Efficiency of the Middle East Banking Sector –A Non Parametric Approach: A Comparative Analysis between Islamic and Conventional Banks

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Abstract

The main purpose of this paper is to examine the efficiency levels of Islamic Banks and Conventional Banks in the Middle East. Data Envelope Analysis (DEA) as a non parametric approach used to investigate the efficiency of both types of banks .Also, t-test used to examine whether there are significant differences of efficiency levels between Islamic Banks and Conventional Banks from 2001 till 2009.The results revealed that there is no significant differences in overall cost efficiency and overall technical efficiency between Islamic banks and conventional banks over the period 2001-2009 under both CRS, and VRS Models.

Keywords: Islamic banks, Conventional banks, Efficiency, Non Parametric approach, DEA, CRS, VRS

JEL Classification: C14, G21

1. Introduction

Measuring efficiency is one of the most critical tools that assist regulators and the top management to make their judgments regarding a unit's performance. Generally, researchers used two different tools in an attempt to measure bank's efficiency. The first tool known as traditional efficiency ratio (ER) which measures how efficiently the bank manage its asset in addition to indicating the effectiveness of utilizing resources to generate appropriate revenues .In Fact ,There are three types of efficiency ratio namely, Asset Utilization (AU), Income to Expense Ratio(IER), and Operating Efficiency (OE). The traditional ratio analysis is also defined in the literature review as non-structural approach which captures the financial ratio of the bank and compares it among the performance of other banks. (Hughes, 2009).

Berger *et al*. (2009), argue that traditional ratio analysis may give misleading results as these ratios do not control the exogenous factor that may have a significant impact on banks' performance and accordingly on its efficiency. Also it does not control for output and input prices of the bank.

The Second tool is well known as a structural approach in which the main premise is relying on the economics of profit maximization or cost minimization. Accordingly, the performance equation designates a profit function or cost function which signifies a production function.

The following section presents literature review of some empirical research of Islamic and conventional banks with regard to efficiency across western and Islamic world. Then followed by Methodology and results interpretation.

2. Literature Review

The banking system contributes to economic growth by mobilizing financial resources and channeling them into activities with higher expected rates of return for a specific level of risk. It provides transaction and payment services, which increase the efficiency of economic activities (Das and Ghosh, 2006).

Current research on efficiency focuses on two categories. The first category uses traditional financial ratios to assess the performance of Islamic banks and compare it to the financial ratios of the conventional banks (e.g. Bader *et.al*. ,2007);The second category of researches used frontier approaches to assess the efficiency of Islamic banks compared to conventional banks (e.g. Varias and Sofianopoulou ,2012).

Iqbal and Molyneux (2005) argued that utilizing frontier methods are thought to be more efficient than traditional financial ratios, as these approaches use statistical methods that eliminate the impact of differences in prices of input and output in addition to any other exogenous market variables that may have an impact on the performance of the organization.

There are enormous researches on bank efficiency that discuss different aspects of efficiency. This researches focused on conventional banks and other focused on Islamic banks and other compare the efficiency levels of both Islamic and Conventional Banks .

Mokhtar et al. (2008) stated that efficiency measurement is an important side of inspecting and examining the performance of any organization. As there are three ways to measure efficiency: maximization of output, cost minimization, and maximization of profit. In this context, Kumbhakar and Lovell (2003),argued that the organization can be considered as a technically efficient if it is able to acquire maximum outputs from given inputs or minimize inputs utilized to yield a specific level of outputs. On the other hand the allocative efficiency can be related to the optimal combination of inputs and outputs at a given price to maximize profit.

Samad (1999) investigated the efficiency of the Malaysian Islamic banks compared to conventional bank using Date Envelop Analysis. During the period of 1992 to 1996 the results show that the managerial efficiency of the conventional banks was higher than that of the full-fledged Islamic bank. Also, the average utilization rate of the Islamic bank is lower than that of the conventional banks. Similarly, the profits earned by the full-fledged Islamic bank either through the use of deposit or loanable funds, or used funds are also lower than the conventional banks, reflecting the weaker efficiency position of the full-fledged Islamic bank. In contrast, the productivity test by loan recovery criteria indicates that the efficiency position of the full-fledged Islamic bank seems to be higher and bad debts as a percentage of equity, loans, and deposits also show a clear superiority over the conventional bank peers.

Hussein (2003) examined the efficiency of 17 Islamic Sudanese banks from cost perspective. In this research a stochastic cost frontier approach was used to measure the cost efficiency of these banks over the period from 1990 to2000.The sample categorized into small banks and large banks. Another categorization were used based on the ownership into state owned banks and foreign banks in addition to classification based on the proportion of Musharaka and Mudaraba finance comparing the total assets. The results of this study reveal that smaller banks are more cost efficient than larger banks; however from the ownership perspective , the results reveal that foreign owned banks are more cost efficient than the state owned bank. According to the proportion of both Musharaka and Murabaha finance relative to total assets, the results suggest that banks which hold high level of Musharaka and Murabaha finance have efficiency advantage compared to banks who hold low level of Musharaka and Murabaha finance relative to total assets.

Al-Jarrah and Molyneux (2003) employed the (SFA) and Fourier-Flexible (FF) form to investigate the efficiency of the banking system in four Arabian countries namely Jordan, Egypt, Saudi Arabia and Bahrain. The sample comprises 82 banks over the period 1992-2000. Several variables used to evaluate its effect on bank's efficiency, these factors are: asset quality, capital level, and environmental variables such as bank size, market characteristics, geographic position, and liquidity ratios. The results revealed that larger banks seem to be more profit efficient in general. The results show that the efficiency scores ranged from 56 percent for investment banks to 75 percent for Islamic banks. In addition, large banks seem to be more profit efficient. In addition, Bahrain was the most cost efficient while Jordan was the least. In general, Islamic banks are the most profit efficient while investment banks are the least efficient. And profit efficiency of Arabic banking system not only has not witnessed significant changes over 1993-1999 but also has experienced a fall in profit efficiency in 2000.

Mokhtar, Abdullah and AI-Habshi (2006) investigated the technical and cost efficiency of the full-fledged Islamic banks, Islamic windows and conventional banks in Malaysia over the 1997-2003 periods using the Stochastic Frontier Approach. The results show that, on average, the efficiency of the overall Islamic banking industry has increased during the period of study while that of conventional banks remained stable over time. However, the efficiency level of Islamic banking is still lower than that of conventional banks. The study also reveals that full-fledged Islamic banks are more efficient than Islamic windows, while Islamic windows of foreign banks tend to be more efficient than those of domestic banks.

Sufian (2007) investigated the efficiency of Islamic banking sector in Malaysia over the period from 2001till 2005 . The non-parametric approach were used which represented in this study by Data Envelope Analysis (DEA).The findings revealed that scale inefficiency lead and govern pure technical inefficiency in Malaysian Islamic Banking Sector .From technical efficiency perspective the results suggest that foreign banks have higher technical efficiency rather than local banks. The main critique of this study is that he author linked some accounting measures of banks

performance to the efficiency score of the DEA model. The results confirmed that the market share and bank size have a significant impact on bank's efficiency. In addition, the results revealed that technical efficiency is positively and significantly correlated to scale and pure technical efficiency. The results confirmed that dominant impact of the scale efficiency over pure technical efficiency in explaining the technical efficiency of Malaysian Islamic banks .As the local banks have large market share and at the same time have a high level of non-performing loans accordingly low level of efficiency comparing to foreign bank which have low market share.

Kamaruddin, et al. (2008) investigate cost and profit efficiency of full-fledged Islamic banks and Islamic window operations of domestic and foreign banks using non parametric approach Data Envelopment Analysis (DEA).The results show that Islamic banking operators are relatively more efficient at controlling costs than at generating profits. The main contributor for cost efficiency of domestic and foreign banks comes from resource management and economies of scale respectively. The authors argue that, the lower cost efficiency scores of Islamic banking operations compared to the conventional banks in Western countries could also be due to several reasons. First, the ratio of cost to income for banks increases following increases in both staff costs and overheads. This reflects higher remuneration packages offered to retain expertise in Islamic banking since staff shortage in Islamic banks is a real problem. Banks would have incurred greater costs in order to have greater marketing and promotional activities and higher investment in technology. Some banks might have adopted stricter provisioning and classification policies for non-performing loans to further strengthen their balance sheets.

Hassan, et al. (2009) investigate the differences in mean cost, revenue and profit efficiency scores of conventional versus Islamic banks and examine the effect of size and age on cost, revenue and profit efficiency of the sampled banks. The sample comprises 40 banks in 11 Organisation of Islamic Conference (OIC) countries over the period 1990-2005 using The DEA nonparametric efficiency approach. The Results show that, there are no significant differences between the overall efficiency of conventional and Islamic banks. However, it was noted that, on average, banks are more efficient in using their resources compared to their ability to generate revenues and profits. The authors argue that there is substantial room for improvement in cost minimisation and revenue and profit maximisation in both banking systems. The results also show that, the size and age factors did not have a significant effect on the efficiency scores in both banking streams.

AlKhathlan and Abdul Malik (2010) used DEA evaluate the relative efficiency of Saudi Banks using annual data from 2003 through 2008 the study cover only ten out of twelve commercial banks operating in Saudi Arabia .The empirical results confirmed that majority of Saudi banks efficiently managed their financial resources and the mean efficiency during the year 2007 was 86.17% and 93.97% as per CCR and BCR approach respectively. In 2007, the results show that five banks as per the CCR Score and six banks as per BCC Score were positioned on the efficient frontier. The empirical results indicate that ARB and BSF should be benchmarked or peer to other Saudi banks as they were the only banks found to be on the efficient frontier using both CCR and BCR models. NCB being the only bank found to be less efficient compared to the other banks in terms of CCR and BCR models.

In the light of measuring the efficiency of conventional banks .Schure, et al. (2004) assesses the efficiency of the European banking sector in the 5-year period over the period between 1993–1997. The datasets comprise 5 years of observations on 1347 savings and 873 commercial banks. They use the new recursive thick frontier approach (RTFA) method to measure the efficiency of EU banks. The findings revealed that the managers of large commercial banks are, on average, more successful in controlling costs than managers of small commercial banks. A similar relationship does not hold for savings banks. A possible reason for this result is that large commercial banks are more often publicly listed accordingly; the senior managers are required to defend themselves in front of the shareholders by controlling cost to the minimum level and increasing profitability to the maximum level. Another potential reason could be that savings and small commercial banks typically operate in highly localized and noncompetitive banking markets, while the relevant banking market of a large commercial bank is typically larger and more competitive (so that their managers face more pressure to cut costs). As a result the managerial inability to control costs (X-inefficiency) is with 17–25% the main source of bank inefficiency in the EU.

Arif and Can (2008), investigate the cost and profit efficiency of 28 Chinese commercial banks for the period 1995–2004, and examined the influence of ownership type, size, risk profile, profitability and key environmental changes on the bank efficiency using a Tobit regression. They argue that "profit efficiency levels are well below those of cost efficiency. This suggests that the most important inefficiencies are on the revenue side. The study also revealed that the joint-stock banks (national and city-based), on average, appear to be more cost-and-profit-efficient than state-owned banks while medium-sized banks are significantly more efficient than small and large banks.

Pasiouras (2008) used data envelopment analysis (DEA) to investigate the efficiency of the Greek commercial banking industry over the period 2000–2004. This study construct four models based on the intermediation approach but different inputs/outputs combinations are examined so as to explore the impact of credit risk and off-balance sheet activities on bank efficiency. The results indicate that the inclusion of loan loss provisions as an input increases the efficiency scores, but off-balance sheet items do not have a significant impact. The differences between the efficiency scores obtained through the profit-oriented and the intermediation approaches are in general small. Banks that have expanded their operations abroad appear to be more technical efficient than those operating only at a national level. Higher capitalization, loan activity, and market power increase the efficiency of banks. The number of branches has a positive and significant impact on efficiency, but the number of ATMs does not.

Mostafa (2009) investigates the efficiency of top Arab banks using two quantitative methodologies: data envelopment analysis (DEA) and neural networks. The study uses a probabilistic neural network (PNN) and a traditional statistical classification method to model and classify the relative efficiency of top Arab banks. The results indicate that out of the 85 banks in the data set only eight are efficient. Of these, the one that appears more frequently as peer (i.e. benchmark) is International Banking Corporation, Bahrain (80 times) followed by Al-Rajhi Bank, Saudi Arabia (36 times) followed by Egyptian American Bank, Egypt (35 times). The results also, revealed that the predictive accuracy of NN models is quite similar to that of traditional statistical methods. The study shows that the NN models have a great potential for the classification of banks' relative efficiency.

3. Research Methodology

Generally, there are two methods to measure efficiency; parametric and nonparametric techniques. Berger and Humphery (1997), argue that there is no consent in the literature to prefer one method to another in order to find out the preeminent way to develop frontier against which relative efficiencies are measured. On one hand the most frequent and well known non-parametric techniques in measuring efficiencies are Data Envelope Analysis (DEA), and the Free Disposal Hull (FDH), and on the other hand the most common parametric techniques are the Stochastic Frontier Approach (SFA), the Thick Frontier Approach (TFA) and the Distribution Free Approach (Al-Jarrah, 2007).

There are some advantages of non-parametric techniques over parametric techniques .The non-parametric techniques don't require a prior assumption about error or specification of functional form for production. Alternatively, the parametric techniques require a specification of functional form of production, cost, and profit in addition to assumption about error. In addition, the non-parametric techniques have been criticized for confusing estimation of efficiency with specification error. (Al-Jarrah, 2007).

As long as there is no accord among researchers regarding the best technique to develop most accurate frontier that be able to measure the efficiency level , Bauer et al.(1997) , suggest that it should be a set of consistency conditions derived from different approaches and if such efficiency estimates are consistent across different methodologies hence these measures will be considered as a reliable methods to measure efficiency levels .Accordingly regulator , top management and decision makers count on these measures .

To measure the efficiency for the Islamic and Conventional Banks Middle East Banks in this study, The Data Envelope Analysis (DEA) will be used in this research for the following reasons:

1) It does not require specifying the functional form or distributional forms for errors (Coelli and Perelman, 1999).

2) It has been used by several researchers (i.e. Samad (1999); Das and Ghosh (2006); Arif and Can (2008); Pasiouras (2008); Mostafa (2009); Hassan, et al. (2009); AlKhathlan; Abdul Malik (2010) and Hassan (2013)

3) Hassan (2013), argued that that DEA is a more robust approach for efficiency assessment as it measures the relative efficiency of each production unit with regard to the efficient frontier that is constructed from the actual data.

3.1 DEA Approach

The Data Envelope Analysis (DEA) was first introduced by Farell (1957) as an attempt to explore the importance of measuring the productive efficiency of an industry for economic theorist and policy makers .DEA is a linear programming statistical tool for frontier analysis of inputs and outputs. DEA compares each producer unit with the optimal producer unit to find out the inefficiency level of each producer. This producer unit called Decision Making Unit (DMU). The main concept of DEA is that each DMU has a function of converting a set of inputs into a set of outputs. Accordingly the optimal or the best Decision Making Units is the one which is capable of producing highest level of inputs with the lowest level of inputs or using the optimal combination of inputs. Then compare all decision making unit with other relative DMU to find out whether there is inefficiency or not by allocating a score to each DMU ranging from one to zero. The interpretation of this score is that when DEA assigned DMU a score equal to

one, this mean that the comparison of this DMU with other relevant unit does not present any indication or proof of inefficiency. The score reveals the radiating distance from the estimated production frontier to the DMU under the attention.

The main objective of DEA is to build a frontier determined by a set of efficient decision making units (DMUs). The DMUs are those which lie on the frontier. DEA Compare each DMUs with the best DMU. The production process of each DMU is to take a set of inputs in order to generate a certain level of output. Accordingly, when the researcher apply this idea on Banks, The DEA will determine which bank are most efficient and will attempt to determine which bank are inefficient as DEA develop the frontier of observed input and output ratios using linear programming techniques .(Fare et al ., 1985). The main rationality of this method is that if a given Bank -I is able to generate (O) units of outputs with (X) inputs, therefore other banks should also be capable of producing the same , provided that they are operate efficiently. Likewise, If Bank II is able to generate certain units of outputs then other banks should be capable of producing the same, too. Bank –I and Bank-II and other banks are called the best Decision Making Units. (DMUs).

The main advantages of using DEA to measure Efficiency is that DEA allows calculating parameters, such as overall cost efficiency ,technical and allocative efficiency .Also , it helps in understanding and computing the pure technical, and scaling efficiencies. Technical efficiency (TE) refers to the capability of a decision making unit to yield the maximum outputs at a given level of inputs, or capability to utilize the minimum level of inputs at a given level of outputs. Allocative efficiency (AE) refers to the capacity to choice the optimum mix of inputs in light of given prices so as to yield a given level of outputs. The level of overall cost efficiency (CA) is the product of technical and allocative efficiency. The TE measure can be additional breakdown into pure technical efficiency (PTE) and scale efficiency (SE).

The fundamental DEA model was introduced by Charnes *et al* (1978) and is called the CCR model. The CCR model is used only in problems with constant returns to scale (CRS). This approach is used when all DMUs are operating at optimal scale regarding perfect competition, same advanced technologies and no constrains whatsoever for availability of resources for equally usage. By applying the property of duality that characterizes linear programming, the CCR model can take the following form,

$$\min_{\theta,\lambda} \theta$$
Subject to:
$$-y_i + \mathrm{Y}\lambda \geq 0$$
$$\theta x_i - \mathrm{X}\lambda \geq 0$$
$$\lambda \geq 0$$

Where θ is a parameter that represents technical efficiency and λ is a vector that corresponds to peer weights.
As long as all DMUs are not operating at an optimal working environment which called optimal scale , The second assumption of the DEA as an extension to CRS model introduced by Banker, Charnes and Cooper(1984) ,taking into consideration variable returns to scale(VRS). Banker *et al* (1984) extended the CRS model with the purpose of resolving problems with variable returns to scale (VRS) adding one constraint *(N*1'λ = 1) to make sure that an inefficient Decision Making Unit is only judged against Decision Making Units of similar size, and consequently presents basis for measuring economies of scale and presenting more accurately efficiency score :

$$\min_{\theta,\lambda} \theta$$
Subject to:
$$-y_i + \mathrm{Y}\lambda \geq 0$$
$$\theta x_i - \mathrm{X}\lambda \geq 0$$
$$\mathrm{N1}'\lambda = 1$$
$$\lambda \geq 0$$

Where N1 is an NX1. The Variable to scale pattern has the most frequently used specification since 1990's (Coelli ,1996).The main logic behind VRS model is that if there is a discrepancy between efficiency score under CRS and efficiency score using VRS this means that there is a scale efficiency effect. Hence, the VRS allow understanding the scale efficiency effect by decaying Technical efficiency into two elements, Pure Technical efficiency and Scale efficiency.

There are three approaches to use DEA model: First approach is input-oriented approach which pursues to minimize the input as much as possible to yield a specific level of output. The second approach is the output oriented approach which targets to maximize the output as much as possible at a prearranged or specified level of inputs. The third

approach is the additive approach which handles the problem of input surplus and output deficit concurrently in a manner that maximizes both. In this paper the author used input-oriented approach which is appropriate to banks in the Middle East .As most banks' managements prefer to set targets and utilize minimum resources to achieve such targets.

3.2 Research Question

To address the problem of efficiency of Islamic banks comparing to conventional Banks the following research question is seeking an answer through testing research hypotheses.

Are there significant differences between Islamic Banks and Conventional Banks in the Middle East with regard to different types of efficiencies?

3.3 Research Hypotheses

In this research, five null hypotheses will be examined to answer the research question, these hypotheses are as follows:

H01: There is no significant difference between cost efficiency level of Islamic Banks and cost efficiency level of Conventional Banks.

H02: There is no significant difference between allocative efficiency level of Islamic Banks and allocative efficiency level of Conventional Banks.

H03: There is no significant difference between technical efficiency level of Islamic Banks and technical efficiency level of Conventional Banks.

H04: There is no significant difference between scale efficiency level of Islamic Banks and scale efficiency level of Conventional Banks.

H05: There is no significant difference between pure technical efficiency level of Islamic Banks and pure technical efficiency level of Conventional Banks.

3.4 Data and Sample

The data comprises Islamic and conventional banks in the Middle East region which are extracted from Bank-Scope data-base that cover the period from 2001 to 2009. The countries included in the sample are : Bahrain , Egypt , Jordan , Kuwait , Lebanon, Oman , Qatar , Saudi Arabia , united Arab Emirates ,Yemen , Iran and Iraq. The sample size as per data availability for commercial banks (Islamic and conventional) through BankScope is 67 Islamic Banks vs. 196 conventional Banks.

3.5 Definition of Variables

Hassan (2013), stated that there are two approaches that used to determine inputs and outputs in analyzing bank's efficiency.

- First Approach: The Production Approach which define activities of the banks as service production that's to say, Banks utilize physical inputs like labor and capital to produce deferent types of financial services such as loans and deposits.
- Second Approach: The intermediation approach which defines the bank as financial service intermediate .In this context, Sealey and Lindley (1977), argued that , under the intermediation approach the main function of the bank is to collect deposits and utilize labor in addition to capital in order to converting these resources into loans and another earning assets . Favero and Papi (1995), agreed on this idea as the main activity of the bank is to convert large deposits and funds from financial institutions into financing and investments activities.

Kwan (2002), argue that the intermediation approach is extensively used method to measure bank's efficiency. With regard to appropriateness of using the two approaches, Berger and Humphrey (1997) imply that the two approaches are quite appropriate for measuring efficiency; however it depends on the main purpose behind the measurements. If the main purpose is to measure the whole bank efficiency, then using the intermediation approach is most appropriate technique because the interest expenses paid to the deposit holder is included which always account for one-half to one third of the total cost of the bank. However, if the main purpose is to measure Bank's branch efficiency, accordingly the production approach is appropriate. As long as this study focus on examining the efficiency for the whole banks without any relation to banks' branches efficiency, consequently, this study will use the intermediation approach.

There are three reasons to apply the intermediation approach in this research. First the intermediation approach is appropriate for evaluating the overall bank's efficiency. Second, It's widely used by several researchers .Third, the participation based approach of Islamic banking is an appropriate perspective for intermediation approach and for the intermediary role of the Islamic banking function. To select inputs and outputs of this study. The quantity of inputs is presented as X1 which is total deposits in the banks .The second Inputs is presented as X2 which is the Capital used to produce earning assets. The Third input is presented by X3 which is the overhead cost including salaries, wages and other operating cost. The output is presented by Y1 which is total earning assets

In the calculation of cost efficiency, besides quantity of input and output, prices of two inputs are similarly required. These prices are prices of deposits, represented by P1; and prices of labor and capital, represented by P2. While P1 is recognized as the income/profit paid to depositors divided by total deposits, P2 is calculated using personnel and other overhead expenses divided by the total assets.

4. Results and interpretation

4.1 Cost Efficiency under CRS model

Table 1 summarizes the mean values -Efficiency Score -of Islamic Banks under the Constant to scale Model CRS and over the period 2001till 2009. The results revealed that the , the cost efficiency score of Islamic Banks has been developed and enhanced over the time , However it's obviously clear that there is a decline of the cost efficiency score of year 2007 and 2008 consecutively .Which might be explained as it's due to the effect and consequences of the global financial crisis.

Table 1.

Bank Type	Years	C.E	T.E	A.E
Islamic Banks	2001	0.721	0.828	0.871
	2002	0.717	0.831	0.863
	2003	0.795	0.897	0.886
	2004	0.797	0.873	0.913
	2005	0.801	0.865	0.926
	2006	0.818	0.869	0.941
	2007	0.758	0.897	0.845
	2008	0.784	0.918	0.854
	2009	0.896	0.955	0.938
Overall Mean		**0.797**	**0.862**	**0.925**

C.E=Cos Efficiency, T.E=Technical Efficiency, A.E=Allocative Efficiency, S.E=Scale Efficiency, PTE=Pure Technical Efficiency

The overall pooled cost efficiency estimates 79.7%. This result suggest that, Islamic Banks in the Middle East waste 20.3% of its resources to produce specific level of output. That's to say, The Islamic Banks utilize only79.7% of its resources to generate the same level of output.

Table 2.

Bank Type	Years	C.E	T.E	A.E
Conventional Banks	2001	0.745	0.875	0.851
	2002	0.806	0.913	0.883
	2003	0.821	0.921	0.891
	2004	0.841	0.922	0.912
	2005	0.826	0.902	0.916
	2006	0.838	0.923	0.908
	2007	0.706	0.836	0.844
	2008	0.889	0.965	0.921
	2009	0.918	0.986	0.931
Overall Mean		0.803	0.898	0.894

C.E=Cos Efficiency, T.E=Technical Efficiency, A.E=Allocative Efficiency, S.E=Scale Efficiency, PTE=Pure Technical Efficiency

The High score of 2009 of 86.8 % which might be translated into low score of inefficiency of 14.2 % could be explained by the high and quick recovery from the financial crisis consequences or the insignificant impact of the financial crisis on the Middle East Market .This might also support the explanation of genuinely operationally efficient as per Islamic Shariaa Rules .

Table 2 reveled that, The cost efficiency score of the conventional bank under the constant return to scale model -CRS- and over the period 2001-2009 is 80.1%. which means that the conventional banks in the Middle East waste around 20% of its resources to generate the same level of output .Comparing these scores with the Islamic Banks Scores the results revealed that , The cost efficiency score of Conventional Banks in the Middle East is slightly higher than the Cost efficiency score of the Islamic Banks . In other words the conventional banks waste less than the Islamic banks with regard to its recourses and might be considered as somewhat more efficient than Islamic banks in utilizing the available resources.

Normally, such slight increase of cost efficiency in Conventional Banks might be explained as follows:

- The conventional Banks have more experience in banking operation than Islamic Banks, As Islamic Banks have been introduced to the Middle East Market two decade ago.
- The high cost of Islamic Banks 'Staff as there is a shortage of Islamic banking expertise in the middle East especially in The executive and Senior Management Levels .
- The high cost of Scholars or what so called Shariaa Board.
- Islamic Banks, especially in the GCC region allocated huge budget for marketing and promotion so that these banks are able to professionally compete with conventional banks.
- The contentious development and the updating banking operation systems with regard to software and its platform to be able to meet the high standard expectation of service of their clients and the prospect clients .So, that competing the conventional banks Such cost definitely has its impact on the operation cost of the Islamic Banks .

4.2 Technical and Allocative Efficiency under CRS Model

The Allocative efficiency measure the ability of the bank's management to utilize resources in optimal proportion giving their relevant cost/price to maximize bank's profit (Hassan 2012).

Table 1 and table 2 revealed the results of Allocative efficiency score of Islamic and conventional Banks consecutively under CRS model .The mean Value of Allocative efficiency is 92.5% for the overall Islamic Banks Pool .That's to say the inefficiency of Islamic banks management is 7.75% .Comparing score of Allocative efficiency of Islamic banks with conventional bank table 2 revealed that the conventional banks have an Allocative efficiency score of 87.4 % which mean that the Islamic banks were more efficient than conventional banks with regard to allocating input and output professionally at given price to maximize profit of the banks .

Technical efficiency measure the ability of banks management to obtain maximum output from a given specific input or minimize input for a given set of output (Hassan 2012). Table 1 suggests the result of overall technical efficiency of Islamic banks over the period 2000-2009 is 86.2%. This means that the Islamic Bank could save 14.8% of their resources to produce same level of output. In other words, The Islamic Bank technically were inefficient by 14.8% accordingly bank's management potentially could reduce the current input level by 14.8% to produce the same level of output. Table 2 revealed the results of overall technical efficiency with regard to conventional banks is 89.8% which means that the conventional banks were inefficient by 10.2% to efficiently produce same level .Accordingly , The conventional banks management could save 10.2% of its resources to produce same level of output in other word leave output unchanged

4.3 Cost Efficiency under Variable to Scale Model

Table 3 summarizes cost efficiency scores of Islamic Banks under the Variable to scale Model (VRS) and over the period 2001till 2009.

Table 3.

Bank Type	Years	C.E	T.E	A.E	SE	PTE
Islamic Banks	2001	0.788	0.882	0.893	0.916	0.808
	2002	0.848	0.896	0.946	0.846	0.758
	2003	0.856	0.891	0.961	0.928	0.827
	2004	0.873	0.941	0.928	0.913	0.859
	2005	0.833	0.885	0.941	0.962	0.851
	2006	0.848	0.889	0.954	0.964	0.857
	2007	0.839	0.891	0.942	0.903	0.805
	2008	0.850	0.898	0.946	0.923	0.829
	2009	0.950	0.912	0.909	0.943	0.860
Overall Mean		0.817	0.895	0.913	0.976	0.873

C.E=Cos Efficiency, T.E=Technical Efficiency, A.E=Allocative Efficiency, S.E=Scale Efficiency, PTE=Pure Technical Efficiency

Table 4.

Bank Type	Years	C.E	T.E	A.E	SE	PTE
Conventional Banks	2001	0.780	0.896	0.871	0.954	0.855
	2002	0.833	0.943	0.883	0.968	0.913
	2003	0.866	0.966	0.896	0.948	0.916
	2004	0.854	0.957	0.892	0.985	0.943
	2005	0.854	0.953	0.896	0.968	0.922
	2006	0.844	0.984	0.858	0.993	0.977
	2007	0.831	0.942	0.882	0.849	0.800
	2008	0.925	0.943	0.981	0.961	0.906
	2009	0.938	0.954	0.983	0.979	0.934
Overall Mean		0.813	0.915	0.889	0.987	0.903

C.E=Cos Efficiency, T.E=Technical Efficiency, A.E=Allocative Efficiency, S.E=Scale Efficiency, PTE=Pure Technical Efficiency

The results revealed that the , the cost efficiency score of Islamic Banks has been developed and enhanced over the time , However it's also clear that there is a decline of the cost efficiency score of year 2007 due to the financial crisis which affect most of financial institution worldwide.

The overall pooled cost efficiency estimates 81.7%. This result suggests that, Islamic Banks in the Middle East waste 18.3% of its resources to produce specific level of output. Table 4 suggests the cost efficiency score of the conventional bank is 82.3% under the variable return to scale model -VRS- and over the period 2001-2009, that's to say the conventional banks in the Middle East waste 17.7% of its resources.

In other word the inefficiency score of Islamic Banks is 18.3% and the Conventional Banks is 17.7%. It's also clear that the overall cost efficiency score of Conventional Banks in the Middle East is slightly higher than the Cost efficiency score of the Islamic Banks . In other words the conventional banks waste less than the Islamic banks with regard to its recourses and might be considered as somewhat efficient than Islamic banks in utilizing the available resources under the variable return to scale model.

4.4 Technical and Allocative Efficiency under VRS Model

Table 1 and table 2 revealed the results of Allocative efficiency score of Islamic and conventional Banks consecutively under VRS model .The mean Value of Allocative efficiency is 91.3% for the overall Islamic Banks Pool .That's to say the inefficiency of Islamic banks management is 8.7%. Comparing score of Allocative efficiency of Islamic banks with conventional bank table 2 revealed that the conventional banks have an Allocative efficiency score of 88.9 % which mean that the Islamic banks were more efficient than conventional banks with regard to allocating input and output professionally at given price to maximize profit of the banks .

Table 1 suggests the results of overall technical efficiency of Islamic banks over the period 2000-2009. The Technical Efficiency mean value is 89.5%. This means that the Islamic Bank could save 10.5% of their resources to produce same level of output. In other words, The Islamic Bank technically were inefficient by 10.5 % accordingly bank's management potentially could reduce the current input level by 10.5 % to produce the same level of output. Table 2 revealed the results of overall technical efficiency with regard to conventional banks is 91.5% which means that the conventional banks were inefficient by 8.5% to efficiently produce same level .Accordingly , The conventional banks management could save 8.5% of its resources to produce same level of output in other word leave output unchanged .

The main advantage of using VRS model is that, this model gives the researchers the ability to decompose the overall Technical efficiency of the banks into Pure Technical Efficiency and Scale Efficiency .Accordingly drawing a deep analyzed image of management professionalism.

Table 3 and 4 revealed the scale efficiency score and pure technical efficiency score of Islamic Banks and Conventional Banks respectively.

Scale efficiency score measures the relationship between average production cost per unit and volume and it provides a clear view of the scale and mass volume impact on overall technical efficiency score. While Pure Technical efficiency score measure the technical efficiency of the bank without the effect of scale efficiency. The results in table 3 suggest that, the overall scale efficiency score of Islamic banks is 97.6% and while table 4 revealed that the overall scale efficiency score is 98.7%. The overall pure technical efficiency of Islamic banks is 87.3% as shown in table 3 while the overall pure technical efficiency of conventional banks is 90.3%. This means that bank managers are not following appropriate and efficient management practices in selecting correct input combinations. These results suggest the attribution of pure technical efficiency is lower than the attribution of Scale efficiency as the source of overall Technical efficiency. From this, it can be said that technical inefficiency is highly driven by pure technical efficiency which mean that there is an underutilization and wasting of banks resources/inputs. Also there is another contribution from scale efficiency, in other word there is scale related problems and inappropriate scale of operation for Islamic Banks and Conventional Banks. Also, the results might be explained by the global economic challenges and the global financial crisis which had a significant impact on Banks performance.

4.5 Results of T-Test

As per the above mentioned results and discussion it's obviously that there is a slight differences in efficiency levels between Islamic Banks and conventional Banks. However, the researcher deeply investigates whether such differences are significant or not. Accordingly, T-Test used to investigate such differences and explain the significant issue.

Table 5. P values of T-test under CRS Model

Year	CE	TE	AE
2001	0.335	0.191	0.255
2002	0.710	0.136	0.528
2003	0.636	0.237	0.141
2004	0.626	0.143	0.447
2005	0.649	0.136	0.216
2006	0.060	0.062	0.482
2007	0.087	0.110	0.064
2008	0.703	0.366	0.096
2009	0.868	0.171	0.240
Overall	0.474	0.069	0.756

C.E=Cos Efficiency, T.E=Technical Efficiency, A.E=Allocative Efficiency

T-Test has been used to examine whether there are significant differences between Islamic Banks and Conventional Banks Table 5 shows the p values result of t-test under CRS approach to examine whether such significance differences exists or not as the comparison between the efficiency mean of Islamic banks and Conventional Banks were statistically insignificant. The results also revealed that the p values for the differences in efficiency were 0.3349, 0.7097, 0.6362, 0.6256, 0.6492, 0.0603, 0.0874, 0.7031, 0.8681 Respectively. While the result of T-Test of

overall cost efficiency score (Pool of Banks) over the period between 2001 till 2009 is 0.4741which indicate that there is no significant differences.

Table 6 shows the result of t-test under VRS approach to examine whether such significance differences exists or not as the comparison between the efficiency mean of Islamic banks and Conventional Banks were statistically insignificant. The results also revealed that the p values for the differences in efficiency were 0.6851, 0.398, 0.0516, 0.5049 , 0.0757 , 0.9249 , 0.3617 , 0.331 , 0.8188 Respectively. While the result of T-Test of overall cost efficiency score (Pool of Banks) over the period between 2000 till 2009 under VRS model is (p=0.5303), which indicate that there is no significant differences between Islamic Banks and Conventional Banks.

Table 6. P values of T-test under VRS Model

Year	CE	TE	AE	SE	PTE
2001	0.685	0.172	0.116	0.475	0.154
2002	0.398	0.113	0.096	0.917	0.243
2003	0.052	0.423	0.060	0.490	0.406
2004	0.505	0.115	0.153	0.778	0.118
2005	0.076	0.105	0.055	0.432	0.090
2006	0.925	0.159	0.393	0.336	0.178
2007	0.362	0.256	0.232	0.365	0.153
2008	0.331	0.311	0.193	0.353	0.184
2009	0.819	0.821	0.788	0.146	0.170
Overall	0.530	0.332	0.681	0.385	0.110

C.E=Cos Efficiency, T.E=Technical Efficiency, A.E=Allocative Efficiency, S.E=Scale Efficiency, PTE=Pure Technical Efficiency

Accordingly and based on the above mentioned results there is no significant differences in overall cost efficiency or what so called economic efficiency between Islamic banks and conventional banks over the period 2001-2009 under both CRS, and VRS.

4.6 Overall Technical Efficiency

Table 5 shows the result of t-test under CRS approach to examine whether such significance differences exists or not as the comparison between the efficiency mean of Islamic banks and Conventional Banks were statistically insignificant. The results also revealed that the p values for the differences in efficiency were 0.1913 , 0.1357 , 0.2373 , 0.1431, 0.1363 , 0.0623 , 0.1102 , 0.3656 , 0.1712 Respectively .The T-Test for the overall pool shows that there is no significant difference between Islamic Banks and Conventional Banks as p value = 0.0697

Table 6 shows the result of t-test under VRS approach to examine whether such significance differences exists or not as the comparison between the efficiency mean of Islamic banks and Conventional Banks were statistically insignificant. The results also revealed that the p values for the differences in efficiency were 0.1722, 0.1127, 0.4234 , 0.1151 , 0.105 , 0.1588 , 0.2561 , 0.3108, 0.8213 Respectively .Also , The T-Test for overall Technical efficiency indicate that there is no significant differences between Islamic Banks and Conventional banks as p value = 0.332.

Accordingly, there are no significant differences in overall technical efficiency between Islamic banks and conventional banks over the period 2001-2009 under both CRS, and VRS.

4.7 Allocative Efficiency

Using T-Test to investigate the existence of significant differences between Islamic Banks and Conventional Banks has been revealed results of insignificant differences as p values shown in table 5 under CRS were 0.2552 , 0.5283 , 0.141, 0.4473 , 0.2158 , 0.4823 , 0.06 , 0.0959 , 0.2398 respectively, while under VRS approach the results as shown in table 6 were 0.1155, 0.0962 , 0.0603, 0.1531, 0.0554, 0.3931, 0.2324 , 0.193, 0.7882. Accordingly, there is no significant difference between Allocative efficiency level of Islamic Banks and Allocative efficiency level of Conventional Banks. While the t-Test of overall pool indicate also non existence of significant differences between two types of banks as p value =0.756

The results of table 6 revealed that , the Allocative efficiency score of Islamic Banks under VRS over the period 2001 till 2009 were 0.733, 0.766 , 0.791, 0.908, 0.981, 0.912, 0.942, 0.986, 0.829 respectively and the Allocative Efficiency score of Conventional Banks were 0.551, 0.513, 0.506, 0.691, 0.626, 0.758 , 0.712, 0.761, 0.781

respectively. While the t-Test of overall pool indicate also non existence of significant differences between two types of banks as p value = 0.681

4.8 Scale Efficiency Pure Technical Efficiency

The results of p values under T-Test as shown in table 6 of VRS were 0.4751, 0.9167, 0.4901, 0.7784, 0.4318, 0.3364, 0.3651, 0.3526, 0.1462 respectively. Accordingly there is no significant difference between Scale Technical efficiency level of Islamic Banks and Scale Technical efficiency level of Conventional Banks. And with regard to testing such difference using the overall pool, t-test show that there is no significant differences between Islamic Banks and conventional Banks as p value= 0.3853

T-Test also, shows that there is no significant difference between Pure Technical efficiency level of Islamic Banks and Pure Technical Efficiency level of Conventional Banks p values shown in table 6 under VRS were 0.1539, 0.2433, 0.4063, 0.1184, 0.0901, 0.1779, 0.1527, 0.1841, 0.1698 respectively. And with regard to testing such difference using the overall pool , t-test show that there is no significant differences between Islamic Banks and conventional Banks as p value= 0.1096.

Accordingly and based on the above mentioned results , There is no significant differences between Islamic Banks and Conventional banks concerning Scale efficiency and Pure Technical Efficiency .

5. Conclusion

This paper examined the efficiency levels of Islamic and Conventional banks as an attempt to understand the differences between the two banking systems.

Two final conclusions are suggested by the results of this paper : First, There is an obvious success of converting high operational cost of Islamic Banks into adding value to the banking system and accordingly to its clients comparing to conventional banks which already used high standard of technology to secure the efficiency of its banking operations.

Second, The Learning curve of Islamic Banks Management had been enhanced with regard to cost efficiency and resources utilization; however as per results revealed in this paper more improvement and enhancements are required to efficiently utilize the available resources of Islamic banks. Also, Increase the awareness of cost efficiency concept of the senior management could be considered as a factor that influence the overall cost efficiency or what so called economic efficiency of Islamic Banks .Accordingly , it could be reflected on Banks' profit and increase Senior management's bonus and employees 'profit share.

It's worthy mentioning that there are some limitations of these results and analysis as they depend only on the intermediation approach and input –oriented technique of DEA , However there are other approaches and techniques that haven't examined yet in this paper .As a suggestion for further researches , researchers may try to examine other techniques and other non-parametric approached in addition to the parametric approaches to be able to draw a comprehensive picture about the efficiency concept of Islamic and conventional Banking systems in the Middle East and compare the results across different regions.

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