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ECONOMIC RESEARCH FORUM
FOR THE ARAB COUNTRIES, IRAN & TURKEY

7 Boulos Hanna St. Dokki, Cairo, Egypt
Tel: (202) 3370810 – (202) 7485553 – (202) 7602882
Fax: (202) 7616042. Email: erf@idsc.net.eg. Website: http://www.erf.org.eg

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Abstract

The study estimates the technical efficiency of 52 GCC banks using two different methods. Using the earning assets, loans and investments, as outputs and fixed assets, labor and financial capital as inputs, the paper finds that there is ample room for GCC banks to improve their technical efficiency. At the country level, banks in Bahrain and Saudi Arabia are found to be more technically efficient than banks in the rest of the GCC countries. The argument is that bank characteristics as well as the environment in which the banks in these two countries operate are more conducive to better efficiency. The results also show that a larger bank size and higher share of equity capital in assets are associated with better efficiency. However, the weak link found between technical efficiency and profitability on one hand, and between technical efficiency and date of establishment, on the other, lend further support to the argument that the general economic environment in which GCC banks operate might have affected their efficiency in addition to their own characteristics. Overall, the results point to the fact that in order for GCC banks to be able to cope with a more competitive environment, over-banked and recessionary markets, they need to operate within a more enabling and efficiency-enticing regulatory framework in addition to consolidating their resources notably, through mergers and strategic alliances with domestic, regional or foreign banks.

1. Introduction

The boom in oil markets during the 1970's and the first half of the 1980's has allowed the countries of the Arab Gulf Cooperation Council (GCC), Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates, to accumulate substantial financial wealth. Part of this wealth has been channeled to the population through high salaries, subsidies and transfers. The ensuing boost in income per capita and savings capacity in GCC countries have resulted in the development of a modern banking sector whose expansion over time has been remarkable.

Being a very homogeneous group in the region, GCC countries, and more specifically their respective banks, are facing many common challenges that are likely to affect their ability to grow and operate within a more competitive environment.

First, GCC banks operate in over-banked, limited and often recessionary domestic markets. Oil still represents a very large portion of their export earnings and budget revenues. In addition, the public sector dominates the economic sphere in terms of ownership and management of most activities. As a result of the over-dependence on oil and the dominance of the public sector, growth in the region remains vulnerable to the vagaries of world oil markets and fluctuation in oil prices. In addition, investors find it difficult to develop many profitable investment opportunities outside the scope of very few sectors such as real estate, trade and stock market activities. This has translated into the concentration of bank lending mainly in consumer loans, real estate, construction and trade finance. Some of these lending opportunities are even more restricted considering the large share of expatriate population in GCC countries and given the limited access of expatriates to bank credit by virtue of many regulations including those related to real estate and corporate ownership.

In addition, many banks in the region have been over-protected and over-guaranteed. Most GCC banks have been protected from foreign competition through regulations imposing barriers to entry. Governments have also provided implicit guarantees for bank deposits. In sum, this state of affairs has reduced competitive pressure on domestic banks in the region and helped them achieve fairly reasonable profit rates.

This lax operating environment cannot be sustained, given the numerous challenges that the banking sector in the GCC countries faces. A first challenge to GCC banks stems from their eventual commitment to liberalize many financial services, including banking, by virtue of their membership in the World Trade Organization (WTO)[1]. GCC banks are expected to face more competitive pressure from foreign banks which will be allowed to operate on equal footing with local banks.

Expanding foreign banks are also bound to force their way into the wealthy GCC markets owing to the development of information technology and expansion of banking service delivery that escape domestic regulation.

Second, GCC banks are undergoing tremendous pressure to fulfill increasingly demanding international standards in terms of capital adequacy, risk management and accounting practices.

A third challenge faced by GCC banks is the mushrooming of investment companies that are likely to attract increasingly sophisticated bank clients looking for better financial investments than those actually offered by commercial banks.

The final challenge would result from lifting Government implicit guarantees on bank deposits and the reduction of its role as a bailer of last resort for troubled banks in the region.

The ability of GCC banks to meet the above challenges and to survive in a more competitive environment will depend on how efficiently they are run. Even if many banks in the GCC countries were able to be profitable, this might be a misleading indicator of future performance given that these banks have been operating under a relatively lax regulatory environment.

In this paper, I will provide estimates of the efficiency of GCC banks in the sense of analyzing how optimally they use physical capital, labor and financial resources to generate earning assets. This endeavor is relevant for policy purposes on several grounds. First, it allows decision makers to evaluate how banks will be affected by increased competitive pressure within their operating environment. It also helps identify banks that need to merge with more efficient ones or exit the banking sector. Efficiency of

[1] Among the six GCC countries only Saudi Arabia is not yet a member of WTO.

banks is equally important for consumers to the extent that more efficient banks tend to have lower service charges, better loan and deposit rates and better quality services.

The next section presents a brief overview of the banking sector in GCC countries. Section 3 underlines the methodology and data used in the analysis. The empirical results are discussed in section 4 and concluding remarks are presented in section 5.

2. Characteristics of the Banking Sector in the GCC Countries

The combined asset value of GCC banks is around U.S. $250 billion. These assets are concentrated across banks and countries. The share of the top five GCC banks is around forty percent of this total, while banks in Saudi Arabia hold about the same percentage share of the combined assets of GCC banks. The asset structure is also highly concentrated within the same country. Table 1 provided in the appendix, gives the share of the largest bank in each GCC country in the total asset value of all banks in that country. The reported figures become more revealing considering in details the distribution of assets across banks. In Saudi Arabia, for instance, the largest three banks hold around seventy five percent of bank assets. In Kuwait the largest two banks own around fifty percent of the total assets of conventional banks, while the largest bank in Qatar holds around sixty five percent of total bank assets. This concentration in asset structure in GCC countries reduces the ability of smaller banks to survive in a more competitive environment and may explain the recent waves of bank mergers, consolidation and restructuring in the Gulf region.

Despite this fairly concentrated asset structure, GCC banks remain fairly small in size relative to large international banks. The largest GCC bank, with an asset value of around U.S. $25 billion, is considered a bank of modest size by international standards. In fact, the combined asset value of all GCC banks does not even come close to the asset value of one large international bank such as CITIGROUP, estimated at around U.S. $717 billion for the year 1999[2].

Another salient feature of GCC banks is the mixed nature of their ownership. While few countries, such as Bahrain and Saudi Arabia, allow foreign banks to be shareholders and operate within their own countries, others impose various barriers to entry and restrictions on foreign ownership. In addition, while private ownership is allowed in all countries of the region, the Government is often a direct shareholder or an implicit guarantor. In many cases banks are owned by groups of families whose members are often directly involved in management.

The asset structure of GCC banks reveals the dominance of investment and loans in total assets with equal shares of around forty-five percent each. The rest is mainly distributed over liquid and fixed assets. External liabilities represent around ninety percent of total liabilities, while the remainder is made up of equity. Deposits represent the main source of external liabilities with a share of more than ninety percent. Table 2 in the appendix gives comparative liquidity, structural and profitability ratios for the GCC countries for the period 1999.

The figures in table 2 reveal that banks in Bahrain and Saudi Arabia hold a less liquid position than the rest of the GCC banks. In return, these two banks hold greater shares of their assets in the form of investments but less shares in the form of loans. GCC banks also maintain acceptable levels of financial risk and capital adequacy with an average ratio of equity to assets above eleven percent. The profitability measures show some degree of variability with banks in Qatar, Oman and U.A.E showing a better ability to generate net profits in relation to assets or equity funds used, than the rest of the countries.

3. Methodology and Data

The efficiency of financial institutions has been addressed in the literature either in terms of scale and scope or in terms of X-efficiency or both[3]. Scale efficiency addresses the question of whether the bank is operating at the minimum of its long-run average cost curve. Any deviation from this level of production could result in inefficiency in terms of scale of operation. The degree of scale economies is usually measured by the percentage change in costs due to a proportionate increase in all outputs.

On the other hand, scope efficiency focuses on the relative cost of joint production with the cost of producing the same total output in different

[2] These statistics are reported in various issues of the Banker magazine.

[3] A good review of the literature can be found in Berger et al. (1993a).

firms. It is measured by the difference between the cost of joint production and the sum of producing the different outputs individually.

X-efficiency measures the ability of banks to minimize costs and maximize revenues through the optimal use and allocation of resources. This ability can be decomposed into two types of efficiencies. The first one is technical efficiency. It refers to the extent banks could reduce input costs for a given level of output (input orientation) or expand output for given levels of inputs (output orientation). The distance to an optimal production or cost frontier measures technical efficiency. It could be deterministic or stochastic and gives the maximal output that can be attained for a given level of input, or the minimal cost for a given level of output and input prices.

The second component of X-efficiency is allocative efficiency. It refers to the possible reduction in cost resulting from using the different inputs in optimal proportions, or equivalently, to operate on the least cost expansion path.

Figure 1 depicts the concepts of technical and allocative efficiencies from an output orientation[4]. Assume the case where we have two outputs, Y1 and Y2, and a single input X. Under constant returns to scale, we could represent the technology by a unit production possibility curve (PPC) in a two-dimension plane. Point A inside the PPC, PP, represents an inefficient firm. The distance AB represents technical inefficiency. A radial measure of this technical inefficiency is given by the ratio:

$$TE = \frac{OA}{OB}$$

Given the price or isorevenue line II, allocative efficiency is represented in figure 1 by the ratio:

$$AE = \frac{OB}{OC}$$

X-efficiency can then be defined by the ratio:

$$EE = \frac{OA}{OC} = \frac{OA}{OB} \times \frac{OB}{OC} = TE \times AE$$

In other words, overall economic efficiency is defined as the product of technical and allocative efficiency[5].

Although early literature has focused on scale and scope efficiency, issues of X-efficiency have increasingly been addressed in more recent work such as Mester (1993, 1994), Berger et al. (1993 a,b), English et al. (1993), Berger and Humphrey (1991) and Ferrier and Lovell (1990). There is a fairly wide consensus in recent studies pointing to the fact that X-efficiency differences across banks are relatively large and tend to dominate scale and scope efficiency[6]. In other words, X-efficiency differences among banks account for the larger part of the difference in their performance. In this paper, I will attempt to measure the X-efficiency of 52 GCC banks using two methods. However, the lack of sufficient data about prices and cost of inputs, has precluded the estimation of allocative efficiency. Therefore, the analysis in this paper will be confined to technical efficiency.

3.1. Measuring Banks' Technical Efficiency

The first method used in this paper to estimate technical efficiency, consists of constructing a non-parametric piece-wise linear frontier using linear programming method known as Data Envelopment Analysis (DEA). The second method consists of estimating a parametric frontier using Corrected Ordinary Least Squares (COLS). In what follows, I present a brief description of the two methods.

The DEA Approach.

The DEA approach is a non-parametric piece-wise linear frontier estimated through linear programming. It consists of constructing an envelopment frontier such that all observed points representing the different banks lie on or below the production frontier.

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[4] Similarly, efficiency can be defined from an input orientation. Input and output efficiency measures can be shown to be equivalent in the case of constant returns to scale.

[5] The advantages of these radial efficiency measures are that they are unit invariant and located between 0 and 1.

[6] See for instance, Berger et al. (1993a) and Berger and Humphrey (1991).

We assume that firms use input vector $x \in lR_+^n$ to produce output vector $y \in lR_+^m$. The idea is to compare the performance of each firm relative to the best observed practice in the sample. The best practice is defined as a convex combination of other firms. The weights of this convex combination are found through a series of linear programming problems. The program for a given firm is defined as:

$$\begin{aligned} &\max_{u,v} (u'y_i / v'x_i) \\ &\textit{subject to } \; u'y_j / v'x_j \leq 1 \qquad j = 1,...,I \;\text{ for } u, v \geq 0 \end{aligned} \tag{1}$$

where $u \in lR_+^n$, $v \in lR_+^m$ and I being the number of firms in the sample. Thus, the program consists of finding the optimal values for u and v such that the measures of efficiency defined for each firm is less than or equal to one.

Using duality in linear programming, problem (1) can be transformed into the following problems[7]:

$$\begin{aligned} &\min_{\theta,\lambda} \; \theta \\ &\textit{subject to}: \\ &-(y_i / \theta) + Y\lambda \geq 0, \\ &x_i - X\lambda \geq 0, \\ &\lambda \geq 0 \end{aligned} \tag{2}$$

where θ is the efficiency score computed for each firm in the sample satisfying the condition that $\theta \leq 1$, with a value of one indicating a point on the frontier; λ is an (Ix1) vector indicating the set of the dominating firms located on the frontier and against which the firm is evaluated; Y is an (m x I) output matrix and X is an (n x I) input matrix.

[7] For a detailed description of the DEA approach, see for instance, Ali and Seiford (1993), Coelli (1996) and Coelli et al. (1998).

Two remarks are in order at this point. First, the above programming problem is output-orientated. It measures inefficiency by the extent output expansion is possible with the same levels of input. Analogously input orientated DEA problem can be obtained by reformulating problem (2)[8]. The choice of orientation depends on which variables managers have control over. If inputs are the decision variables, then input orientation would be appropriate. As pointed out by Coelli et al. (1998), this would be the case of industrial firms having to fill particular orders. In contrast, if firms try to expand output by whatever inputs they have, then output orientation would be more appropriate. In this paper, output orientation is adopted, since banks are more likely to expand their market share rather than cut in input use.

The second remark pertains to the implication of the returns to scale for the above problem. The constant returns to scale (CRS) assumption is appropriate when firms operate at the minimum of their long-run average cost curve, where the average cost is equal to the marginal cost. In this case firms are said to be scale efficient in the sense that they do not save on cost by increasing the scale of their production. A more general assumption would be to account for variable returns to scale (VRS) situations. The above programming problem can be modified to account for VRS by assuming that the sum of the λ coefficients to be equal to one. The programming problem then becomes:

$$\begin{aligned} &\min_{\theta,\lambda} \; \theta \\ &\text{subject to} \\ &-(y_i / \theta) + Y\lambda \geq 0, \\ &x_i - X\lambda \geq 0, \\ &\sum_{i=1}^{I} \lambda_i = 1 \quad \textit{with } \lambda \geq 0 \end{aligned} \tag{3}$$

[8] It can be shown that input–orientation and output-orientation are equivalent in case of constant returns to scale.

The convex restriction pertaining to the situation of VRS implies a tighter envelope than the case of CRS. It follows that the inefficiency (efficiency) scores under CRS are generally greater (smaller) than those under VRS. The difference between the two scores is generally attributed to scale inefficiency. Figure 2 illustrates how CRS technical efficiency is decomposed into pure technical and scale efficiencies.

Under CRS, the input-orientated technical inefficiency of point D is represented by the distance DB. In the case of VRS, it is represented by the distance DC. It follows that the scale inefficiency is represented by the distance BC. The ratio measures of technical, pure technical and scale efficiencies are respectively:

$$TE_{CRS} = \frac{AB}{AD}; \quad TE_{VRS} = \frac{AC}{AD}; \quad and \ SE = \frac{AB}{AC}$$

In order to estimate these efficiency measures for the case of GCC banks, I use the multi-stage methodology described in Coelli (1997) and Coelli et al. (1998).

The COLS Approach:

The use of traditional production frontier is attached with many limitations, notably its incapacity to account for the multiple output and multiple input cases. To take into account joint production in the multiple input cases, several recent works have adopted the output distance function developed by shephard (1970)[9].

Let firms use input vector $x \in lR_+^n$ to produce output vector $y \in lR_+^m$. Production technology can be described by the following output set:

$$\underline{P}(x) = \{y : (x, y) \ is \ feasible\} \tag{4}$$

The output distance function can be defined as follows:

$$D_O(x, y) = \min\{\theta : (y/\theta) \in P(x)\} \tag{5}$$

[9] See for instance, Fare et al. (1993); Coelli and Pereleman (1999, 2000).

It follows that $D_O(x, y) \le 1$ *and* $D_O(x, y) = 1$ if x is on the isoquant of $\underline{P}(x)$.

Lovell (1993) links the distance measure defined by (5) to the Debreu – Farrell distance measure of technical efficiency defined as follows:

$$DF_O(x, y) = \max\{\theta : \theta y \in \underline{P}(x)\} \tag{6}$$

where $DF_O(x, y) \ge 1$

It follows from (5) that:

$$DF_O(x, y) = \frac{1}{D_O(x, y)} \tag{7}$$

The distance function defined in (5) is output-orientated. Input-orientated distance functions could analogously be defined[10].

The distance function D_o is non-decreasing and positively linearly homogeneous in output, and decreasing in input. To construct an operational efficiency measure, a specific functional form, f, is given to parameterize $D_O(x, y)$:

$$D_O(x, y) = f(x, y, \gamma) \tag{8}$$

where γ is a vector of appropriate parameters. Given the homogeneity property of the distance function and arbitrarily choosing one output, y_N, as the normalizing output, one obtains:

$$D_O\left(x, \ y/y_N\right) = f\left(x, \ y/y_N, \gamma\right) = D_O(x, y)/y_N \tag{9}$$

Taking logarithm in both sides of equation (9), we obtain for each firm i:

[10] See for instance, Lovell (1993), pp. 10-11.

$$\ell nD_{oi} - \ell ny_{Ni} = \ell nf\left(x_i, {}^{y_i}\!/\!_{y_{Ni}}, \gamma\right) = F\left(x_i, {}^{y_i}\!/\!_{y_{Ni}}, \gamma\right) \qquad (10)$$

or equivalently

$$-\ell ny_{Ni} = F\left(xi, {}^{y_i}\!/\!_{y_{Ni}}, \gamma\right) - \ell nD_{oi} \qquad \text{for } i = 1,...,n \qquad (11)$$

where F is an appropriate function (in logarithmic form) such as the Cobb-Douglas or the translog functional forms. In this paper, I adopt the widely used translog function for its flexibility in terms of substitution possibilities among inputs and outputs. More explicitly, the estimation equation in this paper for two outputs and three inputs can be written as follows:

$$(-\ln y_1) = \alpha_0 + \alpha_1 \ln(y_2/y_1) + \alpha_{11}(\ln(y_2/y_1))^2 + \sum_{j=1}^{3}\beta_j \ln x_j + \sum_{j=1}^{3}\sum_{k \neq j}\beta_{jk} \ln x_j \ln x_k$$

$$+ \sum_{j=1}^{3}\delta_j \ln x_j \ln(y_2/y_1)$$

(12)

In order to estimate the output distance function, I use the COLS method as described in Coelli and Perelman (1999, 2000). The estimation runs in two stages. In the first stage, the term ($-\ell nD_{oi}$) in equation (11) is interpreted and replaced by a white noise error term and the model (12) is estimated using Ordinary Least Squares method (OLS). In the second stage, the estimated intercept is adjusted, by adding to it the largest negative OLS residual, so that the frontier bounds all points from above. This stems from the requirement that $0 \le D_o \le 1$ *or equivalently* $-\infty \le \ln(D_o) \le 0.$ The efficiency measure for each firm is given by the exponent of the corresponding corrected OLS residual[11].

3.2 Data and Variables

The data used in the analysis were obtained for 52 GCC banks and for the year 1999 from the Financial Operating Report for the GCC banks published by the research unit of the Institute of Banking Studies based in Kuwait. Admittedly, a single year is not, in principle, enough to observe efficiency as the latter might be affected by conditions prevailing only in that specific year. However, the sample I use was dictated by the availability of data for the relevant variables. In addition, many banks had to be dropped from the sample despite the availability of data for the variables at hand, because either they merged with other banks or simply dropped from the banking industry after 1999.

In order to measure technical efficiency of GCC banks, I adopt the intermediation approach to define bank outputs and inputs. According to this approach, banks in their role as financial intermediaries use capital, labor, deposits and other borrowed funds to produce earning assets[12]. For instance, Elyasiani and Mehdian (1990) give three advantages of the intermediation approach over other approaches. They argue that: a) it is more inclusive of the total banking cost as it does not exclude interest expenses on deposits and other liabilities; b) it appropriately categorizes deposits as inputs; and c) it has an edge over other definitions for data quality considerations.

In this paper, I consider two outputs: Y1=all types of loans provided by banks; Y2=investments and deposits made by banks; and three inputs: X1=fixed assets; X2=number of bank employees; and X3=financial capital incorporating deposits, borrowings and any liabilities not classified under deposits or borrowings. All variables, except X2, are measured in millions of U.S. dollars.

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[11] For further discussions and applications of COLS, see Coelli and Perelman (1999, 2000) and the references cited therein.

[12] For a discussion and references on the debate over the definition of banking output see, for instance, Wang (2000), Cummins and Weiss (1998) and Mester (1994).

4. Empirical Results

The efficiency measures of GCC banks, classified by country, for the DEA and COLS estimation methods are provided in table 3 of the appendix. These technical efficiency measures are reported for alternative estimation methods as a test for the sensitivity of the results to the latter methods. Column 3 of this table gives the DEA efficiency measures namely, technical efficiency (CRSTE) which is decomposed, as explained in section 3.1, into purely technical efficiency (VRSTE) and scale efficiency (SCALE). Column 4 of table 3 gives the COLS efficiency measure, COLSDIST.

The correlation coefficient between CRSTE and COLSDIST measures is 0.51. Despite this modest correlation between the two measures of bank efficiency, the results reached by the two methods were broadly in line with each other[13]. The mean technical efficiency measures for CRSTE and COLSDIST of all GCC banks in the sample were fairly close, 0.92 and 0.88, respectively. This means that GCC banks, using the actual levels of fixed capital, employees and financial capital, could expand the production of its earning assets by an average of around 10 percent.

On the other hand, after classifying the top 10 banks in terms of the two measures of efficiency, CRSTE and COLSDIST, five common banks came out in the two classifications. These were the Arab Banking Corporation Group (Bahrain); the Gulf International Bank (Bahrain); Oman Housing Bank (Oman); Saudi- Investment Bank (Saudi Arabia); Abu Dhabi Commercial Bank (U.A.E). Table 4 in the appendix, provides the ranking of the top 10 banks according to the two measures of efficiency.

Table 5 provides country-specific sample descriptive statistics of the two efficiency measures CRSTE and COLSDIST. The results show some degree of variation in efficiency between countries. Upon applying mean equality tests using ANOVA method, it is found that the hypothesis of the equality of mean efficiency across countries is rejected at the five percent significance level and for the two measures of efficiency. The figures in table 5 also show that banks in Bahrain and Saudi Arabia tend to be more technically efficient than banks in the other GCC countries. The two-sample t-tests of no difference between country efficiency means was rejected at the five percent significance level between Bahrain and every other GCC country except Saudi Arabia. The same result is found for the case of Saudi Arabia[14].

It should be noted at this level that the figures reported in tables 3 and 5, represent crude technical efficiency measures that should be adjusted for differences in environmental conditions. In addition, banks may not be strictly comparable given the difference in their mandates and areas of specialization. Some margin of errors might have also affected the results given that variables expressed in local currencies had to be converted into a common currency, the U.S. dollar.

Notwithstanding these provisos, the results are still insightful in many respects. First, Bahrain and Saudi Arabia are leaders in GCC countries in terms of allowing foreign banks to compete and operate within their respective countries. While offshore Bahrain banks are entitled to operate on equal footing with domestic banks; in Saudi Arabia many foreign banks have been allowed to be important shareholders in the domestic banks. The presence of foreign banks as independent entities or as shareholders directly involved in domestic bank management might have contributed to the improvement of the overall efficiency of banks in Bahrain and Saudi Arabia.

On the other hand, Bahrain and Saudi Arabia host the largest banks in the GCC countries. In 1999, the largest four banks, in terms of size of assets, are located in Bahrain and Saudi Arabia with a combined asset value of around, U.S. $78 billion[15]. This makes up almost one third of the total asset value of all GCC banks. This lends support to the argument that larger banks tend to have better managerial expertise and room for maneuvering in terms of allocation of resources that would translate into better efficiency.

Third, Bahrain is considered the region's financial powerhouse with an aggressive pricing policy and efficient regulation that allowed it to attract

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[13] In a sense, the results of the DEA method might be considered as more robust since they do not depend on any specific functional form for the production function.

[14] This test was carried out only for the CRSTE measure of efficiency.

[15] These banks are respectively, the Arab Banking Corporation (Bahrain); Saudi-American Bank (Saudi Arabia); Riyad Bank (Saudi Arabia) and the Gulf International Bank (Bahrain).

money from all over the world[16]. In fact, it is argued that Bahrain owes its role as a regional financial center to, among other things, its internationally recognized stern attitude toward banking regulations.

Fourth, the larger size of the economy of Saudi Arabia might have been an important factor in banking expansion beyond consumer loans and trade finance and in value-added operations such as large project finance.

The banking sector in the rest of the GCC countries remains relatively more conservative with overbanking and limited domestic markets coming into force as major constraints affecting their growth and performance. However, banks in the more dynamic economies of Kuwait and U.A.E seem to be slightly more efficient than their counterparts in Oman and Qatar.

In order to account for differences in technical efficiency between GCC banks, I have linked the measure of technical efficiency, CRSTE, to some of the characteristics of these banks namely, the value of its assets (ASSETS), the share of assets financed by shareholders (EQUAS), the date of establishment (ESTAB) and profitability proxied by the rate of return on assets (ROA). Table 6 reports the OLS estimation results[17]. The results seem to assert the positive link often found in the literature between bank size, measured by ASSETS, and the degree of technical efficiency. It is generally argued that larger banks tend to have better managerial expertise that translate into greater efficiency. The positive relation between efficiency and the share of assets financed by shareholders, EQUAS, shows that, other things being equal, banks with greater contribution from, and possibly a wider base of, shareholders tend to be more efficient. This is in line with the predictions of moral hazard theory. Shareholders would have a greater incentive to apply stricter monitoring on bank management. The insignificant coefficient of ESTAB, points surprisingly to the absence of learning. As banks become more established, they tend to accumulate managerial experience that should lead in principle to better efficiency[18]. In the case of GCC banks, the lack of market discipline and the absence of a competitive economic environment might have affected the incentive of banks to improve their efficiency especially if they could still manage to be profitable. The negative sign and statistical insignificance of the ROA coefficient lend support to this claim. Higher efficiency is generally associated with higher profitability. If profitability of banks is not associated with higher efficiency, this might mean that the overall economic environment in which banks operate have a more important influence on profitability than the skills of its managers. The loose regulation and over-protection of banks in the region, might explain the weak link between efficiency and profitability.

5. Conclusion

In this paper, two methods are used to estimate the technical efficiency of 52 GCC banks. Using the earning assets, loans and investments as outputs, and fixed assets, labor and financial capital as inputs, I have found that GCC banks can, on average, improve their technical efficiency by 10 percent. At the country level, I have found that banks in Bahrain and Saudi Arabia tend to be more technically efficient than banks in the rest of the GCC countries. I argue that this is mainly due to the fact that the environment in which banks operate in these two countries is more conducive to better efficiency.

In order to account for differences in technical inefficiency between GCC banks, the paper links technical efficiency to some relevant variables. The results show that larger bank size and higher share of equity capital in assets are associated with better efficiency. Although these results provide information on correlation rather than causality, they are quite informative from a policy perspective. First, as larger size tends to be associated with higher efficiency and hence, a better ability to survive in a more competitive world, there is room for efficiency improvement through resource consolidation, mergers and alliances with other banks. In addition, to the extent that larger size is a good proxy for better management, banks ought

[16] The banker, article 2, September issue, 2000.

[17] Since the efficiency measures are bounded between 0 and 1, a Tobit model, taking into account the truncation in the dependent variable, was estimated but produced results that are similar to those of OLS.

[18] Mester (1994, p.18) has, for instance, found that inefficient banks tend to be younger than more efficient banks.

to appoint professional bankers and managers in order to adopt the appropriate policies leading to better use of their resources. De-linking management from ownership in the case of GCC banks is a good step in that direction. On the other hand, enlarging the share of equity in total assets and broadening the base of ownership is another step toward improving bank efficiency.

An important finding in this paper consists of the weak link found between technical efficiency and profitability on one hand, and between technical efficiency and date of establishment, on the other. I argue that this points to the fact that the overall economic and regulatory environment in which GCC banks operate might be an important factor affecting their efficiency, in addition to the characteristics of the banks themselves. The impact of excessive government intervention in the economy in general and in the banking sector in particular in the form of administrative control, subsidized loans, equity injections and bail-outs on efficiency and performance of the banking sector in the GCC countries, is a research avenue worth pursuing in that regard.

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Figure 1: Technical and Allocative Efficiency

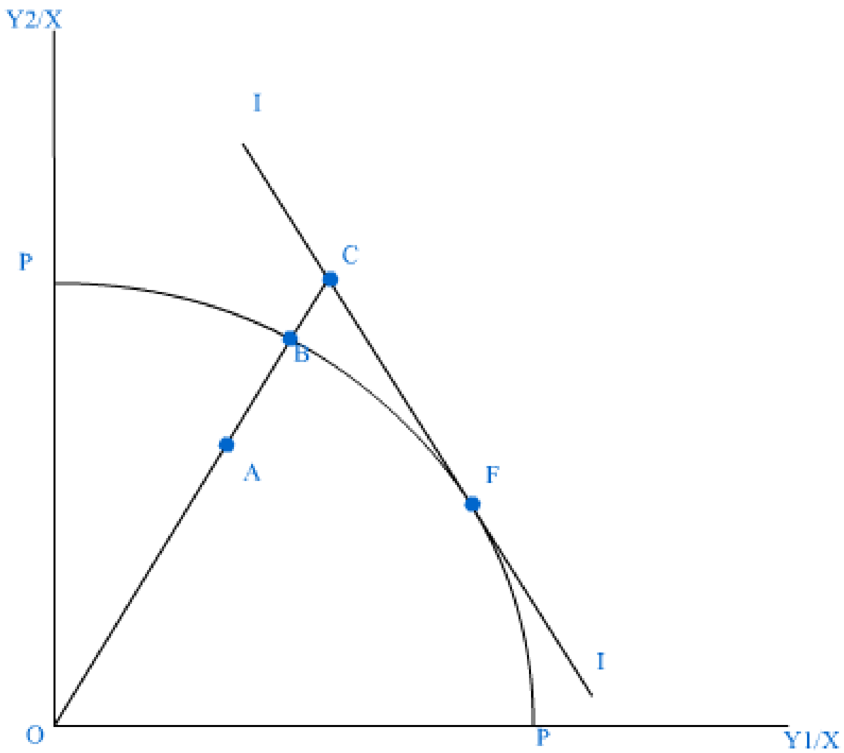
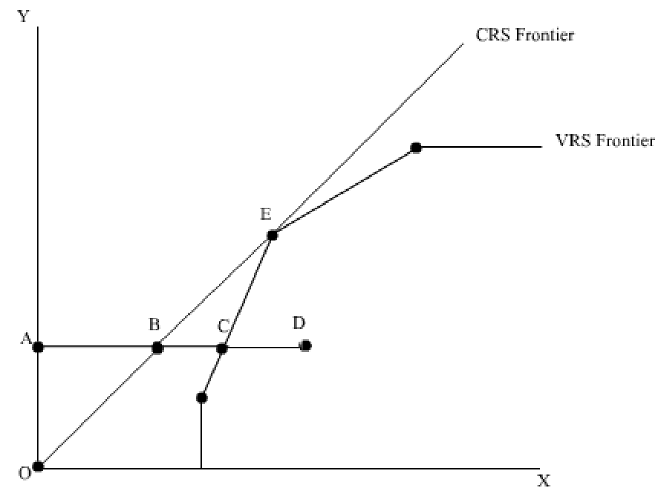


Figure 2: Technical and Scale Efficiencies



Appendix:

Table 1: Share of Largest Bank in Country's Total Bank Assets, 1999

Country	Number of Banks [8]	Name of Largest Bank	Share in Total Assets
Bahrain	9	Arab Banking Corporation	49.7
Kuwait	8	National Bank of Kuwait	34.4
Oman	7	Oman International Bank	23.1
Qatar	4	Qatar International Bank	64.4
Saudi Arabia	8	Saudi American Bank	27.1
UAE	18	National Bank of Abu Dhabi	19.5

Notes: * Some of the banks covered in the table are not included in the sample used in this paper for lack of data pertaining to relevant variables. In addition, the reported figures cover only domestic conventional banks and exclude other financial institutions such as Islamic banks.

Source: Computed by author from the Financial Report of GCC Banks (1997-1999), The Research Unit of the Institute of Banking Studies, Kuwait.

Table 2: Comparative Financial Ratios (%) of GCC Banks (Average over the period 1997-1999)

Variable	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE	All GCC
Liquid Assets to Assets	3.0	11.9	7.5	9.5	5.6	10.9	7.4
Debt to Assets	91.3	87.5	87.3	85.9	89.6	86.3	88.7
Equity to Assets	8.7	12.5	12.7	14.1	10.4	13.8	11.3
Deposits to Assets	78.5	82.4	73.9	81.9	85.4	82.2	82.2
Loans to Assets	43.7	38.7	73.2	66.2	36.8	53.9	44.5
Investment to Assets	49.3	47.0	16.0	22.3	53.4	32.6	44.7
Return on Assets	0.8	1.6	1.9	2.0	1.6	2.1	1.5
Return on Equity	9.1	12.5	15.1	14.0	15.2	15.0	13.6

Source: Financial Report of GCC Banks (1997-1999), The Research Unit of the Institute of Banking Studies, Kuwait.

Table 3: DEA and COLS Efficiency Measures for GCC Banks

Country	Bank	CRSTE	VRSTE	SCALE	COLSDIST
Bahrain	Alahli Bank	0.844	0.846	0.997	0.849
Bahrain	Arab banking Corporation Group	1.000	1.000	1.000	0.991
Bahrain	Bahrain International Bank	1.000	1.000	1.000	0.824
Bahrain	Bahrain Middle East Bank	1.000	1.000	1.000	0.890
Bahrain	Bahrain Saudi Bank	0.984	1.000	0.984	1.000
Bahrain	Bank of Bahrain and Kuwait	0.860	0.861	0.999	0.883
Bahrain	Gulf International Bank	1.000	1.000	1.000	0.971
Bahrain	National Bank of Bahrain	0.897	0.899	0.997	0.898
Bahrain	United Gulf Bank	0.921	1.000	0.921	0.867
Kuwait	Alahli Bank of Kuwait	0.891	0.893	0.998	0.875
Kuwait	Bank of Kuwait and Middle East	0.913	0.915	0.998	0.891
Kuwait	Burgan Bank	0.920	0.924	0.996	0.890
Kuwait	Commercial Bank of Kuwait	0.928	0.930	0.998	0.904
Kuwait	Gulf Bank	0.905	0.906	0.999	0.862
Kuwait	Industrial Bank of Kuwait	0.974	0.975	0.999	0.907
Kuwait	Kuwait Real Estate Bank	1.000	1.000	1.000	0.816
Kuwait	National Bank of Kuwait	0.919	0.919	1.000	0.820
Oman	Bank Dhofar Al-Omani Al-Faransi	0.844	0.866	0.975	0.795
Oman	National Bank of Oman	0.884	0.980	0.902	0.881
Oman	Oman Arab Bank	0.892	0.921	0.969	0.860
Oman	Oman International Bank	0.846	0.911	0.928	0.885
Oman	Oman Housing Bank	1.000	1.000	1.000	0.958
Qatar	Qatar National Bank	1.000	1.000	1.000	0.708
Qatar	Doha Bank Limited	0.723	0.732	0.988	0.726
Qatar	Commercial Bank of Qatar	0.871	0.874	0.996	0.930
Qatar	Alahli Bank of Qatar	0.721	0.727	0.991	0.720
Saudi Arabia	Al-Bank Al Saudi Al-Faransi	0.952	0.953	0.999	0.913
Saudi Arabia	Arab National Bank	0.931	0.939	0.992	0.847
Saudi Arabia	Bank Al-Jazira	0.937	0.940	0.997	0.947
Saudi Arabia	Riyad Bank	0.915	0.958	0.956	0.760
Saudi Arabia	Saudi American Bank	0.926	1.000	0.926	0.842
Saudi Arabia	Saudi British Bank	0.946	0.946	1.000	0.892
Saudi Arabia	Saudi Hollandi Bank	0.937	0.940	0.997	0.928
Saudi Arabia	Saudi Investment Bank	1.000	1.000	1.000	0.997
U.A.E	Abu Dhabi Commercial Bank	1.000	1.000	1.000	0.965

Table 3: Contd.

Country	Bank	CRSTE	VRSTE	SCALE	COLSDIST
U.A.E	Arab Bank for Investment&Foreign Trade	0.940	0.944	0.995	0.876
U.A.E	Bank of Sharjah	0.836	1.000	0.836	0.825
U.A.E	Commercial Bank of Dubai	0.922	0.963	0.957	0.917
U.A.E	Commercial Bank International	0.886	0.895	0.990	0.857
U.A.E	Emirates Bank International	1.000	1.000	1.000	0.887
U.A.E	First Gulf Bank	0.936	0.951	0.985	0.970
U.A.E	Investbank	0.903	0.909	0.993	0.913
U.A.E	Mashreq Bank	0.872	0.887	0.983	0.892
U.A.E	Middle East Bank	0.951	1.000	0.951	0.939
U.A.E	National Bank of Abu Dhabi	0.988	1.000	0.988	0.925
U.A.E	National Bank of Dubai	0.968	0.983	0.985	0.824
U.A.E	National Bank of Fujairah	0.818	0.825	0.991	0.843
U.A.E	National Bank of Ras Al-Khaima	0.911	0.924	0.985	0.930
U.A.E	National Bank of Sharjah	0.917	1.000	0.917	0.860
U.A.E	National Bank of Umm Al-Qurain	0.813	0.822	0.990	0.839
U.A.E	Union National Bank	1.000	1.000	1.000	0.900
U.A.E	United Arab Bank	0.928	1.000	0.928	0.852

Table 4: Ranking of the Top Ten GCC Banks for Alternative Efficiency Measures

Rank	Ranking by CRSTE	Ranking by COLSDIST
1	Arab banking Corporation Group	Bahrain Saudi Bank
2	Bahrain International Bank	Saudi Investment Bank
3	Bahrain Middle East Bank	Arab banking Corporation Group
4	Gulf International Bank	Gulf International Bank
5	Kuwait Real Estate Bank	First Gulf Bank
6	Oman Housing Bank	Abu Dhabi Commercial Bank
7	Qatar National Bank	Oman Housing Bank
8	Saudi Investment Bank	Bank Al-Jazira
9	Abu Dhabi Commercial Bank	Middle East Bank
10	Emirates Bank International	Commercial Bank of Qatar

Table 5: Sample Statistics of DEA and COLS Efficiency Measures

Country	Mean CRSTE	Max CRSTE	Min CRSTE	Mean COLSDIST	Max COLSDIST	Min COLSDIST
Bahrain	0.945	1.000	0.844	0.908	1.000	0.824
Kuwait	0.931	1.000	0.891	0.871	0.907	0.816
Oman	0.893	1.000	0.844	0.876	0.959	0.795
Qatar	0.829	1.000	0.721	0.771	0.930	0.708
Saudi Arabia	0.943	1.000	0.915	0.891	0.997	0.760
UAE.	0.922	1.000	0.813	0.890	0.967	0.824

Table 6: Sources of Inefficiency for GCC Banks (OLS Estimation with Heteroskedastic-Consistent Standard Errors) Dependent Variable: CRSTE

Variable	Coefficient	t-Statistic
Constant	1.94	1.09
ASSETS	6.01 E-06	3.40*
EQUAS	0.56	3.44*
ESTAB	-0.56 E-03	-0.62
ROA	-0.97 E-02	-0.97

Notes: N=52; Adj R-squared=0.20; Log-Likelihood=75.46. * Significant at the 1% level.