Efficiency Analysis of Islamic Banks in Africa, Asia and the Middle East

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Abstract: This article examines the efficiency change or improvement of Islamic banks over 1998-2002 on a country and regional basis using Malmquist DEA methodology. The resulting Malmquist Total Factor Productivity (*TFP*) index is then decomposed to consider changes in their productive and technical efficiency components. Indonesia and Yemen proved the most improved countries over the period, and Asia was the best region. In contrast, the United Arab Emirates, as a country, and the Middle East, as a region, had the best use of inputs and outputs for efficiency change. For technical change efficiency Indonesia and Yemen were the most improved countries and Asia was once again the best performing region. Finally, efficiency change and TFP change was negatively related to the banks' age. Therefore, policy-makers might well look to Islamic banks from the United Arab Emirates for their use of inputs and outputs, and to Indonesian or Yemeni banks for their use of technology.

I. Introduction

Islamic banks are relatively new (the first successful Islamic bank, Egypt's Mit Ghamr Savings Bank, was not established until 1963) compared to conventional commercial banks. They expanded rapidly over the 1980s with the growth of the oil-rich economies in the Middle East. Islamic

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banking has continued to grow ever since with assets of some US$200 billion (Asiamoney, 2002). Increasingly, with globalization and financial liberalization, Islamic banks are competing for business with conventional banks. More importantly, Islamic banks must now compete with the Islamic services of banks, such as Chase Manhattan, Citibank and ANZ Grindlays, for Muslim customers. Yet, despite its continued expansion, only limited evaluation of Islamic bank performance has been conducted at the macro-level.

As governments with large Muslim populations face the challenge of developing Islamic financial systems, policy-makers seek models adopted by other countries. A few, such as Iran, Sudan and (unsuccessfully) Pakistan, have tried to adopt a fully Islamic banking system. Others, like Indonesia, allow both Islamic and conventional banks to compete for local business within their separate areas. Finally, Malaysia has introduced a dualistic approach whereby, besides Islamic banks, conventional banks can also offer Islamic services through 'Islamic windows'. By evaluating Islamic bank performance across countries, the country with the most efficient Islamic banks can be identified, thereby offering policy makers some direction. This paper utilizes data envelopment analysis approach, DEA Malmquist methodology, to investigate the efficiency performance of Islamic banks in 13 countries from the Middle East, North Africa and Asia. The results indicate that Asia is the most efficient region due in part to the use of technology. The next section covers the literature; section 3 details the methodology, with the results in section 4, and section 5 summarizes and concludes.

II. Literature Review

Financial institutions perform numerous tasks and use multiple inputs in the intermediation process including taking deposits and transforming them into loans. The evaluation of bank efficiency in the use of multiple inputs and outputs began with US studies and soon spread to other country-specific measurements across Europe (*e.g.* Altunbas and Chakravarty, 2001). Cross-country bank efficiency performance analysis then spread from the European Union to developing and transition countries with emphasis on whether financial reform had improved bank efficiency (*e.g.* Bonin, et al., 2005).

As most countries have only a few Islamic banks, a cross-country evaluation allows their performance to be evaluated against other Islamic

rather than conventional banking institutions. DEA models assume that the decision-making units (DMUs) are similar. As Islamic banks must follow the same *Sharīʿah* principles regardless of location, this is a reasonable assumption. The early Islamic bank performance studies began with individual bank comparisons and country summaries (*e.g.* Nienhaus, 1988). This was due in part to limited numbers of Islamic institutions in any one country and hence data limitations. The early Islamic bank literature in any case was predominantly devoted to explaining theoretical and ideological aspects rather than empirical analysis (*e.g.* Ariff, 1988; Karim, 2001).

Efficiency analysis of Arab Islamic banks by Molyneux and Iqbal (2005) found that while their cost inefficiencies were similar, their profit inefficiencies varied. This could reflect their differing range of services. Foreign banks were less cost efficient but more profit efficient. So perhaps foreign banks offered higher value services to larger customers and thus earned higher returns. Financial reforms in the 1990s did not appear to improve efficiency. Yudistira (2003) discovered that Middle Eastern banks were less efficient than Islamic banks elsewhere and that larger Islamic banks were more efficient.

According to Asiamoney (2002), Malaysia is at the forefront of Islamic finance with its development of Islamic securities. We therefore hypothesize that Malaysia should prove the most efficient of our sample countries. Similarly, given that the oldest and largest Islamic banks are in the Middle East, some of its individual banks should be among the most efficient. Given that Middle Eastern banks were on average less cost efficient than banks outside that region (Yudistira, 2003), we hypothesize that Middle Eastern banks will have the lowest efficiency change results (this is the change in efficiency from one year to the next rather than the specific level of efficiency as in Yudistira, 2003).

III. Methodology and Data

The method chosen here is the non-parametric Malmquist DEA. It has the advantage that its total factor productivity (TFP) index can be decomposed into its technical efficiency change and technical change components (Fare *et al.*, 1994). In addition, an assumption of cost minimization and revenue maximization is not required. Therefore, as Coelli *et al.* (1998) state, the Malmquist methodology is suitable to measure not-for-profit sectors such as government departments. While Islamic banks are for-profit bodies, it could be argued that they nevertheless have some social objectives and

so profit maximization may not necessarily be their major focus. Their time horizons may also differ from conventional banks due to their equity positions in client projects. So it would be useful to compare these results with DEA results obtained with a cost minimization focus.

The methodology here closely follows Coelli *et al.*, (1998). The Malmquist TFP change index between period *s* (the base period) and period *t* is given by:

$$m_0(y_s,x_s,y_t,x_t)= \left[\frac{d_0^s(y_t,x_t)}{d_0^s(y_s,x_s)} x \frac{d_0^t(y_t,x_t)}{d_0^t(y_s,x_s)}\right]^{1/2} \quad (1)$$

where $d_0{}^s(x_t, y_t)$ represents the distance from the period *t* observation to the period *s* technology. A value of m_0 greater than one will indicate positive TFP growth from period *s* to period *t* while a value less than one indicates a TFP decline (Coelli *et al.*, 1998: 223).

This result can be decomposed into efficiency change and technical change as given by:

$$\text{Efficiency change} = \frac{d_0^t(y_t,x_t)}{d_0^s(y_s,x_s)} \quad (2)$$

and

$$\text{Technical change} = \left[\frac{d_0^s(y_t,x_t)}{d_0^t(y_t,x_t)} x \frac{d_0^s(y_s,x_s)}{d_0^t(y_s,x_s)}\right]^{1/2} \quad (3)$$

The data is from the Bankscope database, which contains bank annual report data on a worldwide basis, which include FitchRatings, Factiva, Capital Intelligence, The Economist Intelligence Unit, Moody's, Standards and Poor's and FinInfo. In this case its 'Islamic bank' specialization provided 21 banks from 13 countries for our sample. The period chosen was 1998 to 2002 to maximize the number of countries available and to miss out the Asian financial crisis. Data was converted to US dollars based on end of year rates. Note that the efficiency change results are only reported from the year 1999 onwards as there was no comparison year for 1998.

When selecting variables for the model, the intermediation approach was chosen. We are testing the efficiency change of the 'intermediation' process of the banks rather than production process, which generally analyzes individual bank branch performance. To measure a bank's productivity, we define inputs and outputs using a variation of the

intermediation approach originally developed by Sealey and Lindley (1977) with adjustment for the application to Islamic banks. Specifically, the input variables for the DEA-type Malmquist productivity index are: the cost of labour (proxied by personnel expenses) and total share of capital. The output variables capture both the traditional lending activity of banks: total loans and the non-lending assets (*i.e.* other earning assets), and total deposits. The classification of deposits as an input or output is debatable, but we consider them here to be an outcome from the production process.

Yudistira (2003) used a similar Malmquist model, but included 'other income' in the outputs and 'fixed assets' and 'total deposits' in the inputs. In addition, our model incorporates capital rather than fixed assets as an input.

IV. Results

The Middle East has the largest banks in our sample with Kuwaiti banks averaging over US $7 billion of assets in 2001 (see Table 1). The average Middle East bank size was some US $2 billion with Asia Islamic banks averaging US $900 million and African banks just US $151 million. The equity-to-assets ratio was highest for the Asian banks and lowest for Africa. Higher equity ratios mean a lower capital risk. Given the Asian Islamic banks' high levels of equity, their profitability may then be expected to be lower. Banks with a higher leverage multiplier *i.e.* lower equity level can often maximize their income by borrowing and then lending more. It is surprising then that the return on average equity result (*ROAE*) is 15.8% and regionally highest for Asian banks. This can be related back to the higher lending average of Asian banks at 59.9% of net loans to total assets. So, despite the fact that Asian Islamic banks had higher equity levels, they maximized their return on equity by lending more.

Middle Eastern banks managed a higher return on average assets (ROAA). In contrast, African banks had lower profitability rates, perhaps related to low lending levels, but higher levels of liquid assets to customer and short-term funding. The cost-to-income ratio, a traditional measure of bank efficiency, was extremely good for the Middle Eastern region at just 46.5% and 48.9% for Asia. The Middle Eastern region is also noted for its typical low cost-to-income ratios for commercial banks.

The input-orientated constant return to scale (*CRS*) formulation was used to compute the Malmquist index to measure the change in productivity. Coelli (1996:43) notes that the *CRS*/*VRS* options have no influence on the DEA-type Malmquist index because both are used to calculate

Table 1: Descriptive Statistics of Islamic Banks Averaged (2001)

	Bank size	Structure	Profitability			Liquidity		Loan Quality	Capital	Efficiency
	(mill. USD)	(Percentage)								
Country	Total Assets	Equity / Total Assets	NIM	ROAE	ROAA	Liquid Assets / Cust & ST Funding	Net Loans / Total Assets	Loan Loss Reserve / Gross Loans	Equity / Net Loans	Cost / Income Ratio
Africa										
Algeria	245.5	9.5	2.8	7.4	0.7	29.4	62.4	N/a	15.3	49.0
Sudan	58.2	11.9	10.8	7.0	0.6	58.9	25.4	3.0	47.3	91.6
Asia										
Bangladesh	869.3	5.2	4.0	15.8	0.8	27.0	71.1	N/a	7.3	43.4
Brunei	1,063.3	7.7	5.9	12.2	0.9	32.7	68.2	1.9	11.3	N/a
Indonesia	150.4	9.7	7.0	33.1	3.2	25.3	75.8	2.3	12.8	75.1
Malaysia	1,520.6	53.9	1.7	2.0	0.8	12.7	24.3	7.6	19.7	28.3
Middle East										
Bahrain	826.5	27.7	15.4	14.4	5.8	17.8	27.7	11.7	103.8	48.4
Egypt	1,369.5	5.1	0.9	9.3	0.4	9.3	41.6	51.9	4.1	49.0
Jordan	837.5	11.8	1.5	4.2	0.7	50.0	32.2	4.3	51.5	60.9
Kuwait	7,745.4	9.5	3.6	24.2	2.3	4.3	51.8	7.6	18.4	30.9
Qatar	977.3	7.2	4.3	22.4	1.6	11.6	84.2	2.9	8.6	41.3
UAE	2,132.4	19.1	3.4	11.3	2.1	8.3	79.6	5.8	26.1	44.1
Yemen	219.3	8.1	2.0	12.4	1.1	43.3	54.1	1.4	15.1	51.0
Sample average	1,385.8	14.3	4.9	13.5	1.6	25.4	53.7	9.1	26.3	51.1
Regional average										
Africa	151.9	10.7	6.8	7.2	0.7	44.2	43.9	3.0	31.3	70.3
Asia	900.9	19.1	4.7	15.8	1.4	24.4	59.9	3.9	12.8	48.9
Middle East	2,015.4	12.6	4.4	14.0	2.0	20.7	53.0	12.2	32.5	46.5

Source: Bankscope Database

the various distances used to construct the Malmquist indexes. Table 2 reports the estimates of the average annual Malmquist productivity index for each country and is then decomposed into three regional groupings of Africa, Asia and the Middle East. In terms of regional productivity, Asia had the highest annual average of growth of 16.5%, followed by the Middle East of 4.1% and Africa with productivity decline of 22.7%. An interesting feature here is that every country in Asia had positive *TFP* growth over the five-year study period, which perhaps could be related to post-crisis recovery in lending. In the Middle East, most countries (except Kuwait) also experienced *TFP* growth. In Africa, however, the regional results were buoyed by a remarkable performance of Algerian banks, which helped mask a negative growth of those in the Sudan.

Table 2: Malmquist Cumulated Productivity Index of Islamic Banks: 1998–2002

Countries	Efficiency Change	Technical Change	TFP Change
Africa			
Algeria	1.000	1.231	1.231
Sudan	1.075	0.667	0.717
Asia			
Bangladesh	1.000	1.139	1.139
Brunei	1.000	1.067	1.067
Indonesia	1.000	1.431	1.431
Malaysia	1.008	1.230	1.240
Middle East			
United Arab Emirates	1.367	0.759	1.038
Bahrain	1.105	0.961	1.062
Egypt	1.000	1.059	1.059
Jordan	1.000	1.068	1.068
Kuwait	1.000	0.799	0.799
Qatar	0.949	1.086	1.031
Yemen	1.000	1.366	1.366
Sample	1.151	0.915	1.053
Regions			
Africa	1.000	0.773	0.773
Asia	1.002	1.162	1.165
Middle East	1.110	0.938	1.041

For Africa, the negative technological growth in Sudan was not offset by the positive efficiency growth with an overall total factor productivity of 1.075. Thus, the Sudanese banks need an improvement of at least 28.3% to attain the international best practice standard, predominantly in their use of technology. Algerian banks recorded no improvement in efficiency change; however, their improved use of technology led to overall productivity growth.

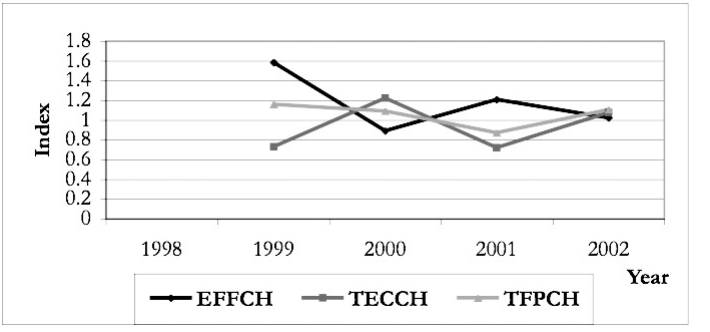
In Asia, Indonesia was the best performer with productivity growth of 43.1%. The main contributor to the positive *TFP* growth was technological progress (1.431), while efficiency remained unchanged over the study period. Perhaps an investment in more advanced banking technology boosted its technological growth. An interesting feature in Asia is that Malaysia was the only country with a positive efficiency growth (1.008) as well as technological growth. However, its growth in efficiency was only 0.8%.

Kuwait had the lowest *TFP* growth of 0.799 among the Middle East countries, and needed 20.1% improvement to achieve the international best practice standard, whilst Yemen scored 36.6% of TFP growth. In addition, Qatar had the lowest efficiency growth of 0.949, while there was a 'catching-up' effect in the United Arab Emirates and Bahrain. The remaining countries had no change in efficiency.

Over all the sample countries, the average *TFP* is positive (1.053), which meant that there was a productivity improvement of 5.3% per annum over the study period. It suggests that the potential driver of the TFP growth is the catching-up effect (1.151) rather than innovation (0.915).

Figure 1 shows that the efficiency change component, *i.e.* a shift in the frontier technology, displays a trend that is similar to the Malmquist *TFP* index, indicating that a *TFP* change largely consisted of efficiency change in the global Islamic banks. Compared to the technological change, the efficiency change was positive (15.1%), which suggests a 'catching-up' by the Islamic bank sample over the study period.

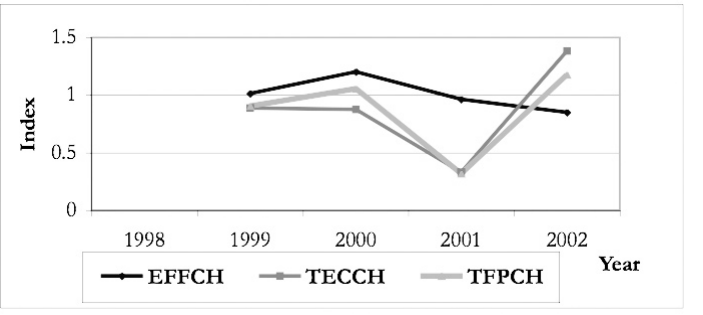
Figure 1: Malmquist TFP Decompositions of Entire Sample, 1998–2002



The 21 bank data set was partitioned into three regional groupings and their Malmquist productivity performance compared. We then examined each country's productivity performance against the standard of international best practice in the whole sample. Thus, we can determine which region performed better. The first regional group examined is Africa (see Figure 2). Our results showed *TFP* growth in the Africa region had a negative trend, with an index of 0.773. This suggests that the two African countries in the sample were not able to acquire and adapt to more advanced technology over the study period, while the catching-up effect obtained a constant average of one. Figure 2 shows that the technological

change component, *i.e.* a shift of the frontier technology, displaying a trend similar to the Malmquist TFP index, indicates that a change in TFP largely consisted of technological change in Africa. Compared to the technological change, the efficiency remained constant, and was not a major source of productivity growth in the study period.

Figure 2: Malmquist TFP Decompositions for African Islamic Banks, 1998–2002



Unlike Africa, the Asia group recorded a positive *TFP* growth (1.165) (see Figure 3). This growth was due more to technological improvement (1.162) than catching-up (1.002). Innovation showed a technological progress of 16.2% over the five-year period, compared to 0.2% for catch-up. In the aftermath of the Asian financial crisis, Islamic banks had a declining technical efficiency level, but improved efficiency results in the aftermath period from 1999 to the year 2000.

Figure 3: Malmquist TFP Decompositions for Asian Islamic Banks, 1998–2002

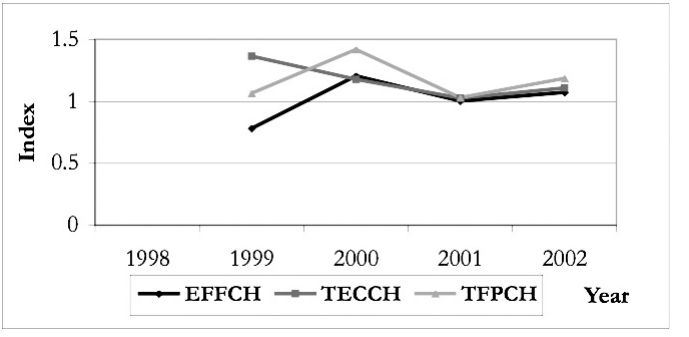
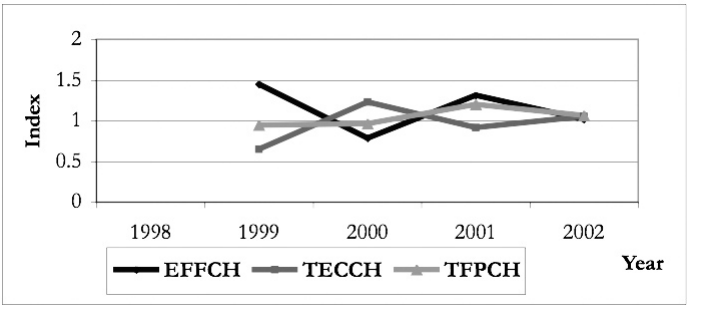


Figure 4 shows the efficiency change component, *i.e.* a shift in the frontier technology, displaying a trend similar to the Malmquist TFP index for the Middle East. This indicates that a change in TFP largely consisted of catching up (1.110) in these banks. Compared to efficiency change, there is a technological regression of 6.6% over the study period.

Figure 4: Malmquist TFP Decompositions for the Middle Eastern Islamic Banks, 1998–2002



Finally, the age of each bank was correlated against the various efficiency results. It could be expected that newer banks may have had a chance to implement newer technologies. In this case, technical efficiency results were not correlated with the bank's age. Efficiency change results and the overall TFP change, however, were negatively correlated with age. Newer banks were able to utilize input and output resources more efficiently (see Table 3).

Table 3: Pearson's Correlations

	TFPCH	TECHCHG	EFFCHG
Age of Islamic bank	-.502*	.000	-.504*

Notes: '*' stands for significance at the 0.05 level; TFPCH refers to Total Factor Productivity Change; TECHCHG refers to Technical Efficiency Change and EFFCHG is Efficiency Change.

The results obtained using Malmquist technology can then be compared to cost efficiency results. Indonesia obtained the highest technical efficiency results using Malmquist measurements in this study; however it was one of the lowest-scoring cost efficient countries (Brown, 2003). Therefore, Indonesian Islamic banks could further improve by reducing costs in

the intermediation process. However, they had advanced technological efficiency. Sudan obtained poor results in both instances. Brunei had a 6.7% improved technological efficiency but was found to be a cost efficient country by Brown (2003).

V. Conclusions

This paper sought to measure the production and technical efficiency of Islamic banks in a range of countries throughout the world. The results indicate that Indonesia had the most technically efficient and *TFP* efficient banks and that Asia was the most efficiency-improved region. Hence, this result supports Yudistira's (2003) findings that banks outside of the Middle East were more efficient. Malaysia had been expected to be the most efficiency-improved country due to its innovation in Islamic products, but Indonesia obtained the best overall *TFP* change result. In contrast, the African Islamic banks lagged behind their worldwide counterparts in average efficiency change, but this could be related to their size. These banks are of a small scale and prior studies have shown that larger-scale Islamic banks are generally more efficient. In Africa, Algeria did obtain good results and perhaps could be a model for countries seeking high levels of agricultural financing.

African banks had low loan levels, but perhaps this could be related to equity financing via *mushārakah* and *muḍārabah* transactions. They did achieve a high net interest margin, so they were able to charge higher rates, but they did obtain lower profitability levels than the other regions. This could be related to their small size. It may reflect their taking equity positions in that profits would be lower in the first few years as the project is established, but in the future they may be afforded higher profitability. African Islamic banks could improve efficiency by implementing better technologies.

Middle East Islamic banks improved slightly in their efficiency change results, but declined in their technical efficiency. Therefore improvements in this region could be obtained by better use of technology. The United Arab Emirates had the best use of inputs and outputs but efficiency still declined in the technical area. Perhaps policy makers need to investigate this country further. Technical efficiency results, however, were best for Indonesia or Yemen and so they, too, should receive similar attention. Therefore, policy, makers might best look to Islamic banks from United Arab Emirates for their use of inputs and outputs, and Indonesian or Yemeni banks for their use of technology.

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