

Examining the Comparative Efficiency of GCC Islamic Banking

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Abstract

Purpose – This study examines the performance of GCC Islamic banking in terms of technical and scale efficiency for the period 2010-2019 at country as well as individual bank level.

Design/methodology/approach –It uses data envelopment analysis (DEA) approach to measure the performance of Islamic banking industry of GCC, where the banks are considered as intermediation firms that transform the input into outputs. The study examines the performance of Islamic banking at country as well as individual bank levels.

Findings–Islamic banking of Oman and UAE are the most and least efficient respectively. Islamic banking in Bahrain became the second top performing

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industry while Kuwaiti Islamic banking industry stands at second least performer.

Practical implications – The study suggest that there is room for improving the managerial and operational policies in UAE Islamic banking industry to achieve efficiency. Moreover, Qatar and Bahrain can save some portion of their inputs by increasing their respective banking operations to an optimum scale. Some banks like Dubai Islamic Bank, Abu Dhabi Islamic Bank, Sharjah Islamic Bank, Kuwait International Bank and Emirates Islamic Bank need to increase their overall technical efficiencies. Besides, other banks like Nizwa, Boubyan, Kuwait International, Sharjah Islamic and Emirates Islamic need to emphasis on pure technical efficiencies, and lastly Abu Dhabi Islamic, Kuwait International, Dubai Islamic, Nizwa and Albilad bank require paying attention to scale efficiencies.

Originality – The study is significant because it gives many interesting insights about the GCC Islamic banking industry and evaluates the efficiency of the Islamic banking at industry and individual bank levels. It uses the recent available data and applies DEA techniques that is one of the reliable techniques for such measurement.

Keywords: *Islamic Banking, Comparative Efficiency, GCC, Data Envelopment Analysis*

1. Introduction

Islamic finance operates in consonance with Islamic Shari'ah that ascertains the money lending with asset-based transactions and assures a profit and loss sharing contract. Islam mandates risk and profit-sharing and prohibits any payments over and above the capital, and emphasizes ethical investments that contribute to the betterment of the society. The rationale and feasibility of Islamic finance in financial intermediation is premised on the Shari'ah criterion that all the financial transactions must be sustained by productive activity and an underlying asset. This obligation demands the Islamic banking institution to invest much diligence and bring efficient and competitive profits for their depositors. The intrinsic nature of Islamic finance requires an Islamic banking and financial institution to be partner in a financial contract, rather than a mere lender or borrower of money. This requirement reassures an Islamic bank to bear risk and provide confidence through explicit disclosure and transparency of the roles and responsibilities defined in the contract which are another fundamental requirement for governing the Islamic finance industry. This explicit and transparent nature of Islamic banking and finance not only contributes towards the soundness and stability of Islamic financial system but requires the banking management to perform their duties with proper diligence and care and establish a close link between finance and productivity in the economy.

Since the inceptions of Islamic Development Bank, Dubai Islamic Bank, and Kuwait Finance House in the 1970s, there has been significant growth in Islamic assets and wealth management in the Middle East. With the development of diverse and innovative Islamic investment funds, the GCC became the hub of Islamic banking and finance industry and spearheads providing the supervision in Shari'ah, accounting and auditing affairs of the Islamic banking and finance industry. Starting with Islamic Developing Bank, Islamic financial industry of GCC is facilitating the flow of capital within Middle East as well as in Africa, Asia and West through Sukuk and other Shari'ah compliant financial products and playing a significant role in strengthening Islamic financial architecture and managing industry challenges.

In the wake of low crude oil prices, continued uncertainty and notwithstanding economic challenges, the assessment of Islamic bank's performance becomes essential in order to ensure the allocative and distributive efficiency and to increase the trust of stakeholders in the Islamic financial system. In addition to this, examining the bank's performance is also essential as it would help the bank managers to examine the success of managerial decisions to realize the importance of efficiency in financial decision making and to formulate the strategic investment plans for the future. Above all, a cross-country bank's performance assessment will help the managers, as well as policy makers, to measure the success of their decisions compared with those made by their counterparts during the period under study. In the context of challenging and competitive environment, the issues of efficiency become important in the banking and financial industry, especially when an emerging industry has a rivalry with another industry at its premises.

The study of GCC Islamic banking is significant and catches the eyes of many researchers because the region not only holds 45% of global Islamic finance assets but also links the flow of finance between Middle East, Asia, Africa and rest of the world. Moreover, there has been a significant increase in the awareness among the depositors and investors and now they are keener than ever about the utilization of their resources. This study is aimed as an academic initiative for enhancing the information and analysis about the performance of GCC Islamic banking industry.

Present study has a dual purpose. First it provides an overview of Islamic banking industry and its growth in GCC that will provide the insights into the banking industry of Middle East to a large readership. Second it attempts to measure the performance of Islamic banking industry of GCC from an efficiency perspective that on one hand, will help the banking management to learn the strength and weakness of their decisions and policy formulation, and on the other hand will help the investors in the best bank for their investments.

The study is designed as followings: the forthcoming section provides an overview of Islamic banking industry at global and GCC levels. It depicts the global and regional

scenery of the Islamic banking industry and highlights the growth and development trends in the region. Section three provides a survey of the previous studies and key finding about the topic to cover the gap in the existing literature. Section four explains the approach and methodology for examining the performance of GCC Islamic banking industry. Section five presents the results and key findings, and final section concludes the study with some policy recommendations.

2. Overview of Global Islamic Finance Industry

Over the last three decades, Islamic banking and financial industry has experienced a huge expansion across the world in terms of asset accumulation and institutional formation. Many financial and investment products were also developed to meet and cater to the growing needs of the individuals and corporates. Today, Islamic banking and financial industry is comprised of more than 500 institutions with an average growth rate of 15-20% and has become an integral part of the global financial industry. It's aggregate sum of wealth is estimated around US \$2.43 trillion which, according to some opinions, is substantially below than its potential wealth worth of US \$4.84 trillion.

2.1 GCC Islamic Banking Industry

Since the inception of modern Islamic banking and financial industry, the region comprising the GCC or Middle East has captured the central position all over the world. Having the credit of largest Islamic banking and financial institutions such as, Al-Rajhi bank, Kuwait Finance House, Abu-Dhabi Islamic bank and Dubai Islamic bank, the GCC Islamic banking industry has expanded in a dynamic international environment. The estimated size of the GCC Islamic finance industry is based on the assumption that it grows by at least 10% annually. This growth phenomenon is based on the following factors:

- GCC, after the global financial crises started in US and then spread to other parts of the world, has become an emerging hub for Islamic finance.
- Global Muslim population continues to grow and move to Middle East for better opportunities.
- Awareness about Islamic banking and finance continues to rise including among the non-Muslims.
- Islamic banking proved itself to be resilient against financial shocks and crises due to its intrinsic nature of underlying asset provision and profit and loss sharing requirements in the financial contracts
- Along with the increase in Muslim population all over the world, the per capita income of Muslim world is also on the rise. To meet the increasing demand in

halal or permissible goods and services such as food, cosmetics, fashion and other industries, Islamic finance has become an essential industry, and the growth in this industry is establishing new milestones.

The subsequent section provides a country-wise overview of the GCC Islamic banking industry.

Kingdom of Saudi Arabia has played a prominent role in the establishment and development of Islamic banking industry. Kingdom hosted the first Islamic economics conference in Makkah in the year 1974 where the proposal of establishing the Islamic economic system was presented which later on proved to be the foundation stone of modern days Islamic banking industry.

The Saudi banking sector consists of twelve local banks (out of which eight are conventional and four Islamic) and fourteen licensed branches of international banks. Only three local banks, out of twelve, collectively account for the forty-five percent while the largest seven banks have combined share of eighty-five percent of total banking industry. The public ownership (including quasi government) pattern is fairly high in the banking industry and the government is among the main shareholders of the ownership in the largest three banks while the fourth largest bank belongs to a family which holds several other businesses too. The industry has a considerable and robust network of banking branches equipped with modern technology and sophisticated banking systems. Saudi banking sector is well-defined with standard organizational structure that is equipped with a secured service network. Its twelve commercial banks had a total of 2,024 branches and 17,858 Automated Teller Machines (ATMs) across the country as of 2016. Although Riyadh is the oldest bank, Al-Rajhi is the largest full-fledge Islamic bank.

Islamic banking industry of Saudi Arabia is relatively smaller, and there are only four banks namely, Al-Bilad, Al-Inma, Al-Jazira and Al-Rajhi banks. Each has its own independent *Shari'ah* Supervisory Board (SSB). Bank Al-Rajhi, established during the second half of 1950s, is the oldest and largest bank in terms of assets. The second oldest bank is Al-Jazira, established in 1975-76 while Al-Bilad and Al-Inma banks entered into operations in 2004 and 2007 respectively. The trend to offer Islamic banking is gaining momentum along-with the increasing local and regional demand and appreciation at international level.

United Arab Emirates also has made significant contribution in the development of Islamic banking. With the establishment of Dubai Islamic Bank in 1975 and issuance of the Federal Law no. 6 of 1985 regarding the Islamic banks, the country is regarded as pioneer in promoting Islamic banking both in regulations and practices. UAE holds almost 32% share in global Islamic banking. However, the share of Islamic banks in the domestic market is relatively small, i.e. 19%. UAE is home of 8 dedicated Islamic banks,

as well as 26 Islamic banking windows equally divided into local and foreign banks. In addition, country has 12 Islamic finance companies and 1 Islamic investment company.

Bahrain with very active central regulatory authority, is regarded as the hub of Islamic finance in the Middle-East. Bahrain is also at forefront in Sukuk, Islamic securities as well as leasing industries. There are six fully fledged Islamic banks as: Albaraka Islamic Investment Bank, Al Salam Bank Bahrain, Arab Banking Corporation (ABC Islamic Bank), Bahrain Islamic Bank, Khaleeji Commercial Bank and Gulf Finance House. A number of foreign financial institutions such as Capital Management House, First Energy Bank, Standard Chartered Bank, Elaf Bank B.S.C, Capinnova Investment Bank, Kuwait Finance House and HSBC Amanah are also providing the Islamic financial schemes through the dedicated Islamic banking windows or branches. Over the two decades, total assets of Bahraini Islamic banking increased from \$1.9 billion in 2000 to \$27 billion in 2018.

Qatar having both the conventional and Islamic banking systems in parallel is another important and emerging hub of Islamic finance. Qatari Islamic banking industry consists of four full-fledged Islamic commercial banks, one corporate bank, and a number of Islamic banking windows and branches of domestic and international financial institutions. Total assets of Islamic banking in Qatar are estimated at QAR360 (nearly \$100) billion.

Kuwait having Kuwait Finance House, established in 1977 (the second largest Islamic banking institution) holds more than 6% share in global Islamic finance. The country operates a dual system where Islamic and conventional financial institutions co-exist. Kuwaiti Islamic banking holds more than 38% share of the domestic finance market. The banking sector is the most developed part of the Islamic financial service industry and consists of five full-fledged Islamic banks, whereas the figure will rise to six if another bank completes its transition to Shari'ah compliant status this year.

Sultanate of Oman is another important player of GCC Islamic banking industry which, like other GCC countries, has dual banking system regulated by Central Bank of Oman. Omani financial industry consists of commercial banks, specialized banks, non-banking financial institutions and leasing companies. Omani Islamic banking industry consists of stand-alone (full-fledged) Islamic banks and Islamic banking windows of conventional banks. Though the commercial banks have obvious dominance, the Islamic banking is developing robustly and capturing the market share of industry progressively. The Omani Islamic banking industry showed YoY growth of 25% in 2017, holds nearly RO 4.1 billion (nearly \$10.65 billion), which constitutes 13% share of banking sector.

Table 2.1 List of Islamic Banks, Branches and ATMs in Respective GCC countries

No	Islamic Banks	Establishment	Branches	ATMs
Saudi Arabia				
1	Al-Rajhi Bank	1950s	539	4,475
2	Bank Al-Jazira	1976	80	621
3	Al-Bilad Bank	2004	114	896
4	Al-Inma Bank	2008	76	1340
United Arab Emirates				
5	Ajman Bank	2008	11	49
6	Abu Dhabi Islamic Bank	1997	80	722
7	Dubai Islamic Bank	1975	90	535
8	Emirates Islamic Bank	2004	68	90
9	Sharjah Islamic Bank (Since 2002 converted to Islamic Banking)	1975	32	103
Bahrain				
10	Al Salam Bank	2006	11	35
11	Bahrain Islamic Bank	1979	4	51
Qatar				
12	Qatar Islamic Bank	1982	32	175
13	Masraf Al Rayan	2006	12	
14	Qatar International Islamic Bank	1991	20	90
Kuwait				
15	Kuwait Finance House	1977	430	790
16	Boubyan Bank	2003	40	162
17	Warba Bank	2010	12	36
18	Ahli United Bank	2000	140	3000
19	Kuwait International Bank (Converted to Islamic since 2007)	1973	26	15
Oman				
20	Bank Nizwa	2013	12	12
21	Alizz Islamic Bank	2012	10	8

Sources: Annual Reports of Respective Banks, 2018.

Table 2.2 shows the performance of selected 17 Islamic banks and 28 conventional banks in the GCC region. As can be seen from the ranking, Al Rajhi Bank, Kuwait Finance House, Dubai Islamic Bank are the top three Islamic banks in GCC region, but the overall position of these banks is not the best.

Table 2.2 Key Performance Indicators of GCC Islamic Banks

GCC Islamic Banks	Country	Islamic bank ranking*	Overall ranking*	Assets (bil. US\$)
Al Rajhi Bank	Saudi Arabia	1	5	90.5
Kuwait Finance House	Kuwait	2	12	54.0
Dubai Islamic Bank	UAE	3	14	47.6
Qatar Islamic Bank	Qatar	4	16	38.4
Abu Dhabi Islamic Bank	UAE	5	19	33.3
Bank Al-inma	Saudi Arabia	6	25	27.9
Masraf Al Rayan	Qatar	7	26	25.1
Al Baraka Banking Group	Bahrain	8	29	23.4
Bank Aljazira	Saudi Arabia	9	32	17.7
Emirates Islamic Bank	UAE	10	33	16.1
Barwa Bank	Qatar	11	36	12.6
Ahli United Bank	Kuwait	12	37	12.1
Qatar International Islamic Bank	Qatar	13	38	11.7
Boubyan Bank	Kuwait	14	40	11.4
Al Hilal Bank	UAE	15	41	11.2
Sharjah Islamic Bank	UAE	16	44	9.1
Kuwait International Bank	Kuwait	17	45	6.0

Source: Islamic Finance Outlook, 2018 Edition, S&P Global Ratings.*Ranking by total assets. GCC-Gulf Cooperation Council. Source: S&P Global Ratings.

3. Literature Review

To measure efficiency of banking institution is the same as measuring the efficiency of an individual firm as bank like productive firm acts as an intermediary to transform inputs into outputs. It is also important for the banks to achieve efficiency because efficiency and profitability are directly related. Once banks are profitable, they can play their role more effectively in controlling the interest rate gap i.e., the spread between the lending rate and deposit rate to ensure higher demand for loans and higher propensity to save (Kablan 2010, Karimazadeh 2002).

The productive efficiency shows the optimal method of production with least cost combination of inputs. The allocative efficiency is related to the optimal distribution of the goods where the last unit satisfies the equality condition of marginal benefit and marginal cost.

The allocative efficiency ensures that a firm utilize its resources in the best possible way to satisfy consumers' expectations. Technical Efficiency means ability of a firm to obtain maximal output from a given set of inputs. It is based on the assumption of constant returns to scale (CRS) which indicates the overall technical efficiency. CRS is mostly applicable to a situation where both grade of efficiency and ratio of inputs to outputs are alike. A firm is considered technically efficient only if it produces a given set of outputs with least amount of inputs available. In other words, technical efficiency indicates the ability of the firm to maximize outputs within a given set of inputs.

Technical efficiency indicates how the firm is transforming multiple resources into multiple financial services (Bhattacharyya et al., 1997). Technical efficiency measure helps to identify the causes or sources of inefficiency due to either input-output ratios or the size of operation. Overall technical efficiency can be further divided into two components such as pure technical efficiency and scale efficiency. Pure technical efficiency is a performance based measuring approach that examines the managerial performance of an organization. While, scale efficiency provides the insight to the management to choose the optimum quantity of the resources to be allocated to the bank size or to choose the scale of production that attains the expected production level. This division allows to exactly pin-point the sources of inefficiencies. The pure technical efficiency score is calculated with the estimation of efficiency frontier under the assumption of variable return to scale (VRS) i.e., increasing or decreasing returns to scale.

Thus, scale inefficiency can be divided into two types: decreasing returns to scale and increasing returns to-scale. If the banks are operating under decreasing returns to-scale or diseconomies of scale, it indicates that the banks are overly large as compared to the optimal size. In other words, banks are suffering from oversize and are not efficient. The scale efficiency scores are based on variable return to scale (VRS) model ranged between 0 and 1 model which is higher than constant returns to scale (CRS) due to the nature of close-fitting of data points. Besides, the acquired score from VRS model facilitates decision creators to determine whether the institution is under the operation of increasing or decreasing or constant return to scale.

There is a great deal of literature examining the performance of banks at all levels. These studies apply different measuring methods including data envelopment analysis (DEA), stochastic frontier analysis (SFA), etc. The existing literature can be classified into categories which focuses on Islamic banks and conventional banks by including single or multiple country comparison.

Al-Jarrah (2007) observes the performance of banks in Jordan, Egypt, Saudi Arabia and Bahrain. He adopts cost efficiency of different banks from 1992-2000 and divides the cost efficiency into allocative and technical efficiency that assumes variable return to

scale and constant return to scale. The study also further categorized the technical efficiency into pure technical and scale efficiency. He shows that the Saudi banks are more cost efficient than the Jordanian banks, and the large banks are better than the small banks. The variation of the results is due to the banks' geographic location and size. In allocative efficiency measures, Saudi banks outperformed the other banks particularly Egypt. It also confirms that large banks have advantage of achieving higher allocative efficiency as compared to small banks.

Srairi (2010) shows the efficiency of seventy-one GCC commercial banks and applies SFA considering country-specific variables for 1999-2007. The results of cost and profit efficiency of the banks under study indicate that conventional banks are more efficient than the Islamic banks whereas all the banks in the selected region have the efficiency in earning profits than minimizing costs.

Noor and Ahmad (2012) take seventy-eight Islamic banks from twenty-five countries from 1992-2009 and adopt DEA to measure the efficiency of Islamic banks. They find Islamic banks are competent in achieving higher pure technical efficiency scores. Moreover, they identify a positive relation between Islamic banks' efficiency and size and profitability, however, a negative relation between Islamic banks' efficiency and loans intensity and capitalization are also observed.

Almazari, and Almumani, (2012) investigate the efficiency of Saudi National Banks based on the data from 2006-2010. They have included financial variables and ratios i.e. total assets, net income, operating income, operating expenses, operational efficiency, asset management, return on assets. The authors find that banks profitability is significantly related with their operational efficiency, asset management, total assets, and bank size.

Sillah, Khokhar and Khan (2014) examine the technical efficiency of twelve Saudi banks with stochastic frontier model which generate mix results. Saudi-foreign owned bank, the Banque Saudi Fransi, has achieved highest efficiency scores in deposit and investment, although it has some fluctuating performance during the study period. The authors also confirm the two banks namely Al-Rajhi and SAMBA as the best income performing banks.

Bukhari and Nizar (2015) investigate the performance of twenty-eight conventional and twenty Islamic banks in GCC from 2006-2012. They include, total loans and investments as output and total deposit, equity, fixed assets and general expenses as input variables. They find no significant difference in efficiency of the conventional and Islamic banks in term of constant return to scale. But for variable return to scale, particularly in 2009 and

2010, conventional are more efficient than Islamic banks. They further show that efficiency of both types of banks is same in Kuwait, Saudi Arabia, and Qatar, while in Bahrain and UAE, conventional are more efficient than Islamic banks.

Afifa and Ridha (2015) conduct a comparative study of conventional and Islamic banks in MENA region for 1990-2010. They apply static frontier analysis (SFA) and DEA. Based on DEA, they find that Islamic banks are slightly better than the conventional in achieving constant returns to scale, however in terms of variable return to scale, the conventional banks are somewhat higher than Islamic banks. While, based on SFA, Islamic banks are relatively successful in minimizing the cost and earning profit during 2007-2010.

Ferhi and Chkoundali (2015) study two hundred and nine Islamic and conventional banks across the world for 1999-2010 with both SFA and DEA. From DEA, Islamic banks are slightly better than conventional banks in constant returns to scale, but in terms of variable returns conventional banks are better than Islamic banks to scale. Furthermore, some Islamic banks are found most efficient in Bahrain, Egypt, Qatar and Turkey. And from SFA, conventional banks are slightly better than the Islamic banks. They also reveal that some Islamic banks in different regions have the highest cost efficiency scores, such as Saudi Arabia, Qatar, and Jordan, Malaysia, Singapore along with the Russian Federation, the United Kingdom, the Cayman Islands

Bahrini (2017) measures the technical efficiency of Islamic banks in the GCC and MENA region by bootstrap DEA and shows that GCC Islamic banks are more stable and efficient than MENA from 2007-2008 (the global financial crisis period) and even from 2009-2010 (early post-financial crisis period).

Miah and Uddin (2017) examine the stability and efficiency of twenty-eight Islamic and forty-eight conventional banks in GCC for 2005-2014. They apply SFA, accounting ratios, and ordinary least square regression technique. They find that conventional banks are better in achieving cost efficiency while Islamic banks are more stable in short-term, however, both are able to attain the long-term stability.

Alshammari (2017) evaluates the GCC conventional and Islamic banks from 2003-2015 considering the ROA and ROE and shows that conventional banks are better than Islamic in terms of profitability. This profitability is affected by some bank-specific variables like liquidity, capital adequacy, bank size and growth. Furthermore, both types are found safe from the global financial crisis of 2008, although their profitability declined at various levels due to the regional economic unrest.

Hassan, Khan, Amin and Khokhar (2018) examine the efficiency of Saudi Islamic banks for 2008-2016 with the application of DEA. The authors consider three inputs variables deposits, assets and capital and three outputs variables such as investments, advances and

income. They find that Al-Rajhi is the most efficient Islamic bank followed by bank Al-Jazira, while, Al-Inma and Al-Bilad are on third and fourth positions, respectively in terms of technical and pure technical efficiency. However, the technical and scale efficiency scores of bank Al-Rajhi declines after 2012. They also find that Bank Al-Bilad has achieved best scores in scale efficiency. In another study in 2018, they again examine the comparative performance of both conventional and Islamic banking in Saudi Arabia by DEA from 2008-2016. They find mixed results among the banks in scoring technical, pure technical and scale efficiency. Similar to their earlier study, the authors identified Al-Rajhi bank has scored highest in terms of technical, pure technical and scale efficiency. On the other hand, both Saudi Hollandi and National Commercial banks, the conventional banks are in the best position.

Recently Khokhar et al. (2020) examined and compare the performance of 21 GCC Islamic and 42 GCC conventional banks at two tiers, covering the period of 2010–2016. In the first tier, an industry-level analysis is conducted of each country, followed by an individual bank-level analysis in the second tier. Deposits, assets, and capital are taken as inputs to measure the outputs using data envelopment analysis techniques. At the industry level, we find that Islamic banking is at par with—if not better than—conventional banking in all terms of efficiency. Particularly, banking in Bahrain and KSA is among the best, whereas there is no scope for improvement in the UAE’s banking industry. This low performance could be attributed to a lack of standardization in products and schemes as well as the level of prudence in decision-making, governance, and operations. At the bank level, many Islamic banks perform even better than conventional banks. Most studies on GCC and MENA focus on the determinants and indicators of development and the banking industry growth in general. Uniquely, we further examine GCC banking performance at the individual bank level by incorporating the latest available data.

Besides the above detailed literature review on bank’s efficiency studies, following table provides a list of other studies with mix-results.

Table 3.1 A glimpse of literature measuring the efficiency of Islamic banks

Studies	Sample Countries	Research Method
Non-Comparative studies-Islamic Banks		
Noor and Ahmad (2012)	25 countries	DEA
Zainal and Ismail (2012)	Malaysia	DEA
Akhtar and Sadaqat (2011)	Pakistan	DEA

Comparing efficiency at full-fledged Islamic banks and Islamic branches of conventional banks

Mokhtar (2008)	Malaysia	DEA
Siddique and Rahim (2013)	Pakistan	DEA
Kamaruddinet al. (2008)	Malaysia	DEA
Studies measuring efficiency of Islamic banks only		
Bahrini (2017)	MENA	DEA
Rosmanet al. (2014)	Bahrain, Yemen, Iraq, Iran, Lebanon, Philippines, Indonesia, Palestine, Malaysia, Jordan, Turkey, Kuwait, Sudan, Brunei Darussalam, Saudi Arabia, Pakistan, United Arab Emirates, Singapore, Syria and Qatar	DEA
Rahim et al. (2013)	MENA and Asian countries	DEA
Ahmad and Noor (2011)	World	DEA
Rahim et al. (2013)	Malaysia	DEA
Sufian (2009)	Sixteen countries: Bahrain; Bangladesh; Egypt; Pakistan; Saudi Arabia; Turkey; UAE; Gambia; Indonesia; Iran; Kuwait; Malaysia; Qatar; South Africa; Sudan; Yemen	
Viveritaet al. (2007)	Thirteen countries: Algeria; UAE; Yemen; Bahrain; Bangladesh; Brunei; Egypt; Indonesia; Jordan; Kuwait; Malaysia; Qatar; Sudan;	
Yusdistira (2004)	World	DEA
Hassan (2005 & 2006)	Twenty-one countries: Brunei; Egypt; Gambia; Algeria; Bahamas; Bahrain; Bangladesh; Indonesia; Iran; Jordan; Kuwait; Lebanon; Malaysia; Mauritania; Qatar; Saudi Arabia; Sudan; Tunisia; UAE; UK; Yemen	DEA

Notes: DEA= data envelopment analysis; SFA= stochastic frontier approach; MFA= meta frontier analysis, FRA=financial ratio analysis

The present study will fill the gap in the existing literature by conducting the comparative survey on the efficiency or the performances of all the Islamic banks in GCC region.

4. Data and Methodology

Present study covers 20 Islamic banks across the region from the period 2010-2016. The study selects this period because Islamic banking in some countries started in very recent time. Thus, this time period provides an opportunity to examine the performance of Islamic banking of all the GCC countries.

Non-parametric Approach: Data Envelopment Analysis (DEA)

This study uses data envelopment analysis (DEA), a non-parametric and alternative to regression analysis that examines the relative productive efficiency with multiple inputs and outputs (Charnes et al., 1978). DEA adopts an advanced function to determine the efficient producers. It varies from the ordinary least squares (OLS) or regression analysis that rely on the comparison of a relative to an average producer. Unlike regression analysis that depends on central tendencies and lacks in extensive and powerful testing of the managerial performance of productivity at the optimum levels, the DEA approach relies on external observations and identifies a frontier characterized as an extreme point method. DEA assumes that if a firm can produce a certain level of output utilizing specific input level, another firm with equal scale should accomplish the production at the same level. The most efficient producers can turn into a composite producer that enables the estimation of an efficient solution for every level of input or output. DEA can handle numerous input and output models and doesn't require an assumption of functional system relating inputs to outputs. Besides, it does not need to satisfying any explicit optimization objective regardless of the size and nature of the organization. DEA follows linear programming under the hypothesis of variable return to scale to measure efficiency of an organization. In decision-making unit (DMU), the higher efficiency of production is usually measured by the maximum level of output with given level of input.

There are two widely used methods under DEA: first, an output orientation that provides maximum output with a given level of input, and second, an input orientation which provides a given level of output with minimum amount of input. Present study adopts comparative analysis of the input-oriented efficiency technique. In order to find the most exact and precise consequences, it is recommended to follow a single-year analysis rather than multi-year efficiency analysis for an institution or individual decision making unit (DMU). For this reason, present study estimates the efficiency of individual bank on annual basis. This method enables to get the best consequence in most volatile banking industry over the years.

Based on the above, the study assumes there are "n" number of decision making units (DMU) to be evaluated under following model specification.

$$\max z = \sum_{i=1}^n u_i y_i \quad (1)$$

Subject to

$$\sum_{j=1}^m v_j x_j = 1 \quad (2)$$

$$\sum_{i=1}^n u_i y_i - \sum_{j=1}^m v_j x_j - \leq 0 \quad (3)$$

$$u_i, v_j \geq 0$$

Where,

z = Efficiency of DMU under consideration

u_i = n output coefficients of DMU under consideration

y_i = n output weighting coefficients for DMU under consideration

v_j = m input coefficients for DMU under consideration

x_j = m input weighting coefficients for DMU under consideration

The equation (1) provides the efficiency score for DMU i , equation (2) transforms the weighted inputs of DMU i equal to 1, and equation (3) confirms that the weighted outputs cannot be more than the weighted inputs for all DMU's (capping efficiency to 1).

Input and Output Specifications

Since Islamic banks are in a part of resource mobilization process, the selection of intermediation method for this study is appropriate as these DMUs transform inputs i.e., deposits, assets and capital into output i.e., investment, advances and net income (Sealey, C. and Lindley, J. 1977; Favero, C. and Papi, L. 1995; Kwan, S. 2002). Although there are two other methods available for measuring efficiency i.e. the production approach and the profit-oriented approach, some studies advocate for the intermediation approach to evaluate banks' efficiency (Bukhari M. S. Sillah & Nizar Harrathi, 2015; Muhammad Tariq Majeed, Abida Zanib, 2016; Hassan, M., Khan, M, N., Amin, F.M., and Khokhar, I., 2018).

Table 4.1 exhibits the list of variables for this study, for example deposits, assets and capital as inputs variable and investment, advances and income as outputs.

Table 4.1 Description of the Variables

Variables Notation Description

Inputs:

Deposits	X1	Deposits of customers
Assets	X2	Total assets include cash and balance with treasury and other banks, due from financial institutions, investment, financing and other related assets, operating fixed assets, deferred taxed
Capital	X3	Share capital is the summation of all funds that banks used to raise by issuing shares.

Outputs:

Investment	Y1	Investment
Advances	Y2	Financing and other related assets
Income	Y3	Total bank revenues and subtracting the costs of doing business such as depreciation, interest, taxes and other expenses.

5. Result and Discussion

In GCC member countries, Islamic banking industry developed in different spans of time, volume and size. Saudi Islamic banking is the oldest and largest industry in GCC having an average of \$31,171million as assets, \$24,448as deposits and \$4,868as capital, whereas, investment, loans and income are \$27,582 \$20,985 and \$691 million, respectively on average during the study span. On average, in terms of deposits, Kuwait having \$16,911 million stands at second, while in terms of capital, Qatar having \$3,744 million stands at second position in GCC Islamic banking industry. Oman has a small Islamic banking industry as its total assets, deposits and capital of Islamic banking industry is\$1181, \$835, and \$284 million and it's investment and loans are \$827 and \$561 million, respectively.

Table 5 .1 Descriptive statistics of variables for the Period 2010-2019 (\$ millions)

Variables	Inputs			Outputs		
	Assets	Deposits	Capital	Investment	Loans	Income
KSA						
Mean	31,171	24,448	4,868	27,582	20,985	691
S.D	32,782	25,821	5,016	7,612	22,248	722
UAE						
Mean	17,944	13,017	2,379	14,056	10,643	268
S.D	5,303	3,890	757	5,317	4,344	138
Kuwait						
Mean	25,181	16,911	3,027	6,888	7,761	238
S.D	3,766	3,124	400	1,366	761	92
Bahrain						
Mean	9,295	6,699	1,016	6,069	4,419	51
S.D	1,728	1,225	120	1,515	1,100	27
Qatar						

Mean	18,433	13,800	3,744	14,656	10,491	721
S.D	9,303	4,354	2,348	9,886	7,478	973
Oman						
Mean	1,181	835	284	827	561	0
S.D	722	705	14	606	517	9

Source: Authors' own calculation, S. D = Standard Deviation

Table 5.2 exhibits a mix-trend in terms of all the efficiencies among Islamic banking industries of the region. Obviously, it is more technically efficient in Qatar (with 93% score) and least efficient in Oman (68%). Saudi Arabia has the largest economy as well as the largest Islamic banking industry, therefore sometimes, it becomes difficult to operate at the full efficiency parameter. This reflected in the performance of Saudi Islamic banking industry that stands on third position in performance. From bottom, UAE stands at second least performing country in Islamic banking efficiency. Based on the mean values of pure technical efficiency scores, the below table shows that Saudi Arabia, Kuwait, Bahrain and Qatar are all best performers (0.95) and UAE is the least performer (0.86). This means that by improving their management policies and operational practices UAE Islamic banking industry could avoid wasting 14 percent (1-0.86) of their inputs in average.

Table 5.2 Efficiency Estimates of Islamic banks

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Mean	SD
KSA												
Technical Efficiency	0.93	0.80	0.99	0.91	0.88	0.85	0.80	0.94	0.96	0.97	0.90	0.07
Pure Technical Efficiency	0.98	0.95	1.00	0.97	0.92	0.88	0.84	0.96	0.98	0.99	0.95	0.05
Scale Efficiency	0.95	0.85	0.99	0.95	0.96	0.97	0.95	0.98	0.98	0.98	0.96	0.04
UAE												
Technical Efficiency	0.78	0.86	0.70	0.70	0.78	0.81	0.81	0.85	0.93	0.94	0.82	0.08
Pure Technical Efficiency	0.88	0.93	0.74	0.74	0.85	0.86	0.86	0.88	0.95	0.96	0.86	0.08
Scale Efficiency	0.89	0.92	0.94	0.94	0.93	0.94	0.94	0.96	0.98	0.98	0.94	0.03
Kuwait												

Technical Efficiency	0.93	0.88	0.85	0.86	0.93	0.94	1.00	0.89	0.99	0.98	0.92	0.05
Pure Technical Efficiency	0.97	0.92	0.91	0.90	0.94	0.95	1.00	0.98	1.00	0.98	0.95	0.04
Scale Efficiency	0.96	0.95	0.94	0.96	0.99	0.99	1.00	0.92	0.99	1.00	0.97	0.03
Bahrain												
Technical Efficiency	0.87	0.82	0.90	0.90	0.83	0.95	0.90	0.86	0.87	0.88	0.88	0.04
Pure Technical Efficiency	0.92	0.88	0.94	0.97	0.94	1.00	0.99	0.94	0.97	0.96	0.95	0.03
Scale Efficiency	0.93	0.93	0.95	0.93	0.88	0.95	0.91	0.91	0.90	0.91	0.92	0.02
Qatar												
Technical Efficiency	0.91	0.99	0.89	0.90	0.86	0.89	0.91	0.96	0.97	1.00	0.93	0.05
Pure Technical Efficiency	0.94	0.99	0.89	0.91	0.87	0.94	0.96	0.98	0.99	1.00	0.95	0.05
Scale Efficiency	0.96	0.99	1.00	0.99	0.98	0.95	0.95	0.98	0.99	1.00	0.98	0.02
Oman												
Technical Efficiency	N/A	N/A	N/A	0.90	0.72	0.43	0.66	0.68	0.68	0.68	0.68	0.14
Pure Technical Efficiency	N/A	N/A	N/A	1.00	0.88	0.82	0.84	0.86	0.86	0.86	0.87	0.06
Scale Efficiency	N/A	N/A	N/A	0.90	0.83	0.55	0.76	0.77	0.77	0.77	0.76	0.11

Source: Authors' own calculation based on DEA

Further, the results show that Qatari Islamic banking industry is scale efficient followed by Bahrain with a scale efficiency of 0.97 and 0.96 respectively, it further reveals that Qatar saved 3 percent (1- 0.97) and Bahrain saved 4 percent (1- 0.96) of their inputs by raising their sizes to reach the optimum scale. The results also illustrate that UAE is lowest in scale efficiency as its' score is 0.93 that means 7 percent (1-0.93) resources are lost in average. The results further reveal that with given inputs, Bahrain followed by Saudi Arabia and Oman perform well and generates maximum output during the study period.

Results in the table 5.3 exhibit that during the whole study period, Saudi Islamic banking industry operates at mixed trend. It operates at IRS in 2010 followed by IRS in 2012 and 2017 to 2019. It operates at DRS in the remaining years except in 2014. Qatari Islamic

banking operates at CRS in 2010 and 2013. While Operates at IRS in 2011, 2015, 2016, 2017 and 2019. In the same period UAE operates at IRS in 2011, 2014, 2015, 2017 and 2018. It is noted that in 2019 all GCC countries operate at IRS or CRS that shows the stability in the Islamic banking industry in the region during this time.

Table 5.3 Estimation of Efficiency Frontier

Banking Industry	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
KSA	IRS	DRS	IRS	DRS	CRS	DRS	DRS	IRS	IRS	IRS
UAE	DRS	IRS	DRS	CRS	IRS	IRS	CRS	IRS	IRS	CRS
Kuwait	IRS	DRS	DRS	CRS	IRS	CRS	IRS	DRS	IRS	CRS
Bahrain	CRS	DRS	IRS	CRS	DRS	IRS	DRS	DRS	CRS	CRS
Qatar	CRS	IRS	DRS	CRS	DRS	IRS	IRS	IRS	CRS	IRS
Oman	N/A	N/A	N/A	CRS	DRS	DRS	IRS	CRS	CRS	CRS

Source: Authors' own calculation based on DEA

Table 5.4 presents the overall technical efficiency of top and bottom five banks of GCC in this study. In the five best banks, all GCC member countries except Oman have one bank. Masraf Al Rayan of Qatar on the top followed by Al Rajhi Bank of Saudi Arabia. The bottom five includes three banks from UAE and one each from Bahrain and Oman. No bank from Saudi Arabia, Kuwait and Qatar has appeared in the bottom five GCC performing banks.

Table 5.4 Ranking on Average Basis of Technical Efficiency (2010-2019)					
Top Five Banks			Bottom Five Banks		
Bank	Efficiency Score	Country	Bank	Efficiency Score	Country
Masraf Al Rayan	0.994	Qatar	Abu Dhabi Islamic Bank	0.819	UAE
Al Rajhi Bank	0.973	Saudi Arabia	Albaraka Banking Group	0.758	Bahrain
Bahrain Islamic Bank	0.962	Bahrain	Sharjah Islamic Bank	0.741	UAE
Ajman Bank	0.961	UAE	Emirates Islamic Bank	0.692	UAE

Ahli United Bank	0.958	Kuwait	Bank Nizwa	0.657	Oman
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Source: Authors' own calculation based on DEA

Surprisingly, in terms of pure technical efficiency, Masraf Al Rayan of Qatar is at top performer followed by Bahrain Islamic Bank of Bahrain. One bank each from Saudi Arabia, Oman and UAE are also included in the five top performing banks. On the contrary, UAE has three banks while one bank each from Bahrain and Oman is also included in the list of least performing banks (see table 5.5).

Top Five Banks			Bottom Five Banks		
Bank	Efficiency Score	Country	Bank	Efficiency Score	Country
Masraf Al Rayan	0.998	Qatar	Albaraka Banking Group	0.895	Bahrain
Bahrain Islamic Bank	0.994	Bahrain	Abu Dhabi Islamic Bank	0.886	UAE
Al Rajhi Bank	0.994	Saudi Arabia	Bank Nizwa	0.827	Oman
Al Izz Islamic Bank	0.992	Oman	Sharjah Islamic Bank	0.755	UAE
Ajman Bank	0.987	UAE	Emirates Islamic Bank	0.733	UAE

Source: Authors' own calculation based on DEA

In scale efficiency, the results (see in table 5.6) reveal that Masraf Al Rayan from Qatar and Alinma Bank from Saudi Arabia are on the top five banks, followed by Boubyan Bank from Kuwait stands third. In top five banks two banks belong to Saudi Arabia. In the least performing banks, Bank Nizwa from Oman is the least performing bank followed by Albaraka Banking Group from Bahrain. In the five least performing banks, others include one bank each from Oman, Saudi Arabia and UAE. The results indicate that there is need to improve the scale efficiency of these banks.

Top Five Banks	Bottom Five Banks
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Bank	Efficiency Score	Country	Bank	Efficiency Score	Country
Masraf Al Rayan	0.996	Qatar	Dubai Islamic Bank	0.894	UAE
Alinma Bank	0.990	Saudi Arabia	Bank Albilad	0.884	Saudi Arabia
Boubyan Bank	0.986	Kuwait	Al Izz Islamic Bank	0.872	Oman
Sharjah Islamic Bank	0.980	UAE	Albaraka Banking Group	0.850	Bahrain
Al Rajhi Bank	0.979	Saudi Arabia	Bank Nizwa	0.781	Oman

Source: Authors' own calculation based on DEA

6. Conclusion and Recommendation

This study attempts to measure the performance of 20 Islamic banks of GCC in terms of technical, pure technical and scale efficiencies from 2010-2016. The findings reveal the followings:

First, Saudi Arabia is the leader having the largest Islamic banking industry in terms of total assets, deposits and capital of Islamic banking industry followed by UAE and Qatar, while Oman has the smallest share in GCC Islamic banking industry.

Second, the study shows mixed results of efficiencies among the GCC Islamic banking industry. Islamic banking industry of Bahrain and Saudi Arabia respectively is on top and second best efficiency level while it is least efficient in the UAE and Kuwait is the 2nd least performing country. Besides, the industry is more scale efficient in Qatar followed by Bahrain. Oman is still at infancy stage where Islamic banking industry is emerging. It is also found that Bahrain, Saudi Arabia and Oman outperform in terms of generating output with a given level of inputs during the study period.

Third, the findings about technical efficiency reveals that Al Rajhi Bank (Saudi Arabia) and Alizz Islamic Bank (Oman) are at the forefront in top five followed by Bahrain Islamic Bank (Bahrain), Masraf Al Rayan (Qatar) and Ahli United Bank (Kuwait). In contrast, the least performing four out of five Islamic banks are from UAE (namely, Dubai Islamic Bank, Abu Dhabi Islamic Bank, Sharjah Islamic Bank, and Emirates Islamic Bank) and one bank from Kuwait (Kuwait International Bank). The results based on pure technical efficiency demonstrate that two out of five top performing banks are from Saudi Arabia (Al Rajhi Bank and Bank Albilad), and one bank each from Bahrain (Bahrain Islamic Bank), Kuwait (Warba Bank) and Oman (Alizz Islamic Bank) while the four out of five least performing Islamic banks are from Kuwait and UAE (Boubyan, Kuwait International bank; Sharjah and Emirates Islamic bank) and one from Oman (Bank Nizwa).

In terms of scale efficiency, Al Rajhi bank is identified as the top performing while Abu Dhabi Islamic Bank is the least performer.

The study suggests that there is a room for improving the managerial and operational policies in UAE Islamic banking industry to avoid wasting 7 percent of their inputs which are lost on average. Moreover, it is recommended that Qatar and Bahrain can save up to 3 percent and 4 percent of their inputs by increasing their respective banking operations to an optimum scale, respectively. Some banks like Dubai Islamic bank, Abu Dhabi Islamic bank, Sharjah Islamic bank, Kuwait International bank and Emirates Islamic Bank need to increase their overall technical efficiencies. Besides, other banks like Nizwa, Boubyan, Kuwait International, Sharjah Islamic and Emirates Islamic need to emphasise on pure technical efficiencies, and lastly Abu Dhabi Islamic, Kuwait International, Dubai Islamic, Nizwa and Albilad bank require paying attention to scale efficiencies.

Above findings helps proper policy implications of respective banks in the region. In order to achieve the optimum efficiency, these banks should consider their scale level in efficiency and decide whether to expand or contract the banking services. They should inspect whether they are undersized or oversized towards reaching the optimum level. The intra-banking relationship at regional level can further help for achieving this goal particularly for those banks with lower efficiencies.

It is also recommended that a further study can be conducted to analyze the comparative performance of Islamic and conventional banking as well as to determine the success factors of GCC banking industry.

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