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The Impact of Bank Characteristics on the Efficiency: Evidence from MENA Islamic Banks

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Abstract

Islamic banking has experienced over the past two decades spectacular growth. Numerous researches, using non-parametric frontier methods, demonstrated that Islamic banks are more efficient than their conventional counterparts.

This study aims at analyzing the efficiency Islamic banks by using the non-parametric data envelopment analysis (DEA), to estimate five efficiency scores for each bank, and to study the impact of the banking characteristics on efficiency scores. Based on a sample of Islamic banks in the MENA region over the period 2005-2009, we have shown that the dominant source of overall inefficiency of these banks is organizational (technical inefficiency) rather than regulatory (allocative inefficiency).

Through a panel methodology, we also demonstrated that internal factors of Islamic banks contribute significantly to the evolution of the economic efficiency of MENA Islamic banks.

JEL classification numbers: G01, G21, G24, G28, G29
Keywords: Islamic banking, Efficiency, Scale Efficiency, Data Envelopment Analysis, MENA, Panel

1 Introduction

The banking sector is heavily exposed to regulatory, technological and technical changes that are caused by globalization and disintermediation. The intensified competition encourages banks to strengthen their positions in banking markets and gain substantial market share. With financial liberalization, the banks began looking for new sources of revenue while developing new businesses to diversify their resources. Thus, banking

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products have been increased. Therefore, Innovation is a major preoccupation of researchers in banking sector.

During the last decade, the financial world has seen the beginning and the rapid expansion of a specified niche known as the "Islamic finance". Although, during the years 1940s and 1950s, Islamic finance was an «academic dream" for economists and Muslim intellectuals, it is now a "practical reality". Islamic banking has been initially developed to satisfy the requirements of Muslims anxious to perform banking transactions conform to the principles of "Sharia". Now, it gains universal acceptance.

Since the beginning of 90's, the Islamic institutions have significantly expanded their network to both Muslim and non-Muslim countries. Since the opening of the first Islamic bank Mit Ghamr Local Savings Bank of Egypt in 1963, Islamic finance has not stopped to gain new market shares. According to a recent financial report, the Islamic banking total assets worldwide are estimated to exceed $ 1.1 trillion at the end of 2011[3]. Islamic banks are the fundamental components of the Islamic financial system. Several researches on Islamic banking and finance have increased steadily in recent years leading to a better understanding of the new form of Islamic banking that is based on the prescriptions of "sharia law".

Al-Jarhi and Iqbal (2001) defined Islamic bank as a banking institution conducting all known banking activities including borrowing and lending without interest. It mobilizes funds on the basis of "Mudarabah" or "Wakalah" and may accept demand deposits as interest free loan. Therefore, it deploys funds on profit and loss basis or may advances on debt creating basis according to the principles of "Sharia" being an investment manager.

Islamic banks performs the same intermediary function as the conventional banks, they do this in distinctly different ways. The distinguishing feature that characterizes Islamic banks resulting from the implementation of the Islamic "Shariah" principles, compared to conventional banks is the lack of interest (Usury) in the structure of Islamic financial products. Islamic banks are established to avoid interest in all bank transactions. They don't receive a predetermined interest from borrowers and don't pay a predetermined interest to depositors (Shamsher et al., (2008)). But there are other aspects in which Islamic banking differs from conventional banking, in particular, the principle of profit and loss-sharing. The principle is that a lender is engaged to share the risks of the loan with the borrower. In other words, Islamic banks act as partners, sharing both the gains and the losses generated by their customers (El Moussawi and Obeid (2010)).

Given the remarkable growth of the Islamic banking sector throughout the world an analysis of the degree of performance of Islamic banks is important. El Moussawi and Obeid (2010) noted that evaluation of Islamic banking performance is an important issue at several levels. First of all, the improvement of performance in Islamic banks should result in a decrease of the prices of Islamic products offered to customers and an increase of investments. Secondly, performance is a crucial determining factor for the future regional and international growth of Islamic banks.

In fact, the traditional tools of the financial analysis have become insufficient to understand the thanking sector's efficiency. In this regard, several researches have used simple ratio-based analysis to measure the performance of Islamic banks. These methods can be used useful for studying benchmarking and provide important insights, but they are

[3]Islamic Finance in OIC Member Countries. Statistical, Economic and Social Research and Training Centre for Islamic Countries, OIC Outlook Series, May 2012.

limited in scope because they take one dimensional view of a service, product or process and ignore any interactions, substitutions or trade-offs between key variables (Iqbal and Molyneux (2005)). The imperfections of these traditional methods require the adoption of new approaches that are more appropriate to the specific context of the banking sector.
The aim of this paper is to use the non parametric Data Envelopment Analysis (DEA) method to measure the level of efficiency of 21 Islamic banks operating in the MENA region during the period 2005 to 2009. This method allows us to distinguish between the overall, technical, pure technical, allocative and scale efficiencies. Then, the results of this study will permit us to analyze the impact of the factors that are important in improving efficiency of Islamic banks.

2 Literature Review

Compared to the literature devoted to study the efficiency of conventional banks, the work on Islamic banks is still in its early stage. Most studies conducted on this last category of banks have focused on theoretical issues. Similarly, empirical studies have been based essentially on descriptive statistics rather than rigorous statistical estimation (El-Gamal and Inanoglu (2004)) and econometric methods such as DEA method or stochastic frontier method.
In order to evaluate the efficiency and performance of Islamic banks, many studies in field can be mentioned and classified in two major groups. The first group includes studies based on traditional ratios-analyses to estimate the performance of Islamic banks, such as Samad and Hassan (1999), Iqbal (2001), Hassan and Bashir (2003), Bader et al., (2007).
The second group that focuses on efficiency has used frontier approaches to evaluate the performance and efficiency of Islamic banks. Generally, the findings revealed by these studies differ empirically. Nevertheless, the available data indicate that Islamic banks have generally outperformed their conventional counterparts and were able to exploit their comparative advantages. They have also shown a higher efficiency compared to conventional banks (Bashir (1999), Samad and Hassan (1999), Hassan and Bashir, (2003), Yudistira (2004), Hussein (2004)).
In this respect, study of Yudistira (2004) was the first empirical test that used the non-parametric (DEA) approach to investigate the efficiency of 18 Islamic banks over a period of 4 years (1997-2000). The results indicate that Islamic banks show considerable overall efficiency across the sample period. The year 2000 was the most efficient indicating efficiency score of 0.909 compared to 0.902, 0.870, and 0.897 for the years 1997, 1998 and 1999 respectively. The author attributed the inefficiency which was recorded in 1998 (0.870) to the global crisis in 1998-1999. After this hard period, the Islamic banks have performed very well. In addition, he explained that this inefficiency was mainly due to pure technical inefficiency rather than scale inefficiency. Moreover, the regression analysis reveals that Islamic banks within Middle East region are less efficient than their counterparts outside the region. The author justified this result by the fact that Islamic banks outside the Middle East region were relatively new and were governed by their respective regulators. These results were inconsistent with those found by Hassan (2003)[4].

[4]Cited in Hassan (2005).

Using both Stochastic Frontier Approach (SFA) and non-parametric DEA method to study the efficiency of Islamic banks in Pakistan, Sudan and Iran, countries where the financial system operate under Islamic "Shariah", over the period 1994-2001, Hassan (2003) found that the main source of overall technical inefficiency of Islamic banks is the scale inefficiency. He also found that Islamic banks have become more allocatively efficient after started operating under completely Islamised banking systems.

Hassan (2005) employed a variety of parametric (SFA) and non-parametric (DEA) techniques to examine the relative cost, profit, X-efficiency and productivity of 43 Islamic banks in 21 countries during the period 1994-2001. In the first stage he calculated five DEA efficiency measures namely cost, allocative, technical, pure technical and scale efficiencies. In addition, he correlated the scores with the conventional accounting measures of bank performance. His results were consistent since the Islamic banks operated in regulatory environments which are, in general, not very favorable to their activities. The average technical efficiency of Islamic banks (84%) is relatively higher than their average allocative efficiency (74%). This implies that the dominant source of inefficiency is allocative (regulatory) inefficiency rather than technical (management) inefficiency. The results also suggest that Islamic banks are relatively less efficient in reducing costs, but they are relatively efficient in generating profits.

The study undertaken by El-Gamal and Inanoglu (2004) compared the cost efficiencies of 49 conventional banks with four Islamic special finance houses in Turkey over the period 1990-2000. Overall, the results suggest that Turkish Islamic banks were more efficient than conventional ones. Their practice was oriented to assets which were based on investments which led to lower non-performing loans ratios.

Bader et al., (2008) provided an analysis concerning 21 countries of Organization of Islamic Conference (OIC). Their study focused on measuring and comparing the cost, revenue and profit efficiency of 43 Islamic versus 37 conventional banks during the period 1990-2005. By using DEA method, they examined the effect of size, age, and region on cost, revenue, and profit efficiency of those banks. The authors concluded that there were no significant differences between the overall efficiency results of conventional and Islamic banks. The two categories of banks are less efficient in generating revenues and profits than using their resources. According to these authors, the cause of this inefficiency might be attributed to the ability of managers to better control the use of internal bank's resources, rather than controlling the revenues which were, normally, influenced by external factors such as competition, regulation etc.

Instead of the DEA method in Bader et al., (2008), Shamsher et al., (2008) employed SFA. Their results indicated that there is a slack in the usage of resources across all banks. Therefore, according to the overall banks efficiency scores, the average bank is better in generating profits than using its resources. In addition, they showed that profit efficiency is more stable over time compared to the cost efficiency of these banks.

More recently, Shahid et al., (2010) compare the efficiency between the Conventional and Islamic Banks of Pakistan. Their sample includes five Islamic and five conventional banks over the period (2005-2009). Based on the non-parametric approach (DEA), the results indicate that the technical efficiency of conventional banks is better than Islamic banks. The efficiency of the first banks category is due not only to the improvement of technology, but also the existence of the traditional banking system for more than four decades. Moreover, in term of cost and allocative efficiencies Islamic banks show a healthy competition compared to conventional banks. These findings reflect the fact that

Islamic banks are on the horizon of improving trends every year and explore other tendencies.
Our study attempts to assess the efficiency of Islamic banks. The efficiency estimate of each Islamic bank is computed by using the non-parametric Data Envelopment Analysis (DEA) method. According to the profits and losses sharing paradigm, we assume that Islamic banks are able to allocate their resources more efficiently than conventional banks. Also we will analyze the determinants of bank's efficiency basing our reflection on the sensitive variables cited in the literature of Islamic banks efficiency.

3 Data Sample

Our study focuses on a sample of 22 Islamic banks carrying out their activities in the Middle East and North Africa (MENA) region during the period 2005 to 2009. The choice of fields of study is dictated by the fact that the banking sector in the MENA region has experienced major transformations in its operating environment during the last two decades. Therefore, this region continues to be a center for the growth of Islamic finance. In addition, it includes countries from North Africa, which allows us to expand the scope of analysis beyond the Persian Gulf area.
The income statement, balance sheet and the notes of the financial statements were obtained from the annual report of each bank as reported on their individual websites. Moreover, external variables affecting banking performance were collected from the International Monetary Fund (IMF) and from the International Financial Statistic (IFS).

4 Methodology

4.1 Efficiency Measurement

There are numerous ways of measuring efficiency of banks that can be made through two ways: the ratio analysis and the frontier efficiency analysis. Iqbal and Molyneux (2005) found that frontier approaches are considered to be superior to standard financial ratios analysis because they use programming or statistical techniques that remove the effects of differences in input and output prices and other important market factors affecting the standard performance of banks. At the economic level, efficiency methods focus attention on the quality of internal management and quality of strategic choices. In summary, methods of performance evaluation using the efficiency frontier can determine possible ways of access to "best practices" by varying the "inputs" or varying the "outputs" or by combining these two routes. Frontiers can also serve to precisely determine the target of an improvement from the observation (Burkat et al., (1999)).
There are different approaches that have been reported in the literature to evaluate bank efficiency such as parametric and non-parametric frontier analyses. The parametric approach includes stochastic frontier analysis, the free disposal hull, while the non-parametric contained the data envelopment analysis (DEA).

4.2 Data Envelopment Analysis (DEA Model)

The DEA was developed by Charnes et al., (1978). They extended the approach used by Farrell (1975). DEA is a non-parametric efficiency approach in the sense that it involves constructing a nonparametric production frontier based on the actual input-output observations relative to which efficiency of each firm is measured (Coelli (1996)). However, Sherman and Gold (1985) were the first to apply DEA to estimate bank's efficiency.

The DEA method measures relative efficiency without knowing what variables are more important. Therefore, it doesn't require a prior assumption about the analytical form of the production function. Also it derives the best production function solely on the basis of observed values making it impossible to misspecify the production technique (Sahid et al., (2010)). The analysis under DEA can be carried out by assuming either constant returns to scale (CRS) initiated by Charnes et al., (1978) or variable returns to scale (VRS) developed by Banker et al., (1984). The estimation with these two assumptions allows the overall technical efficiency to be decomposed in two parts: pure technical efficiency which refers to the firm's ability to avoid waste by producing as much output as input usage allows, or by using as little input as output production allows and scale efficiency which refers to exploiting scale economies by operating at a point where the production frontier exhibits constant returns to scale (Sufian et al., (2007)).

The present study employs the non-parametric frontier input-oriented DEA approach. Using both CRS and VRS assumptions allows us to distinguish between five different types of DEA efficiency measures namely cost efficiency (CE), allocative effeciency (AE), technical efficiency (TE), pure technical efficiency (PTE) and scale efficiency (SE). Thus, focusing on minimizing inputs has the advantage of reflecting the behavior of banks that operate in the context of deregulation and competition. The majority of them are trying to reduce the amount of inputs used in the production process in order to increase their effectiveness.

4.3 Input-Output Definition and the Choice of Variables

It is commonly agreed that the choice of variables in efficiency studies significantly affects the results. The problem is further compounded of the fact that variable selection is often constrained by the paucity of data on relevant variables. The definition and measurement of inputs and outputs in the banking function remains a contentious issue among researchers. Defining what constitutes input and output is fraught with difficulties, since many of the financial services are jointly produced and prices are typically assigned to a bundle of financial services. Additionally, banks may not be homogeneous with respect to the types of outputs actually produced. To determine what constitutes inputs and outputs of banks, one should first decide on the nature of banking technology. Two approaches are commonly used in the banking theory literature: the production and intermediation approaches (Sealey and Lindley (1977)).

Under formal approach, pioneered by Benston (1965), the banks are primarily viewed as providers of services to customers. The input set under this approach includes the traditional factors of production, capital and labor. The output under this approach represents deposits and loans as the most important services provided to customers because they are responsible for the creation of most of the value added (Berger and Humphrey (1992)). Hence, according to this approach, the output is measured by the

number of deposits, the number of credits offered to customers or their related transactions for each of these products (Colwell and Davis (1992)), while the number of employees and physical capital is considered as inputs.

This approach focuses on the quantity of products. Therefore, the productivity and efficiency can be analysed by comparing the quantity of services given with the quantity of resources used (Mlima and Hjalmarsson (2002)).

However, under the intermediation approach, developed for the first time by Sealey and Lindley (1977), financial institutions are viewed as intermediating financial assets between surplus and deficient units. Virtually all observers would agree that bank liabilities have some characteristics of inputs, because they provide the raw material of investable funds, and that bank assets have some characteristics of outputs as they are ultimate uses of funds that generate the bulk of the direct revenue that banks earn (Berger and Humphrey (1992)). Under this approach, all deposits and other funds purchased with the assistance of labor and capital are considered as inputs that are used to produce loans and other assets.

At present, the intermediation approach seems most preferred and widely used in empirical studies for estimating bank's efficiency. This approach includes interest expenses to calculate total cost of the bank, while the production approach ignores completely this type of expenses, although they are important for any bank, because they often account for between one-half and two-thirds of total costs. Moreover, the intermediation approach may be superior in evaluating the importance of frontier efficiency for the profitability of financial institutions, since the minimization of total costs, and not just production costs, is needed to maximize profits (Iqbal and Molyneux (2005)).

Based on documented literature (Yudistira (2004), Hassan (2005), Sufian et al., (2007)), this study uses the intermediation approach as it enables banks to be prescribed as a manufacturing units, converting deposits and other liabilities into loans and investments, yielding returns uncontaminated by usury. Islamic banks in our sample are considered as intermediaries between savers and borrowers. This choice is justifying by the main character of Islamic banks. The principle of Islamic bank which is often viewed as a joint stock firm which shares are easily tradable (Dar and Presley (2000)), is the participation in enterprise, employing the funds based on PLS paradigm. This principle reflects the importance of intermediary activities that Islamic banks perform.

The Islamic banks are modeled as multi-product firms producing three outputs namely loans (Y1), investment portfolios (Y2) and other earning assets (Y3) by engaging three inputs namely labor (X1), fixed assets (X2) and total funds (X3). The choice of their inputs and outputs was influenced, firstly, by extant literature on DEA application in banking industry, data availability and theoretical considerations. Secondly, since Islamic banks avoid interest-based products, the inclusion of "other earning assets" in the analysis is particularly important. Definitions and measures of these variables are summarized in Table 1.

Table 1: Inputs, Outputs and Input Prices

Variables	Variable name	Description
Inputs :		
X1	Labor	Total expenditures on employees.
X2	Physical capital	The sum of Fixed assets and premises.
X3	Total Funds	Total deposits from customers and other banks plus total borrowed funds.
Outputs :		
Y1	Total loans	Total of short-term and long-term loans to customers and other banks.
Y2	Investissements	Investment securities held for trading, Investment securities available for sale (AFS) and Investment securities held to maturity.
Y3	Off-balance sheet items	Commission, service charges and fees.
Inpts prices :		
P1	Price of labor	Total personal expenses / the total funds.
P2	Price of physical capital	Depreciation expenses / the fixed assets.
P3	Price of funds	Interest expenses on deposits plus other operating expenses / the total funds.

5 Empirical Results

5.1 Analysis of Efficiency Scores

Table 2 presents the descriptive statistics of cost efficiency (CE), allocative efficiency (AE), technical efficiency (TE), pure technical efficiency (PTE) and scale efficiency (SE) scores of the Islamic banks for the years 2005 (Panel A), 2006 (Panel B), 2007 (Panel C), 2008 (Panel D), 2009 (Panel E) and All Years (Panel F). The use of several panels allows us to estimate a specific frontier for each year instead of estimating a single frontier for the entire study period. Hence, we can observe each bank individually and capture efficiency changes that may occur in the banking sector during the estimation period. These results suggest that the cost efficiency has been on a declining trend during the earlier part of the studies. It decreased from a value of 60.3% in 2005 to 51.2% in 2006, increasing during the latter years (2007, 2008), before declining again in the final year under observation with an average value of 57.8%.

The results in Table 2 reveals that the average means for cost efficiency (CE), allocative efficiency (AE), technical efficiency (TE), pure technical efficiency (PTE), and scale efficiency (SE) scores of the Islamic banking operations for the 2005-2009 study period are 57.1%, 71.1%, 61.1%, 74,7% and 80.1% respectively. We note that the average allocative efficiency of Islamic banks (71.1%) is higher than average technical efficiency (61.1%) during the evaluation period. Also, in each year, allocative efficiency of Islamic banks is consistently higher than technical over the estimation period. This suggests that the dominant source of overall inefficiency of Islamic banks in our sample is technical (managerial) rather than allocative (regulatory). Moreover the results implies that Islamic banks, knowing the input prices, do better in choosing the proper least costly input mix

and offers the most profitable combinations of outputs than provide maximum services with a given level of resources. Thus, the results imply that the managers of Islamic banks are able to better controlling the market factors by adapting to price constraints and make the right choices, than control the technical aspects which allow them to better link bank's internal resources and organize the production.

Furthermore, the decomposition of technical efficiency (TE) into its pure technical (PTE) and scale efficiencies (SE) components, suggests that the scale efficiency dominates pure technical efficiency during the period. The average scale efficiency has a value of 80% while the pure technical efficiency is 74.7%. This implies that the pure technical inefficiency (25.3%) may be the main source of total technical inefficiency of banks in our sample. Indeed, operating through the PLS paradigm may cause the allocative efficiency of Islamic banks. The real purpose of this prescription is to manage the risk instead of research of predetermined profits, because the return on capital would be determined *ex post.* For this reason, Islamic banks in the sample were directed towards financing projects that warranted a solvency and sound guarantees.

Table 2: Summary Statistics of Efficiency Scores

Efficiency Measure	Mean	Maximum	Minimum	Std. Dev	CV
Panel A					
CE	0.603	1.000	0.019	0.297	0.491
AE	0.774	1.000	0.042	0.264	0.341
TE	0.641	1.000	0.121	0.275	0.429
PTE	0.763	1.000	0.195	0.243	0.318
SE	0.823	1.000	0.464	0.189	0.231
Panel B					
CE	0.512	1.000	0.000	0.336	0.657
AE	0.648	1.000	0.000	0.344	0.531
TE	0.612	1.000	0.000	0.283	0.462
PTE	0.719	1.000	0.000	0.287	0.398
SE	0.810	1.000	0.000	0.247	0.305
Panel C					
CE	0.573	1.000	0.000	0.366	0.638
AE	0.688	1.000	0.000	0.361	0.525
TE	0.631	1.000	0.000	0.293	0.463
PTE	0.749	1.000	0.000	0.270	0.361
SE	0.793	1.000	0.000	0.255	0.322
Panel D					
CE	0.591	1.000	0.005	0.365	0.617
AE	0.725	1.000	0.013	0.342	0.472
TE	0.583	1.000	0.179	0.274	0.471
PTE	0.751	1.000	0.187	0.269	0.359
SE	0.794	1.000	0.287	0.221	0.278
Panel E					
CE	0.578	1.000	0.002	0.342	0.592
AE	0.718	1.000	0.006	0.327	0.455
TE	0.583	1.000	0.245	0.237	0.407
PTE	0.751	1.000	0.303	0.227	0.302
SE	0.794	1.000	0.285	0.218	0.218
Panel F					
CE	0.578	1.000	0.000	0.337	0.589
AE	0.718	1.000	0.000	0.326	0.458
TE	0.582	1.000	0.000	0.342	0.441
PTE	0.753	1.000	0.000	0.256	0.342
SE	0.785	1.000	0.000	0.223	0.279

Based on the coefficients of variation (CV) in Table 2, the results indicate a high level of dispersion of efficiency scores during the estimation period. The average ratios represent 0.589, 0.458, 0.441, 0.342and 0.279 for CE, AE, TE, PTE and SE, respectively. We can observe that there are significant efficiencies differences which indicate the existence most efficient banks and less efficient ones (Appendix 1).

5.2 Second Stage Regression

In this stage, we are going to examine whether any aspects of Islamic bank's structure is related to their degree of efficiency, in order to know what Islamic banks can do to improve their efficiency. Are resources allocated to their best uses? The purpose is to determine which factors can affect the efficiency level of Islamic banks.

The conventional procedure to accomplish this goal is to regress the efficiency scores initially estimated in the first-stage DEA analysis over a set of common explanatory variables. Following Darrat et al., (2002), Yudistira (2004), Hassan (2005); Sufian et al., (2007), El Moussawi and Obeid (2010), we use a range of different internal and external bank's characteristics which summarized by the following equation:

$$y_{it} = x'_{it}\beta + \varepsilon_{it} \quad (1)$$

$$\varepsilon_{it} = \beta_{0i} + \mu_{it} \quad (2)$$

where we have observations on firm (i) across years (t). The vector of dependent variables (y_{it}) is (CE_{it}, AE_{it}, TE_{it}, PTE_{it}, SE_{it}). Then each dependent variable was regressed on the set of independent variables ($LogTA_{it}$, $Loans/TA_{it}$, $Equity/TA_{it}$, LLP/TL_{it}, ROA_{it}, ROE_{it}, $LogGDP_{it}$, CPI_{it}) which constitute the vector (x'_{it}). The two right terms in the equation (2) make up respectively the firm specific effect (β_{0i}) and idiosyncratic (μ_{it}) components of the error term. Finally, we have made five econometric regressions that are summarized in table 3.

Bank size is measured by the logarithm of total assets (LogTA). To reflect a bank's attitude towards risk, we use three explanatory variables. The proxy of bank's loan intensity is measured by loans to total assets ratio (Loans/TA) which affects operating costs and in turn might influence operating efficiency. In addition, we measure the bank's leverage intensity by total shareholder's equity divided by total assets (Equity/TA). We also include the ratio of total loan loss provisions to total loans (LLP/TL) to measure bank's risk. To analyze the relationship between efficiency and profitability of Islamic banks we use both return on assets (ROA) and return on equity (ROE) ratios. Macroeconomic factors have been used in several studies as factors that can determine the bank efficiency. We use two indicators in our study as proxies for macroeconomic conditions, namely, the growth of economy measured by the logarithm of Gross Domestic Product (LogGDP) and the inflation rate as measured by rate of the Consumer Price Index (CPI).

We assemble the results from second-stage regressions in Table 3. The results indicate that bank size is negatively and significantly related to all efficiencies. Such a finding is consistent with results reported by Isik and Hassan (2000) for Turkey, Darrat et al., (2001)

on the Kuwaiti banks and more recently by El Moussawi and Obeid (2010) whose study focused on the banks of the Gulf region. Accordingly to El Moussawi and Obeid (2010) the negative impact exerted by the size on the efficiency of Islamic banks can be explained by the growth in size which causes an additional cost that may tend to reduce the efficiency of large banks.

Economies of scale are supposed to have positive effects on the performance of small banks and a negative impact on the big banks included in our sample. This is also confirmed by the negative sign of the scale efficiency coefficient in the size regression. Moreover, we can note from this result that competition between Islamic banks and their conventional counterparts, on the one hand, and between large and small Islamic banks, on the other hand incites small banks and encourage them to be more efficient by better managing cost and access to resources on competitive terms compared.

The variable capitalization measured by Equity/TA ratio acts negatively and significantly with technical, pure technical and scale efficiencies of Islamic banks but it has a positive effect on allocative and overall efficiencies. These results are consistent with those disclosed by Sufian et al., (2007) and El Moussawi and Obeid (2010). The negative effect of bank's capitalization on TE of Islamic banks appears to be due to the fact that increasing this ratio banks tend to decrease fructification of the available capital. Sufian and al., (2007) explained this inverse relationship between TE and capitalization by the fact that the most efficient banks use more leverage (less equity) compared to its counterparts.

Therefore, the results seems to suggest another possible explanation as when banks tend to increase their capitalization, they are involved in riskier operations which generate an increase in doubtful loans and banking costs in order to hold more equity.

Consistent with Darrat et al., (2001) cost and allocative efficiency are positively influenced by the capitalization ratio of the bank, supporting the efficient structure hypothesis that efficient bank compete aggressively to generate profits. Furthermore, we can conclude that allocative efficient banks are those who are more moving towards the financing of investments to hold equity.

In addition, we find that the associations between Loans/TA and the bank efficiency have a positive impact on TE and its two components. The positive association corroborates the results revealed by Darrat et al., (2001), Hassan (2005), Sufian et al., (2007) and shows that more technical efficient banks are able to manage their financial operations more productively. This allows them probably gain more share of the credit markets by offering the highest level of services and credits from available resources. These banks should have lower costs of production.

However, the significant negative relation between the share of loans in total assets and AE implies that, although these banks show a better organization of loans that they offer, they are allocatively less efficient. This can be explained by the underestimation of risk taken. Therefore, the banks do not practice appropriate pricing and the loans offered to clients are not profitable.

The third proxy of risk (LLP/TL) as measured by the ratio of provisions for doubtful loans and total credit, shows a significant negative relationship between this ratio and efficiency measures (AE, SE) of Islamic banks. According to El Moussawi and Obeid (2010), the negative relationship between credit risk and allocative efficiency of Islamic banks proves that the decline in economic activity, which is often accompanied by an increase of bankruptcy, affects negatively the bank's income by increasing the number of non-performing loans. This reflects the need for a rigorous credit risk management

conducted by these banks and thus corroborates the previous result of the negative impact of credit on allocative efficiency, i.e. the underestimation of banking risks.

According to the estimation results, we can note that the variation of the sign of the estimated coefficients, related to the financial profitability (ROE) and economic profitability (ROA), makes difficult to determine the impact of profitability on the efficiency of Islamic banks in our study. Although surprising, this result confirms what El Moussawi and Obeid (2010) concluded.

Nevertheless, the positive relationship between TE, SE and profitability (ROE, ROA) indicates that a high level of technical efficiency should reflect theoretically a high level of profitability. This means that if a bank seeks to improve its profitability, it must choose its inputs efficiently, reduces costs and thus improves its efficiency.

In contrast, the negative relationship between financial profitability, CE and AE can be explained either by the X-inefficiency hypothesis (Leibenstein (1970)) inspired by the managerial theory. It postulates that inefficiency reveals from organizational problems which are due to incentive problems in the economic theory of contracts. We can explain these results by the theory of imperfect competition where banks must compete aggressively to achieve high level of profitability (El Moussawi and Obeid (2010)). In other words, banks which tend to increase their productivity more effectively seem to have difficulties in increasing their margins because they operate in a competitive market, and don't have the market power that would allow them to make significant profits.

Contrary to El Moussawi and Obeid (2010) who found a negative relationship between GDP and the variable efficiency of Islamic banks based on a sample of banks in the Gulf region, but consistent with Sufian et al., (2007), our results suggest that the relationship between economic growth and efficiency is positive but not significant.

In our study, the positive insignificant relationship between economic growth and efficiency of Islamic banks indicates that the demand for financial services tends to increase as economies develop and societies become richer. The expansion of the economy allows banks to make profits from the higher demand for their financial services. Another possible explanation for this result is that banks have sought to improve the services offered to customers by moving more and more towards innovation in production that allows them to reduce costs and increase efficiency.

Finally, the inflation rate has, according to the estimation results, a negative insignificant effect on technical efficiency, pure technical efficiency and scale efficiency and a positive insignificant effect on the cost efficiency and allocative efficiency. However, the negative impact on technical efficiency indicates that banks in our sample are not able to adjust in time their interest rates to changes in inflation rates. This can be explained by the first result that we found, which indicates that the inefficiency of Islamic banks is due to technical inefficiency. That is to say they do not manage the technical aspects of banking production, by which they are able to provide more profitable and less costly services.

Table 3: Second-Stage Regression Results

	CE		**AE**		**TE**		**PTE**		**SE**	
Explanatory Variables	**FE**	**RE**	**FE**	**RE**	**FE**	**RE**	**FE**	**RE**	**FE**	**RE**
LogTA	-0.174***	-0.065	-0.099**	-0.016	-0.116	-0.071**	-0.164**	-0.011***	-0.029**	-0.073
	(0.0589)	(0.0546)	(0.0458)	(0.0581)	(0.0722)	(0.0338)	(0.0690)	(0.0029)	(0.0131)	(0.0593)
Equity/TA	0.213*	-0.071	0.709***	0.174	-0.049	-0.379*	-0.234	-0.369*	-0.796**	-0.849***
	(0.1180)	(0.2157)	(0.2433)	(0.2296)	(0.2671)	(0.2120)	(0.2552)	(0.2086)	(0.3443)	(0.2352)
Loans/TA	-0.263**	-0.129	-0.522***	-0.263**	0.095	0.245**	0.148	0.198**	0.206***	0.204**
	(0.1046)	(0.1016)	(0.1168)	(0.1069)	(0.1282)	(0.0967)	(0.1225)	(0.0952)	(0.0652)	(0.1026)
LLPLTL	0.001	-0.018	-0.033**	-0.058	0.019	0.009*	0.032	0.018	-0.015**	-0.001
	(0.0301)	(0.0329)	(0.0136)	(0.0367)	(0.0326)	(0.0057)	(0.0352)	(0.0360)	(0.0075)	(0.0462)
ROA	0.655*	0.392	0.049	-0.134	0.249	0.259*	0.752	0.523**	0.046**	0.502
	(0.3515)	(0.5989)	(0.6154)	(0.6695)	(0.6757)	(0.1396)	(0.6457)	(0.2581)	(0.0210)	(0.8468)
ROE	-0.132	-0.047	-0.065	0.009	0.007	0.031**	-0.153	-0.083**	0.055***	-0.040
	(0.1352)	(0.1472)	(0.1509)	(0.1644)	(0.1657)	(0.0144)	(0.1583)	(0.0415)	(0.0136)	(0.2075)
LogGDP	0.351	0.055	0.305	-0.026	0.135	0.088	-0.211	0.045	0.075	0.054
	(0.3283)	(0.0871)	(0.3663)	(0.0791)	(0.4022)	(0.0619)	(0.3843)	(0.0610)	(0.5185)	(0.0575)
CPI	0.002**	-0.002	0.001	-0.001	-0.001	-0.001*	0.001	-0.001	-0.001	-0.001
	(0.0008)	(0.0004)	(0.0009)	(0.0005)	(0.0009)	(0.0004)	(0.0009)	(0.0003)	(0.0012)	(0.0036)
Constant	-0.387	0.929	-0.472	1.248*	0.754	0.736	3.485	0.608	0.800	1.209**
	(2.2705)	(0.6822)	(2.5334)	(0.6476)	(2.7818)	(0.5383)	(2.6581)	(0.5305)	(3.5856)	(0.5403)
F(20,76)	22.62		15.00		7.64		7.72		3.93	
P-value	0.0000		0.0000		0.0000		0.0000		0.0000	
$\chi^2(8)$ **Hausman**	31.72		49.50		3.79		14.20		16.34	
P-Value	0.0001		0.0000		0.8752		0.0767		0.0378	
Regression method	**Fixed Effect**		**Fixed Effect**		**Random Effect**		**Random Effect**		**Fixed Effect**	

Notes: Standard Deviations for coefficients are shown in parentheses. The significance of coefficients at various levels is indicated by *** for 1 per cent level, ** for the 5 per cent level and * for the 10 per cent level.

6 Conclusion

The rapid evolution of the concept of Islamic finance as an alternative to conventional finance has made the Islamic banking a subject of several studies and researches. In this respect, the analysis of changes in levels of efficiency of Islamic banks was an issue that has attracted the attention of many researchers in the field.

Under this notion of efficiency, this article has tried to provide an empirical analysis to estimate efficiency of 21 Islamic banks operating in the MENA region over the period 2005-2009. We first calculated the different efficiency scores (CE, AE, TE, PTE and SE) using the nonparametric approach (DEA). The results show that, in the case of MENA banks included in our study, allocative efficiency dominates the technical efficiency throughout the estimation period. This implies that the major source of inefficiency of these banks is purely technical. In addition, scale efficiency is higher than the pure technical efficiency. Indeed, the adoption of the principle of sharing profits and losses in various financial transactions, which is the essential feature of Islamic banks, allows or encourages them to make a careful selection of clients and projects that expect to fund. This reduces the probability of failure of customers, reduced financing costs and therefore increases their overall efficiency.

The second stage regression analysis revealed other significant findings. First of all, small Islamic banks are more efficient than large Islamic banks. This is due to the stimulating and positive effects of economies of scale on the small banks' performance, and the strong competition that encourages them to strengthen their position.

Secondly, we have demonstrated that a strong capitalization of Islamic banks promote their allocative efficiency. Islamic banks' own funds may be raised by the financing of investment projects where banks become shareholders (partnership). The principle of partnership that involves a sharing of risk between the stakeholders of the contracts encourages banks to choose carefully the projects they intend to finance, promotes economic development, reduces the costs risks, and thus increases the efficiency. Although the ratio of loans to total assets showed a positive impact on the technical efficiency of Islamic banks, it is negatively correlated with allocative efficiency. The excellent organization and good management of Islamic banks' resources gave them the possibility to extend their activities by offering the maximum of credits at their proper tariffs. This situation has exposed them to high level of risks and therefore reduced their allocative efficiency.

Thirdly, the relationship between the profitability of Islamic banks and their efficiencies is not stable. The variation of the impact of profitability on efficiency can be explained by the hypothesis of X-inefficiency, or by the assumption of imperfect competition.

Finally, the results show that the positive impact of economic growth on the efficiency of Islamic banks is not significant. Similarly, inflation has a negative but statistically insignificant impact.

Islamic banking has emerged as a response to religious and economic requirements and as an attractive financial field. The religious requirements demand to avoid interest-based on all transactions and provide new perspectives on the role of the bank in promoting productive investment activities, influencing the distribution of income and adding stability to the economy. Islamic banking is thus perceived as improved in all dimensions system. The Islamic banking system must be internally efficient and technologically advanced in order to compete with their conventional counterparts.

The findings of this study are expected to contribute to the existing knowledge on the operating performance of the MENA Islamic banking industry.

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Appendix

Average efficiency scores

Bank	EE	AE	TE	PTE	SE
Al Baraka banc of Algeria	0.007	0.016	0.334	0.429	0.784
Al Rajhi Bank	0.908	0.922	0.641	0.984	0.652
Bank Albilad	0.159	0.372	0.428	0.571	0.729
ABC Islamic Bank	0.861	0.875	0.943	0.978	0.965
Gulf Finance House	0.312	0.549	0.524	0.559	0.933
Ithmar Bank	0.225	0.331	0.502	0.592	0.865
Taib Bank	0.181	0.296	0.231	0.368	0.378
Bank of Sharjah	0.436	0.801	0.548	0.556	0.988
Dubai Islamic Bank	0.925	0.954	0.526	0.934	0.568
Emirates Islamic Bank	0.479	0.903	0.520	0.533	0.976
Mashreq Bank	0.141	0.188	0.398	0.768	0.521
Islamic International Arab Bank	0.912	0.912	0.988	1.000	0.988
Boubyan Bank	0.886	0.885	0.978	1.000	0.978
Kuweit Finance House	0.798	0.990	0.693	0.987	0.705
Qatar Islamic Bank	0.999	0.999	0.979	1.000	0.979
Al Baraka Bank Sudan	0.757	0.848	0.487	0.907	0.538
Bank of Khartoum	0.486	0.892	0.428	0.547	0.774
Sudanese French bank	0.569	0.960	0.378	0.595	0.644
Al Barakaq Türk	0.547	0.598	0.888	0.913	0.972
Bank Asya	0.796	0.857	0.857	0.920	0.931
Kuveyt Türk	0.434	0.777	0.529	0.558	0.949