

## **Efficiency Analysis of Foreign and Domestic Banks and its Determinants: Evidence from Gulf Cooperation Council (GCC) Countries**

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**Abstract:** *This paper aims to assess the foreign and domestic banks efficiency and its determinants in Gulf Cooperation Council (GCC) countries. In total, 50 foreign and domestic banks were examined for the period of five years from 2015- 2019. The two stage procedures approach was used by this paper to analyse banks efficiency. First input- oriented Data Envelopment Analysis model was used to analyze the efficiency scores and in the second Tobit regression model was applied to investigate the efficient drivers. Furthermore, nonparametric Kruskal-Wallis and Mann Whitney tests and the parametric (t-test) were applied to compare the efficiency between foreign and domestic banks. On average, the findings showed that many domestic and foreign banks in GCC countries were inefficient with mean efficiency scores of less than 100%. The overall banks inefficiency could be explained by managerial inefficiency in exploiting their resources to the fullest; second domestic banks groups on average were more efficient than foreign banks groups supporting home field advantage theory. Finally the multivariate regression analysis highlights that; bank size, credit risks, management quality and liquidity were the most significant efficiency drivers. The findings were useful to the regulators and bankers in GCC countries on operating performance of banking industry and its future evolution. The study results were important because the study pinpoints the drivers of efficiency and its sources of inefficiency, it would help regulator and banks with strategic planning. This will assist the countries to maintain a healthy and sustainable financial system in an economy.*

**Keywords:** Bank efficiency determinants, Bank industry, GCC countries, Efficiency drivers, two-stage DEA

### **1.0 Introduction**

Banking sector plays a significant role in country's economic growth, since no economic growth can be achieved unless mobilized funds through banking system is efficiently channelled and allocated in the viable investments. The efficiency of banking system affects positively the economic growth of a country and in the same way inefficiency of banking system could results into the negative consequences to the economic growth as a whole (Levine 1998; Berger and Humphrey, 1997; Amel et al., 2004; Brissimisa et al., 2010). Banking system not only allocates mobilized deposits through intermediation process but exceptional provides liquidity and efficiency payment system service both locally and internationally to the economy which gives the sector a key role over other financial institutions (Heffernan, 2005; Matthews & Thompson, 2008). Following the important role played by banking sector to the economy; evaluation of banking sector efficiency has increased attention to academicians, researchers, regulators, and

managers and the focus of analysing performance changing from traditional financial ratios to a multi-dimensional perspective (Seiford & Zhu, 1999; Al-Khasawneh et al, 2012).

In the GCC countries banking industry plays important role in financial development since corporate bond and stock markets are usually underdeveloped. Therefore, the economies of these countries can be enhanced and improved if there is a well functioning and efficient banking system. In 1990's, the GCC countries underwent major transformations in the financial systems with the presence of foreign owned banks and substantial acquisitions and mergers. Financial systems liberalization process initiated in GCC countries was aimed at creating a more efficient, profitable, diversified and resilient banking industry. The philosophy underlying these reforms was to make the banking industry in GCC countries more market oriented. While these reforms and transformations were being implemented, the global economy also witnessed a major changes towards integration of global financial services. Therefore, these transformations of banking system has increased competition between domestic banks and foreign banks, because GCC countries were committed to major restructuring and liberalize their banking systems in line with World Trade Organisation (WTO) (Aghimien et al, 2014).

The presence of foreign banks has both positive and negative impact in domestic financial system in the country, thus, the foreign banks entry in GCC countries was just like a coin which has both pros and cons. It either created potential benefits or brings harms to domestic banks. Therefore, comparing the efficiency performance of domestic and foreign banks become very essential because little was known about banking sector efficiency and its drivers since the foreign banks entry in a domestic financial landscape after financial sector reforms in GCC countries.

The overall objective of this paper was to analyze the efficiency and investigate the drivers explaining the efficiency of domestic and foreign banks in GCC countries from 2014- 2019 with two procedures. First DEA model was applied to estimate TE, PTE and SE. DEA technique was used in this study because the method has been widely used by researchers to analyse banks' efficiency (Coelli, 1996; Seiford and Thrall, 1990). In the second stage, the Tobit regression was employed to identify the drivers of banks' efficiency.

All study findings are valuable and useful and may provide some important insights to all stakeholders including: policy makers, regulators, investors, bank managers and customers. This paper tends fill up the gap in the banking sector performance literature through analysing GCC banks efficiency and their drivers using DEA models and Tobit regression with the 2015-2019 because little studies have been looked into this issue.

The paper is organized as follows: the next section presents the theoretical and empirical literature in relation to banks efficiency and its drivers using DEA model and Tobit regression. Section 3 outlines the methodology and data used by this study, Section 4 discusses the empirical results and, finally, the study is concluded in Section 5.

## **2.0 Literature Review**

Well established banks efficiency literature has been extensively done in developed economies such as; US, UK and some European countries. In this context, extensive studies were analyzed

on banks efficiency and its drivers provided important information not only to the needs of policy makers, regulators, shareholders, banks managers and customers, but also contributing to the knowledge of banking sector performance literature.

## **2.1 Theoretical Framework**

In comparing the efficiency analysis of domestic and foreign banks two theories were suggested by Berger et al (2000) known as home field advantage and global advantage theories which will be briefly reviewed in the context of banking sector efficiency.

### **2.1.1 Global Advantage Theory**

The global advantage theory proposes that foreign banks might have the benefits from principle of comparative advantages relative to domestic banks (Berger et al 2000). The global advantage hypothesis proposes that foreign banks are more efficient than domestic banks for a number of reasons such as; advanced technology, competent management with high skills of risk management, high quality employees, best practice policies and procedures, high level of international experience, sophisticated investment, serve profitable multinational customers and better access to capital markets (Berger et al, 2005). The hypothesis was supported by (Sabi, 1996: Denizer, 2000: Havrylchuk, 2006: Helhel 2015) with similar findings that foreign-owned banks were more efficient and hence could produce much more profits than domestic-owned banks due to better utilization of risks management and application of modern information technologies.

### **2.1.2 Home Field Advantage Theory**

The hypothesis argues that domestic owned banks are generally more efficient than foreign owned banks. This is due to the fact that foreign owned banks could have disadvantages over domestic owned banks due to the organizational diseconomies to monitor and operate an institution from a distance home country which could cause limited access to soft qualitative information, lack of understanding of local conditions and various socio-economic barriers against foreign banks such as culture, language, supervisory structures, currency, regulations and specific market characteristics for operating country (Berger et al, 2005). The hypothesis was supported by (Sathye, 2001: Sufian, 2007) who found similar results that foreign owned banks to be less efficient than domestic banks.

## **2.2 Empirical Studies on Banks Efficiency**

DEA approach has been widely applied to analyze banks efficiency, mostly reported efficiency literature were mainly conducted in well developed countries such as the US, UK and other European countries. Using Australian banks, Sathye (2001) used DEA technique to analyse the allocative and technical efficiency and found out that foreign owned banks to be less efficient than domestic banks and technical inefficiency contributed to the main source of OTE. Wu (2007) analyzed the efficiency of banks in Australia using both Malmquist productivity index approach and DEA approach from 1983 to 2001 during the period of post deregulation and found out that foreign banks showed superior efficiency. On the other hand, Bhattacharya et al. (1997) employing a two-stage DEA approach to investigate the impact of liberalization on Indian banking sector efficiency found out that publicly owned banks were more efficient than foreign banks. Sathye (2003) employing DEA to measure the efficiency of Indian groups of banks and found out that foreign banks group were efficient than Indian private owned banks group. Sufian

(2007) used DEA approach to analyse OTE, PTE and SE of domestic and foreign Islamic banks in Malaysia. The results found out that domestic Islamic banks were more efficient compared to foreign Islamic banks and in general the efficiency of Islamic banks in Malaysia was decreased in 2002 before it was slightly increased in 2003 and 2004. Similarly, Sufian and Kamarudin (2015) used DEA approach to evaluate the efficiency of the sample of 6 foreign Islamic and 15 domestic Islamic banks in south Asian countries from 2006 to 2011 and indicated that domestic Islamic banks efficiency scores were more than foreign Islamic banks. Similar findings to Kamarudin et al (2017) who examined OTE, SE and PTE scores of domestic and foreign banks in Brunei, Indonesia and Malaysia from 2006 to 2014 using DEA, Kruskall Wallis and Mann Whitney found out that domestic Islamic banks efficiency level was more than foreign banks. Sufian and Habibullah (2012) found different results in Malaysian banks during the financial crisis period in 1997 and the findings showed that foreign banks TE was higher than domestic owed banks.

### **2.3 The Drivers of Banks Efficiency**

The second objective of this paper was to examine the relationship between banks efficiency and banks specific (internal) factors which were possible sources of banks inefficiencies (Kumbhakar & Lovell, 2000). The drivers of banks' efficiency had been empirically investigated by many previous researchers. However, most of them were from the developed nations. In the literature there are micro and macro drivers with significant influence, this paper focused only on micro bank specific factors.

#### **2.3.1. Bank Size**

Pasiouras et al (2007) used DEA method and a Tobit regression model to evaluate the efficiency and its determinants of banking sector in Greek. The results found out that the bank size was positively related with bank efficiency. The findings were similar to Sufian, 2009; Yayar & Karaca 2014; Nizamülmülk & Yilmaz, 2016) who found out that bank size was positive and significant with banks efficiency. In contrary to those findings (Daley & Mathews 2009; Cook et al. 2000) used DEA and panel data to estimate the determinants of banks efficiency and found out that bank size and efficiency were negatively significantly related. This study expected a positive effect with banks efficiency and proposed the following hypothesis:

*H<sub>2</sub>: Bank efficiency is positively affected by bank size*

#### **2.3.2 Profitability**

Casu and Molyneux (2003) used a Tobit regression to investigate the European banks efficiency determinants and found out that profitability ratios and bank efficiency were positively related. Similar results were noted by Hassan and Sanchez (2007) from Latin America banks, Sufian (2009) for banks in Malaysia, Rosman et al. (2014) for Middle Eastern and Asian countries banks and Mamatzakis et al. (2015) for Japanese commercial banks found out that the profitability was significantly positive related to banks efficiency. Based on the above discussion, this paper expected a positive effect of profitability on banks efficiency. Thus, the following hypothesis was developed:

*H<sub>2</sub>: Bank efficiency is positively affected by profitability*

### **2.3.3 Credit Risks**

Delis and Papanikolaou (2009) investigated the determinants of banks efficiency in European banks by using a semi parametric two stage method and credit risks and presented a negative relationship with bank efficiency. Similar results were presented by Sanchez and Hassan (2013) who found out that credit risks measured by loan loss reserves had negative relation with bank efficiency. Sufian and Noor (2009) in Middle East and North Africa and Asian countries in the period of 2001 to 2006 using Tobit regression model found out that non performing loans and banks efficiency had a negative relation. Naceur and Goaid (2008) investigated the determinants of banks efficiency using Tobit regression model and found a greater credit lower banks efficiency and Yilmaz, did a similar study as to Güneş (2015) by using panel data in Turkish banks found out that lower credit (lower nonperforming loans) had positive effect on bank efficiency and profitability and Saha et al. (2015) found out that non-performing loans had significantly negative effect on banks efficiency. In contrary to Kumar and Gulati (2008) for Indian banking sector by using logistic regression analysis found that credit risk did not have any significant effect on OTE. Based of the above empirical evidence this paper expected negative effect of credit risks on banks efficiency and proposed the following hypothesis:

*H<sub>3</sub>: Bank efficiency is negatively affected by credit risks*

### **2.3.4 Bank Liquidity**

Naceur et al. (2009) analyzed the level of bank efficiency using a Meta frontier calculated by DEA and the Tobit regression model to evaluate the effect of capital strength, the findings revealed that highly liquidity increased banks efficiency. The findings were consistent with (Bourke, 1989; Ajibike & Aremu, 2015) who found out a positive effective of banks' liquidity on performance. This was in contrast to Alshatti, 2014; Marozva, 2015 who found out a negative impact of liquidity on banks' efficiency and this paper expected positive effect of liquidity on banks efficiency and developed the following hypothesis:

*H<sub>4</sub>: Bank efficiency is positively affected by liquidity*

### **2.3.5 Management Quality**

Sufian (2009) investigated the Malaysian banks efficiency determinants from 1994 to 1999 using Tobit regression and found out that bank management quality which was measured by noninterest expenses to total assets had negative and significant effect with bank efficiency. The findings were supported by Saha et al. (2015) who examined the determinants of banks efficiency in Malaysia from 2005 to 2012 and found out that management quality had negative significant relationship with banks efficiency. This study expected negative relationship between management quality and banks efficiency and developed the following hypothesis.

*H<sub>5</sub>: Bank efficiency is positively affected by management quality*

### **2.3.6 Capital Strength**

Naceur et al. (2009) analyzed the level of bank efficiency using a Meta frontier calculated by DEA and the Tobit regression model to evaluate the effect of capital strength. The findings revealed that highly capital strength increased banks efficiency. The finding was similar to Sanchez & Hassan, 2013; Pasiouras, 2008; Tecles & Tabak, 2010; Rosman et al. 2014 which

found out positive relationship between the level of capitalization and banks efficiency. However, these findings were inconsistent with Bhattacharyya, Lovell & Sahay, 1997: Casu & Molyneux, 2003: Sufian, 2009 which found out no any relationship between the degree of capitalization and bank efficiency. The positive effect is expected in this paper and therefore it is hypothesized that:

*H4: Bank efficiency is positively affected by capital Strength*

### **2.3.7 Financial Leverage**

Nizamülmülk and Yilmaz (2016) applied Tobit Regression model to examine the determinants of banks efficiency in Turkey using 32 banks for the period from 2007 to 2013. They found out a negative relationship between financial leverage and TE. The findings were similar with (Catalbas & Atan 2005: Isik & Hassan 2003, Batir, et al, 2017) who found a negative relationship between leverage and banks efficiency. This study expected a negative relationship between leverage and banks efficiency and it proposed the following hypothesis:

*H7: Bank efficiency is positively affected by financial leverage*

The above discussion indicated that the studies on banks efficiency and factors influencing efficiency in the same study were limited in GCC countries. Therefore, through this study contributions can be made in the literature by comparing efficiency performance and its drivers of banks' efficiency in GCC.

## **3.0 Methodology**

### **3.1 Sample and Sources of data**

Data was collected from a list of 25 domestic banks and 25 foreign banks in GCC countries during the period of 2015-2019 (Table 3.1). The Bank Scope database was the main source of data for this study which was produced by the Bureau van Dijk. Most of specific banks' data in the World were obtained in Bank Scope database. In addition, the specific countries data of original currencies' were disclosed in Bank Scope database which also gives the option to convert the banks data to any other country currency. In order to maintaining homogeneity and comparability the data currencies for all six GCC countries were converted into US dollars. The data in this study was selected by using a purposive sampling technique. The choice of the study's sample was based on the following criteria, the selected bank has been in operations during the period of study and among the top ten banks in the country.

**Table 3.1: Sample Size of Selected Domestic and Foreign banks in GCC**

<i>S/N</i>	<i>Domestic Banks (UAE)</i>	<i>Foreign Banks (UAE)</i>
1	Emirates NBD	HSBC Bank
2	National Bank of Abu Dhabi	Barclays Bank
3	Abu Dhabi Commercial Bank	Standard Chartered Bank
4	Commercial Bank of Dubai	Citibank
5	First Gulf Bank	Bank of Baroda
<i>S/N</i>	<i>Domestic Banks (Oman)</i>	<i>Foreign Banks (Oman)</i>
1	National Bank of Oman	Standard Chartered Bank
2	Bank Muscat	HSBC Bank
3	Oman Arab Bank	Habib Bank Ltd
4	Bank Dhofar	Bank of Beirut
5	Bank Sohar	State Bank of India
<i>S/N</i>	<i>Domestic Banks (Qatar)</i>	<i>Foreign Banks (Qatar)</i>
1	Qatar National Bank	HSBC Bank
2	Commercial Bank of Qatar	Standard Chartered Bank
3	Doha Bank	Gulf Bank
4	Al Khalij Commercial Bank	Mashreq Bank
5	International Bank of Qatar	Arab Bank Limited
<i>S/N</i>	<i>Domestic Banks (Saudi Arabia)</i>	<i>Foreign Banks (Saudi Arabia)</i>
1	National Commercial Bank	Deutsche Bank
2	Samba Financial Group	Emirates Bank
3	Banque Saudi Fransi	Bank Muscat
4	Arab National Bank	BNP Paribas
5	Riyad Bank	National Bank of Kuwait
<i>S/N</i>	<i>Domestic Banks (Bahrain)</i>	<i>Foreign Banks (Bahrain)</i>
1	National Bank of Bahrain	Citibank
2	Ahli United Bank	HSBC Bank
3	National Bank of Kuwait	BNP Paribas
4	Commercial Bank of Kuwait	HSBC Bank
5	Al Ahli Bank of Kuwait	Citibank

**Source: GCC central banks & Bank Scope database (2019)**

### **3.2.2 Inputs and Outputs Variables Selection for DEA Model**

The study used intermediation approach opposed to the production approach the modified version (Berger and Humphrey, 1997) for choosing input and output variables because the paper was focused on the analysis at the bank level. Two outputs and three variables were used for computing efficiency scores (Table 3.2). Since DEA approach efficiency results are affected by size of the sample, the sample size used by this study was in line with the rules of the thumb available in DEA literature. The study followed the DEA convention that the minimum number of DMUs were greater than three times the number of inputs plus output  $[(n > 3(m + s))]$ , where  $n$ =number of DMUs,  $m$ =number of inputs and  $s$ =number of outputs(Cooper et al. 2007) . Given

m=3 and s=2, the sample size (n=50) selected in this paper exceeds the desirable size as suggested by the rules of thumb to have sufficient discriminatory power.

**Table 3.2: Inputs and Outputs Variable selected for DEA Model**

<b>Variables</b>	<b>Previous Research</b>
<b>Input</b>	
Total deposits (X <sub>1</sub> )	GrifellTatje´ & Lovell 1999: Sathye ,2003: Darrat et al 2002: Kamarudin et al 2017
Staff numbers (X <sub>2</sub> )	Seiford and Zhu ,1999: Fukuyama & Weber,2002: Sathye,2003: Kamarudin et al 2017
Total expenses (X <sub>3</sub> )	Bhattacharyya et al, 1997: Sathye ,2003: Seelanatha 2012
<b>Output</b>	
Total Loans (Y <sub>1</sub> )	Bhattacharyya et al 1997: Fukuyama & Weber, 2002: Seelanatha 2012: Kamarudin et al 2017
Total income (Y <sub>2</sub> )	Bhattacharyya et al. 1997: Seiford and Zhu,1999: Sathye 2000: Kamarudin et al, 2017
X <sub>1</sub> ( deposits + short term funding): X <sub>2</sub> (total number of employees): X <sub>3</sub> (total operating and non operating expenses): Y <sub>1</sub> (total of short-term + long-term loans): Y <sub>2</sub> (interest income + non-interest income)	

**Source: Literature review, 2020**

### **3.3 Selection of variables for Tobit Regression Model**

This paper used seven determinants that may explain banks' efficiency. Literatures specify the determinants that explain the banks' efficiency. Some researches examine only banks internal factors and others identify both banks internal and external drivers. Based on conducted previous researches this paper only examined bank-specific variables because those were controllable internally by the management (Table 3.3).

**Table 3.3: Explanatory variables for Tobit Regression Model**

<b>Variables</b>	<b>Previous Research</b>
Bank size	Daley & Mathews 2009: Cook et al. 2000: Pasiouras et al. 2007: Sufian, 2009: Jackson & Feth, 2000: Yayar & Karaca 2014: Nizamülmülk & Yilmaz, 2016
Profitability	Casu & Molyneux ,2003: Hassan & Sanchez 2007: Rosman et al. 2014: Mamatzakis et al. 2015
Credit Risks	Delis and Papanikolaou ,2009: Hassan & Sanchez, 2007: Sufian & Noor, 2009: Naceur et al. 2009: Saha et al. 2015
Liquidity	Bourke,1989:Naceur et al. 2009: Ajibike & Aremu ,2015: Alshatti, 2014: Marozva, 2015
Management Quality	Sufian ,2009: Saha et al. (2015)
Capital strength	Bhattacharyya, Lovell & Sahay, 1997: Casu & Molyneux, 2003: Sufian, 2009: Kwan & Eisenbeis 1997: Hassan & Sanchez, 2007 Pasiouras, 2008: Tecles & Tabak, 2010: Rosman et al. 2014
Financial Leverage	Catalbas & Atan 2005: Isik & Hassan 2003, Batir, 2017: Yilmaz ,2016:

**Source: Literature review, 2020**

### 3.4 Methodological framework

#### 3.4.1 Data Envelopment Analysis Model

Data Envelopment Analysis (DEA) model was used to analyse relative efficiency scores, the paper employed input oriented both CCR and BCC to estimate the scalar measures of TE and PTE (Charnes et al 1978: Banker et al. 1984). DEA techniques for analysing Decision Making Unit (DMU) efficiency scores in different scale assumptions were explained in the following equations:

#### Input oriented models:

$$Min = \theta - \ell \left( \sum_{i=1}^m S_i^- + \sum_{k=1}^r S_k^+ \right) \quad 3.1$$

$$St. \quad \sum_{j=1}^n \lambda_j x_{ij} + S_i^- = \theta x_{iq} \quad 3.2$$

$$\sum_{j=1}^n \lambda_j y_{kj} - s_k^+ = y_{kq} \quad 3.3$$

$$\lambda_i \geq 0, s_i^+ \geq 0, s_i^- \geq 0 \quad 3.4$$

$$CCR \quad \sum_{j=1}^n \lambda_j - free \quad 3.5$$

$$\text{BCC} \quad \sum_{j=1}^n \lambda_j = 1 \quad 3.6$$

Where  $\lambda_j, j = 1, 2, \dots, n$  are weights of all DMUs  $s-i, i = 1, 2, \dots, m$  are slack variables of particular inputs and  $s+k, k = 1, 2, \dots, r$  are surplus variables of particular outputs. The ratio  $\theta_o^{CCR} / \theta_o^{BCC}$  gives the scale efficiency scores. All aforementioned the measures of efficiency were bounded between zero and one.

### 3.4.2 Tobit Regression Model

Tobit Regression Model was applied to test statistical relationship between banks efficiency measured by PTE and banks specific (internal) factors due to the fact that the truncated data could be accounted by the model (Casu & Molyneux, 2003). Because the dependent variable was limited or censored from below, thus Tobit Regression Model was more appropriate for this study than Ordinary Least Square (OLS) regression (Maddala, 1983; Greene, 1997). The paper used Tobit regression model which was first developed by Tobit (1958) and was given in the following functional form:

$$y_i^* = \beta_1 + \beta_2 X_{2i} + \dots + \beta_k X_{ki} + \mu_i \quad 3.7$$

$$y_i = 0 \quad \text{if} \quad y_i^* \leq 0 \quad \text{and}$$

$$y_i = y_i^* \quad \text{if} \quad y_i^* \geq 0$$

The equation above was extended by including the explanatory variables and efficiency scores as dependent variables as follows.

$$\Theta_{it} = \alpha_0 + \beta_1 (\log. A_{it}) + \beta_2 (ROA_{it}) + \beta_3 (NPL_{it}) + \beta_4 (LQD_{it}) + \beta_5 (NIE_{it}) + \beta_6 (EQTA_{it}) + \beta_6 (LEV_{it}) + \mu_{it}$$

Where:  $\Theta_{it}$  = PTE scores of Bank  $i$  at time  $t$ ,  $\alpha_0$  = Intercept,  $\log A_{it}$  = size of bank  $i$  at time  $t$ ,  $ROA_{it}$  = profitability of bank  $i$  at time  $t$ ,  $NPL_{it}$  = credit risk of bank  $i$  at time  $t$ ,  $LQD_{it}$  = liquidity ratio of bank  $i$  at time  $t$ ,  $NIE_{it}$  = Management quality of Bank  $i$  at time  $t$ ,  $EQTA_{it}$  = Capital strength of bank  $i$  at time  $t$ ,  $LEV_{it}$  = financial leverage of Bank  $i$  at time  $t$  and  $\mu_{it}$  = Error term

### 3.5 Definition and Measurement of Variables

Table 3.4 presents the descriptions summary of the variables used on banks' efficiency together with expected effect on banks' efficiency.

**Table 3.4: The Descriptions of the variables**

<b>Variables</b>	<b>Symbol</b>	<b>Descriptions</b>	<b>Expected Sign</b>
Pure Technical Efficiency	DEA <sub>PTE</sub>	the efficiency scores DEA - BCC Model	N/A
Bank size	H <sub>1</sub> log A	Natural log of banks total assets	+
Profitability	H <sub>2</sub> ROA	PBT/Total Assets	+
Credit Risks	H <sub>3</sub> NPL	Total Non Performing loans/Total loans	-
Liquidity	H <sub>4</sub> LQD	Total Loans/Total Assets	+
Management Quality	H <sub>5</sub> NIE	Total non Interest expenses to total assets	-
Capital strength	H <sub>6</sub> EQTA	Equity/Total Assets	+
Financial Leverage	H <sub>7</sub> LEV	Ratio of total debt to total assets at year-end	-

Source: Literature review, 2020

## 4.0 Results and Discussion

### 4.1 Efficiency of Domestic Banks

The summary results of the mean efficiency scores of domestic banks are shown in Table 4.1 for years 2015, 2016, 2017, 2018, 2019 and for all years and panels. The results indicated the mean of TE and PTE for GCC has been on an increasing trends from 73.2% to 81.5% and 80.8% to 90.8% during the years from 2015 to 2016 respectively, then showing downward trends for both efficiency scores in year 2017 to 78.5% and 88.6% respectively, before was rising again from 84.8% to 87.5% and 90.7% to 95.8% during the years from 2018 to 2019 respectively. The findings for all domestic banks in the whole period of study (Panel 6) indicated that the domestic banks were characterized with large asymmetry among banks in respect to their scores efficiency that ranges between 36.8% - 100% and 38.8% - 100% for TE and PTE respectively. The mean efficiency scores revealed to be 82.7% and 90.4% for TE and PTE respectively. This implies that, banks if produce their output on the efficient frontier instead of their current location; they would need only 82.7% of their inputs currently utilized. The connotation of these findings was that the magnitude of inefficiency scores in domestic banks in GCC countries was 17.3%. This proposes that, by applying the best available technology on average the sector could reduce its inputs of operating costs and number of staff by at least 17.3% and still the same level of output can be produced. In general, the findings indicated that banks were using up more inputs than the level of outputs they were producing. This implying that domestic banks had wasted 17.3% of their input resources in producing the same level of output; the findings showed that, efficiency scores in PTE was higher than TE due to the reason that the scores efficiency resulted from VRS scores are greater than or equal to CRS (Banker et al, 1984)

**Table 4.1 Summary Results of Efficiency Measures for GCC domestic-banks from 2015 to 2019.**

<b>Efficiency Scores</b>	<b>No. DMUs</b>	<b>Min.</b>	<b>Max</b>	<b>Mean</b>	<b>SD</b>
<i>Panel 1: Domestic banks: 2015</i>					
OTE	25	0.388	1.000	0.732	0.218
PTE	25	0.386	1.000	0.808	0.186
SE	25	0.542	1.000	0.906	0.133
<i>Panel 2: Domestic banks: 2016</i>					
OTE	25	0.446	1.000	0.815	0.192
PTE	25	0.468	1.000	0.908	0.144
SE	25	0.578	1.000	0.898	0.145
<i>Panel 3: Domestic banks: 2017</i>					
TE	25	0.369	1.000	0.785	0.235
PTE	25	0.472	1.000	0.885	0.168
SE	25	0.508	1.000	0.887	0.166
<i>Panel 4: Domestic banks: 2018</i>					
TE	25	0.549	1.000	0.848	0.146
PTE	25	0.588	1.000	0.907	0.133
SE	25	0.785	1.000	0.935	0.085
<i>Panel 5: Domestic banks: 2019</i>					
TE	25	0.664	1.000	0.875	0.132
PTE	25	0.742	1.000	0.958	0.076
SE	25	0.764	1.000	0.913	0.108
<i>Panel 6: All Domestic Banks: All Years</i>					
TE	125	0.368	1.000	0.827	0.186
PTE	125	0.388	1.000	0.904	0.142
SE	125	0.484	1.000	0.915	0.126

**Source: Author computation, 2020**

#### **4.2 Efficiency Scores of GCC Foreign Banks**

Table 4.2 illustrated the summary results of average scores efficiency of the foreign owned banks for all years of study and for all panels. The mean of TE and PTE for banks indicated that there was an increasing trend from 67.6% to % 76.2% and 78.6% to 84.6 % during the years from 2015 to 2016 for TE and PTE respectively. Then was followed by a slightly downward trend for both mean efficiency scores in years 2017 to 73.8% and 82.7% respectively, before the trend was

rising again from 85.4% to 92.2% and 90.4% to 95.6 % during the years from 2018 to 2019 for both OTE and PTE respectively. The findings in all years (Panel 6) for all foreign banks indicated that the foreign banks were characterized with significantly large asymmetry among banks in respect to their scores efficiency which ranges between 0.2% - 100% and 18.6% - 100% for OTE and PTE respectively. The efficiency scores mean turned out to be 71.8% for TE. This suggests that on average, foreign banking sector, if producing its outputs on the efficient frontier instead of its current (virtual) location, would need only 71.8% of their inputs currently used. The connotation of this finding was that, the magnitude of inefficiency scores was 28.2%. This suggests that, by applying best practice technology the sector on average could reduce their inputs of operating costs and staff by at least 28.2% and still the same level of outputs can be produced. In general, the findings showed that foreign banks were using up more inputs than the level of output they were producing. In other words, foreign banks had wasted 28.2 % of resources in producing their levels of output. The decomposition of TE into the components of PTE and SE the findings indicated that PTIE was SIE of GCC foreign banks in all years, the findings results are consistent with (Aghimien et al 2014) and earlier studies that the dominant factor affecting banks in GCC countries is managerial inefficiency.

**Table: 4.2 Summary Results of Efficiency Measures for GCC Foreign Owned Banks from 2015 to 2019.**

<b>Efficiency Scores</b>	<b>No. DMUs</b>	<b>Min.</b>	<b>Max</b>	<b>Mean</b>	<b>SD</b>
<i>Panel 1: Foreign - banks: 2015</i>					
TE	25	0.443	1.000	0.676	0.206
PTE	25	0.626	1.000	0.786	0.146
SE	25	0.468	1.000	0.838	0.221
<i>Panel 2: Foreign banks: 2016</i>					
TE	25	0.621	1.000	0.762	0.174
PTE	25	0.666	1.000	0.846	0.162
SE	25	0.848	1.000	0.942	0.076
<i>Panel 3: Foreign banks: 2017</i>					
TE	25	0.526	1.000	0.738	0.165
PTE	25	0.644	1.000	0.827	0.132
SE	25	0.758	1.000	0.888	0.112
<i>Panel 4: Foreign banks: 2018</i>					
TE	25	0.823	0.914	0.854	0.051
PTE	25	0.828	0.986	0.904	0.0658
SE	25	0.836	0.996	0.934	0.068
<i>Panel 5: Foreign banks: 2019</i>					
TE	25	0.832	1.000	0.922	0.081
PTE	25	0.922	1.000	0.956	0.042
SE	25	0.864	1.000	0.964	0.053
<i>Panel 6: All Foreign Banks: All Years</i>					
TE	125	0.002	1.000	0.718	0.262
PTE	125	0.186	1.000	0.842	0.189
SE	125	0.021	1.000	0.853	0.224

**Source: Author computation, 2020**

### **4.3. Robustness Tests**

The empirical results of data obtained from DEA computation was robustness tested in two different groups of independent sample namely domestic and foreign owned banks. It was recommended that for two independent samples coming from populations having the same distribution Mann Whitney [Wilcoxon] is relevant test (Coakes & Steed, 2003). The technique of robustness testing was used by previous studies (Isik & Hassan, 2014; Sufian et al 2012). In this paper parametric (t-test) and non-parametric (Mann Whitney and Kruskal-Wallis) were

conducted to obtain robust test results. In Table 4.3 the parametric t-test results revealed that domestic banks scored 0.827 where foreign banks scored 0.718 for TE test. In terms of PTE and SE test, domestic banks scored 0.904 and 0.915 while foreign banks were 0.842 and 0.853 respectively. The findings indicated that TE, PTE and SE were statistically and significant at at 5%, level which implies that the analysis had sufficient evidence to claim that the TE, PTE and SE performances of foreign banks were lower than domestic banks in GCC countries. Comparing to the mean efficiency scores results of domestic banks and foreign banks, it is clearly observed that the efficiency scores of all types for foreign banks were less compared to domestic banks. The finding may infer that domestic banks utilize their inputs more efficiently. The findings results favour Home field advantage hypothesis as domestic banks are more efficient than foreign banks. Therefore, the findings indicate that the global advantage hypothesis does not exist in GCC countries. The findings were compatible with the previous studies of (Sathye, 2001; Mesut, 2013; Sufian, 2017) which confirmed that foreign owned banks were less efficient than domestic banks.

**Table 4.3: Efficiency Measures for Robustness tests of Domestic and Foreign banks 2015–2019**

Groups Test	Parametric- tests		Non Parametric - tests		Kruskall Wallis tests	
	t-tests t(Prb>t)		Mann Whitney tests z(Prb>z)		$\chi^2$ (Prb> $\chi^2$ )	
	Means	T	Means- rank	Z	Means- rank	$\chi^2$
TE						
<i>Domestic banks</i>	0.827	2.668	108.92	-2.869	108.92	7.788
<i>Foreign banks</i>	0.718		80.51		80.51	
PTE						
<i>Domestic banks</i>	0.904	2.638	108.53	-2.566	108.53	6.674
<i>Foreign banks</i>	0.842		84.88		84.88	
SE						
<i>Domestic banks</i>	0.915	2.056	108.44	-2.648	108.44	6.058
<i>Foreign banks</i>	0.853		83.88		83.88	

**Significance Test at 5%**

**Source: Author computation, 2020**

#### 4.4 The Drivers of Banks Efficiency

Tables 4.4 presents the summary of regression results of factors explaining banks efficiency using Tobit regression model. Tobit regression model was used as a second stage to examine how banks' specific factors affect banks efficiency in GCC countries

#### **4.4.1 Effect of bank Size on Efficiency**

The study used LogA as proxy of banks size and result found a positive and significant relationship between banks size and PTE, as expected from study hypothesis. The implication of this finding is that large size banks in GCC countries were more efficient due to the economies of scale arguments. This study finding was consistent with previous studies by (Sufian, 2009: Jackson & Feth, 2000: Yayar & Karaca 2014: Nizamülmülk & Yilmaz, 2016) who found out that bank size have a positive and significant effect on banks efficiency. In this case, the large banks in GCC countries are efficient in transforming inputs into outputs regardless of their size of scale. The possible reasons for positive effect of banks size on efficiency could be large banks pay less inputs costs and attaining increasing return to scale due to allocation of fixed costs over a large volume of banking services or efficiency obtains from workforce specialization (Hauner, 2005).

#### **4.4.2 Effect of Profitability on Efficiency**

The study used ROA to measure bank profitability and exhibited positive and significant relationship with banks PTE, as expected and implied that banks with high efficient were able to earn more profits. This finding was consistent with the results found out by (Casu and Molyneux 2003: Sufian, 2009: Malaysian banks, Rosman et al. 2014: Mamatzakis et al. 2015),

#### **4.4.3 Effect of Credit Risks on Efficiency**

Total Non Performing loans to Total loans (NPL) as a proxy of credit risks exhibited negative relationship with banks PTE, as expected in this paper, indicating that increase in credit risks increased inefficiency of banks. The finding is similar to previous studies conducted by (Barr et al. 2002: Hassan and Sanchez, 2007: Sufian and Noor, 2009) who found out a negative effect of nonperforming loans on banks' efficiency. The finding implied that the banks managers in GCC countries should emphases more on credit risks management,

#### **4.4.4 Effect of Bank Liquidity on Efficiency**

The bank liquidity measured by loans to total assets found out to be positive and to have significant relationship with banks PTE as expected in this study. The finding implies that banks with higher liquidity ratios in GCC countries tend to have higher efficiency scores. The finding is consistent with the previous findings by (Isik & Hassan 2003: Casu & Girardone, 2004 and Sufian, 2009) who found out a positive effect of liquidity on efficiency but statistically insignificant. Isik and Hassan (2003) suggested that the positive effect of loans activity on banks efficiency could be caused by the relatively efficient banks their ability to manage bank operations more productively, which enables the banks to have lower costs of operation which made it to offer more reasonable loans terms giving them to gain larger share in loans market segment.

#### 4.4.5 Effect of management quality on efficiency

The management quality measured by total non-interest expenses to total bank assets (NIE/TA) were found to be a negative and significant relationship with banks' PTE, as expected in the proposed hypothesis. The implication is that, more noninterest operating expenses lead to inefficient in utilizing inputs for a given level of output. This finding supports the previous studies of (Sufian (2009: Saha et al. 2015) and Claessens et al. (2001) who suggested that the deterioration of banks efficiency level is caused by overstaffing.

#### 4.4.6 Effect of Capital Strength on Efficiency

The ratio of total equity to total assets as a proxy of capital strength was a significant and positive effect on PTE, as expected in this study. This positive relationship with bank efficiency was expected by this study in viewing that high equity level as a cushion for the future losses in GCC banks. This finding is similar to (Isik & Hassan, 2003: Casu and Girardone 2004: Pasiouras, 2008: Rosman, 2014) found capital strength was positive and statistically significant related to banks efficiency.

#### 4.4.7 Effect of Financial Leverage on Efficiency

The study used ratio of total debt to total assets to measure financial leverage and found to have negative effect on banks efficient, however, not statistically significant. Negative effect implied that banks with higher ratio tends to be inefficient because they are risk averse and prefer to safer and lower earning portfolios (Jackson and Fethi, 2000). The similar negative findings were found by (Catalbas & Atan 2005: Isik and Hassan 2003: Nizamülmülk and Yilmaz, 2016 Batir, 2017).

**Table 4.4: Results for Tobit regression of domestic and Foreign Banks in GCC Countries**

Tobit - Regression					Number of obs. = 250	
					LR chi <sup>2</sup> (12) = 68.74	
					Prob > chi2 = 0.000	
					Pseudo R <sup>2</sup> = 0.6145	
					[95 % Confidence – Interval]	
DEAPTE	Coefficient.	Standard. Error	T	P > t		
log A	0.0201	0.0215	5.861	0.002	0.0624	0.0222
ROA	0.5865	0.0133	4.884	0.006	0.0305	0.0828
NPL	-0.0680	0.0140	-6.582	0.000	-0.0678	0.0517
LQD	0.0899	0.0849	4.685	0.003	0.0609	0.1236
NIE	-0.0145	0.0104	-4.483	0.001	-0.0349	0.0060
EQTA	0.8875	0.0237	4.287	0.006	0.0407	0.0848
LEV	-0.4174	0.1190	0.516	0.785	-0.6520	0.1828
_cons	0.8672	0.0733	12.862	0.000	0.7225	1.0119

Source: Author computation, 2020

## 5.0 Conclusions

This paper compared efficiency performance and its drivers of 25 domestic banks and 25 foreign owned banks in GCC countries during the period of 2015-2019 using DEA models. The intermediation approach was used to select inputs and outputs variables. In addition Tobit regression model was applied to investigate the effect of a set of banks specific exploratory variables namely bank size, profitability, credit risks, bank liquidity, management quality, capital strength and financial leverage on banks efficiency. The findings indicated that on average the efficiency scores of domestic banks sector was 0.827 which implied that the same level of output could be produced by domestic banks only with 82.7% of the amount of inputs used. Banks could have reduced their labour and total expenses (inputs) by 17.3% and still could produce the same amount of outputs. Meanwhile mean efficiency of foreign banks was 0.718 which indicated that the banks could have produced the same outputs level with only 71.8% of the amount of inputs of resources utilized. Foreign banks could have reduced their labour and total expenses (inputs) by 28.2% and still could produce the same level of output. Thus, the overall banks inefficiency could be explained somehow by underutilization of inputs resources. In the study specification banks employ deposits, labour and total expenses as inputs to produce loans and total income. Therefore, underutilization of inputs resources for a specific bank could be related to large amount of operating costs, overstaffing or unproductive deposits if compared to its peers. The PTE and SE scores indicated that domestic banks inefficiency could be attributed more by PTIE (9.6%) than SIE (8.5%). The PTE and SE scores indicated that foreign banks inefficiency were attributed more by PTIE (15.8%) than SIE (14.7%). Both banks groups in GCC countries were facing managerial inefficiency in exploiting their resources to the fullest; banks can make more value by removing inefficiencies and redundancies (Evanoff & Israelvich, 1991).

The findings indicated that domestic banks recorded higher level of TE, PTE and SE scores than foreign owned banks in GCC over the period from 2015 to 2019 at 5% level of significance. The findings favour *home field advantage hypothesis* since foreign banks was less efficient than their domestic counterparts and that *global advantage hypothesis* was not prevailing in GCC countries. Finally the results on Tobit regression model revealed that bank size, profitability, credit risks, management quality and capital strength were the main drivers of banks efficiency in GCC countries. The findings indicated that there was a positive and significant relationship between banks efficiency and bank size, profitability and liquidity. On the other hand, there was negative and significant relationship between banks efficiency and credit risks and management efficiency.

The findings of this study are crucial for the development of new financial rules and regulations for policy makers in order to improve the banking sector performance in GCC countries. For bank managers and investors, the findings provide crucial insight on the efficiency of banking sector in the Region.

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