Journal of Economic Cooperation and Development, **34**, 1 (2013), 63-92

Efficiency of Islamic Banks: A Comparative Analysis of MENA and Asian Countries

Abdul Rahim Abdul Rahman and Romzie Rosman

It is crucial for Islamic banks to be efficient in order to withstand competitive pressures and financial crises. This study empirically examines and compares the efficiency of selected Islamic banks in Middle Eastern and North African (MENA) countries (including Gulf Cooperation Countries) and Asian countries. The efficiency scores were measured using data envelopment analysis based on the intermediation approach. The sample was comprised of 63 Islamic banks, focusing on performance for a four year period (2006 to 2009).

The study finds that the main source of technical inefficiency among the Islamic banks is the scale of their operations. The Islamic banks, in general, achieved a high score for pure technical efficiency, indicating that the banks' management were able to efficiently control costs and use the inputs to maximise the outputs regardless of scale effects. On average, Islamic banks from Asian countries are found to be relatively more efficient than those in MENA countries. Interestingly, most of the efficient Islamic banks were from Gulf Cooperation Countries. The economic condition of a country is found to be the main determinant of an Islamic bank's efficiency.

Introduction

The recent global financial crisis brought the Islamic financial industry into the spotlight as a possible alternative for investment and banking (Smola and Mirakhor, 2010). Islamic financial institutions have a relatively high market share in several emerging markets, such as Malaysia and several Middle Eastern countries (Beck et al., 2013). Islamic banking is recognised as one of the fastest growing areas in finance and has grown all over the world. The number of Islamic financial institutions worldwide has risen to over 300 in more than 75 countries concentrated mainly in the Middle East and South East Asia

(Sufian and Noor, 2009). Countries like Malaysia and Bahrain are striving to be regional hubs for Islamic financial services (Ariss, 2010).

Despite the rapid growth of the Islamic banking and finance industry, analysis of Islamic banking at a cross-country level is still in its infancy (Sufian and Noor, 2009). Furthermore, cross-country analysis – in particular of MENA and Asian countries – is important as most of the well-established Islamic banks are operating in these countries.

The aim of this study is to fill the gap in the literature by providing empirical evidence on the efficiency of Islamic banks in MENA and Asian countries during the period 2006 to 2009. Interestingly, the study period includes the occurrence of the financial crisis of 2007/2008 following the subprime meltdown in the United States, which affected the global financial system including Islamic banks that work side-by-side with the conventional banks.

Review of the Literature

Extensive studies have been conducted on bank efficiency, with most focusing especially on geographical regions and individual countries. Many studies have focused on the US (see, for example: Aly et al., 1990; Spong et al., 1995) and on European countries (see, for example: Favero and Papi, 1995; Pasiouras, 2008b). Other studies have focused on the banking industry in Middle Eastern countries, for example, in Turkey (see, for example, Isik and Hassan, 2002a and 2002b), Kuwait (see, for example, Darrat et al., 2002) and Jordan (see, for example, Maghyereh, 2004); countries in Asia, for instance, Malaysia (Omar et al., 2006; Mohd. Tahir et al., 2009), China (Ariff and Can, 2008; Avkiran, 2011) and India (Sathye, 2003); and in Oceania, such as Australia (see, for example, Sathye, 2001; Sturm and Williams, 2004).

Moreover, there are many studies that have conducted cross-country efficiency analyses, for instance, the work of Berg et al. (1993), Allen and Rai (1996), Hassan et al. (2000), Diestsch and Lozano-Vivas (2000), Chaffai et al. (2001), Mostafa (2009), Pasiouras (2008a) and Sun and Chang (2011). However, only a few studies have focused particularly on the Islamic banks (see, for example: Hassan and Hussein, 2003; Yudistira, 2004; Hassan, 2006; Sufian, 2006, 2007; Ahmad Mokhtar et al., 2008).

The study by Hassan and Hussein (2003) investigated the efficiency of the banking industry in Sudan by employing a panel of 17 banks for the period 1992 to 2000. The study employed a variety of parametric measures to assess cost and profit efficiency, and non-parametric data envelopment analysis (DEA) to estimate cost, allocative, technical, pure technical and scale efficiency. The results showed the Sudanese banking system exhibited 37 percent allocative efficiency and 60 percent technical efficiency, suggesting that the overall cost inefficiency of the Sudanese Islamic banks was mainly due to technical (managerial-related) rather than allocative (regulatory) factors.

In a cross-country analysis of the Islamic banks, Yudistira (2004) investigated the performance of 18 Islamic banks from 1997 to 2000 using a non-parametric approach. The banks were selected from among Gulf Cooperation Countries (GCC), East Asian, African and Middle Eastern countries. In the study, DEA was utilised to analyse the technical and scale efficiencies of the Islamic banks. The results suggested that the Islamic banks experienced slight inefficiencies during the global crisis of 1998/1999. The inefficiencies were related to pure technical inefficiency rather than scale inefficiency. The study also suggested that efficiency differences across the sample data appeared to be mainly determined by country-specific factors.

Hassan (2006) investigated the relative efficiency of the Islamic banking industry by analysing a panel of 43 Islamic banks in 21 countries during the period 1995 to 2001. Based on the parametric analysis to measure cost and profit efficiency, and non-parametric DEA to estimate cost, allocative, technical and scale efficiency, the findings showed that, on average, the Islamic banks were relatively less efficient compared to their conventional counterparts in other parts of the world. The results also showed that the main source of inefficiency was allocative inefficiency rather than technical inefficiency, and that the main source of technical inefficiency for the Islamic banks was not pure technical inefficiency but scale inefficiency.

Sufian (2006, 2007) investigated the performance of the Malaysian Islamic banking sector during the period 2001 to 2005 by utilising DEA. The findings suggested that the scale inefficiency dominated pure technical inefficiency in the Malaysian Islamic banking sector.

In addition, the domestic Islamic banks were more efficient compared to the foreign Islamic banks, albeit marginally.

Finally, Ahmad Mokhtar et al. (2008) studied the efficiency and competitiveness of the Islamic banks in Malaysia considering both fully-fledged Islamic banks as well as Islamic windows of the conventional banks in Malaysia. The study measured the technical and cost efficiencies using DEA. The findings showed that the efficiency of the Islamic banking industry overall increased during the period 1997 to 2003. The study revealed that the fully-fledged Islamic banks were more efficient than the Islamic windows, but they were still less efficient than conventional banks. They also found that the Islamic windows of the foreign banks were more efficient than the Islamic windows of the domestic banks.

Research Methodology

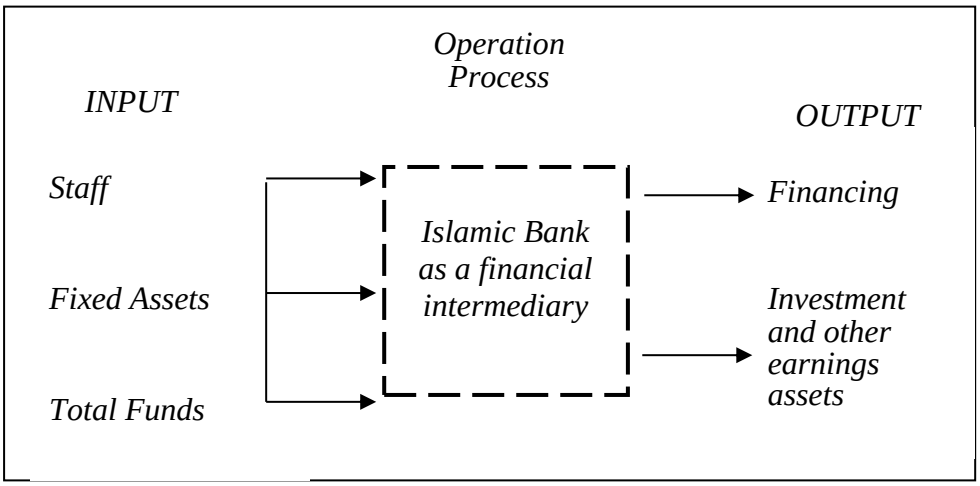
This study uses the common non-parametric approach of DEA which is widely used in efficiency analysis (see, for example: Aly et al., 1990; English et al., 1993; Favero and Papi, 1995; Katib, 1999; Drake and Hall, 2003; Sturm and Williams, 2004). Ahmad Mokhtar et al. (2006a) reviewed 47 bank efficiency studies and found that DEA was the most widely used estimation technique to measure the banks' efficiency, especially technical efficiency.

This study uses input-based orientation measures. Importantly, the reason for using input-based oriented measures is because of the fact that cost control is one of the banks' objectives. Input orientation aims to minimise inputs while satisfying at least the given output levels and output orientation attempts to maximise outputs without requiring more of any of the observed input values (Cooper et al., 2000) A few studies have used input-oriented measures (see, for example: Aly et al., 1990; Ferrier and Lovel, 1990; Furukawa, 1995; Zaim, 1995; Miller and Noulas, 1996; Resti, 1997; Bauer et al., 1998). Input orientation is also chosen in most studies since banks, in general, have no direct control over the amount of services required by their customers (Schaffnit et al., 1997). Moreover, the input and output-orientated measures identify the same frontier; therefore, the same set of banks would be identified as being the most efficient or best practice banks.

In terms of the approach, this study uses the intermediation approach. In practice, the intermediation approach is the most widely used technique to measure efficiency (Kwan, 2002). Berger and Humphrey (1997) suggest that the intermediation approach is the best for evaluating an entire bank because it is inclusive of interest expense, which often accounts for one-half to two-thirds of the total costs. The intermediation approach follows the traditional banking framework in which the bank transforms funds using labour and physical capital into interest earnings on balance sheet items such as various types of loans (Isik and Hassan, 2003a).

In addition, the Islamic financial system is based on the principle of participation in enterprise or equity-based activities where the business participants may end up with profit or loss; this implies the importance of intermediary activities (Ahmad Mokhtar et al., 2006b). Yudistira (2004) recommends the use of the intermediation approach as it is in line with the principles of the Islamic financial system. Here, the Islamic banks act as financial intermediaries using the funds provided by the shareholders, depositors and investment account holders for financing, trading and investment purposes. The same staff and fixed assets (for example, offices) are also used to produce the outputs which are the financing (such as *murabahah* and *ijarah* financing) and other earnings assets, as shown in Figure 1.

Figure 1: Input-output relationship in Islamic banking (intermediation approach)



This study refers to the work of Hassan (2006) that examined the efficiency of Islamic banks across countries. Accordingly, by using the intermediation approach as in many banking studies (see, for example, Isik and Hassan, 2002, 2003a and 2003b), the Islamic banks are modelled as multi-product firms, producing two outputs and employing three inputs. All the variables are measured in millions of US dollars. The input variables are: (1) labour, (2) fixed capital, and (3) total funds. The labour is measured by staff costs; fixed capital is measured by the costs of the premises and fixed assets; and total funds are measured by the sum of the deposits (demand and time) and non-deposit funds[1] as at the end of the accounting period. On the other hand, the output variables include total loans[2] and other earning assets[3].

After estimating the technical efficiency of the Islamic banks, second-stage panel regression analysis is performed to explain the determinants. The panel data is used to analyse the determinants of efficiency. By referring to Brooke (2008), the panel data equation is as follows:

$$yi\ t = \alpha + \beta xi\ t + ui\ t$$

where $yi\ t$ is the dependent variable, α is the intercept term, β is a k x 1 vector of the parameters to be estimated on the explanatory variables, and $xi\ t$ is a 1 x k vector of the observations of the explanatory variables,

$t = 1, \ldots., T$; $i = 1, \ldots.., N$.

The common determinants are used for both the bank-specific and country-specific variables. The incorporation of country-specific variables is important due to recent research (see, for example: Dietsch and Lozano-Vivas, 2000; Chaffai et al., 2001) which has found that country-specific variables affect the efficiency score especially in international studies. The variables are as shown in Table 1.

[1] Non-deposits funds include borrowed funds from inter-bank, central bank, domestic banks, overseas banks and others as well as funds raised by issuing securities (Hassan, 2006).
[2] BankScope defines uniform term loans for both Islamic and conventional banks. For Islamic banks, it means mostly *Murabahah* types of transactions (Hassan, 2006).
[3] Other earning assets include loans and advances to banks, trading securities, investments in properties and any related earnings assets.

Table 1: Description of the variables used as determinants of efficiency

Variable	Description	Relationship	Remarks
Bank-specific			
ROA	Return on assets	+ve/-ve	It is a proxy of bank profitability. A bank becomes more efficient as a result of enhancing its profitability. There can be a positive relationship with bank efficiency (see, for example: Isik and Hassan, 2002a; Hassan and Marton, 2003; Miller and Noulas, 1996; Hassan, 2006; Pasiouras, 2008b; Sufian, 2009) or a negative relationship with bank efficiency (see, for example: Casu and Girardone, 2004; Ataullah and Lee, 2006).
lnTA	Natural logarithm of total assets	+ve/-ve	It is used as a proxy of bank size to capture the possible cost advantages associated with size (economies of scale). There can be a positive relationship with bank efficiency (see, for example: Aly et al., 1990; Miller and Naulas, 1996; Hauner, 2005; Hassan, 2006) or a negative relationship with bank efficiency (see, for example: Darrat et al., 2002; Isik and Hassan, 2002a and 2003a).
EQTA	Total equity to total assets	+ve/-ve	It is used as a proxy of capital adequacy where regulators view a higher level of equity as a cushion of future losses. There can be a positive relationship with bank efficiency (see, for example: Berger and Mester, 1997; Isik and Hassan, 2003a; Casu and Girardone, 2004) or a negative relationship (see, for example: Akhigbe and McNulty, 2005; Sufian, 2009).
Country-specific			
lnGDP	Natural logarithm of gross domestic product per capita	+ve/-ve	It is used as a proxy for economic conditions. Per capita income affects numerous factors related to the demand for bank loans and deposits. There can be a positive relationship with efficiency (see, for example: Chaffai et al., 2001; Kablan, 2010) or a negative relationship (see, for example: Pasiouras, 2008a; Sufian, 2009).

Both the bank-specific variables (namely, ROA, lnTA and EQTA) and country-specific variable (namely, lnGDP) are the determinants of efficiency. The variables of total assets and GDP are transformed into the natural logarithm of total assets and the natural logarithm of GDP, respectively. As indicated by Tabachnik and Fidell (1996), the transformation to the natural logarithm basically stabilises the variance of a sample and normalises skewed sample distributions which would weaken the statistical relationship. Hence, it minimises the possibility of violating the regression analysis.

The panel regression ordinary least squared (OLS)[4] model is used to explain the direction and significance of the effects on technical efficiency (namely, OTE, PTE and SE). The Hausman test is also performed to decide whether the fixed effect model or random effect model is to be used for the regression analysis. In order to analyse this regression model, STATA 10 is used. STATA 10 is data analysis and statistical software that can analyse cross-sectional, time-series and panel data.

Research Findings

Islamic Banks' Efficiency Based on the Common Frontier

The standard or basic approach was taken by defining the common frontier and pooling the dataset of the Islamic banks of all countries and considering a DEA model with three (3) banking inputs and two (2) outputs. This approach does not incorporate the country-specific environmental conditions of respective countries (Hassan et al., 2000). In DEA, the decision-making units are assumed to be involved in similar activities, to produce a common set of outputs, and to operate in comparable environments (Avkiran, 2006). Therefore, the scores are obtained under the assumption that the efficiency differences across countries can be attributed entirely due to managerial decisions within banks regarding the scale and mix of inputs (Pasiouras, 2008a)[5]. The OTE, PTE and SE of Islamic banks for the 4-year average are shown in Table 2.

[4] There are many studies that use OLS regression in the second stage of DEA (see, for example, Ataullah and Le, 2006) and some studies that favour OLS as compared to Tobit regression (see, for example, McDonald, 2009).

[5] The environmental variables and bank-specific variables are incorporated in the second-stage regression analysis when examining the determinants of the Islamic banks' efficiency.

Table 2: OTE, PTE and SE of the Islamic banks for the 4-year average (2006-2009) – Common frontier

	OTE	**PTE**	**SE**
All Banks	0.487	0.728	0.688

Note:
OTE = Overall technical efficiency
PTE = Pure technical efficiency
SE = Scale efficiency

By looking at the Islamic banking industry as a whole, it can be found that the OTE, PTE and SE for the 4-year average were 48.7%, 72.8% and 68.8%, respectively. Hence, the average bank in the sample could improve its OTE, PTE and SE by 51.3%, 27.2% and 31.2%, respectively. In general, the inefficiency was due to scale inefficiency and not pure technical inefficiency. This means that the source of inefficiency of the Islamic banks was their operation at the wrong scale. The Islamic banks were either operating at increasing return to scale (IRS) or decreasing return to scale (DRS). IRS indicates that an increase in inputs results in a higher increase in outputs, while DRS means that an increase in inputs results in lesser output increases. Hence, Islamic banks that have experienced IRS in their operations could achieve significant cost savings and efficiency gains by increasing their scale of operations. Substantial gains can be obtained by altering the scale via internal growth or further consolidation in the sector (Sufian and Noor, 2009). In contrast, the Islamic banks that were operating at DRS should consider downsizing because those banks have already grown beyond their most productive scale size. However, it is more time-consuming to rectify scale inefficiency as compared to pure technical inefficiency (Avkiran, 2006).

As the source of inefficiency for the Islamic banks was largely the scale inefficiency, Table 3 shows the percentage share of the Islamic banks' return to scale based on a common frontier where the Islamic banks are compared globally.

Table 3: All Islamic banks' RTS for 2006, 2007, 2008 and 2009 (percentage share) – Common frontier

Year		IRS	CRS	DRS	Total
2006	No. of banks	12	8	37	57
	% share	21	14	65	100
2007	No. of banks	13	7	38	58
	% share	22	12	66	100
2008	No. of banks	12	12	34	58
	% share	21	21	58	100
2009	No. of banks	12	10	29	51
	% share	23	20	57	100

Note:
RTS = Return to scale
IRS = Increasing return to scale
CRS = Constant return to scale
DRS = Decreasing return to scale

The majority of the Islamic banks were operating at DRS (65% in 2006; 66% in 2007; 58% in 2008; and 57% in 2009). Operating at DRS means that when the bank increases its inputs, the result will be a less than proportionate increase in their outputs. Some of the banks were operating at IRS (21% in 2006; 22% in 2007; 21% in 2008; and 23% in 2009) where a rise in inputs resulted in a more than proportionate rise in outputs. Only a small percentage of the Islamic banks were operating at the optimum scale, that is, constant return to scale (CRS) (14% in 2006; 12% in 2007; 21% in 2008; and 20% in 2009). These were the only banks operating at the right scale.

The result is not surprising since many studies have found that the source of technical inefficiency is mainly scale inefficiency (see, for example: Miller and Noulas, 1996; Isik and Hassan, 2002a; Maghyereh, 2004; Hassan, 2006; Sufian, 2006 and 2007; Mohd. Tahir et al., 2009), although there are also studies finding that the sources of technical inefficiency are linked to pure technical inefficiency (see, for example: Aly et al., 1990; Yudistira, 2004; Pasiouras, 2008a) where the pure technical inefficiency is due to the misallocation of inputs in producing outputs by the banks regardless of scale effect.

Islamic Banks' Efficiency Based on Specific Frontier

In order to minimise the effects of environmental or regional factors that influence the efficiency scores using the common frontier, this study categorised the Islamic banks into specific frontiers, that is, banks from MENA countries or banks from Asian countries (based on their own regional frontier). The OTE, PTE and SE of the Islamic banks in the MENA countries for the 4-year average are shown in Table 4.

Table 4: OTE, PTE and SE of Islamic banks, 4-year average (2006-2009) – MENA countries

	OTE	**PTE**	**SE**
MENA countries	0.490	0.795	0.637

Note:
OTE = Overall technical efficiency
PTE = Pure technical efficiency
SE = Scale efficiency

Interestingly, it is found that the results do not differ much from the earlier findings using the common frontier. This may be due to the fact that large numbers of the Islamic banks in the sample were from MENA countries (more than 65%). Similarly, the main source of inefficiency for the Islamic banks in MENA countries was scale inefficiency.

Based on the results, the technical inefficiency exhibited by the banks stemmed from their operation at the wrong scale (operating either at IRS or DRS), but did not result from pure technical inefficiency. Table 5 shows the return to scale for the Islamic banks in the MENA countries based on the specific frontier; that is, comparing the banks within their region.

Table 5: Islamic banks' RTS for 2006, 2007, 2008 and 2009 (percentage share) in MENA countries –Specific frontier

Year		IRS	CRS	DRS	Total
2006	No. of banks	13	5	23	41
	% share	32	12	56	100
2007	No. of banks	9	7	26	42
	% share	21	17	62	100
2008	No. of banks	10	8	22	40
	% share	25	20	55	100
2009	No. of banks	7	5	22	34
	% share	20	15	65	100

Note:
RTS = Return to scale
IRS = Increasing return to scale
CRS = Constant return to scale
DRS = Decreasing return to scale

Further investigation was carried out by calculating the percentage of the Islamic banks based on their RTS in the MENA countries. It shows that the majority of the Islamic banks were operating at DRS (56% in 2006; 62% in 2007; 55% in 2008; and 65% in 2009). Some Islamic banks were operating at IRS (32% in 2006; 21% in 2007; 25% in 2008; and 20% in 2009). However, there were only some Islamic banks (12% in 2006; 17% in 2007; 20% in 2008; and 15% in 2009) operating at the CRS, that is, the optimum scale. These were the banks operating at the most productive scale size.

The OTE, PTE and SE of the Islamic banks in the Asian countries for the 4-year average are shown in Table 6. It was found that the efficiency scores of the Islamic banks in these countries were much higher compared to those of the MENA countries. This may be due to the smaller gap and variation among the Islamic banks in the Asian countries.

Table 6: OTE, PTE and SE of Islamic banks (4-year average) – Asian countries

	OTE	PTE	SE
Asian countries	0.857	0.929	0.922

Note:
OTE = Overall technical efficiency
PTE = Pure technical efficiency
SE = Scale efficiency

High average efficiency scores for OTE, PTE and SE were calculated for these Islamic banks (85.7%; 92.9% and 92.2%, respectively). Similarly, the main source of inefficiency for Islamic banks in Asian countries was due to scale inefficiency although the difference between PTE and SE on average was only minimal (0.7%). Hence, the overall findings show that the source of inefficiency of the Islamic banks in Asian countries was also scale inefficiency although the difference between PTE and SE was minimal. Hence, the banks that were already operating at the optimum scale should focus on their selection of inputs to improve pure technical efficiency. Table 7 shows the RTS for Islamic banks in Asian countries based on their own specific frontier.

Table 7: Islamic banks' RTS for 2006, 2007, 2008 and 2009 (percentage share) Asian countries – Specific frontier

Year		**IRS**	**CRS**	**DRS**	**Total**
2006	No. of banks	3	6	7	16
	% share	19	37	44	100
2007	No. of banks	3	7	6	16
	% share	19	44	37	100
2008	No. of banks	3	8	7	18
	% share	17	44	39	100
2009	No. of banks	3	9	5	17
	% share	18	53	29	100

Note:
RTS = Return to scale
IRS = Increasing return to scale
CRS = Constant return to scale
DRS = Decreasing return to scale

Calculating the percentage of Islamic banks based on their RTS for Asian countries shows some operating at IRS (19% in 2006; 19% in 2007; 17% in 2008; and 18% in 2009) and some operating at DRS (44% in 2006; 37% in 2007; 39% in 2008; 29% in 2009). A higher percentage of banks was operating at the optimum level which is at CRS (37% in 2006; 44% in 2007; 44% in 2008; and 53% in 2009). This shows that the banks that were already operating at CRS needed to further improve their input utilisation to enhance their OTE. Finally, it can be noted that

the trend shows that the Islamic banks in the Asian countries had high and constant scores of OTE, PTE and SE for the four year period, and that a high percentage of Islamic banks were operating at their most productive scale. Hence, the Islamic banks in the Asian countries when compared in their specific frontier produced higher average efficiency scores.

Ranking of Islamic Banks' Efficiency

This study also examines the efficiency score using the common frontier on average for the four year period (2006 to 2009) for each individual bank, and ranks it accordingly from the highest score to the lowest score. Hence, the management of each Islamic bank can be compared, from the most efficient to the least efficient. This comparison can benefit policy makers and facilitate further analysis of each Islamic bank in future research. The individual characteristics of the Islamic banks can also be examined further.

Table 8 shows the ranking of Islamic banks for PTE on average for the period 2006-2009. PTE is a measure of efficiency without scale effects. It only relates to the ability of managers to utilise the bank's given resources irrespective of their scale. It is found that thirteen (13) Islamic banks were purely technically efficient on average. These banks were: ABC Islamic Bank; Abu Dhabi Islamic Bank; Al Rajhi Bank; Albaraka Islamic Bank; Amlak Finance PJSC, Arcapita; Dubai Islamic Bank; EONCAP Islam Bank; First Investment Company; First National Bank Modaraba; Investors Bank; Qatar International Islamic Bank; and Standard Chartered Modaraba. It should be noted that the average scores for First Investment Company and Standard Chartered Modaraba were based on the two year average, and the score for First National Modaraba was only based on 2009 due to data unavailability. Under the assumptions of variable return to scale, by avoiding the scale, it is found that the majority of the efficient Islamic banks were again from the GCC. In contrast, among the least efficient banks (with scores less than 0.4) were Arab Finance House, Bank Syariah Mandiri, Meezan Bank, Jordan Islamic Bank and A'Ayan Leasing and Investment Company.

Table 8: Ranking of Islamic banks for PTE (average 2006-2009) – All banks

Country	Bank	2006	2007	2008	2009	Average	Ranking
Bahrain	ABC Islamic Bank	1	1	n/a	1	1.000	1
UAE	Abu Dhabi Islamic Bank	1	1	1	1	1.000	1
Saudi Arabia	Al Rajhi bank	1	1	1	1	1.000	1
Bahrain	Albaraka Islamic Bank	1	1	1	1	1.000	1
UAE	Amlak Finance PJSC	1	1	1	n/a	1.000	1
Bahrain	Arcapita Bank	n/a	1	1	1	1.000	1
UAE	Dubai Islamic Bank	1	1	1	1	1.000	1
Malaysia	EONCAP Islamic Bank	1	1	1	1	1.000	1
Kuwait	First Investment Company	n/a	n/a	1	1	1.000	1
Pakistan	First National Bank Modaraba	n/a	n/a	n/a	1	1.000	1
Bahrain	Investors Bank	1	1	1	n/a	1.000	1
Qatar	Qatar International Islamic Bank	1	1	1	1	1.000	1
Pakistan	Standard Chartered Modaraba	1	n/a	1	n/a	1.000	1
Malaysia	Hong Leong Islamic Bank	1	0.952	1	1	0.988	14
Iran	Bank Tejarat	1	1	1	0.887	0.972	15

Table 8: Ranking of Islamic banks for PTE (average 2006-2009) – All banks(Cont)

Country	Bank	2006	2007	2008	2009	Average	Ranking
Bahrain	Venture Capital Bank	0.912	1	1	n/a	0.971	16
Kuwait	Kuwait Finance House	0.785	1	1	1	0.946	17
Qatar	Qatar Islamic Bank	0.753	1	1	1	0.938	18
Iran	Bank Maskan	0.792	0.992	0.952	1	0.934	19
Kuwait	Investment Dar Company	0.83	1	n/a	n/a	0.915	20
Iran	Bank Saderat Iran	1	0.881	0.883	0.873	0.909	21
Turkey	Turkiye Finans Katilim Bankasi	0.89	0.974	0.778	n/a	0.881	22
Iran	Bank Mellat	0.663	1	1	0.802	0.866	23
UAE	Tamweel PJSC	0.78	0.614	1	1	0.849	24
Malaysia	Affin Islamic Bank	1	1	1	0.323	0.831	25
Iran	Bank Sepah	0.66	0.862	0.909	0.862	0.823	26
Bahrain	Shamil Bank of Bahrain	0.602	0.562	1	1	0.791	27
Brunei	Bank Islam Brunei	0.89	0.868	1	0.357	0.779	28
Malaysia	RHB Islamic Bank	1	0.652	0.805	0.641	0.775	29
Bahrain	Al Salam Bank	0.881	0.704	0.599	0.883	0.767	30
Turkey	Bank Asya-Asya Katilim Bankasi	0.769	0.835	0.749	0.669	0.756	31

Table 8: Ranking of Islamic banks for PTE (average 2006-2009) – All banks(Cont)

Country	Bank	2006	2007	2008	2009	Average	Ranking
Bahrain	Unicorn Investment Bank	n/a	1	0.976	0.201	0.726	32
Saudi Arabia	Bank Al-Bilad	1	0.942	0.516	0.386	0.711	33
Malaysia	Bank Islam Malaysia	0.79	0.713	0.418	0.912	0.708	34
Bahrain	Capivest	0.464	0.784	n/a	0.865	0.704	35
Malaysia	CIMB Islamic	0.453	0.357	1	1	0.703	36
Yemen	Saba Islamic Bank	0.412	0.528	0.864	0.957	0.690	37
Sudan	United Capital Bank	0.71	0.638	0.66	n/a	0.669	38
Sudan	Tadamon Islamic Bank	0.502	0.492	0.743	0.857	0.649	39
Malaysia	Bank Muamalat Malaysia	1	0.553	0.509	0.518	0.645	40
Bahrain	Gulf Finance House	0.638	n/a	n/a	n/a	0.638	41
Bangladesh	Shahjalal Islamic Bank	0.585	0.789	0.802	0.29	0.617	42
Pakistan	First Habib Modaraba	0.179	n/a	0.654	1	0.611	43
Egypt	Faisal Islamic Bank of Egypt	0.775	0.707	0.505	0.435	0.606	44
UAE	Sharjah Islamic Bank	0.883	0.54	0.532	0.368	0.581	45
Pakistan	Emirates Global Islamic Bank	1	0.673	0.326	0.231	0.558	46
Turkey	Kuwait Turkish Participation Bank	0.579	0.604	0.545	0.414	0.536	47

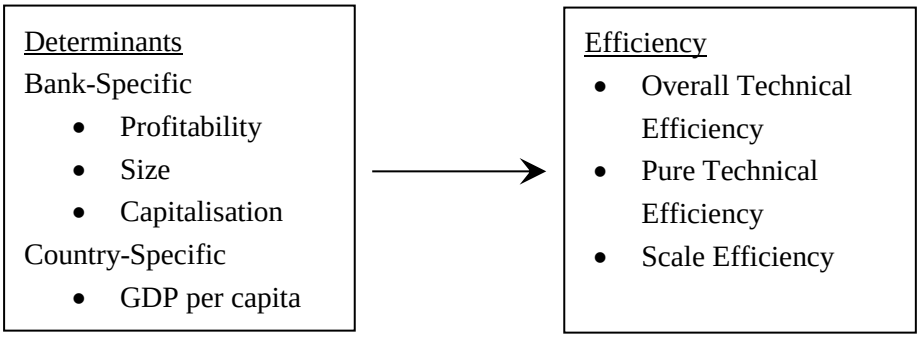
Table 8: Ranking of Islamic banks for PTE (average 2006-2009) – All banks(Cont)

Country	Bank	2006	2007	2008	2009	Average	Ranking
Palestine	Arab Islamic Bank	0.388	0.463	0.574	0.684	0.527	48
Bangladesh	ICB Islamic Bank	0.447	0.666	0.618	0.25	0.495	49
Egypt	Egyptian Saudi Finance Bank	0.392	0.393	0.603	0.578	0.492	50
Pakistan	Dawood Islamic Bank	n/a	0.688	0.346	0.433	0.489	51
Tunisia	BEST Bank	0.325	0.427	0.656	0.467	0.469	52
Sudan	Industrial Development Bank	0.235	0.259	0.381	1	0.469	52
Iraq	Kurdistan International Bank	0.342	1	0.15	0.376	0.467	54
Qatar	First Finance Company	0.4	0.293	0.681	n/a	0.458	55
Bahrain	Khaleeji Commercial Bank	0.374	0.547	0.5	0.388	0.452	56
Malaysia	Asian Finance Bank	n/a	0.681	0.199	0.455	0.445	57
Pakistan	BankIslami Pakistan Limited	0.664	0.574	0.275	0.234	0.437	58
Lebanon	Arab Finance House	0.404	0.427	0.362	n/a	0.398	59
Indonesia	Bank Syariah Mandiri	0.315	0.173	0.503	n/a	0.330	60
Pakistan	Meezan Bank	0.311	0.246	0.416	0.33	0.326	61
Jordan	Jordan Islamic Bank	0.322	0.222	0.445	0.303	0.323	62
Kuwait	A'Ayan Leasing and Investment Company	0.209	0.21	0.35	n/a	0.256	63

Determinants of Islamic Banks' Efficiency

In order to find the determinants of Islamic banks' efficiency as depicted in Figure 2, three panel regression OLS models are tested. The common determinants include bank-specific factors (namely, size, profitability and capitalisation) and a country-specific variable (namely, economic conditions). The natural logarithm of total assets is the proxy for size; return on assets is the proxy for profitability; total equity per total assets is the proxy for capitalisation; and the natural logarithm of GDP per capita is the proxy for economic conditions.

Figure 2: Determinants of Islamic banks' efficiency



There are three models to examine the determinants of overall technical efficiency, pure technical efficiency and scale efficiency, respectively. Table 9 summarises the results of Models 1, 2 and 3. In Model 1, it is found that the country-specific factor, namely, the country's economic condition measured by GDP per capita, had a significant positive effect on OTE at the 1% level. However, it is found that size had a significant negative effect on OTE at the 10% level. Profitability as measured by ROA had a negative effect at the 10.5% level. Since OTE can be decomposed into PTE and SE, Model 2 and Model 3 examine the determinants of PTE and SE, respectively. In Model 2, it is found that size and capitalisation had a significant positive effect on PTE at the 1% level. However, GDP per capita had a significant positive effect at the 15% level and profitability had a negative effect on PTE although it was not significant. In Model 3, it is found that GDP per capita had a significant positive effect on SE at the 1% level. However, size had a negative significant effect on SE at the 1% level. It is also found that profitability and capitalisation had a negative effect on SE although the effect was not significant.

The positive effect of GDP per capita is an important indicator as studies (see, for example: Chaffai et al., 2001; Kablan, 2010) that include various country-specific factors have found a significant positive effect on efficiency. This is due to the fact that the income per capita of a country can affect many factors related to the activities of financial intermediaries, such as the demand for financing, investment and deposits. This shows that the fundamental factors of good economic conditions for both MENA, including GGC, and Asian countries can influence the level of efficiency of the Islamic banks.

It is found that bank size had a negative effect on overall technical efficiency and scale efficiency. This finding supports earlier studies (see, for example: Darrat et al., 2002; Isik and Hassan, 2002a and 2003a) that found a negative relationship. In the case of this study, the negative relationship might be due to the findings that the majority of the Islamic banks especially in the MENA were operating at DRS. Hence, these banks were too large and may have been operating at the less optimum scale; that is, they were scale inefficient. However, the bank size had a significant positive effect on PTE at the 1% level; and this finding is supported by many previous studies (see, for example: Aly et al., 1990; Miller and Naulas, 1996; Hauner, 2005; Hassan, 2006). In these cases, the management of the bigger banks were more efficient in converting their inputs into outputs regardless of their scale.

Table 9: Summary of Model 1, Model 2 and Model 3 results

	Model 1		**Model 2**		**Model 3**	
	OTE		**PTE**		**SE**	
	Coef.	P > (t)	Coef.	P > (t)	Coef.	P > (t)
ROA	-0.0056	0.105	-0.0023	0.492	-0.0045	0.203
lnTA	-0.0423	0.062	0.0552	0.007	-0.1019	0.000
EQTA	0.0016	0.263	0.0038	0.004	-0.0019	0.143
lnGDP	0.0756	0.002	0.0317	0.147	0.0569	0.008
Constant	0.0915	0.625	-0.0404	0.808	0.9732	0.000
R-squared		15.03%		19.87%		29.29%

Note:
OTE = Overall technical efficiency
PTE = Pure technical efficiency
SE = Scale efficiency
ROA = Return on assets
lnTA = Return to natural logarithm of total assets
EQTA = Total equity per total assets
lnGDP = Return to natural logarithm of GDP per capita

It is also found that the capitalisation of Islamic banks had a positive effect on pure technical efficiency at the 1% level. This positive relationship with bank efficiency is expected as studies (see, for example: Berger and Mester, 1997; Isik and Hassan, 2003a; Casu and Girardone, 2004) viewed the higher level of equity as a cushion for future losses.

Finally, it is found that profitability had a negative effect on overall technical efficiency, pure technical efficiency and scale efficiency, however it was not significant. This is surprising as many studies have found that financial performance, especially ROA, is significantly positively related to technical efficiency (see, for example: Isik and Hassan, 2002a; Hassan and Marton, 2003; Miller and Noulas, 1996; Hassan, 2006; Pasiouras, 2008b; Sufian, 2009) compared to studies that found a negative relationship (see, for example: Casu and Girardone, 2004; Ataullah and Le, 2006) and a few studies (see, for example: Sherman and Zhu, 2006; Laurenceson and Qin, 2008) that found an insignificant relationship between profitability and efficiency. Hence, as argued by Duncan and Elliott (2004), the inconsistency of the positive relationship between efficiency and financial performance suggests that financial institutions that pursue improved financial performance through the single-minded focus on lower costs may be fundamentally misguided. In this case, the Islamic banks might have been operating in unfavourable country environments. As explained by Avkiran (2006), the "unlucky" unit may well be operating at maximum efficiency when compared to its peers. However, it is not captured in accounting profitability measures.

Conclusion

This study finds that the Islamic banks globally on average were purely technical efficient in the study period. However, the main source of technical inefficiency was due to the Islamic banks operating at the wrong scale, particularly the majority of Islamic banks operating at DRS where they needed to reduce their inputs to achieve optimum scales. Hence, the Islamic banks in general obtained high scores for pure technical efficiency, and this indicates that the banks' management were

able to efficiently control the costs and use the mix of inputs to produce outputs regardless of scale effects.

The differences in scores for the Islamic banks in the MENA countries and Asian countries might be due to the country-specific factor that influences the efficiency score. Furthermore, the comparison of Islamic banks across Asian countries might not have produced huge gaps as there were only 18 banks from 5 different countries, most of them were from Malaysia and Pakistan, and the efficiency scores were relatively high. This was different for an Islamic bank from a MENA country as there were 42 banks represented by 15 different countries, and that may have caused the average score to be quite low for their region. However, by examining individual Islamic banks, it is found that the most efficient Islamic banks were from GCC. The Islamic banks from Asian countries that were efficient among their group were still ranked lower when they were compared globally.

The economic condition of a country was the main determinant of an Islamic bank's efficiency. This explains the importance of environmental factors that can influence the efficiency of Islamic banks. Good and stable economic conditions are an advantage for Islamic banks in acting as efficient financial intermediaries. In relation to bank-specific factors, capitalisation showed a positive influence on efficiency. This shows that well-capitalised Islamic banks were efficient. However, the size of Islamic banks had a significant negative effect on scale efficiency. The possible reason for this is that the majority of the Islamic banks were too large and operating at DRS. However, this was not the case for pure technical efficiency, where larger banks tended to be more technically efficient. Islamic banks that operate at too large a scale of operation may find it difficult to use their resources efficiently and hence produce at less than the optimum scale. Moreover, the negative effect of profitability on efficiency might raise a question about the efficiency measures that are not captured by accounting profitability measures. This might be due to some efficient Islamic banks operating in an unfavourable country environment that affects their profitability.

Finally, this study can make a significant contribution especially to the understanding of the performance of Islamic banks in MENA and Asian countries in the period before and after the financial crisis (from 2006 to 2009). The findings have measured and explained the efficiency of

Islamic banks, and an improvement in such efficiency can lead to higher profits and survival in a competitive environment and sustain financial crisis. This gives some insight to policy makers, especially in the central banks and international bodies such as the Islamic Financial Services Board, as the sector's long-term sustainability depends on economic efficiency including technical efficiency (Hassan, 2006). Moreover, identifying the sources of inefficiencies can improve organisational learning which is a source of competitive advantage (Avkiran, 2009). Hence, Islamic banks need to move forward by utilising their resources to become more efficient and to ensure healthy growth in their industry.

References

Ahmad Mokhtar, H. S., Abdullah, N. & Alhabshi, S.M. (2006a), "A Conceptual Framework for and Survey of Banking Efficiency Study", *Unitar E-Journal*, 2(2), 1-19.

Ahmad Mokhtar, H. S., Abdullah, N. & Alhabshi, S.M. (2006b), "Efficiency of Islamic Banking in Malaysia: A Stochastic Frontier Approach", *Journal of Economic Corporation*, 22 (2), 37-30.

Ahmad Mokhtar, H. S., Abdullah, N. & Alhabshi, S.M. (2008), "Efficiency and Competition of Islamic Banking in Malaysia", *Humanomics*, 24(1), 28-48.

Akhigbe, A. & McNulty, J.E. (2005), "Profit Efficiency Sources and Differences Among Small and Large U.S. Commercial Banks", *Journal of Economics and Finance*, 29 (3), 289 – 299.

Allen, L. & Rai, A. (1996), "Operational Efficiency in Banking: An International Comparison", *Journal of Banking and Finance*, 20, 655 - 672.

Aly, H. Y., Grabowski, R., Pasurka, C. & Rangan, N. (1990), "Technical, Scale, Allocative Efficiency in US Banking: An Empirical Investigation", *The Review of Economics and Statistics*, 72, 211-218.

Ariff, M. & Can, L. (2008), "Cost and Profit Efficiency of Chinese Banks: A Non-Parametric Analysis", *China Economic Review*, 19 (2), 260-273.

Ariss, R. T. (2010). Competitive Conditions in Islamic and Conventional Banking: A Global Perspective. *Review of Financial Economics*, 19, 101-108.

Ataullah, A. & Le, H (2006), "Economic Reforms and Bank Efficiency in Developing Countries: The Case of Indian Banking Industry", *Applied Financial Economics*, 16, 653 – 663.

Avkiran, N. K. (2006), Productivity Analysis in the Service Sector with Data Envelopment Analysis (3rd eds), Australia.

Avkiran, N. K. (2011), "Association of DEA Super-efficiency estimates with Financial Ratios: Investigating the Case for Chinese banks", *Omega*, 39(3), 323-334.

Banker, R. D., Charnes, A. & Cooper, W. W. (1984), "Some Models for Estimating Technical and Scale Efficiency in Data Envelopment Analysis", *Management Science*, 30, 1078-1092.

Bauer, P. W., Berger, A. N., Ferrier, G. D. & Humphrey, D. B. (1998), "Consistency Conditions for Regulatory Analysis of Financial Institutions: A Comparison of Frontier Efficiency Methods", *Journal of Economics and Business*, 50 (2), 85-114.

Beck, T., Dermiguc-Kunt, A. & Merrouche, O. (2013), "Islamic vs. Conventional Banking: Business Model, Efficiency and Stability", *Journal of Banking & Finance,* 37, 433-447.

Berger, A. N. & 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., Hunter, W.C. & Timme, S.G. (1993), "The Efficiency of Financial Institutions", *Journal of Banking and Finance,* 17, 221-249.

Berger, A. N. & Mester, L. J. (1997), "Inside the Black Box: What Explains Differences in the Efficiencies of Financial Institutions?", *Journal of Banking and Finance*, 21(7), 895-947.

Casu, B. & Girardone, C. (2004), "Financial Conglomeration: Efficiency, Productivity and Strategic Drive", *Applied Financial Economics.* 14, 687 – 696.

Chaffai, M.E., Dietsch M. & Lozano-Vivas A. (2001), "Technological and Environmental Differences in the European Banking Industries", *Journal of Financial Services Research,* 19 (2/3), 147-162.

Charnes A., Cooper, W.W. & Rhodes, E. (1978), "Measuring the Efficiency of Decision Making Units", *European Journal of Operational Research,* 2, 429-444.

Cooper, W. W., Seiford, L. M. & Tone, K. (2000), Data Envelopment Analysis: A Comprehensive Text with Models, Applications, References and DEA-Solver Software, Kluwer Academic Publisher, Massachusetts.

Darrat, A. F., Topuz, C. & Yousef, T. (2002), "*Assessing Cost and Technical Efficiency of Banks in Kuwait",* Paper Presentation to the ERF's 8th Annual Conference in Cairo. Retrieved March 10, 2007. http://www.erf.org

Dietsch, M. & Lozano-Vivas, A. (2000), "How the Environment Determines Banking Efficiency: A Comparison between French and Spanish Industries", *Journal of Banking and Finance*, 24, 985 – 1004.

Drake, L. & Hall, M. J. B. (2003), "Efficiency of Japanese Banking: An Empirical Analysis", *Journal of Banking and Finance*, 27, 891-917.

Duncan, E. & Elliott, G. (2004), "Efficiency, Customer Service and Financial Performances Among Australian Financial Institutions", *The International Journal of Bank Marketing*, 22 (5), 319-342.

English, M., Grosskopf, S., Hayes, K. & Yaisawarng, S. (1993), "Output Allocative and Technical Efficiency of Banks", *Journal of Banking and Finance*, 17, 349-366.

Favero, C. & Papi, L. (1995), "Technical Efficiency and Scale Efficiency in the Italian Banking Sector: A Non-Parametric Approach", *Applied Economics*, 27, 385-395.

Ferrier, G. D. & Lovel, C. A. K. (1990), "Measuring Cost Efficiency in Banking: Econometric and Linear Programming Evidence", *Journal of Econometrics*, 46, 229-245.

Furukawa, H. (1995), "Measuring Efficiency and Productivity Growth in Japanese Banking: A Non-Parametric Frontier Approach", *Applied Financial Economics*, 5, 95-107.

Hassan, M. K. (2006), "The X-Efficiency in Islamic Banks", *Islamic Economic Studies,* 13 (2), 49 – 78.

Hassan, M. K. & Hussein, K. A. (2003), "Static and Dynamic Efficiency in the Sudanese Banking System", *Review of Islamic Economics*, 14, 5 – 48.

Hassan, I., Lozano-Vivas, A. & Pastor, J. T. (2000), Cross-Border Performance in European Banking in Bank of Finland, *Bank of Finland Discussion Papers 24/2000*, Finland.

Hassan, I. & Marton, K. (2003), "Development and Efficiency of the Banking Sector in a Transitional Economy: A Hungarian Experience", *Journal of Banking and Finance*, 27 (12), 2249 – 2271.

Hauner, D. (2005), "Explaining Efficiency Differences Among Large German and Austrian Bank", *Applied Economics*, 37 (9), 969 – 980.

Iqbal, M. & Molyneux, P. (2005), Thirty Years of Islamic Banking: History, Performance and Prospects, Palgrave Macmillan, England.

Isik, I. & Hassan, M. K. (2002a), "Technical, Scale and Cost Efficiencies of Turkish Banking Industry", *Journal of Banking and Finance*, 26, 719-766.

Isik, I. & Hassan, M. K. (2002b), "Cost and Profit Efficiency of Turkish Banking Industry: An Empirical Investigation", *The Financial Review*, 37 (2), 257-280.

Isik, I. & Hassan, M. K. (2003a), "Efficiency, Ownership and Market Structure, Corporate Control and Governance in Turkish Banking Industry", *Journal of Business Finance and Accounting*, 30 (9 & 10), 1363-1421.

Isik, I. & Hassan, M. K. (2003b), "Financial Disruption and Bank Productivity: The 1994 Experience of Turkish Banks", *The Quarterly Review of Economics and Finance*, 43, 291 – 320.

Kablan, S. (2010), "Banking Efficiency and Financial Development in Sub-Saharan Africa, IMF, *International Monetary Fund* (*IMF) Working Paper.*

Katib, M. N. (1999),"Technical Efficiency of Commercial Banks in Malaysia", *Banker's Journal Malaysia,* 111, 40-53.

Kwan, S. H. (2002), "The X-efficiency of Commercial Banks in Hong Kong", *Federal Reserve Bank of San Francisco Working Papers Series*, 2002-14, 1-30.

Laurenceson, J. & Qin, F (2008), "Has Minority Foreign Investment in China's Banks Improved Their Cost Efficiency?", *China and World Economy*, 16 (3), 57 -74.

Maghyereh, A. (2004), "The Effect of Financial Liberalization on the Efficiency of Financial Institutions: The Case of Jordanian Commercial Banks", *Journal of Transnational Management Development*, 9 (2-3), 71 – 106.

McDonald, J (2009), "Using Least Squares and Tobit in Second Stage DEA Efficiency Analysis", *European Journal of Operational Research*, 197 (2), 792-798.

Miller, S. M. & Noulas, A. G. (1996), "The Technical Efficiency of Large Bank Production", *Journal of Banking and Finance*, 20, 495-509.

Mohd. Tahir, I., Abu Bakar, N. M. & Haron, S. (2009), "Estimating Technical and Scale Efficiency of Malaysian Commercial Banks: A Non-Parametric Approach", *International Review of Business Research Papers*, 5 (1), 113 -123.

Mostafa, M. M. (2009), "Modeling the Efficiency of Top Arab Banks: A DEA-Neural Network Approach", *Expert Systems with Application*, 36, 309 -320.

Omar, M. A., Abdul Rahman, A. R. Mohd Yusuf, R., Abd. Majid, M. S & Mohd. Rasid, M. E. S. (2006), "Efficiency of Commercial Banks in Malaysia", *Asian Academy of Management Journal of Accounting and Finance*, 2 (2), 19-42.

Pasiouras, F. (2008a), "International Evidence on the Impact of Regulations and Supervision on Banks' Technical Efficiency: An Application of Two-Stage Data Envelopment Analysis", *Review of Quantitative Finance and Accounting*, 30, 187 – 223.

Pasiouras, F, (2008b), "Estimating the Technical and Scale Efficiency of Greek Commercial Banks: The Impact of Credit Risk, Off-balance Sheet Activities, and International Operations", *Research in International Business and Finance,* 22, 301 – 318.

Resti, A. (1997), "Evaluating the Cost Efficiency of the Italian Banking System: What Can We Learn from the Joint Application of Parametric and Non-Parametric Techniques", *Journal of Banking and Finance*, 21, 221-250.

Sathye, M. (2001), "X-efficiency in Australian Banking: An Empirical Investigation", *Journal of Banking and Finance,* 25, 613 -630.

Sathye, M. (2003), "Efficiency of Banks in a Developing Economy: The Case of India", *European Journal of Operational Research,* 148, 662 – 671.

Schaffnit, C., Rosen, D. & Paradi, J. C. (1997), "Best Practice Analysis of Bank Branches: An Application of DEA in a Large Canadian Bank", *European Journal of Operational Research,* 98, 269 – 289.

Sherman, H. D. & Zhu, J. (2006), "Benchmarking with Quality-Adjusted DEA (Q-DEA) to Seek Lower-Cost High Quality Service: Evidence from a U.S. Bank Application", *Annals of Operations Research*, 145, 305 – 309.

Smola, E. and Mirakhor, A. (2010), "The Global Financial Crisis and Its Implications for the Islamic Financial Industry", *International Journal of Islamic and Middle Eastern Finance and Management,* 3, (4), 372-385.

Spong, K., Sullivan, R. J. & DeYoung, R. (1995), What Makes a Bank Efficient? – A Look at Financial Characteristics and Bank Management and Ownership Structure, in Federal Reserve Bank of Kansas City, *Financial Industry Perspective*.

Strum, J. & Williams, B. (2004), "Foreign Bank Entry, Deregulation and Bank Efficiency: Lessons from the Australian Experience", *Journal of Banking and Finance*, 28, 1775-1799.

Sufian, F. (2006 and 2007), "The Efficiency of Islamic Banking Industry: A Non-Parametric Analysis with Non-Discretionary Input Variable", *Islamic Economic Studies,* 14 (1&2), 53 – 86.

Sufian, F. (2009), "Determinants of Bank Efficiency during Unstable Macroeconomic Environment: Empirical Evidence from Malaysia", *Research in International Business and Finance,* 23, 54-77.

Sufian, F. & Noor, M. A. N. M (2009), "The Determinants of Islamic Bank's Efficiency Changes: Empirical Evidence from MENA and Asian Banking Sectors", *International Journal of Islamic and Middle Eastern Finance and Management,* 2 (1), 120 – 138.

Tabachnik, B.G. & Fidell, L.S. (1996), Using Multivariate Analysis, Harper Collins, New York.

Yudistira, D. (2004), "Efficiency in Islamic Banking: An Empirical Analysis of Eighteen Banks", *Islamic Economic Studies,* 12 (1), 1 – 19.

Zaim, O. (1995), "The Effect of Financial Liberalization on the Efficiency of Turkish Commercial Bank", *Applied Financial Economics,* 5, 257-264.