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The relationship between Islamic bank efficiency and stock market performance: Evidence from GCC countries

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Abstract - Using data envelopment analysis (DEA), this paper estimates the efficiency of 25 Islamic banks operating in Gulf Cooperation Council (GCC) countries during the period 2003–2009. It also examines the relationship between the efficiency of Islamic banks and the performance of their stock. The results suggest that efficiency measures, particularly technical and pure technical efficiency, have increased over the period of study but remain low as compared to conventional banks. The inefficiency of Islamic banks can be attributed to pure technical inefficiency rather than to scale inefficiency. We also find that large and small banks are more efficient than medium banks in terms of overall technical efficiency. Furthermore, the empirical findings show that both technical and pure technical efficiency changes are positively related to share returns, while changes in scale efficiency have no impact on stock performance. Finally, the regression also indicates a significant and positive association between market return and the book-to-market equity ratio with share prices.

Keywords: banking, technical efficiency, stock performance, Islamic banks, data envelopment analysis, GCC countries

1. Introduction

An Islamic bank is an institution that mobilizes and invests financial resources according to Shariah. Islamic banking transactions are based on six basic principles: prohibition of interest, risk sharing, money as potential capital, prohibition of speculative behaviour, sanctity of contracts, and Shariah approved activities (Iqbal 1997).

Islamic banking, which started to operate from the 1960s, exists today in all regions of the world, particularly in the Middle East and Southeast Asia. According to the report of the Blominginvest bank, which was established in February 2009, more than 390 Islamic financial institutions are spread across 75 countries with total assets estimated to be close to $1 trillion by 2010. The rating agency, Moody's Investors' Service, forecast that Islamic bank assets worldwide will reach $4 trillion within five years. The Islamic financial system is considered to be one of the fastest growing financial and economic sectors in the world. During the last decade, the Islamic banking industry has grown at a remarkable pace, at 20–30% per year being three times the rate for conventional banks. According to many reports, the rapid and continued growth of Islamic banking is driven by multiple factors such as: increasing demand from a large number of Muslims; increasing oil wealth of Muslim countries; low banking penetration in Muslim majority nations; increasing demand from non-Muslim customers and countries; and the support of government and regulatory bodies for the development and promotion of Islamic banking.

Furthermore, the Islamic financial system has been less affected than the traditional system by the latest economic and financial crisis (2008), due mainly to its profit-loss sharing principle, and also because of its strict prohibition of investments in risky instruments, such as toxic assets and derivatives. In addition, according to an IMF survey (2010) and Chapra (2009), Islamic banks have contributed to

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financial and economic stability during the global financial crisis. The strong performance of Islamic banks over recent years has encouraged several universal banks in developed countries to add Islamic products to their conventional banking industry, through Islamic banks windows or Islamic banking subsidiaries.

In view of the rapid growth of Islamic banks, several issues are revealed about the performance of these financial institutions. In addition, as Islamic banking was introduced as a parallel system of conventional banks in the majority of countries, the performance of the new form of banking may have an impact on the soundness and stability of the banking system as a whole (Mariani 2010). Moreover, the last economic and financial crisis has turned the focus towards Islamic financial institutions which, according to many sources, have showed stronger resilience than conventional banks (e.g., Moody's; IMF working paper 2010). Despite the strong position of Islamic banks, several studies (Iqbal 2007; Iqbal and Van Greuning 2007) have identified weaknesses and vulnerabilities among Islamic banks in the areas of risk management (operational risk; weak internal control processes) and human resource issues (quality of management; technical expertise; professionalism). Therefore, it will be interesting to analyse the performance of Islamic banks during the last decade in order to provide some guidelines for managers, investors and policy makers to improve the efficiency of these banks and to formulate managerial strategies and public policies. Therefore, the aim of this study is to investigate the efficiency of Islamic banks operating in Gulf Council Cooperation (GCC) countries during the period 2003–2009, and to examine the relationship between the efficiency of Islamic banks and the performance of their stock. To our knowledge, this is the first study which analyses the relationship between efficiency and share performance in the context of Islamic banks in GCC countries.

To gain a better understanding of the Islamic banking sector in GCC countries, our analysis is conducted in two steps. First, by employing Data Envelopment Analysis (DEA) as a non-parametric approach, we estimate the technical efficiency of 25 GCC Islamic banks under the profit-oriented method which defines cost variables as inputs, and revenue variables as outputs. In addition, to analyse the sources of inefficiency of these banks, we calculated pure technical efficiency and scale efficiency as two components of technical efficiency. We chose a period of six years between 2003 and 2009 in order to investigate the evolution of the efficiency of Islamic banks over time. Moreover, in this study we attempt to compare the efficiency measures of Islamic financial institutions according to their size in terms of total assets. Following several studies concerning the conventional banking industry (e.g., Haddad et al. 2010; Pasiouras 2008; Beccali et al. 2006), in the second stage of this paper we investigat the potential association between Islamic banks' efficiency and their share prices. To meet this objective, we regress annual stock returns calculated as the sum of daily share returns on efficiency scores obtained in the first step, adding some control variables.

This paper presents some interesting points compared with some other studies on Islamic banking efficiency in GCC countries. First, our sample comprises more than 90% of GCC Islamic banks assets, which makes it the most comprehensive database on the GCC Islamic banking industry. Also, to the best of our knowledge, this is the first study that relates the efficiency of Islamic banks in GCC countries to their stock prices. Finally, our paper also attempts to study the impact of the recent economic and financial crisis on the performance of GCC Islamic banks, and compares the efficiency of large, medium and small banks.

2. Literature review

Two streams of literature are discussed in this study, the first concerning the efficiency of Islamic banks, the second being relevant to the relationship between bank efficiency and share performance.

Studies on Islamic bank efficiency

While there is wide discussion in the literature on bank efficiency within the conventional bank sector, particularly for the developing countries and, to a smaller degree, the transition economies, the work on Islamic banks remains limited. Even with the development of the Islamic banking sector in several regions of the world, few studies have evaluated the efficiency of the new form of banking, and noneconcern the relationship between bank efficiency and share performance.

According to Bashir (2007) and Sufian et al. (2008), the majority of studies on Islamic banks have focused on the concept issues describing the underlying principles (Al-Omar and Iqbal 2000; Zahar and Hassan 2001; Lewis, 2008) and performance measures using the traditional financial ratios of these type of banks (Bashir 2001; Olson and Zoubi 2008; Srairi 2009). A few studies have utilized frontier analysis techniques rather than traditional methods to estimate the efficiency of Islamic banks. Using both the stochastic frontier approach (SFA) and the DEA models, Hassan (2007) estimated a variety of parametric techniques (cost, profit efficiency, and productivity)to a panel of 43 Islamic banks operating in 22 countries during the period 1993–2001. He found that Islamic banks are relatively more efficient in generating profits compared with control costs. In fact, the score of profit efficiency was found to be about 84%, while for cost the efficiency was only 74%. The results also indicated that the major source of inefficiency was allocative inefficiency rather than technical inefficiency.

Mokhtar et al. (2008) used a non-parametric DEA technique and an intermediation approach to estimate the technical and cost efficiency of the fully-fledged Islamic banks as well as Islamic windows in Malaysia from 1997 to 2003. The main results of the study revealed that, although the fully-fledged Islamic banks were more efficient than the Islamic windows, the two types of Islamic banks were still less efficient than the conventional banks. This finding also showed that the average efficiency of the overall Islamic banking sector increased over the survey period.

Employing the DEA model, Sufian et al. (2008) examined the technical efficiency and its components (pure technical efficiency and scale efficiency) of 37 Islamic banks operating in 16 MENA and Asian countries during the period 2001–2006. The results suggest that pure technical

inefficiency dominated scale inefficiency of Islamic banks during all years except for the year 2006. On the other hand, the authors found that the MENA Islamic banks exhibited higher technical efficiency compared to their Asian Islamic bank counterparts.

A more recent study concerning GCC countries was conducted by Srairi (2010), who employed a SFA model with country-specific environment variables and estimated the cost and profit efficiency of 71 commercial banks during the period 1999–2007. The empirical results indicated that, on average, the conventional banks are more efficient in terms of cost and profit than the Islamic banks. This study also revealed that both conventional and Islamic banks in Arab Gulf countries are relatively more efficient in generating profits than in controlling costs.

Bank efficiency and share performance

While there is an extensive literature examining several issues on bank efficiency, such as the impact of liberalization on the efficiency of banks (e.g., Chen et al. 2005; Das and Ghosh 2006; Paul and Kourouche 2008), the sources of bank inefficiency (e.g., Grigorian and Manole 2006; Pasiouras 2008; Sufian 2009), the comparison of the efficiency of banks according to country (e.g., Fries and Taci 2005; Kasman and Yildirim 2006; Inui et al. 2008), ownership structure (e.g. Isik and Hassan 2003; Bonin et al. 2005; Kyj and Isik 2008), and comparison of type of bank (foreign and domestic: Havrylchyk 2006; new and old: Canhoto and Dermine 2003; conventional and Islamic: Srairi 2010), only a limited number of papers have investigated the impact of the efficiency of banks on stock performance, and none of these papers have concerned Islamic banks. The relationship between the efficiency of banks and stock performance within the conventional banking sector has been studied both on the basis of an individual country and for a cross-section of countries.

Haddad et al. (2010) estimated the monthly efficiency and productivity of 24 listed Indonesian banks and their market performance using the non-parametricSlack-Based Model (SBM) approach over the period January 2006 to July 2007. They found that the stock market values of the banks were in accordance with their performance. The results also indicated a positive correlation between the index of the Indonesian stock exchange (JCI) and bank efficiency. On the other hand, the findings suggest that Indonesian banks with foreign ownership tend to be less efficient than their domestic counterparts.

Using both DEA and SFA methods, Xiang and Shamsudding (2009) calculated the technical, cost and profit efficiency of nine publicly-listed Australian banks over the period 1997–2007, and analyzed the potential link between these efficiency scores and stock returns. They observed that an improvement in cost and profit efficiency, calculated using the SFA model, increased bank stock performance. However, the DEA efficiency scores were uncorrelated with stock returns.

Pasiouras et al. (2008) examined the association between the efficiency of ten Greek banks and their share performance between 2000 and 2005. The authors used the DEA technique (profit-oriented approach) and computed three efficiency levels: technical efficiency under constant returns to scale (CRS); technical efficiency under variable returns to scale (VRS); and scale efficiency. The results indicated that annual changes in technical efficiency (under CRS or VRS) were positively related to stock returns, while changes in scale efficiency had an insignificant impact on share performance. Erdem and Erdem (2008) used a DEA with intermediation approach, and found no association between stock price returns and change in economic efficiency for Turkish banks.

Across international financial markets, Beccali et al. (2006) used both SFA and DEA approaches to estimate cost efficiency for a sample of banks operating in five European countries (France, Germany, Italy, Spain and United Kingdom) in the year 2000. The results suggested that the change in the prices of bank shares reflects percentage changes in cost efficiency, particularly those derived from DEA. More recently, Liadaki and Gaganis (2010), who employed a larger sample (15 EU countries and 171 banks) and a longer time period (2002–2006) than Becalli et al. (2006), estimated the cost and the profit efficiency by using the SFA model and taking into account the macroeconomic and other country-specific characteristics. The main result of this study showed higher profit inefficiency (21%) than cost inefficiency (10%). This means that European banks are more efficient in controlling costs than in generating profits. However, Srairi (2010) found that profit efficiency scores are more informative to shareholders and investors in Gulf Arab countries. In fact, changes in profit efficiency have a positive and significant effect on stock returns, while there is no association between changes in cost efficiency and stock returns.

3. Methodology and data

In this study, we employ a three-stage procedure to analyse the efficiency of Islamic banks and the relation to share price performance:

1. A non-parametric approach (DEA technique) is used to estimate efficiency scores with an input-oriented model.
2. Annual stock returns are calculated on the basis of daily share returns in order to measure the share performance for each bank.
3. The relationship between bank efficiency and stock performance is examined by regressing the annual return on stock against the yearly change of efficiency levels.

DEA model

From the literature, it is apparent that two models are used to examine the efficiency of banks. Parametric techniques, such as Stochastic Frontier Analysis (SFA), Thick Frontier Approach (TFA), and Distribution Free Approach (DFA), use econometric tools and specify the function form for the cost or profit function. On the contrary, non-parametric approaches, such as Data Envelopment Analysis (DEA) and Free Disposable Hull Analysis (FDHA), do not make an assumption concerning the functional form of the frontier, and use a linear program to calculate the efficiency level. The small size of our sample pushed us to adopt the DEA technique, which was first introduced by

Charnes et al. (1978). According to Avkiran (1999), DEA is thought to work well with fewer data, fewer assumptions, and limited sample sizes. Furthermore, DEA does not require any specification of the functional form on the data to construct the production frontier, and the distribution forms of errors (Bauer et al. 1998). However, DEA has some limitations. This technique is very sensitive to outlying observations, and all deviations from the frontier indicate inefficiency (Havrylchyk 2006). Moreover, the DEA approach does not allow for any error in the data and, in consequence, it may overstate the true levels of relative inefficiency for some entities (Drake and Hall 2003; Berger and Mester 1997). Despite its limitations, we propose that DEA is a robust tool for examining the efficiency of Islamic banks in GCC countries.

DEA is a deterministic model that can be used to examine the relative efficiency of a number of entities (decision-making units: DMUs) in the sample having the same multiple inputs and multiple outputs. To calculate the efficiency scores, a linear programming model is solved for each bank. The DEA model measures the efficiency of each DMU relative to all other DMUs, with the simple restriction that all DMUs lay on, or below, the efficiency frontier (Das and Ghosh 2006). If a DMU lies on the frontier, it is referred to as an "efficient unit". Otherwise, it is DEA-inefficient. The value of the efficiency score for each DMU is ranged between zero and one. To define the best practice frontier, DEA can run under either constant returns to scale (CRS), or variable returns to scale (VRS). The main difference between these two models is the treatment of returns to scale. The VRS model, which was defined by Banker et al. (1984), compares each bank only with other banks operating in the same region of return to scale (banks of similar size). However, the CRS assumption is only justifiable when all banks are operating at an optimal scale. It means that a rise in inputs results in a proportionate rise in outputs. On the other hand, a DEA model can be constructed using an input-orientation (minimizing inputs) or output-orientation (maximizing outputs) approach.

The input-orientation approach is defined as the ability of the bank to obtain a given level of outputs by utilizing a minimum combination of inputs; the opposite approach analyzes the ability of banks to produce the maximum level of outputs, given the current level of inputs (Cooper et al. 2000). In this study, we adopt an input-oriented DEA technique because of the expressed interest of the Islamic banking sector in more control costs. Many studies (e.g., Archer and Abdel-Karim 2002; Kamaruddin et al. 2008) conclude that the cost of funds and labour in Islamic banks is higher compared with those in conventional banks.

The DEA approach permits calculation for each bank of the overall technical efficiency (TE) and its two components, pure technical efficiency (PTE) and scale efficiency (SE). PTE, also called "managerial efficiency", represents the failure of the bank to extract the maximum output from its adopted input level and, hence, it relates to the ability of the manager to utilize the firm's given resources (Drake and Hall 2003; Pasiouras 2008). SE, another indicator of efficiency, measures the proportional reduction in input usage if the bank can operate at a point where the production exhibits CRS (Kyj and Isik 2008). It can be computed by dividing TE under the assumption of CRS to the TE under the VRS assumption (TE = PTE*SE). To calculate these efficiency scores, we employed the software DEAP version 2.1 developed by Coelli (1996).

Specification of inputs and outputs

To estimate the efficiency frontier using the DEA technique, we needed measures of inputs and outputs. In the literature, there has been little consensus over which inputs and outputs should be used with the DEA model and how they could be measured (Berger and Humphrey 1992). Consequently, several approaches are used in bank efficiency studies: the production approach, the intermediation approach, the operating approach, and the profit approach.

Following recent studies on bank efficiency (e.g., Drake et al. 2006; Pasiouras 2008; Sturm and Williams 2004), in this study we adopt the profit-oriented approach. This method focuses on revenues as well as costs. It also has the advantage of allowing a better understanding of the strategies used by banks to respond to the changes in environment. Accordingly, three inputs and two outputs are selected to estimate efficiency levels. Hence, the vector of inputs comprises: employee expenses (x1), other operating expenses (x2) and loan loss provisions (x3). The vector of outputs includes two variables: net interest income (y1 = interest income- interest expense) and other operating income (y2).

Bank efficiency and share performance

Once the efficiency scores (TE, PTE, SE) and the annual share returns are computed,in the third stage of this study we examine the impact of the efficiency of Islamic banks on performance (e.g., Liadaki and Gaganis 2010; Sufian and Abdul-Majid 2009; Erdem and Erdem 2008). The relationship is checked using the following linear model:

$$RS_{it} = \alpha + \beta_1 CE_{it} + \beta_2 MR_{jt} + \beta_3 BSF_{it} + \varepsilon_{it} \quad (1)$$

where RS_{it} is the annual return on bank i's stock in year t. CE_{it} represents the annual percentage change in bank efficiency and includes the technical (TE, model 1) or pure technical (PTE, model 2) or scale efficiency (SE, model 3) for bank i in year t. MR_{jt} is the market return for the banking sector j in year t, and BSF_{it} concerns some specific factors and includes two variables, LTA_{it}, which is the size of bank i in year t measured as the natural logarithm of total assets, and BM_{it}, which is the book-to-market equity ratio calculated as the ratio of the book value of a bank's equity to its market value. The α intercept represents the constant of the model, β_i is the parameters to be estimated and ε_{it} is the disturbance term calculated as follows:

$$\varepsilon_{it} = u_{it} + v_i$$

Since we have a panel regression combining cross section and time series data, we estimate this model by using a fixed effect model (v_i which represents bank specific effect is fixed over time) and a random effect model (in the case v_i is considered as an error term). The fixed effect model is tested by the Fisher (F) test, while the random effect model is examined by the Lagrange Multiplier (LM) test. If the null hypothesis of heteroscedasticity residual variance is rejected, the ordinary least square (OLS) regression

Table 1. Summary statistics of dataset used in the study (average values).

	2003	2004	2005	2006	2007	2008	2009
Panel A: inputs and outputs[a]							
– Employee expenses (x1)	23.47	25.21	32.7	48.35	67.63	73.89	70.27
– Other operating expenses (x2)	19.66	21.26	36.47	43.77	52.78	58.83	61.22
– Loan loss provision (x3)	19.95	19.05	17.71	13.16	18.92	61.73	120.47
– Net interest income (y1)	103.92	116.50	168.35	200.29	272.66	275.72	262.78
– Other operating income (y2)	27.86	38.62	77.86	113.12	157.13	132.67	95.82
Panel B: control variables and stock return[b]							
– Total assets (US$ Millions)	2707	3065	3835	5200	7124	9062	9739
– Book-to-market equity	–	2.15	0.90	1.35	1.45	2.23	1.53
– Annual stock return	–	44.82	67.84	–27.33	16.56	–81.25	–15.33

[a] = variables in US$ million; [b] = all variables are in percentages, except where indicated.

is favored. To choose between these two models, we calculated the Hausman test (H).

Data

Our sample comprises 25 Islamic banks operating in five Gulf Arab countries (GCC) with six banks in Bahrain, eight banks in Kuwait, two banks in Qatar, two banks in Saudi Arabia, and seven banks in the United Arab Emirates, over the period 2003–2009. The choice of region is justified for many reasons: first, the GCC countries, which comprise six states (Bahrain, Kuwait, Qatar, Saudi Arabia, the United Arab Emirates, and Oman) hold the largest share (about 61.6%) of Islamic bank' assets in the world ($263 billion in 2008). Saudi Islamic banks occupy the first place in terms of GCC Shariah-compliant assets (35%), followed by Kuwait (24%), the United Arab Emirates (19%), Bahrain (14%), and Qatar (8%). During the last decade, the Islamic banking sector in GCC countries had achieved strong growth in term of total assets (over 35%). Also, since 2002, the GCC region has been in a relatively strong position (7% growth between 2002 and 2008) and is expected to continue at the same pace and to launch huge projects of more than $1 trillion during the next decade. Finally, while the GCC states provide opportunities in many sectors and offer ample liquidity in the banking sector, Islamic banks are expected to further diversify their products and services and so attract a wider clientele. In addition, the Islamic financial system will continue to spread to investment banking, project finance, capital markets, insurance, wealth management and micro-finance (Iqbal 2007).

The annual data of Islamic banks (financial statements) used to calculate the efficiency scores are collected from Bankscope Database of Bureau Van Dijk's Company. The daily stock prices and market index are obtained from Datastream. Since Gulf countries have different currencies, all the annual financial values are converted into US dollars using appropriate average exchange rates for each year. Also, to ensure comparability of data across countries, all values are deflated to the year 2003 using each country's consumer price index (CPI).

Table 1 summarises the mean of inputs and outputs employed in the DEA model and also presents the average value of stock returns and control variables used in the regression over 2003 to 2009. The table shows a great increase of all inputs and outputs during the period of study. In fact, we note that employee expenses, the other operating expenses, the net interest income, and other operating income have risen about 200%, 211%, 153%, and 243%, respectively. The loan loss provision was constant during 2003–2007 and grew rapidly during the two last years of the study period (2008 and 2009). It is interesting to note that the crisis did not have the same effect on Islamic banks as is reported for conventional banks (Blominvest bank report 2009), the income of Islamic banks exhibiting only a small decrease of 4%. Finally, we note an increase of more than 25% of the average rate of assets.

4. Empirical results

The analysis of the empirical findings on the efficiency of Islamic banks in GCC countries is structured in two main parts. First, we estimate the overall technical efficiency and its components, measured by DEA method, and evaluate its evolution over time. Further, we attempt to examine the efficiency of Islamic banks according to their size. In the second part, we extend the analysis by examining the relationship between efficiency scores of Islamic banks and their share performance

DEA efficiency measures

In this section, we examine the efficiency scores of Islamic banks calculated under the profit-oriented approach and obtained by the DEA technique. In order to analyse the evolution of the efficiency of Islamic banks between 2003 and 2009, we chose to construct a common frontier for all banks in the sample; the implicit assumption was of an absence of technical change during the period of study. In this approach, the efficiency of each bank observed in different years is estimated in relation to a common benchmark technology (Canhoto and Dermine 2003).

Table 2 provides a summary of annual means of efficiency indexes over 2003–2009 classified by year (panel A) and by size (panel B). As can be seen from this table, overall technical efficiency scores exhibit an upward trend from 2003 to 2009. The mean of TE varies from 61.2% (2003) to 68.5% (2009) with an average equal to 65.5%. This result appears to show an improvement of the efficiency of

Table 2. Efficiency scores by year and size (average values).

	TE		PTE		SE	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**
Panel A: by year						
2003	0.612	0.147	0.718	0.136	0.855	0.116
2004	0.643	0.195	0.738	0.149	0.864	0.138
2005	0.650	0.141	0.751	0.143	0.883	0.200
2006	0.642	0.112	0.778	0.141	0.839	0.150
2007	0.671	0.115	0.799	0.106	0.847	0.131
2008	0.681	0.162	0.813	0.128	0.838	0.127
2009	0.685	0.085	0.817	0.138	0.852	0.128
Panel B: by size						
Small banks	0.669	0.156	0.676	0.153	0.990	0.157
Medium banks	0.653	0.118	0.762	0.123	0.840	0.140
Large banks	0.686	0.159	0.779	0.147	0.885	0.142
Overall	0.655	0.140	0.773	0.137	0.855	0.144

TE = technical efficiency; PTE = pure technical efficiency; SE = scale efficiency.

Islamic banks during the period of study. Indeed, efficiency scores, particularly TE and PTE, increased by 12% and 13% on average, respectively, while scale efficiency remained constant. However, during 2008 and 2009, these measures are constant but slightly changed and increased by 1.5% and 1.7%, respectively, compared to 2007. It is apparent that the last financial and economic crisis has affected the performance of Islamic banks, but to a lesser extent than for conventional banks. According to Hasan and Dridi (2010), "the initial impact of the crisis on Islamic Banks' profitability in 2008 was limited. However, with the impact of the crisis moving to the real economy, Islamic Banks in some countries faced larger losses compared to their conventional peers".

Despite the increase in efficiency of Islamic banks between 2003 and 2009, the average of the input waste is large and equal to 34.5%. Therefore, there is still room for improvement in the performance of these banks through more efficient use of resources. Indeed, the efficiency scores of Islamic banks in GCC countries are low compared not only to conventional banks (Srairi, 2010; Rosly and Abu Baker 2003) but also to Islamic banks in other countries. For instance, Kamaruddin et al. (2008) found that the average of technical efficiency of the Malaysian Islamic banks is 93% for the period 1998–2004. In a recent study of Islamic banks in MENA and Asian countries, Sufian et al. (2008) found that Islamic banks in Indonesia during the period 2001–2006 are the most efficient from the Asian region, exhibiting a mean technical efficiency of 92.3%. However, several studies (e.g., Mohammed et al. 2008; Hassan et al. 2009) suggested that there are no significant differences between the overall efficiency results of conventional compared with Islamic banks.

The decomposition of overall technical efficiency into PTE and SE components provides information on the source of technical inefficiency. Table 2 reveals that the pooled means for PTE and SE during the period analyzed are of 77.3% and 85.5%, respectively. The result shows that the inefficiency in Islamic banks could be attributed to pure technical inefficiency (29.3%) rather than to scale inefficiency (17%). It means that Islamic banks in GCC countries are managerially inefficient in controlling costs but manage their inputs efficiently. This finding of the dominant impact of managerial inefficiency over scale inefficiency is also reported in other studies, for example, Sufian et al. (2008) for Islamic banks in MENA and Asian countries; Kyj and Isik (2008) for the Ukrainian banking industry; and Zaim (1995) for Turkish banks. According to several studies (e.g., Bashir 2007; Iqbal 2007), the inefficiencies in Islamic banks can also be attributed to many other causes such as: limited number of short-term instruments; shortage of products for medium and long term maturities; portfolios of Islamic banks being concentrated on equity and non-interest based financing, and especially focused on trade financing; small size of banks; weak management; and lack of proper risk-monitoring systems.

Furthermore, we attempt in this study to identify the nature of scale inefficiency, which can be due to increasing returns to scale (IRS) or decreasing returns to scale (DRS). Table 3 displays statistics for the number of banks in the different categories of scale economies, and also presents the returns to scale of banks classified by size. According to the figures in this table, only 19% of Islamic banks operate at their optimal scale (CRS) and the majority of banks are scale-inefficient (58% at DRS and 23% at IRS). It is also interesting to note that the share of the banks experiencing economies of scale (IRS) and diseconomies of scale (DRS) are relatively constant during the sample period. The results confirm those shown in Table 2, relative to the stability of scale efficiency of Islamic banks over the period of study. Panel B of Table 3 also indicates that the majority of Islamic small banks (83%) exhibited IRS (53%) or CRS (30%), while the medium and large banks operated at DRS (80%). It means that increasing the activities and size of Islamic small banks may bring significant cost savings and, in consequence, improve the technical efficiency of these

Table 3. Return to scale in Islamic banks by year and size.

Years	DRS		IRS		CRS		Total of banks
	Nb. of banks	% share	Nb. of banks	% share	Nb. of banks	% share	
Panel A: by year							
2003	15	62	6	25	3	13	24
2004	15	62	5	21	4	17	24
2005	14	58	6	25	4	17	24
2006	13	52	6	24	6	24	25
2007	12	48	7	28	6	24	25
2008	15	60	5	20	5	20	25
2009	15	60	5	20	5	20	25
Total	99	58	40	23	33	19	172
Panel B: by size							
Small banks	10	17	32	53	18	30	60
Medium banks	44	79	3	5	9	16	56
Large banks	45	80	5	9	6	11	56

DRS: decreasing returns to scale; IRS: increasing returns to scale; CRS: constant returns to scale.

banks, in contrast to the case of expansion by the medium and large banks. A similar finding has been made for other countries such as Singapore (Rezvanian and Mehdian 2002), Turkey (Isik and Hassan 2002) and India (Rezvanian et al. 2008).

In order to compare the efficiency scores of banks according to their size, we categorized the sample banks into three groups based on their total assets, with an approximate number of banks in each category. The first group comprises nine small banks with an asset size of less than $3 billion. The second group includes medium banks (eight banks) whose assets are between $3 and $5 billion, while, the last group comprises large banks (eight banks) whose assets exceed $5 billion.

In terms of overall technical efficiency, panel B of Table 2 shows that large (68.6%) and small (66.9%) banks are the most efficient, while the medium banks presented the lowest mean TE of 65.3%. This is consistent with several studies which reported a significant positive association between size and efficiency (e.g., Drake and Hall 2003; Chen et al. 2005; Pasiouras 2008; Srairi, 2010). Large banks present some advantages over small and medium banks. According to Kyj and Isik (2008), "large banks may be able to hire a better management team, utilize better technology, be located in larger, more competitive markets, and have more diversified loan portfolio. Large banks, thus, may have lower default risk, and lower borrowing costs". However, other studies found a negative (e.g., Christopoulis et al. 2002; Bonin et al. 2005) or no significant (e.g., Berger and Hannam 1998; Girardone et al. 2004) relationship between size and efficiency. On the other hand, the result indicates that large (77.9%) and medium (76.2%) banks are more pure technically efficient than small banks (67.6%). However the latter display a superior measure for scale efficiency, this being 10.5% and 15% higher than for medium and large banks, respectively. Consequently, it seems that Islamic small banks need more improvement in terms of managerial practice, while Islamic medium banks need to increase their scale efficiency.

Efficiency and share performance

To assess the relationship between the efficiency of Islamic banks and their share prices, we regress annual stock price returns on annual percentage change of efficiency scores, derived from DEA analysis, with other explanatory variables. Models 1, 2 and 3 in Table 4 present the regression results estimated by the fixed-effect model for technical, pure technical, and scale efficiency changes respectively. The results indicate that both technical and pure technical efficiency changes have a positive and statistically significant (1% for TE and 5% for PTE) effect on stock returns. Indeed, the share prices of Islamic banks respond positively towards improvement in managerial efficiency. Hence, it seems that information regarding the efficiency of banks is reflected in the stock prices of banks. In fact, in an efficient market, share prices incorporate all publicly available information (Fama 1970). Thus, according to Beccalli et al. (2006) and others, efficient banks can better improve their share price performance than inefficient banks. So, our results are in line with several studies in other countries which found a positive association between technical efficiency change and share performance (e.g., Pasiouras et al. 2008 for Greek banks; Xiang and Shamsudding 2009 for Australian banks; Sufian and Abdul Majid 2009 for China banks). However, other researches (e.g., Liadaki and Gaganis 2010 for European banks; Ioannidis et al. 2008 for Asian and Latin American banks; Chu and Lim 1998 for Singapore banks) show that changes in stock returns reflect changes only in profit efficiency rather than in cost efficiency. According to Liadaki and Gaganis (2010), these results can be explained by the fact that rational shareholders and investors are more interested by the profit of banks as an indicator of the future dividends. Moreover, cost efficiency reflects the

Table 4. Regression results of equation (1).

$$RS_{it} = \alpha + \beta_1 CE_{it} + \beta_2 MR_{it} + \beta_3 BSF_{it} + \varepsilon_{it}$$

RS_{it} is the annual return on bank i's stock in year t. CE_{it} represents the annual percentage change in bank efficiency and includes the technical (TE, model N°1) or pure technical (PTE, model N°2) or scale efficiency (SE, model N°3) for bank i in year t. MR_{jt} is the market return for banking sector j in year t and BSF_{it} concerns some specific factors and includes two variables: LTA_{it} is the size of bank i in year t measured as the natural logarithm of total assets and BM_{it} is the book-to-market equity ratio calculated as the ratio of the book value of a bank's equity to its market value.

Variables	Model 1	Model 2	Model 3
Constant: α	2.15	2.03	2.11
	(2.75)*	(2.62)*	(2.70)*
Annual change in efficiency scores			
Technical Efficiency: TE	3.14	–	–
	(2.30)**		
Pure Technical Efficiency: PTE	–	7.07	–
		(2.61)*	
Scale Efficiency: SE	–	–	0.83
			–0.83
Control Variables			
Market return: MR	0.84	0.86	0.87
	(9.05)*	(8.88)*	(8.96)*
Size of bank: LTA	0.71	0.56	0.51
	(1.61)	(0.91)	(1.60)
Book to market equity ratio: BM	7.31	7.35	7.12
	(2.55)**	(2.49)**	(2.41)**
Adjusted R2	0.617	0.597	0.499
F value	38.66*	35.29*	35.60*
Nb. Observations	125	125	125
F value	48.3	46.4	43.2
LM	385.2	391.3	380.4
Hausman test	36.1	33.8	31.2

T-statistics are between parentheses; *, and ** indicate statistical significance at 1%, and 5% respectively.

capability of managers but it is not directly observed in the stock market.

From Table 4 (model 3), it is also noted that the estimated coefficient of scale efficiency change is positive but it is not statistically significant. It means that scale efficiency does not have any impact on a bank's share returns. This finding is also confirmed by the coefficient of bank size which is insignificant in all of the regression models. A similar result was also found by Pasiouras et al. (2008) and Sufian and Abdul Majid (2009).

With regard to the control variables and their influence on stock returns, Table 4 indicates that market return in all models has the expected sign and a significant power to explain the variation in stock prices. This result, which is consistent with previous studies (e.g., Xiang and Shamsuddin 2009; Erdem and S.Erdem 2008), shows that stock price returns of Islamic banks are positively related to the overall performance of the market. On the other hand, the association between the ratio of book-to-market value (BM) and share performance is positive and significant at the 5% level for all models. However, our results are different from the study of Xiang and Shamsuddin (2009) concerning Australian banks which found a negative sign of BM, implying a possibility of market expectation of systematic risk.

5. Discussion

Many policy implications and recommendations can be derived from the results of this paper. First, since Islamic banks in GCC countries exhibited a lower level of efficiency compared to conventional banks, it is necessary for these institutions to promote and enhance their functioning in several areas (Bashir 2007; Iqbal 2007). Islamic banks are still operating with a limited number of instruments for the short-term, and there is a shortage of products for medium- to long-term maturities. In this regard, Islamic banks have to offer new products and modes of finance that enhance risk management and portfolio diversification. Due to limited size and resources, Islamic banks are unable to reap the benefits of economies of scale and are also unable to afford high cost management information systems to assess and monitor risks. Accordingly, Islamic banks have to perform strategic alliances with other Islamic financial institutions, and collaborate with conventional banks which are more sophisticated in terms of financial engineering. Further, to better control and reduce their costs, Islamic banks need to invest more in technology, to develop innovative

methods in terms of risk management, and to increase the efficiency of their staff by investing in training and development. The results also show that there has been an improvement in efficiency of Islamic banks over the period of liberalization in Gulf countries. Therefore, authorities in this region should continue to reinforce financial reforms, increase economic integration between countries, and undertake constructive policy actions to develop Islamic capital markets which help to integrate Islamic financial institutions into regional and international financial systems. Finally, while there is a positive association between the performance of Islamic banks and their stock price returns, it appears that efficiency measures contain important and helpful information which could be used by managers of banks, shareholders and investors.

6. Conclusions

Islamic banking is viewed as competitive and an alternative to the conventional banking system in many states of the world, particularly in GCC and some Asian countries. In addition, during the last decade, Islamic banking assets have been growing at a faster pace (an average annual growth of 20%) than the overall banking system, with the expectation that it will play an increasing important role in the coming years. Moreover, the Islamic financial system has proved to be the least affected by the last economic and financial crisis. In the light of these considerations, it is important to assess and analyse how Islamic banks have performed during the past few years.

In the present study, we estimate the efficiency of 25 GCC Islamic banks over the period 2003–2009. By using a non-parametric DEA technique, under the profit oriented approach, we calculate technical, pure technical and scale efficiencies to study the evolution of these efficiency measures across time and to analyse the size efficiency relationship. Additionally, this paper attempts to investigate the influence of the performance of Islamic banks in terms of efficiency on their stock prices. Several important findings emerge from this present study. The results indicate that the average technical efficiency was equal to 66% and that there was a rising trend for both TE and PTE, suggesting that Islamic banks in GCC countries improved their efficiency during the survey period. This was the period where the processes of liberalization of the GCC financial system were realised at an accelerated pace. Overall, we also find that inefficiency in Islamic banks is attributed mainly to pure technical inefficiency (29%) rather than scale inefficiency (17%). Thus, it seems that Islamic banks are managerially inefficient in controlling their costs and their inputs. It is interesting to note that the majority of Islamic banks are scale-inefficient and are either small- or medium-sized, which implies that these banks can achieve cost savings and improve their efficiency by increasing their size and scale of operations. Furthermore, our findings regarding the impact of size on the efficiency of Islamic banks suggest that, while large banks are more managerially and technically efficient than small banks, they are also less scale-efficient than the smaller banks. In terms of pure technical efficiency, large-sized Islamic banks seem also to be the most efficient ones, followed by the medium banks. In this regards, it appears that small banks need to improve their managerial practices, while medium banks have to increase their scale efficiency.

Using the efficiency scores of Islamic banks, we analysed the link between efficiency change and stock returns. The results derived from the fixed effect model show that percentage changes in the prices of bank stocks reflect percentage changes in both technical and pure technical efficiency. However, we do not find any significant relationship between scale efficiency and stock returns. Thus, our results seem to support the argument that stock returns respond positively towards improvement in managerial efficiency, but do not react towards changes in scale efficiency (Sufian and Abdul Majid 2009). Hence, the efficiency of a bank's operation provides significant information about its share price performance, which is not explained by market movements.

One implication of the findings is that managerially-efficient banks should be more profitable and therefore generate greater shareholder returns. This is in line with the efficient market theory that, in an efficient market, a change in cost efficiency should be incorporated in the price formation process. Finally, the study also revealed that market return and ratio of book-to-market value have a positive impact on stock returns.

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