solver, *International Series in Operations Research and Management Science*.

محددات كفاءة الإيرادات في القطاع المصرفي الماليزي

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الجامعة الإسلامية العالمية الماليزيا

وجامعة بترا الماليزيا وجامعة مارا التكنولوجيا - ماليزيا

المستخلص. يقدم هذا البحث شواهد تطبيقية جديدة حول الكفاءة الإيراد في قطاع المصارف الإسلامية الماليزية للفترة من ٢٠٠٦-٢٠١٠م وقد عالج البحث العوامل الداخلية والخارجية التي تؤثر في كفاءة الإيراد في هذه المصارف، وتكونت عينة الدراسة من ١٧ مصرف إسلامي محلي وأجنبي، وقد استخدمت في الدراسة طريقة التحليل الظرفي للبيانات لحساب كفاءة الإيرادات، وقد وجدت الدراسة أن المصارف الإسلامية المحلية أقل كفاءة إيراديه من المصارف الإسلامية الأجنبية، وأن حجم رأس مال البنوك والقوة السوقية لهم وحجم السيولة كان لها أثر ايجابي في الكفاءة الإيراديه ولكن تأثيرها لم يكن متساوي عند كل المصارف.