

## **Evaluating the Overall Technical Efficiency of Islamic Banks Operating in the MENA Region During the Financial Crisis**

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**ABSTRACT:** The present paper measured overall technical efficiency of Islamic banks operating in the MENA region during the financial crisis of 2007-2009 to address the question what are the levels of overall, pure technical and scale efficiency of Islamic banks operating in the MENA region and how they evolved during the financial crisis. This paper addresses this question technical, pure technical, and scale efficiency measures are analyzed by employing on-parametric technique, Data Envelopment Analysis (DEA). The study results suggested that Islamic banks in other MENA countries and North Africa on an average are relatively technically inefficient. This might be due to the underdeveloped banking system in those countries. In addition, the decomposition of technical efficiency into pure technical and scale efficiency shows that on average, the Islamic banks in North Africa countries and other MENA countries are having problems in the allocation of resources between their inputs and outputs mix compare to Islamic banks in GCC.

**Keywords:** Islamic banks; DEA; Technical Efficiency; Scale Efficiency; GCC; MENA

**JEL Classifications:** G01; G21; G24; G29

### **1. Introduction**

The Islamic banking system started to appear around 1970. Islamic banks started to spread around in Arab and Islamic countries such as Iran, Pakistan, and Bangladesh. The Islamic banks required to observed sharia laws, which operate in four different business laws. The first is the principle of the lender and borrower sharing in the latter is profit and loss. The second is fix charges established beforehand. The third is assessing no interest, and the fourth is lender-borrower cooperation (Bellalah and Ellouz, 2004).

In recent years, Islamic banks have showed constant growth. The number of Islamic banking in whole world increased from 75 institutions to about 300 institutions in 2005 (El Qorchi, 2005). The total assets of the Islamic bank industry were about \$250billion, while the growth rate was about 15% per year, which is about three time the growth rates in the traditional banking system (Parker, 2007). In addition, Parker (2007) and Arnold (2007) stated the assets in Islamic banks industry have increased 25-40% during 2007 and the Islamic banking is expected to reach \$2.7 trillion by 2015 (Kumar, 2010).

### **2. Literature Review**

There are many researchers started to research efficiency in the Islamic banking and tried to answer the reasons behind the growth in Islamic banks during financial troubles. Samad and Hassan (1999) measured profitability, liquidity, risk and solvency in Islamic banking community. The researchers used financial ratios and two different periods. The result of study revealed that Islamic banks had more liquid assets than Western banks and Islamic banks were less risky overall than Western banks.

Yudistira (2004) examined efficiency of 18 Islamic banks over the period of three years, from 1997 to 2000. This study used the DEA to measure of banks efficiency. Study result showed The Islamic institutions evaluated were found to be less efficient between 1998 and 1999 as compared with 1997 to 2000. The inefficiency in 1998 was out to be more related to pure technical inefficiency than scale efficiency (Yudistira, 2004).

This study also showed that Islamic banks in the Middle East were less efficient than Islamic financial institutions in other parts of the world. The study results recommended the importance of mergers and acquisitions for the small and medium- sized Islamic banks (Yudistira, 2004).

Samad (2004) analyzed the performance of the Islamic banks in compare to Western banks in Bahrain. The data of the study contained six Islamic and 15 Western banks from 1991 to 2001. The study examined income statements and balance sheets for these banks by using a set of financial ratios to measure their respective profitability, liquidity, and credit- risk performance.

The result of the study showed there were no significant differences between the Islamic and the Western banking systems in Bahrain when it came to profitability and deposit risk. However, the Islamic banks had higher equity ratios and lower liquidity risk than the Western banks systems.

Ariff et al., (2008), have studies 80 banks. Forty-three (43) were Islamic, while the other 37 were Western. The data in this study were collected for 1990 to 2005 and data were converted to US dollars and adjusted for inflation. The study showed how the Islamic banking sector reacted during the 1990 financial crisis. The study implements the DEA to measure the efficiency (Ariff et al, 2008). The results of the study showed both Islamic and Western banks were equally efficient in using their resources in proportion to their capability for creating profit.

This study also suggested that the small Islamic banking system were more efficient in performance compare with conventional banking system due to their capital structure. also the study showed the cost and profit efficiency of older Western banks were better than of older Islamic banks, the reasons being that Western banks gained more experiences though times.

The study revealed that newer Islamic banks were less efficient than older ones, while the older Western banks were better in cost and revenue efficiency than the newer ones. The reasons for these findings seem to derive from the relative size of the banks' assets as well as the greater experience of the older banks.

Hassan (2010) explored the elements that may have influenced both Islamic and conventional banks in the United Arab Emirates during the 1996 to 2008. In this study, the researcher used the regression, ROA, and ROE as dependent variables, while the independent factors were A GDP per capita, size, financial development indicators (FIR), liquidity, concentration, cost, and number of branches. The results of the study revealed that liquidity and concentration were the significant factors of the conventional national bank's performance, while cost and number of branches were the most significant factors of the Islamic banks' performance (Hassan, 2010).

Other studies have indicated that Islamic banks encounter the same risks western banks. This study examined 28 Islamic banks in 14 countries by inquiring risk managements teams for these banks about the risks that Islamic banks might be facing compared to the traditional banking system. The results of study showed Islamic banks face same the risks that Western banks face however with different levels (Ariffin et al., 2009).

Srairi (2009) stated that Islamic banks typically take on more risk than Western ones due to deficiency of experience and unaware with financial tools that they have to deal with. As a result, Islamic banks demand more capital to manage this level of risk.

Johnes et al., (2009), measured the efficiency of Islamic versus Western banks in the Cooperation Council of the Arab States of the Gulf GCC area. Two tools were used to measure the efficiency. The first was the financial ratios analysis and the second the DEA. Data were collected for six banks in the GCC area for 2004 to 2007. Study showed that Islamic banks were less cost efficient but more revenue and profit efficient than Western banks.

Srairi (2010) used the stochastic frontier approach to measure the cost and profit efficiencies for 71 Islamic and western banks in Gulf Cooperation Council countries, over the period 1999–2007. This study found that Western banks in this area were more efficient in profit and cost than Islamic banks.

Omar et al., (2007) studied the efficiencies of private banks in Indonesia, during the period of 2002-2004. The study used the DEA tool to analysis the data that was collected from 21 private banks. From these two banks were Islamic while the rest were Western banks. The study suggested these two Islamic banks were operating above the average efficiency in cost and profit level of the Western banks.

Safiullah (2010) evaluated the performance of Islamic banks to Western banks by using financial ratios. The data for the study was obtained from 4 Islamic banks, and 4 Western Banks from 2004 to 2008. This study showed that Islamic banks achieve better out come in business development, profitability, liquidity, and solvency than Western banks.

Alkassim (2005) compared the Islamic with the traditional banking system. The study, which included 16 Islamic banks and 18 traditional banks, used regression analysis with eight variables. The data for this study covered 1997- 2004.

This study used regression method with three dependent variables: return on assets, return on equity, and net interest margin. The study showed a positive relationship between total assets and profitability in the Islamic banks, while the traditional banks showed a negative correspondence between total assets and profitability. In addition, the total equity had a positive relationship to profitability in the Islamic banks, while it had a negative relationship to profitability in the Western banking system. The study also revealed that lending showed a positive relationship with profitability in both the Western and Islamic banks (Alkassim, 2005).

Al Khathlan and Malik (2010) used the DEA to measure the efficiency of Islamic banks in Saudi Arabia. The study collected data from 10 Islamic banks from the banks individual websites, from 2003 to 2008. The study showed managing of the financial resources correctly has a positive influence on efficiency of the banks.

The next set of studies revealed the effect of size on a bank's efficiency. One examined the efficiency of banks in Kuwait. This study used the DEA to measure efficiency. The balance sheets and income statements of eight banks were examined over the period of 1994-1997. The three inputs used were labor, capital, and deposits, while the outputs were loans and investments. The results indicated that about 47% of the resources of the banks were incorrectly to generate profit. In addition, the small banks were found to be more efficient than the larger ones. Study also showed positive correlation between the profitability, capitalization, and efficiency in the Kuwaiti banking system (Darrat, Topuz, & Yousef, 2002).

Mostafa (2007) investigated the efficiency of the 100 Arabs banks using the DEA for evaluation of their work in 2005. The study revealed that Institutional size had an influence on their efficiency. Study also recommended that these banks could improve their operations and become more efficient by reducing wastage and increasing savings.

Isik and Hassan (2002a) examined the relative efficiency of Turkish banks and the influence of specific variables on their operations. Some of these variables were size, international conditions, ownership, and control of profits. The study period comprised 1988 through 1996. During this timeframe of the study efficiency has decreased in this sector. A major negative factor proved to be the banks' technical inefficiency.

Isik and Hassan (2002b) also showed that there was low correlation between profit and cost in the Turkish banking system. The study also showed that banks with lower profits were found to be more cost efficient. However, study result showed a positive relationship between banks size in Turkey and the opportunity to garner profits.

Al Shamsi et al., (2009), analyzed the efficiency of the banking system in the United Arab Emirates. This study used the DEA to analyze the data. The study revealed the Inefficiencies were due to poor allocation of resources. Also the result showed that banks became more efficient by increasing the number of branches, new banks were more efficient than older ones, and partial government ownership decreased bank efficiency and the greater the percentage of their ownership, the greater the decrease.

Burki and Ahmad (2010) examined the efficiency and performance of the banking system in Pakistan. Their sample consisted of 46 institutions in all. The study implemented the Stochastic Frontier Analysis as well as inefficiency cost analysis to examine the influence of their transformation from state-owned to foreign and private banks during 1991 to 2005. The study also showed smaller banks were weaker and tended to engage in mergers and acquisitions as a way to increase their efficiency. The newly transformed private banks were found to be the most cost efficient, followed by foreign and state-owned ones. The study showed banks continue to improve their performance over the reform period.

### **3. Research Question**

What are the levels of overall, pure technical and scale efficiency of Islamic banks operating in the MENA region during the financial crisis?

#### 4. Methodology

##### a. Data Envelopment Analysis (DEA)

The researcher has used the technique of DEA for computing the measures of technical, pure technical, and scale efficiencies for individual banks in the MENA region.

DEA is considered a linear programming technique that converts multiple inputs and outputs of each decision-making unit (DMU) or bank for this study into a measurable unit's that relatively compared to other DMUs. DEA estimates the efficiency of the DMU by comparing its performance with that of the best practice DMUs chosen from its same group of DMUs.

In DEA, technical efficiency (TE) usually handles the likelihood of reducing inputs to produce given output levels. While the second option would be output-oriented, TE considers the possible development in outputs for a given set of input quantities.

In this study, the researcher use the CCR model that was developed by Charnes et al., (1978) and BCC that was developed Banker et al., (1984) models to obtain efficiency measures corresponding to the assumptions of CRS and VRS, respectively. The efficiency measures attained from CCR model are known as overall technical efficiency (OTE) scores and are confounded by scale efficiencies. The efficiency measures acquired from BCC model are identified as pure technical efficiency (PTE) scores and without of scale efficiency effects. We can have scale efficiency (SE) for each DMU by a ratio of OTE score to PTE score (i.e., SE=OTE/PTE).

Efficiency = weighted sum of outputs / weighted sum of inputs (1)

$$\begin{aligned} \max \quad & \frac{\sum_{k=1}^s v_k y_{kp}}{\sum_{j=1}^m u_j x_{jp}} \\ \text{s.t.} \quad & \frac{\sum_{k=1}^s v_k y_{ki}}{\sum_{j=1}^m u_j x_{ji}} \leq 1, \quad \forall i \\ & v_k, u_j \geq 0 \quad \forall k, j \end{aligned} \quad (2)$$

where,  $y_{ki}$  : amount of output  $k$  produced by DMU  $i$ ,  $x_{ji}$  : amount of input  $j$  utilized by DMU  $i$ ,  $u_k$  : weight given to output  $k$  and  $v_j$ : weight given to input  $j$ . The above fractional equation can be converted to a linear program problem as follows.

$$\begin{aligned} \max \quad & \sum_{k=1}^s v_k y_{kp} \\ \text{s.t.} \quad & \sum_{j=1}^m u_j x_{jp} = 1 \\ & \sum_{k=1}^s v_k y_{ki} - \sum_{j=1}^m u_j x_{ji} \leq 0, \quad \forall i \\ & v_k, u_j \geq 0 \quad \forall k, j \end{aligned} \quad (3)$$

Equation 3 is solved  $n$  times to identify the relative efficiency scores of all DMUs. Each DMU selects input and output weights that maximize its efficiency score thus an efficient frontier is constructed by the combination of efficient units. In general, a DMU is considered to be efficient if it possess a score of 1, and a score less than 1 implies that it is inefficient. CCR model considers constant returns to scale (CRS) whereas the BCC model considers variable returns to scale (VRS)

$$\begin{aligned}
 & \min \quad \theta \\
 s.t \quad & \sum_i \lambda_i x_{ji} \leq \theta x_{jp} \quad \forall j \\
 & \sum_i \lambda_i y_{ki} \geq y_{kp} \quad \forall k \\
 & \sum_i \lambda_i = 1 \\
 & \lambda_i \geq 0 \quad \forall i
 \end{aligned} \tag{4}$$

The DEA is constructed with the best production function solely based on observed data, so statistical tests for significance of the parameters is not necessary. Several DEA models exist. The researcher employed the VRS and CRS Models to measure the relative efficiency of its Islamic banks for the period of 2006 to 2009. Separate measures were calculated for each year. The researcher used the DEA Excel Solver developed by Zhu (2002). The examined data were interpreted to answer the research question (i.e., what are the levels of overall, pure technical and scale efficiency of Islamic banks operating in the MENA region during the financial crisis?).

#### **b. Definition of Variables and Data**

The researchers used the intermediation approach to measure efficiency in Islamic banking using the DEA model because Islamic bank is consider an equity based model. The input of the model was labor cost, fixed assets, and total deposits, and the output of the model was total loans, liquid assets, and other income. Islamic banks tend to issue reports in the currency of their country of operations. The researchers thus followed Pastor et al., (1997) by converting the Islamic banks' local currencies into U.S. dollars by using the exchange rate on the first date of the study implementation.

All data for the study was collected from the end-of-year balance sheets and income statements for the individual years 2006 to 2009, which are made available on the website of the banks. The study sample contained 32 banks from the Mena Region, which is consisted of 18 banks operating in GCC Countries, 8 banks operating in North Africa, and 6 banks operating in other Mena Countries.

### **5. Empirical Findings**

In this section, the researcher would be discussing the input-oriented efficiency scores obtained from the CCR and BCC model. The purpose of this quantitative research study was to determine overall technical efficiency, pure technical, and scale efficiency of Islamic banks operating in the MENA region during the financial crisis 2007-2009 to address the question: What are the levels of overall, pure technical and scale efficiency of Islamic banks operating in the MENA region during the financial crisis?

The study sample contained 32 banks from the Mena Region, which is consisted of 18 banks operating in GCC Countries, 8 banks operating in North Africa, and 6 banks operating in other MENA Countries. The efficiency of Islamic banks in MENA area was first examined by applying the DEA approach for each year by using a common frontier.

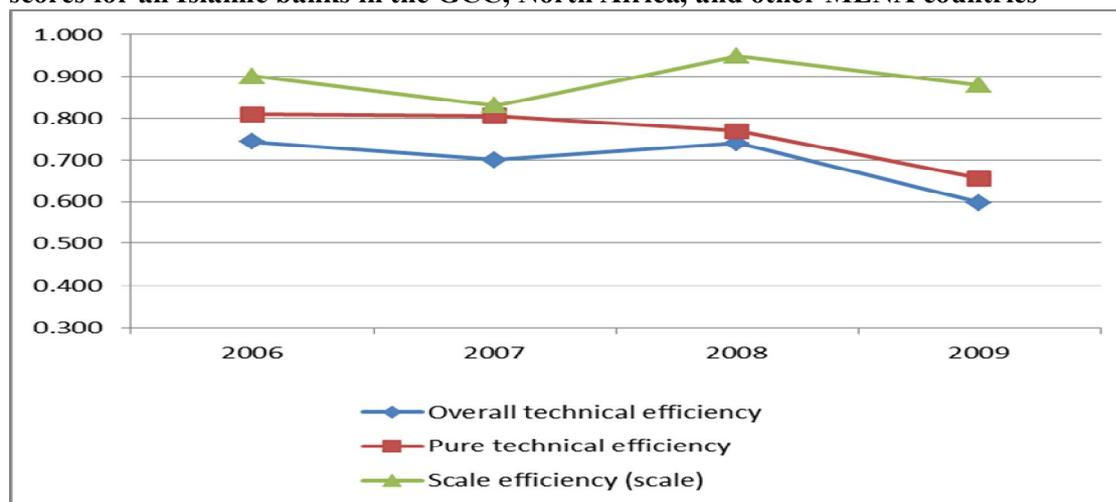
The researcher then examine the analysis by examining the efficiency of 18 banks operating in GCC Countries, 8 banks operating in North Africa, and 6 banks operating in other MENA Countries and a pooled common frontier for all banks for all years. Table 1 and figure 1 reports shows the means of the efficiency scores for the years 2006, 2007, 2008, 2009, 18 banks operating in GCC Countries, 8 banks operating in North Africa, and 6 banks operating in other MENA Countries for all years.

Based on the constructed frontiers, Islamic banks in GCC, North Africa, and other MENA countries exhibited a mean overall efficiency score of .743 in 2006, decline to .700 in 2007, increase to .740 in 2008, and decrease to .598 in 2009. For each year, it appears that scale efficiency is higher than pure technical efficiency, and that bank inefficiency was attributed to pure rather than scale technical inefficiency.

**Table 1. Overall Technical Efficiency, Pure Technical Efficiency, and Scale efficiency scores for all Islamic banks in the GCC, North Africa, and other MENA countries**

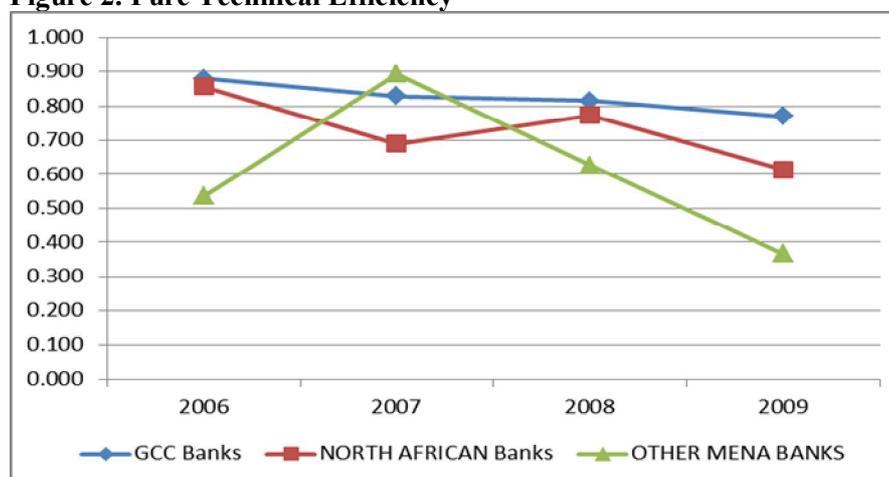
Years	Overall Technical Efficiency	Pure Technical Efficiency	Scale Efficiency
2006	0.743	0.809	0.900
2007	0.700	0.806	0.830
2008	0.740	0.769	0.948
2009	0.598	0.655	0.879

**Figure 1. Overall Technical Efficiency, Pure Technical Efficiency, and Scale efficiency scores for all Islamic banks in the GCC, North Africa, and other MENA countries**



Our results from Table 2 and figure 2 showed that GCC banks demonstrated a higher mean in pure technical efficiency for each year 0.880, 0.828, 0.815, and 0.769 compared to North African banks 0.856, 0.690, 0.773, and 0.614 and other MENA banks 0.535, 0.894, 0.627, and 0.367 respectively. Which suggested that GCC banks were operated more managerially efficient in controlling costs and have been operating at the right scale of operation compared to North African and Other MENA banks. This means that GCC, North African and Other MENA banks could further reduce their factor of production for 2009 by 0.231, 0.388, 0.633 respectively, and maintaining the same output level.

**Figure 2. Pure Technical Efficiency**  
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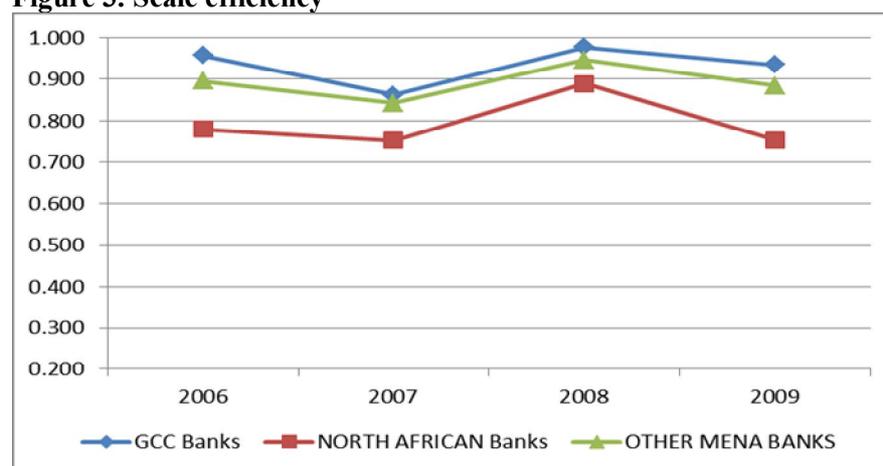
<b>Banks</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>
<b>GCC Banks</b>	0.880	0.828	0.815	0.769
<b>North African Banks</b>	0.856	0.690	0.773	0.614
<b>Other MENA Banks</b>	0.535	0.894	0.627	0.367

Our results from Table 3 and figure 3 showed that GCC banks demonstrated a higher mean in scale efficiency for each year 0.956, 0.861, 0.976, and 0.934 compared to North African banks 0.779, 0.752, 0.889, and 0.754 and other MENA banks 0.895, 0.841, 0.946, 0.883 respectively.

**Table 3. Scale efficiency**

<b>Banks</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>
<b>GCC Banks</b>	0.956	0.861	0.976	0.934
<b>North African Banks</b>	0.779	0.752	0.889	0.754
<b>OTHER MENA Banks</b>	0.895	0.841	0.946	0.883

**Figure 3. Scale efficiency**



The decomposition of the overall efficiency into pure technical and scale efficiency suggest that other MENA inefficiency was attributed to pure technical inefficiency rather than scale inefficiency. In contrast, North African banks inefficiency was attributed to scale rather than pure technical inefficiency. This means those banks' efficiency level increases with the scale of operation. A relatively low pure technical efficiency score suggests that other MENA are pure technically inefficient and faced with misallocation of inputs and outputs in banking operation. Therefore, the bank management should re-evaluate their management strategies to further improve the banking operations.

## 6. Conclusions

The purpose of this study was to increase the understanding of the technical efficiency of Islamic banks in GCC, North Africa, and other MENA countries of during the period from 2006 to 2009 by employing a non-parametric approach, namely, the Data Envelopment Analysis. The study results answered the research question: What are the levels of overall, pure technical and scale efficiency of Islamic banks operating in the MENA region during the financial crisis? The results have shown that the Islamic banks in other MENA countries and North Africa on average are relatively technically inefficient. This might be due to the underdeveloped banking system in those countries. In addition, the decomposition of technical efficiency into pure technical and scale

efficiency shows that on average, the Islamic banks in North Africa countries and other MENA countries are having problems in the allocation of resources between their inputs and outputs mix compare to Islamic banks in GCC.

As well, the study showed that GCC banks demonstrated a higher mean in pure technical efficiency for each year 0.880, 0.828, 0.815, and 0.769 compared to North African banks 0.856, 0.690, 0.773, and 0.614 and other MENA banks 0.535, 0.894, 0.627, and 0.367 respectively. This suggested that Islamic banks in GCC region were operated more managerially efficient in controlling costs and have been operating at the right scale of operation comparing. In addition, Islamic banks in GCC have demonstrated a higher mean in scale efficiency for each year 0.956, 0.861, 0.976, and 0.934 compared to North African banks 0.779, 0.752, 0.889, and 0.754 and other MENA banks 0.895, 0.841, 0.946, 0.883 respectively. Further research should take into consideration other variables that could affect the Islamic efficiency such as size, ownership, and regulation within that country.

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