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Islamic Banking Sectors in Gulf Cooperative Council Countries: Analysis on Revenue, Cost and Profit Efficiency Concepts

Fakarudin Kamarudin[1], Annuar Md Nassir[2], Mohamed Hisham Yahya[3], Ridzwana Mohd Said[4] and Bany Ariffin Amin Nordin[5]

This paper examines the revenue efficiency and the others efficiencies concepts profit and cost efficiency levels of 74 banks (47 conventional and 27 Islamic banks) in Gulf Cooperative Council (GCC) countries over the periods 2007 to 2011. The level of efficiencies was measured using Data Envelopment Analysis (DEA) method which applied the intermediation approach. We find that, that the Islamic banks have exhibited a lower efficiency levels for all three efficiencies measures rather than conventional banks. This study seems to suggest revenue efficiency seems to play the main factor leading to the lower or higher profit efficiency levels. The determinants that could improve the revenue efficiency in GCC Islamic banks were identified using Multiple Regression Analysis (MRA). Four bank specific determinants were found to influence the improvement of revenue efficiency: asset quality, non-traditional activities, management quality and liquidity. The improvement of the revenue efficiency in GCC Islamic banks was also influenced by the macroeconomic variable inflation and concentration ratio of the three largest banks.

1. Introduction

Islamic bank is an intermediary and trustee of money of other people but the difference is how it shares profit and loss with its depositors. The introduction of the element of mutuality in Islamic banking makes its depositors as customers with some ownership of right in it (Dar and Presley, 2000).Meanwhile the conventional banking follows conventional interest-based principle, the Islamic banking is based on interest free principle and principle of Profit-and-Loss (PLS) sharing in performing their businesses as intermediaries (Arif, 1988). According to

[1,2,3,4,5] Faculty of Economics and Management, Universiti Putra Malaysia,
Email: fakarudinkamarudin@gmail.com, fakarudin@econ.upm.edu.my

Santos (2000), the conventional banking theories assume that banks earn profits by purchasing transactions deposits from the depositors at a low interest rate, then reselling those funds at a higher interest rate to borrowers.

Nowadays, the globalization era has improved the financial institutions over the world through the greater deregulation and liberalization. The Islamic Banking is the one of the most growing institutions and become most competitive to the conventional banking. The practice of Islamic banking is now spread world-wide, from Middle East to Europe and the USA.

However, the increasing in advance technology, the liberalization of financial markets at a global scale and the information revolution has put competitive pressure on banking sectors (Carvallo and Kasman, 2005). This competition pressure is particularly significant for banks in the emerging markets as they constitute the main financial intermediaries to channel saving and investment. In this content, the competitive advantage is improved if banks could function efficiently.

Therefore, the conventional banks enjoy several advantages over Islamic banks because they have a good experience and long history, practice and accept the interest from the loan that represent major source of the banks' revenue. In addition, conventional banks also enjoy a huge capital, do not share loss with clients, have much more developed technologies, ask for guaranteed collaterals in most transaction and spread very widely through the large numbers of the banks' branches. Furthermore, the conventional bank could also enter Islamic banking market that gives a more advantage to be a competitive rival to Islamic banking. For example, the Western financial market players such as Citibank, ABN AMRO, HSBC and others established their own Islamic windows or subsidiaries to attract petrodollars' deposits from the Middle East and Muslims clientele in local markets. Most of the previous studies had investigated the efficiency of the both Islamic and conventional banks and the results are mixed and inconclusive. Some of the researchers suggest the conventional banks are more efficient than Islamic (Sairi 2010 and Samad 1999), while others discovered on the other way (Hussien, 2004; Yudistira, 2004 and Samad and Hassan, 1999). Consequently, it is interesting to examine efficiency level form the both banking sectors.

Berger and Humphrey (1997) suggest studies focused on the efficiency of financial institutions have become an important part of banking literature science the early 1990s. A study by Berger et al. (1993a) suggests that if banks are efficient, they could expect improved profitability, better prices and better service quality for consumers and that greater amounts of funds would be intermediated. In fact, the general concept of efficiency covers three components; namely, cost, revenue and profit efficiency (Adongo et al., 2005 and Bader et al., 2008). Evidence on bank efficiency could be produced by discovering these three types of efficiency concept. However, few studies have examined the comprehensive efficiency that consists of these three components. Most previous studies have mainly focused on the efficiency of cost, profit or both (Sairi 2010; Bader et al., 2008; Ariff and Can, 2008; Maudos et al., 2002).

Studies on bank efficiency which ignore the revenue side have been criticised (Bader et al., 2008). It is mainly because most of the studies have only revealed the levels of cost efficiency which are higher than the profit efficiency, but they have not identified the causes. According to Chong et al. (2006), banks desire to maximize the profit to maximize the shareholders' value or wealth. However, the main problem that contributes to the lower profit efficiency comes from revenue inefficiency. Ariff and Can (2008), Sufian et al. (2012a) and Sufian et al. (2012b) found that the inefficient revenue affected the difference between cost and profit efficiency. A study which investigated on the causes of inefficiency was done by Maudos et al. (2002), Rogers (1998) and Berger et al. (1993) who found that revenue inefficiency was caused either by mispricing of outputs or giving wrong choice of output.

Therefore, instead of focusing the Islamic and conventional banks on profit efficiency alone, it is better to compare it with cost efficiency as well in order to identify the existence of revenue efficiency. To the best of our knowledge, this is the first empirical study that has examined the comprehensive efficiencies concept including the revenue efficiency on Islamic and conventional banking sector in GCC countries. By employing a non-parametric Data Envelopment Analysis (DEA) method, we analyze the cost, revenue and profit efficiencies of the GCC Islamic and conventional banks over the period of 2007 to 2011. The preferred non-parametric Data Envelopment Analysis (DEA) methodology has allowed us to distinguish between three different types

of efficiency, which are cost, revenue and profit efficiencies. Furthermore, we perform a series of parametric (t-test) and non-parametric (Mann- Whitney [Wilcoxon] and Kruskall-Wallis) tests to examine whether the Islamic banks are more revenue efficient rather than conventional banks in GCC countries.

The present study also seeks to discover the determinants that are responsible in producing efficient results in terms of revenue efficiency in GCC banking sectors using the Multiple Regression Analysis (MRA). The analysis applied the Generalized Least Square (GLS) method consisting of Fixed Effect Model (FEM) and Random Effect Model (REM) run by Hausman test. This information could be useful to several parties and may have several implications for regulators, bankers, investors and academicians.

The paper is set out as follows: the next section provides the related literature. Section 3 discusses on the methods and variables employed in the study. We present the empirical findings in section 4. The article concludes and provides discussions on the policy implications in section 5.

2. Literature Review

There are some documented studies that compare the performance of Islamic banks with their conventional counterparts. Nevertheless, the previous studies mostly concentrate on the technical, pure technical and scale efficiency (Isik and Hassan, 2002; Hassan and Hussein, 2003; Yudistira, 2004 and Tahir and Haron, 2008). Despite the significant importance of this area, documented studies that address on cost, revenue and profit efficiency are very few (Yudistira, 2004; Hassan, 2005 and Brown and Skully, 2005).

Sufian et al. (2008) perform an analysis on the efficiency of Islamic Banks using empirical evidence from the MENA (Middle East and North Africa) and Asian Countries. Using the non-parametric Data Envelopment Analysis method (DEA), they estimate three different types of efficiency measures, namely technical, pure technical and scale efficiency. The result shows that pure technical inefficiency (PTIE) outweighs scale inefficiency (SIE) in the Islamic bank. Although the Islamic banks have been operating at a relatively optimal scale of

operations, they were managerially inefficient to exploit their resources to the fullest.

On the other hand, Hassan and Hussein (2003) study the efficiency of the Sudanese banking system during the period of 1992 and 2000. They apply a variety of parametric and non-parametric DEA techniques to a panel of 17 Sudanese banks. They discover that the Sudanese banking system have exhibited 37% allocative efficiency (AE) and 60% technical efficiency (TE), suggesting that the overall cost inefficiency of the Sudanese Islamic banks were mainly due to the technical efficiency (managerially related) rather than allocative efficiency (regulatory).

Saaid (2003) investigates the X-efficiency (TE and AE) of 12 Sudanese banks using Stochastic Frontier Approach (SFA). He asserts that the overall inefficiency could be attributed more on TIE rather than on allocative inefficiency (AIE). Thus, the inefficiency in the Sudanese Islamic banks could be associated more with input wasting (TIE) rather than choosing the incorrect input combinations (AIE).
On the other hand, there are many studies had conducted the cost and profit efficiency in the conventional banks rather than Islamic banks and discovered that the different levels between cost and profit efficiency are caused by the inefficiency from the revenue side (such as: Chu and Lim, 1998; Rogers, 1998; Maudos et al., 2002 and Berger and Mester, 2003).

Cost efficiency means that a firm is able to minimise the costs of inputs while producing the same amount of outputs sold at certain prices (Berger and Mester, 1997 and Ariff and Can, 2008). Berger and Humphrey (1997) claimed that most of the previous studies focused on the cost efficiency (such as Srinivasin, 1992; Linder and Crane, 1992; Shaffer, 1993; Berger and Humphrey, 1992; Rhoades, 1993; Pilloff, 1996 and Resti, 1997) and suggested that research on the revenue and profit efficiency has been scarce. Most ignored the revenue and profit side on the efficiency of the banks (Akhavein et al., 1997 and Bader et al., 2008).

Profit efficiency is also a firm's maximisation of profit since it takes into account both the cost and revenue effects on the changes in output scale and scope. Profit efficiency measures how close a bank comes to producing the maximum profit, given an amount of inputs and outputs and a level of their prices (Akhavein et al., 1997; Akhigbe and McNulty,

2003 and Ariff and Can, 2008). Thus, the profit efficiency provides a complete description on the economic goal of a bank that requires banks to reduce the cost and increase the revenue. Furthermore, according to Berger and Mester (2003) and Maudos and Pastor (2003), profit efficiency offers more useful information on management efficiency.

Revenue is defined as how effectively a bank sells its outputs. Maximum revenue is obtained as a result of producing the output bundle efficiently (Rogers, 1998 and Adongo et al., 2005). In fact, revenue efficiency is decomposed of technical and allocative efficiency which are related to managerial factors and is regularly associated with regulatory factors (Isik and Hassan, 2002). English et al. (1993) posits, in order to ascertain the revenue efficiency, banks should focus on both technical efficiency (managerial operating on the production possibilities) and allocative efficiency (bank producing the revenue maximizing mix of outputs based on the certain regulation).

Study by Sufian and Majid (2007) examine the cost and profit efficiency in the Malaysian banks over the period 2002-2003. They find that the cost efficiency was on average significantly higher compared to the profit efficiency. In addition, Rogers (1998), Moudos et al. (2002) and Ariff and Can (2008) also find similar results where the level of the profit efficiency is lower than cost efficiency.

In fact, the revenue efficiency could be the main factor that influences the lower or higher profit efficiency level. Ariff and Can (2008), Sufian et al. (2012a) and Sufian et al. (2012b) found that the inefficient revenue affected the difference between cost and profit efficiency. However according to Berger and Humphrey, (1997), Akhavein et al. (1997), Bader et al. (2008), Sufian et al. (2012a) and Sufian et al. (2012b) stated that there have been limited studies done on revenue efficiency in the banking sectors. A study which investigated on the causes of inefficiency was done by Maudos et al. (2002), Rogers (1998) and Berger et al. (1993) who found that revenue inefficiency was caused either by mispricing of outputs or giving wrong choice of output.

3. Data and Methodology

The present study gathers data from all GCC Islamic and conventional banks from 2007 to 2011. The primary source for financial data is obtained from the BankScope database produced by the Bureau van Dijk which provides the banks' balance sheets and income statements. The data were collected from 74 banks (47 conventional and 27 Islamic banks) and list of banks presented in Appendix 1.

3.1 Method of Measurement in First Stage

The study uses the non-parametric Data Envelopment Analysis (DEA) frontier analysis method, also known as mathematical programming approach. It constructs the frontier of the observed input-output ratios by linear programming techniques. The linear substitution is possible between observed input combinations on an isoquant (the same quantity of output is produced while changing the quantities of two or more inputs) that was assumed by DEA. Charnes et al. (1978) were the first to introduce the term DEA to measure the efficiency of each DMU, obtained as a maximum of a ratio of weighted outputs to weighted inputs. The more the output produced from given inputs, the more efficient is the production. Sherman and Gold (1985) were the first to apply DEA method to banking sectors. According to Bader et al. (2008), the DEA technique is extensively used in many recent banking efficiency studies (Drake et al., 2006 and Sufian 2008). Nevertheless, it was Farrell (1957) who originally developed this non-parametric efficiency approach.

Thus, the DEA Excel Solver developed by Zhu (2009) under the VRS model is adopted in order to solve the cost, revenue and profit efficiency. The cost, revenue and profit efficiency models are given in Equations (1) – (3) below. As can be seen, the cost, revenue and profit efficiency scores are bounded within the 0 and 1 range.

Frontier Type	Cost Efficiency (1)	Revenue Efficiency (2)	Profit Efficiency (3)
VRS	$min \sum_{i=1}^{m} p_i^o \tilde{x}_{io}$ *subject to* $\sum_{j=1}^{n} \lambda_j x_{ij} \le \tilde{x}_{io} \quad i=1,2,...,m;$ $\sum_{j=1}^{n} \lambda_j y_{rj} \ge y_{ro} \quad r=1,2,...,s;$ $\lambda_j, \tilde{x}_{io} \ge 0$ $\sum_{j=1}^{n} \lambda_j = 1$	$max \sum_{r=1}^{s} q_r^o \tilde{y}_{ro}$ *subject to* $\sum_{j=1}^{n} \lambda_j x_{ij} \le \tilde{x}_{io} \quad i=1,2,...,m;$ $\sum_{j=1}^{n} \lambda_j y_{rj} \ge \tilde{y}_{ro} \quad r=1,2,...,s;$ $\lambda_j \tilde{y}_{ro} \ge 0$ $\sum_{j=1}^{n} \lambda_j = 1$	$max \sum_{r=1}^{s} q_r^o \tilde{y}_{ro} - \sum_{i=1}^{m} p_i^o \tilde{x}_{io}$ *subject to* $\sum_{j=1}^{n} \lambda_j x_{ij} \le \tilde{x}_{io} \quad i=1,2,...,m;$ $\sum_{j=1}^{n} \lambda_j y_{rj} \ge \tilde{y}_{ro} \quad r=1,2,...,s;$ $\tilde{x}_{io} \le x_{io}, \tilde{y}_{ro} \ge y_{ro}$ $\lambda_j \ge 0$ $\sum_{j=1}^{n} \lambda_{j=1}$

Source: Zhu (2009)

where

s	is output observation
m	is input observation
r	is s^{th} output
i	is m^{th} input
q_r^o	is unit price of the output r of DMU0 (DMU0 represents one of the n DMUs)
p_i^o	is unit price of the input i of DMU0
$\tilde{y}_{ro}$	is r^{th} output that maximise revenue for DMU0
$\tilde{x}_{io}$	is i^{th} input that minimise cost for DMU0
y_{ro}	is r^{th} output for DMU0
x_{io}	is i^{th} input for DMU0
n	is DMU observation
j	is n^{th} DMU
λ_j	is non-negative scalars
y_{rj}	is s^{th} output for n^{th} DMU
x_{ij}	is m^{th} input for n^{th} DMU

By calculating these three efficiencies concepts (cost, revenue and profit), we could observe the GCC Islamic and conventional banks on these efficiency levels and more robust results could be obtained.

3.2 Inputs, Outputs, Approaches and the Choice of Variables

The collection or selection of the bank inputs and outputs could be difficult in the evaluation of the bank efficiency to be used in the first stage of DEA analysis. Bader et al. (2008) stated explicitly that there is 'no perfect approach' in the selection of the bank inputs and outputs. Berger and Humphrey (1997) also found that there are some restrictions on the type of variables since there is a need for comparable data and to minimise possible biases due to different accounting practices in the collection of the variables. In fact, they stated that even in the same country, different banks might apply different accounting standards. The results of the efficiency scores for each study on the bank efficiency will be affected due to the selection of variables. Thus, the DEA method requires bank inputs and outputs as the choice is always an arbitrary issue (Ariff and Can, 2008 and Berger and Humphrey, 1997). Since the issue selecting approaches is still arbitrary, this study had decided to use intermediation approach because we assume bank is more suitable to be classified as intermediary entity

Therefore, two inputs, two input prices, two outputs and two output prices variables were chosen. The overall selection of the variable of banks' input and output was based on Ariff and Can (2008) and other major studies on the efficiency of the banks (Sufian et al., 2012a; Sufian et al., 2012b; Sufian and Habibulah, 2009; Bader et al., 2008; Isik and Hassan, 2002; and Hassan, 2005). The two input vector variables consist of x1: deposits and x2: labour. The input prices consist of w1: price of deposit, w2 and price of labour

The two output vector variables are y1: loans and y2: income. Meanwhile, two output prices consist of r1: price of loans and r2: price of income. The summary of data used to construct the efficiency frontiers are presented in Table 1.

Table 1: Summary statistics of the Variables input and output in the DEA model (in million USD)

Variable	Mean	Minimum	Maximum	Std. Deviation
Deposit (x1)	11,740.227	0.044	69,172.564	13,213.378
Labour (x2)	121.856	0.900	661.387	124.103
Loan (y1)	9,795.650	6.875	54,017.420	10,190.788
Income (y2)	694.820	0.100	3,178.320	711.964
Price of deposit (w1)	0.078	0.001	5.773	0.387
Price of labour (w2)	0.012	0.001	0.120	0.014
Price of loan (r1)	0.101	0.010	6.393	0.377
Price of income (r2)	0.362	0.000	14.333	1.518

Notes: x1: Deposits (deposits and short term funding), x2: Labour (personnel expenses), y1: Loans (total of short-term and long-term loans), y2: income (gross interest and dividend income), w1: Price of deposits (total interest expenses/ deposits), w2: Price of labour (personnel expenses/ total assets), r1: Price of loans (interest income on loans / loans), r2: Price of income (other operating income/ income)

3.3 Method of Measurement in Second Stage

3.3.1 Multiple Regression Analysis

The next purpose of this study is to identify the potential bank specific and macroeconomic determinants which influence the GCC Islamic banking sector's revenue efficiency. Most previous studies have used a multiple regression analysis (MRA) model in order to focus on the relationship between bank profitability and explanatory variables to identify the determinants of the profitability (such as, Maudos et al., 2002 and, Sufian and Habibullah, 2009).

By using the revenue efficiency scores as dependent variable, we developed the following regression model:

$$\begin{aligned} ln\theta_{jt} = {} & \alpha_t + \beta_{jt}(LnTA_{jt} + lnLLRGL_{jt} + lnETA_{jt} + lnNIITA_{jt} + ln\ NIETA_{jt} + ln\ LOANSTA_{jt} \\ & + lnGDP_{jt} + lnINFL_{jt} + lnCR3_{jt} + lnTA_{jt} * IB_{jt} + lnLLRGL_{jt} * IB_{jt} \\ & + lnETA_{jt} * IB_{jt} + lnNIITA_{jt} * IB_{jt} + ln\ NIETA_{jt} * IB_{jt} + ln\ LOANSTA_{jt} * IB_{jt} \\ & + lnGDP_{jt} * IB_{jt} + lnINFL_{jt} * IB_{jt} + ln\ CR3_{jt} * IB_{jt}) + \varepsilon_{jt} \end{aligned}$$

Where:

$\ln\theta_{jt}$	is the revenue efficiency of the j-th bank in the period t obtained from DEA model
lnTA	is a log total assets (size of bank)
lnLLRGL	is a loan loss reserve to gross loan (asset quality)
lnETA	is an equity to total assets (capitalisation)
lnNIITA	is a non-interest income over total assets (non-traditional activities)
lnNIETA	is a non-interest expense over total assets (management quality)
lnLOANSTA	is a total loan over total assets (liquidity)
lnGDP	is a log of gross domestic product (economic growth)
lnINFL	is a customer prices index (inflation)
lnCR3	is a concentration ratio of three largest banks assets
lnTA*IB	is an interaction bank size and dummy Islamic bank
lnLLRGL*IB	is an interaction asset quality and dummy Islamic bank
lnETA*IB	is an interaction capitalisation and dummy Islamic bank
lnNIITA*IB	is an interaction non-traditional activity and dummy Islamic bank
lnLOANSTA*IB	is an interaction liquidity and dummy Islamic bank
lnGDP*IB	is an interaction economic growth and dummy Islamic bank
lnINFL*IB	is an interaction inflation and dummy Islamic bank
lnCR3*IB	is an interaction concentration ratio of three largest banks asset and dummy Islamic bank
j	is a number of bank
t	is a year
α	is a constant term
β	is a vector of coefficients
ε_{jt}	is a normally distributed disturbance term

This study will run the result according to the step-wise or separately models rather than on simultaneous models in order to avoid the multicollinearity problems. Therefore, the proposed model contains 11 models that are used to examine the relationship between the revenue efficiency of the GCC banks and determinants variables.

3.3.2 Determinants Variables Description Used in MRA Models

There are six bank specific and three macroeconomics determinants variables used in the second stage of analysis. In addition, this study also introduces interaction variables. The interaction of all variables against the dummy Islamic banks (IB) produces a specific and robust result on the determinants that contribute to the higher revenue efficiency in GCC Islamic banks. For further description on these variables please refer Appendix 2

3.3.3 Estimation Method: Generalized Least Square

The Generalized Least Square (GLS) method is used in this study rather than the Ordinary Least Square (OLS) as method of estimation to estimate the panel data regression formed. The decision is made following Gujarati's (2002) suggestion that GLS may overcome the heteroscedasticity, resulted from utilizing financial data with differences in sizes. Due to the fact that the sample employed in this study consists of small and large banks, differences in sizes of the observations are expected to be observed.

The usual practice of econometrics modelling assumes that error is constant over all time periods and locations due to the existence of homoscedascity. Nevertheless, problems could arise which lead to heteroscedasticity issues as variance of the error term produced from regression tend not to be constant, which is caused by variations of sizes in the observation. Therefore, the estimates of the dependent variable will be less predictable (Gujarati, 2002).

Using OLS estimation will solve the problem since it adopts the minimizing sum of residual squares condition. The OLS allows all errors to receive equal importance no matter how close or how wide the individual error spread is from the sample regression function. On the other hand, GLS minimizes the weighted sum of residual squares. In GLS estimation, the weight consigned to each error term is relative to its variance of the error term. Error term that comes from a population with large variance of error term will get relatively large weight in minimizing residual sum of squares (RSS). Consequently, if a problem of non-constant error arises, GLS is able to produce estimators in Best Linear Unbiased Estimators (BLUE) version because it accounts for

such a problem by assigning appropriate weight to different error terms, which in turn, produces an ideal constant variable (Gujarati, 2002).

4. Empirical Results

4.1 First Stage: Results and Tests of DEA

Table 2 and figure 1(graph) illustrates all efficiencies concepts which are cost, revenue and profit efficiency for GCC Islamic and conventional banks.

Figure 1: Graph on Cost, Revenue & Profit Efficiencies for Islamic & Conventional Banks in GCC countries during year 2007-2011

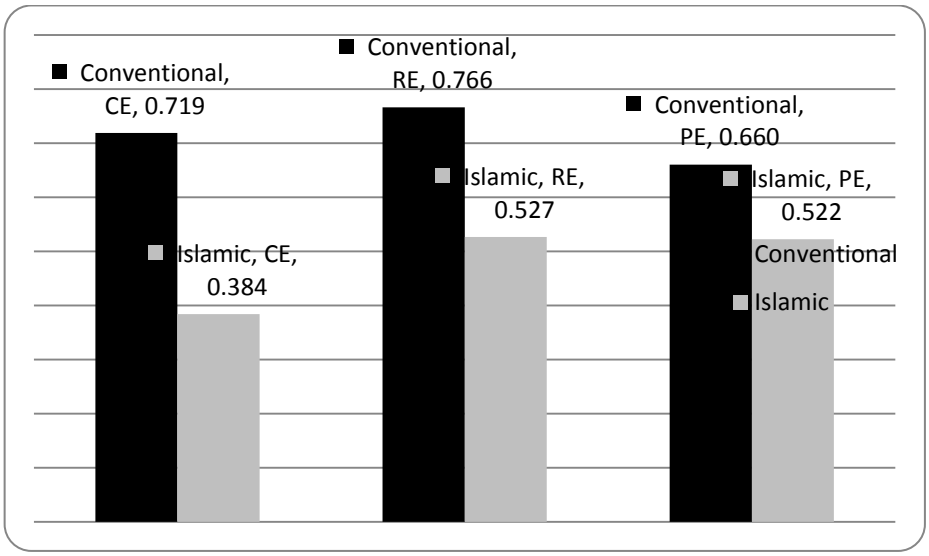

Table 2: Summary on Cost, Revenue and Profit Efficiencies for Islamic and Conventional Banks in GCC countries during year 2007-2011

No.	Islamic Bank	CE	RE	PE	No.	Conventional Bank	CE	RE	PE
1	ABC Islamic Bank (E.C.)	0.058	0.426	0.609	1	Abu Dhabi Commercial Bank	0.999	1.000	1.000
2	Abu Dhabi Islamic Bank	1.000	1.000	1.000	2	Ahli Bank QSC	0.610	0.861	0.761
3	Ajman Bank	0.273	0.300	0.276	3	Ahli United Bank BSC	0.571	0.661	0.334
4	Al Rajhi Banking and Investment Corp	1.000	0.978	1.000	4	Ahli United Bank KSC	0.589	0.638	0.407
5	Albaraka Banking Group B.S.C.	0.955	0.539	0.858	5	Al Ahli Bank of Kuwait (KSC)	0.627	0.772	0.550
6	Albaraka Islamic Bank BSC	0.105	0.096	0.045	6	Al Khalij Commercial Bank	0.576	0.471	0.320
7	Alinma Bank	0.322	0.488	0.478	7	Arab Banking Corporation BSC	0.680	0.551	0.271
8	Al-Salam Bank-Bahrain B.S.C.	0.008	0.300	0.270	8	Arab National Bank	0.634	0.671	0.586
9	Arcapita Bank B.S.C.	0.007	0.079	0.051	9	Awal Bank	0.494	0.633	0.622
10	Bahrain Islamic Bank B.S.C.	0.012	0.164	0.100	10	Bank Al-Jazira	0.527	0.525	0.415
11	Bank AlBilad	0.017	0.305	0.266	11	Bank Dhofar SAOG	0.829	0.826	0.780
12	Bank Alkhair BSC	0.038	0.008	0.004	12	Bank Muscat SAOG	0.672	0.747	0.652
13	Boubyan Bank KSC	0.007	0.350	0.472	13	Bank of Bahrain and Kuwait B.S.C.(BBK)	0.605	0.601	0.369
14	Dubai Islamic Bank plc	0.599	0.627	0.450	14	Bank of Sharjah	0.732	0.792	0.717
15	Elaf Bank	0.378	1.000	1.000	15	Bank Sohar SAOG	0.779	0.877	0.800
16	Emirates Islamic Bank PJSC	0.002	0.306	0.161	16	Barwa Bank	1.000	1.000	1.000
17	Investors Bank BSC	0.811	1.000	1.000	17	Burgan Bank SAK	0.542	0.688	0.445
18	Islamic Development Bank	0.814	0.974	0.931	18	Commercial Bank International P.S.C.	0.812	0.723	0.614
19	Kuwait Finance House	0.821	0.799	0.713	19	Commercial Bank of Dubai P.S.C.	0.737	0.795	0.725

Table 2: Summary on Cost, Revenue and Profit Efficiencies for Islamic and Conventional Banks in GCC countries during year 2007-2011 (cont.)

No.	Islamic Bank	CE	RE	PE	No.	Conventional Bank	CE	RE	PE
20	Kuwait International Bank	0.019	0.354	0.398	20	Commercial Bank of Kuwait SAK (The)	0.584	0.874	0.751
21	Noor Islamic Bank	0.148	0.469	0.227	21	Commercial Bank of Qatar (The) QSC	0.742	0.761	0.679
22	Qatar International Islamic Bank	0.016	0.230	0.160	22	Doha Bank	0.588	0.640	0.426
23	Qatar Islamic Bank SAQ	0.143	0.439	0.348	23	Emirates Bank International PJSC	1.000	1.000	1.000
24	Seera Investment Bank BSC	0.356	0.916	0.900	24	First Gulf Bank	0.856	0.965	0.903
25	Shamil Bank of Bahrain B.S.C.	0.022	0.127	0.043	25	Gulf Bank KSC (The)	0.641	0.890	0.838
26	Sharjah Islamic Bank	0.407	0.600	0.480	26	Gulf International Bank BSC	0.763	0.843	0.729
27	Venture Capital Bank	0.744	0.696	0.891	27	International Bank of Qatar Q.S.C.	0.561	0.682	0.495
					28	International Banking Corporation BSC	0.810	1.000	1.000
					29	Invest Bank P.S.C.	0.858	0.921	0.901
					30	Mashreqbank	0.721	0.638	0.357
					31	National Bank of Abu Dhabi	0.907	0.991	0.986
					32	National Bank of Bahrain	0.438	0.464	0.284
					33	National Bank of Dubai	0.576	0.725	0.530
					34	National Bank of Fujairah	0.784	0.725	0.592
					35	National Bank of Kuwait S.A.K.	0.804	0.801	0.830
					36	National Bank of Oman (SAOG)	0.711	0.731	0.634
					37	National Bank of Ras Al-Khaimah	0.927	0.770	0.837
					38	National Bank of Umm Al-Qaiwain	0.821	0.836	0.836

Table 2: Summary on Cost, Revenue and Profit Efficiencies for Islamic and Conventional Banks in GCC countries during year 2007-2011 (cont.)

No.	Islamic Bank	CE	RE	PE	No.	Conventional Bank	CE	RE	PE
					39	National Commercial Bank (The)	0.906	0.838	0.906
					40	Oman Arab Bank SAOG	0.847	0.809	0.770
					41	Oman International Bank	0.729	0.665	0.600
					42	Qatar National Bank	0.830	0.977	0.855
					43	Riyad Bank	0.679	0.778	0.675
					44	Saudi British Bank (The)	0.652	0.697	0.583
					45	Saudi Hollandi Bank	0.583	0.645	0.462
					46	Union National Bank	0.698	0.831	0.656
					47	United Arab Bank PJSC	0.860	0.875	0.885
	MEAN FORM ALL BANKS	**0.384**	**0.527**	**0.522**		**MEAN FROM ALL BANKS**	**0.719**	**0.766**	**0.660**

4.1.1 Efficiency of GCC Islamic Banks

Table 2 shows the mean of cost, revenue, and profit efficiency for the GCC Islamic banks of 38.4%, 52.7% and 52.2% respectively. In other words, the GCC Islamic banks have been inefficient in producing outputs by using the same input (revenue inefficiency) and by not fully using the inputs efficiently to produce the same outputs (cost inefficiency). Banks are said to have slacked if they fail to fully minimize the cost and maximize the revenue (profit inefficiency). The results indicate that levels of cost inefficiency, revenue inefficiency, and profit inefficiency are shown as 61.6%, 47.3% and 47.8% respectively.

For the cost efficiency, the results indicate that on average Islamic banks have utilized only 38.4% of the resources or inputs to produce the same level of outputs. In other words, on average, Islamic banks have wasted 61.6%, of its inputs, or it could have saved 61.6%, of its inputs to produce the same level of outputs. For revenue efficiency, the average Islamic bank could only generate 52.7% of revenues, less than what it was initially expected to generate. Hence, revenue is lost by 47.3% , indicating that the average Islamic bank loses an opportunity to receive 47.3% more revenues given the same amount of resources, or it could have produced 47.3% of its outputs given the same level of inputs. It is also worth noting that on average, Islamic banks have been more revenue efficient in producing their outputs compared to their ability to generate costs and profits.

Noticeably, the highest level of inefficiency is on the cost side, followed by the profits side. Similarly, the average Islamic bank could have earned 52.2% of what was available, and lost the opportunity to make 47.8% more profits from the same level of inputs. Consequently, the profit efficiency is higher than cost efficiency due to higher revenue efficiency levels. Therefore, the higher revenue efficiency seems to have contributed to the higher profit efficiency or lower profit inefficiency levels compared to the cost efficiency levels.

4.1.2 Efficiency of GCC conventional Banks

The empirical findings presented in Table 2 seem suggest that the GCC conventional banks have exhibited mean cost, revenue, and profit

efficiency (inefficiency) of 71.9% (28.1%), 76.6% (23.4%), and 66.0% (34.0%) respectively. Furthermore, it is interesting to note that on average GCC conventional banks have been found to be more efficient compared to their Islamic bank peers. For revenue efficiency, the average conventional bank could generate 76.7% of revenues than it was expected to generate. Hence, the average conventional bank lost an opportunity to receive 23.4%% more revenue, given the same amount of resources.

As for the cost efficiency, the results seem to suggest that the average conventional bank have utilized only 71.9% of the resources or inputs in order to produce the same level of output. In other words, on average, conventional banks have wasted 28.1% of its inputs, or it could have saved 28.1% of its inputs to produce the same level of outputs. Therefore, there was substantial room for significant cost savings for the conventional banks if they employ their inputs efficiently. Obviously, the inefficiency is on the cost side, which is followed by the profits side. Similarly, the average conventional bank could have earned 66.0% of what was available, and lost the opportunity to make 34.0% more profits when utilizing the same level of inputs.

In conclusion, the empirical findings from this study seem to suggest that the conventional banks have exhibited a higher efficiency levels for all three efficiency measures [eg: cost efficiency (71.9% vs. 38.4%), revenue efficiency (76.6% vs. 52.7%), and profit efficiency (66.0% vs. 52.2%)]. In essence, revenue efficiency seems to play the main factor leading to the lower or higher profit efficiency levels. Besides, results for the conventional banks shows that the level of profit efficiency is lower than cost efficiency due to the higher revenue efficiency or lower inefficiency level from the revenue side. Meanwhile, the level of profit efficiency is higher than cost efficiency due to the higher revenue efficiency level from the revenue side in the Islamic banks.

4.1.3 Robustness Tests

Table 3 shows the robustness tests. The results from the parametric *t*-test and non-parametric Mann-Whitney (Wilcoxon) test suggest that the GCC Islamic banks have exhibited a lower mean cost efficiency level than conventional bank peers (0.384 < 0.719) and significantly different at 1%. Likewise, the GCC Islamic banks have also exhibited a lower

mean profit efficiency level compared to conventional banks (0.522 < 0.660) and significantly different at 1%. The results from the parametric *t*-test are further confirmed by the non-parametric Mann-Whitney (Wilcoxon) and Kruskall-Wallis tests. Similarly, the parametric *t*-test and non-parametric Mann-Whitney (Wilcoxon) and Kruskall-Wallis tests results indicate that the GCC Islamic banks have exhibited lower revenue efficiency level compared to the GCC conventional banks (0.527 < 0.766) and significant different at 1%.

Table 3: Summary of parametric and non-parametric tests on GCC Islamic and Conventional banks during the year 2007-2011

	Test groups					
	Parametric test		**Non-parametric test**			
Individual tests	t-test		Mann-Whitney		Kruskall-Wallis	
			[Wilcoxon Rank-Sum] test		Equality of Populations test	
Hypothesis			MedianIslamic =			
			MedianConventional			
Test statistics	*t(Prb>t)*		*z(Prb>z)*		*X² (Prb > X²)*	
	Mean	*t*	Mean Rank	*z*	Mean Rank	*X²*
Cost Efficiency						
Islamic banks	**0.384**	9.502***	119.182	–5.982***	119.182	35.779***
Conventional bank	**0.719**		184.766		184.766	
Revenue Efficiency						
Islamic banks	**0.527**	8.056***	124.245	–5.287***	124.245	27.951***
Conventional bank	**0.766**		182.164		182.164	
Profit Efficiency						
Islamic banks	**0.522**	3.673***	140.709	–3.036***	140.709	9.216***
Conventional bank	**0.660**		173.701		173.701	

***. Correlation is significant at the 0.01 level (2-tailed). **. Correlation is significant at the 0.05 level (2-tailed). *. Correlation is significant at the 0.01 level (2-tailed).

Based on the results presented in Table 3, this study concludes that conventional bank is more efficient than Islamic bank in GCC countries since all tests shows those efficiencies (cost, revenue and profit efficiency) are significant at 1% .

4.2 Second Stage: Results and Tests of GLS

In essence, when the result from the 1st stage identified that the revenue efficiency on GCC Islamic banks was lower than GCC conventional banks, the study preceded with the second stage which is to identify the determinants that could improve the revenue efficiency in GCC slamic banking sector. There are 11 models of multivariate regression analysis (MRA) utilised separately under this stage. Model 1 which is a baseline model consists of all six basic proposed bank specific determinants variables: size of bank (lnTA), assets quality (lnLLRGL), capitalisation (lnETA), non-traditional activities (lnNIITA), management quality (lnNIETA) and liquidity (lnLOANSTA). Model 2 adds the macroeconomic control variables which are economic growth (lnGDP) inflation (lnINFL) and concentration ratio of three largest banks assets (lnCR3) in estimation regression, and maintains the bank specific variables.

Meanwhile, Model 3 to Model 11 represents the focused models adopted to identify the potential determinants on revenue efficiency in GCC Islamic banks. These models (Model 3 to Model 11) retain all the bank specific and macroeconomic variables and include the additional interaction variables with binary dummy Islamic bank variable (IB) namely lnTA*IB, lnLLRGL*IB, lnETA*IB, lnNIITA*IB, lnNIETA*IB, lnLOANSTA*IB, lnGDP*IB, lnINFL*IB and lnCR3*IB . The interaction of all variables against the dummy Islamic banks (IB) produces a specific and robust result on the determinants that contribute to the higher revenue efficiency in GCC Islamic banks.

Hausman test was used in order to decide which estimation technique is more appropriate between FEM and REM. Table 4 shows the Hausman test on FEM and REM. Since the entire chi square (X^2) in all models is significant at 1%, the test suggests that the FEM is more appropriate rather than REM for the estimation technique.

Table 5 shows the MRA models on the relationship between revenue efficiency and explanatory variables and all explanations will based on this table. This table produced the results on the potential determinants on the revenue efficiency for the overall banks (Islamic and conventional) in GCC banking sector. Next, the determinants on revenue efficiency particularly on GCC Islamic banks are produced in Model 3 to 11 with the interaction variables of IB. The equations are based on 74 banks year observation during the period of 2007 to 2011.

Table 4: Hausman Test

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11
Chi-Sq. Stat (X^2)	30.835***	73.894***	64.555***	69.452***	71.236***	85.775***	51.180***	66.217***	59.416***	68.634***	60.963***
Prob. X^2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Est. tech	FEM	FEM	FEM	FEM	FEM	FEM	FEM	FEM	FEM	FEM	FEM

Table 5: Multivariate Regression Analysis Models under Fixed Effect Model

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11
CONSTANT	–0.962*	–2.666*	–2.806**	-2.064	–3.233**	–2.350*	–2.551*	–2.449*	–2.458*	–3.715***	–6.964***
Std. Error	0.503	1.366	1.386	1.354	1.397	1.321	1.324	1.358	1.366	1.416	2.367
Determinants Variables											
lnTA	0.183	-0.137	-0.080	-0.118	-0.119	–0.239*	-0.145	-0.123	-0.118	-0.131	-0.123
Std. Error	0.115	0.137	0.164	0.134	0.136	0.134	0.132	0.136	0.137	0.135	0.136
lnLLRGL	-0.088	–0.150***	–0.148***	0.053	–0.150***	–0.128**	–0.178***	–0.149***	–0.143***	–0.152***	–0.150***
Std. Error	0.054	0.055	0.055	0.084	0.055	0.053	0.054	0.054	0.055	0.054	0.054
lnETA	0.157	-0.088	-0.093	-0.087	-0.222	-0.092	-0.085	-0.090	-0.070	-0.092	-0.081
Std. Error	0.122	0.130	0.131	0.128	0.150	0.126	0.126	0.129	0.130	0.129	0.129
lnNIITA	0.244***	0.298***	0.303***	0.289***	0.301***	-0.024	0.311***	0.304***	0.284***	0.282***	0.281***
Std. Error	0.042	0.048	0.049	0.047	0.048	0.088	0.047	0.048	0.048	0.048	0.048

Table 5: Multivariate Regression Analysis Models under Fixed Effect Model (cont.)

lnNIETA	-0.104	–0.231**	–0.238**	–0.285***	–0.239**	–0.300***	0.039	–0.203**	–0.215**	–0.251**	–0.234**
Std. Error	0.095	0.098	0.099	0.098	0.098	0.096	0.116	0.098	0.098	0.097	0.097
lnLOANSTA	-0.088	-0.074	-0.067	-0.107	-0.071	-0.041	-0.097	–0.459**	-0.070	-0.074	-0.076
Std. Error	0.077	0.075	0.076	0.074	0.074	0.073	0.073	0.187	0.075	0.074	0.074
Macroeconomic Variables											
lnGDP		0.375	0.419	0.311	0.483	0.537*	0.423	0.407	0.029	0.824**	0.522*
Std. Error		0.300	0.309	0.296	0.305	0.293	0.291	0.298	0.361	0.348	0.305
lnINFL		-0.140	-0.162	-0.104	–0.190*	–0.255***	–0.172*	-0.143	-0.097	–0.468***	–0.334**
Std. Error		0.096	0.102	0.095	0.100	0.097	0.094	0.095	0.099	0.163	0.130
lnCR3		0.765**	0.660*	0.566	0.652*	0.208	0.573*	0.733**	0.921**	-0.260	0.163
Std. Error		0.354	0.393	0.354	0.358	0.366	0.347	0.352	0.365	0.542	0.444
Interaction Variables											
lnTA*IB			-0.146								
Std. Error			0.232								
lnLLRGL*IB				–0.335***							
Std. Error				0.106							
lnETA*IB					0.447*						
Std. Error					0.252						
lnNIITA*IB						0.436***					
Std. Error						0.102					
lnNIETA*IB							–0.722***				
Std. Error							0.178				

Table 5: Multivariate Regression Analysis Models under Fixed Effect Model (cont.)

lnLOANSTA*IB Std. Error							0.448** 0.199				
lnGDP*IB Std. Error								0.733* 0.429			
lnINFL*IB Std. Error										0.463** 0.187	
lnCR3*IB Std. Error											7.474** 3.375
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**	**Model 9**	**Model 10**	**Model 11**
R^2	0.835	0.848	0.848	0.854	0.850	0.858	0.857	0.851	0.850	0.851	0.851
Adj R^2	0.781	0.796	0.795	0.803	0.798	0.810	0.808	0.799	0.797	0.800	0.799
Durbin Watson	2.314	2.343	2.345	2.313	2.346	2.440	2.391	2.307	2.358	2.373	2.365
F-statistic	15.600***	16.356***	16.123***	16.884***	16.341***	17.541***	17.392***	16.492***	16.323***	16.580***	16.480***
Estimation technique	FEM	FEM	FEM	FEM	FEM	FEM	FEM	FEM	FEM	FEM	FEM

***. Correlation is significant at the 0.01 level (2-tailed).
**. Correlation is significant at the 0.05 level (2-tailed).
*. Correlation is significant at the 0.1 level (2-tailed).

4.2.1 Determinants of Revenue Efficiency

Table 5 presents the results of baseline model (Model 1) on the determinants of revenue efficiency without macroeconomic control variables, dummy variables and any interaction. This model represents the relationship between revenue efficiency and all possible bank specific determinants throughout the GCC banking sector between 2007 and 2011. The results show that the relationship between revenue efficiency and three determinants namely asset quality (lnLLRGL), non-traditional activities (lnNIITA) and management quality (NIETA) are significantly positive and negative in Model 1 and is also consistent in all models. However, the liquidity (lnLOANSTA) is significantly reported only in model 8. The impact of size (lnTA) and capitalisation (lnETA) on the revenue efficiency are totally insignificant in all models in the estimation regression.

The first significant determinant is lnLLRGL proxy of asset quality. The coefficient lnLLRGL reveals a negative relationship and is statistically significant at 1% level. Similar results are applied to all models (except Model 1 and 4), indicating that the lower ratio of lnLLRGL increase the asset quality and lead to higher revenue efficiency. The result is consistent with previous studies such as those by Sufian, (2009), Sufian and Habibullah (2009), Kosmidou (2008) and Cornett et al. (2006) which further support the argument that lower lnLLRGL banks face higher asset quality and this contributes to higher efficiency.

The second significant determinant is non-traditional activities (lnNIITA). The coefficient of lnNIITA is statistically positive and significant at 1% in the all regression model (except Model 6). The positive results imply that banks which derived a higher proportion of its income from non-interest sources such as fee based services tend to report a higher level of revenue efficiency. The study by Canals (1993) also suggests that revenue generated from new business units have significantly contribute to improve bank performance.

Finally, the findings suggest that the management quality (lnNIETA) is statistically significant and negative at the 5%. The negative results indicate the higher management quality tend lower the bank' revenue efficiency. The finding is in consonance with the bad management hypotheses of Berger and DeYoung (1997). The lower coefficient of

lnNIETA represents a good management quality due to the efficient manager to manage the expenses to improve the quality of the bank to increase the banks' profit. Low measure of cost efficiency is a signal of poor senior management practices, which apply to input-usage and day-to-day operation.

On the other hand, Model 2 includes the macroeconomic variables as additional control variables in the estimation regression. The overall results show the economic growth (lnGDP), inflation (lnINFL) and concentration ratio (lnCR3) are insignificantly to the revenue efficiency of the GCC banks.

As a conclusion, asset quality, non-traditional activities and management quality represent the significant determinants that lead to the higher revenue efficiency in the GCC banking sector and non of the macroeconomics determinants that could influence the revenue efficiency level.

4.2.2 Robustness Checks: Controlling for Islamic Banks

In essence, asset quality, non-traditional activities and management quality represent the determinants that influence the higher revenue efficiency of GCC banking sector. However, the second objective of this study is to identify the bank specific determinants of revenue efficiency in GCC banking sector, particularly in GCC Islamic banks. It proceeded with robustness test by allowing all the bank specific determinants to interact and by adding control variables (macroeconomic) against the dummy GCC Islamic banks variable (IB). New six interaction variables lnTA*IB, lnLLRGL*IB, lnETA*IB, lnNIITAIB, lnNIETA*IB and lnLOANSTA*IB were included in Model 3 to Model 11. In addition, the three macroeconomic variables (lnGDP*IB, lnINFL*IB and lnCR3*IB in model 9, 10 and 11) had also interacted against IB variable. Therefore, for these models the discussion will focus on the results of the new variables added to the baseline specification (Model 1).

Table 5 shows a negative coefficient of lnLLRGL*IB in Model 4 and statistically significant at 1% indicating that lower non-performing loans (better asset quality) lead to the higher revenue efficiency of the GCC Islamic banks. Most of the previous studies also discovered the similar

finding on the asset quality with the bank efficiency (Kosmidou, 2008; Sufian and Habibullah, 2009)

The empirical findings in Model 6 seem to suggest a positive coefficient of the lnNIITA*IB variable (statistically significant at the 1% level) indicating that the relatively higher non-traditional activities of GCC Islamic banks tend to exhibit a higher level of revenue efficiency. Sufian and Habilbullah (2009) have shows similar results.

Model 7 summarised in Table 5 shows that the management quality of banks significantly affects the higher revenue efficiency in the GCC Islamic banks since the coefficient of lnNIETA*IB show a negative and significant result at 1%. The negative finding imply that the lower costs or expenses of the banks lead to the better management quality and contribute to the higher revenue efficiency of the banks (Berger and DeYoung, 1997; Athanasoglou et al., 2008)

In Model 8 of Table 5 we report the lnLOANSTA* IB result. As observed, the empirical findings seem to suggest a positive and significant coefficient of the LOANSTA* IB. The result seems to suggest a positive relationship between the level of liquidity and the GCC Islamic banks' revenue efficiency indicate that higher liquidity of banks higher the revenue of the banks may be due to the strong economy. Sufian and Habibullah (2009) suggest that the loan-performance relationship depends significantly on the expected change of the economy.

On the other hand, there are two macroeconomics determinants that influence the revenue efficiency of the GCC Islamic bank namely inflation and bank's concentration ratio (Model 10 and 11) since the coefficient of lnINFL*IB and lnCR3*IB are positive statistically significant at 5% that exhibit in Model 10 and 11. The positive sign showed that inflation was anticipated. This indicated that the interest rates were adjusted accordingly, resulting in revenues to increase faster than costs; subsequently, giving positive impact on GCC Islamic banks' revenue efficiency. Banks will charge a higher interest rate and obtain higher revenue. Other studies (Molyneux and Thornton, 1992; Demirguc-Kunt and Huizinga, 1999; Pasiouras and Kosmidou, 2007) have also shown a positive relationship between either inflation or long-term interest rate and profitability. Turning to the concentration ratio

variable, the coefficient of lnCR3 is significant at 5% and positively related to GCC Islamic banks; revenue efficiency that can be observed in Model 11. The empirical findings seem to support the Structure-Conduct-Performance (SCP) hypothesis. To recap, the SCP hypothesis states that banks in highly concentrated markets tend to collude, and therefore earn monopoly profits (Molynuex et al., 1996).

5. Conclusion

The study was carried out with the main purpose to examine the revenue efficiency with the others efficiencies concepts profit and cost efficiency of the Islamic and conventional banking sector in GCC countries over the period of 2007 to 2011. To date, the majority of researchers have focused more on cost and profit efficiency in banking sectors and only a few have looked on revenue efficiency. Furthermore, most of these studies are carried out on the conventional banking sectors, while empirical evidence on the Islamic banking sectors is relatively scarce. The non-parametric Data Envelopment Analysis (DEA) method is applied to distinguish between three different types of efficiency measures, namely cost, revenue, and profit. Additionally, we perform a series of parametric (*t*-test) and non-parametric (Mann-Whitney [Wilcoxon] and Kruskall-Wallis) tests to obtain the robust result.

We find that interesting results where revenue efficiency seems to play the main factor leading to the lower or higher profit efficiency levels. In essence, the profit efficiency on conventional banks will not be affect by the higher revenue efficiency levels since the result shows the level of profit efficiency is lower than cost efficiency due to the higher revenue efficiency, whereas the higher revenue efficiency only affects the higher profit efficiency levels in GCC Islamic banks. Therefore, the higher revenue efficiency in GCC Islamic banks seems to have contributed to the higher profit efficiency levels and contribute to a higher profit of the Islamic banks.

Other than addressing the revenue efficiency on the GCC banking sector, this study had also focused on examining the determinants of revenue efficiency particularly on GCC Islamic banks. Since the DEA result showed that the revenue efficiency in GCC Islamic banks did not improved, this study moved on to the second stage which was to identify

the determinants that could improve the revenue efficiency in GCC Islamic banks.

The six bank specific determinants that were examined were the size of bank, asset quality, capitalisation, non-traditional activities, management quality and liquidity. Economic growth, inflation and three-bank concentration ratio were three external determinants included to serve as additional control variables. To identify the significant relationship between revenue efficiency and those potential determinants under the second stage, the study used the Multivariate Regression Analysis (MRA). This stage applied the Generalized Least Square (GLS) method consisted of Fixed Effect Model (FEM) rather than Random Effect Model (REM) tested by Hausman test. To obtain robust results, all potential determinants interacted with dummy variables GCC Islamic banks.

It was found that the four bank specific determinants that influenced the revenue efficiency of the GCC Islamic banks were the asset quality, non-traditional activities, management quality and liquidity. The improvement of the revenue efficiency in GCC Islamic banks was also influenced by the macroeconomic variable inflation and concentration ratio of the three largest banks.

The findings of this study are expected to contribute significantly to the existing knowledge on the operating performance of the GCC Islamic and conventional banking sector. Nevertheless, the study has also provided further insights to the bank's specific management as well as the policymakers with regard to attaining optimal utilization of capacities, improvement in managerial expertise, efficient allocation of scarce resources, and the most productive scale of operation of Islamic banks operating in in GCC countries. This may also facilitate directions for sustainable competitiveness of the GCC Islamic banking sector operations in the future.

References

Abreu, M., Mendes, V. (2001). Commercial bank interest margins and profitability: evidence from some EU countries. In: Paper presented at the Proceedings of the Pan-European Conference Jointly Organised by the IEFS-UK and University of Macedonia Economic and Social Sciences, Thessaloniki, Greece, May 17-20.

Akhavein, J.D., Berger, A.N. and Humphrey D.B. (1997), "The effects of megamergers on efficiency and prices: Evidence from a bank profit function," *Review of industrial Organization* 12(1):95-139.

Akhigbe, A. and McNulty, J.E. (2003), "The profit efficiency of small US commercial banks," *Journal of Banking and Finance* 27(2):307-325.

Altunbas, Y., Evans, L., and Molyneux, P. (2001), "Bank ownership and efficiency," *Journal of Money, Credit and Banking* 33(4), 926−954.

Adongo, J., Strok, C. and Hasheela, E. (2005), Measuring the alternative profit X-efficiency of Namibia's Banking Sector, *Nepru Research Report* 36:1-58.

Angbazo, L. (1997), "Commercial bank interest margins, default risk, interest-rate risk, and off-balance sheet banking," *Journal of Banking and Finance* 21: 55-87.

Ariff, M. (1988), "Islamic banking," *Asian-Pacific Economic Literature* 2(2):46-62.

Ariff, M. and Can, L. (2008), "Cost and profit efficiency of Chinese banks: A non-parametric analysis,"*China Economic Review* 19(2):260-273.

Athanasoglou, P.P., Brissimis, S.N. and Delis, M.D (2008), "Bank-specific industry-specific and macroeconomics determinants of bank profitability," *Journal of International Financial Markets, Institutions and Money* 18: 121-136.

Bader, M.K.I., Mohammed, S., Ariff, M. and Hassan, T. (2008), "Cost, revenue and profit efficiency of Islamic versus Conventional banks: international evidence using data envelopment analysis," *Islamic Economic Studies* 15(2):24:76.

Berger, A. N. (1995), "The relationship between capital and earnings in banking," *Journal of Money, Credit and Banking* 27(2): 432–456

Berger, A.N. (1997), "The efficiency effects of bank mergers and acquisitions: A preliminary look at the 1990s data. In: Amihud, Y. and Miller, G. (eds.), Mergers in Financial Institutions. Business One-Irwin, pp. 79–111.

Berger, A.N. and DeYoung, R. (1997), "Problem loans and cost efficiency in commercial banks," *Journal of Banking and Finance* 21: 849–870.

Berger, A.N. and Humphrey, D.B. (1992), "Megamergers in banking and the use of cost efficiency as in antitrust defense," *Antitrust Bulletin* 37 (summer):541-600.

Berger, A.N. and Humphrey, D.B. (1997), "Efficiency of financial institutions: International Survey and directions for future research, *European Journal of Operational Research* 98 (2):175-212.

Berger, A.N. and Mester, L.J. (1997), "Inside the black box: What explains differences in the efficiencies of financial institutions?," *Journal of Banking and Finance* 21(7):895-947.

Berger, A.N. and Mester, L.J. (2003), "Explaining the dramatic changes in performance of US banks: technological change, deregulation, and dynamic changes in competition," *Journal of Financial Intermediation* 12(1):57–95.

Berger, A.N., Demsetz, R.S., Strahan, P.E. (1999), "The consolidation of the financial services industry:causes, consequences, and implications for the future," *Journal of Banking and Finance* 23: 135–194.

Berger, A.N., Hancock, D., Humphrey, D.B. (1993), "Bank efficiency derived from the profit function,"*Journal of Banking and Finance* 17(2-3):317-347.

Berger, A.N., Hunter, W.C. and Timme, S.G. (1993), "The efficiency of financial institutions: a review and preview of research past, present and future," *Journal of Banking and Finance* 17(2-3):221-249.

Bourke, P. (1989), "Concentration and other determinants of bank profitability in Europe, North America and Australia," *Journal of Banking and Finance* 13: 65-79.

Brown, K. and M. Skully (2005), "Islamic banks: A cross-country study of cost efficiency performance, accounting, commerce and finance," *The IslamicPerspective Journal*, 8(1-2):43-79.

Canals, J. *Competitive Strategies in European Banking*. Oxford: Oxford University Press, 1993.

Carvallo, O. and Kasman, A. (2005), "Cost efficiency in the Latin American and Caribbean banking system," *Journal of International Financial Markets, Institutions and Money* 15(1):55-72.

Casu, B. and Girardone, C. (2004), "Financial conglomeration: efficiency, productivity and strategic drive," *Applied Financial Economics* 14: 687-96.

Charnes, A., Cooper, W.W. and Rhodes, E. (1978), "Measuring the efficiency of decision making units," *European Journal of Operations Research* 2(6):429-44.

Chong, B.S., Liu, M.H. and Tan, K.H. (2006), "The wealth effect of forced bank mergers and cronyism," *Journal of Banking and Finance* 30(11):3215-3233.

Chu, S.F. and Lim, G.H. (1998), "Share performance and profit efficiency of banks in an oligopolistic market: evidence from Singapore," *Journal of Multinational Financial Management* 8(2-3):155-168.

Cornett, M.M., McNutt, J.J. and Tehranian, H. (2006), "Performance changes around bank mergers: Revenue enhancements versus cost reductions," *Journal of Money, Credit, and Banking* 38:1013-1050.

Dar, H. and Presley, J.R. (2000), "Lack of profit loss sharing in Islamic banking: management and control imbalances," *International Journal of Islamic Financial Services* 2(2):1-16

Demirguc-Kunt, A. and A. Huizinga (1999), "Determinants of commercial bank interest margins and profitability: some international evidence," *World Bank Economic Review*13(2):379-408.

DeYoung, R. (1997), "Bank mergers, X-efficiency and the market for corporate control," *Managerial Finance* 23(1):32-47.

Drake, L., Hall, M. J. B. and Simper, R. (2006), "The impact of macroeconomic and regulatory factors on bank efficiency: a non-parametric analysis of Hong Kong's banking system," *Journal of banking and Finance* 30(5):1443–1466.

English, M., Grosskopf, S., Hayes, K. and Yaisawarng, S. (1993), "Output allocative and technical efficiency of banks," *Journal of Banking and Finance* 17(2-3):349-366.

Farrell, M.J. (1957), "The measurement of productive efficiency," *Journal of the Royal Statistical Society*. 120(3):253-290.

Flamini, V., McDonald, C.A. and Schumacher, L.B. (2009), The determinants of commercial bank profitability in Sub-Saharan Africa. International Monetary Fund Working Paper No.09/15.

Gujarati, D. (2002), Basic econometric, 6th Ed., New York. MacGraw Hill
Hassan, M. K. (2005), The cost, profit and x-efficiency of islamic banks: Economic research forum. 12th Annual Conference, Cairo, Egypt.

Hassan, M.K and Hussein, K.A. (2003), "Static and dynamic efficiency in the Sudanese banking system," *Review of Islamic Economics* 14:5-48.

Hussein, K. H. (2004), Banking efficiency in Bahrain: Islamic versus conventional banks. *Islamic Development Bank, Islamic Research and Training Institute*, Research Paper, No. 68.

Isik, I. and Hassan, M. K. (2002), "Cost and profit efficiency of the Turkish banking industry: An empirical investigation," *The Financial Review* 37(2), 257-280

Ismail, A., Davidson, I. and Frank, R. (2009), "Operating performance of European bank mergers," *The Service Industries Journal* 29: 345-366.

Kosmidou, K. (2008), "The determinants of banks' profits in Greece during the period of EU financial integration," *Managerial Finance* 34: 146-159.

Linder, J.C. and Crane D.B. (1992), "Bank Mergers: Integration and profitability," *Journal of Financial Services Research* 7(1):35-55.

Maudos, J. and Pastor, J. M. (2003), "Cost and profit efficiency in the Spanish banking sector (1985–1996): A non-parametric approach," *Applied Financial Economics* 13(1): 1−12.

Maudos, J., Pastor, J.M., Francisco, P. and Javier, Q. (2002), "Cost and profit efficiency in European banks," *Journal of International Financial Markets, Institutions and Money* 12(1):33-58.

Miller, S.M. and Noulas, A.G. (1997), "Portfolio mix and large bank profitability in the USA," *Applied Economics* 29: 505-512.

Molyneux, P., Altunbas, Y. and Gardener, E.P.M. (1996), Efficiency in European banking. Chichester: Jhon Wiley and Sons.

Molyneux, P., Thornton, J. (1992), "Determinants of European bank profitability: A note, *Journal of*
Banking and Finance 16: 1173–1178.

Pasiouras, F. and K. Kosmidou (2007), "Factors influencing the profitability of domestic and foreign commercial banks in the European Union," *Research in International Business and Finance* 21(2):222–37

Perry, P. (1992), "Do banks gain or lose from inflation," *Journal of Retail Banking* 14: 25–40.

Pilloff, S.J. (1996), "Performance changes and shareholder wealth creation associated with mergers of publicly traded banking institutions," *Journal of Money, Credit, and Banking* 28(3):294-310.

Resti, A. (1997), "Evaluating the cost efficiency of the Italian banking system: what can be learned from the joint application of parametric and non-parametric techniques," *Journal of Banking and Finance* 21(2):221-250.

Rhoades, S.A. (1993), "Efficiency effects of horizontal (in-market) bank mergers," *Journal of Banking and Finance* 17 (2-3):411-422.

Rogers, K.E. (1998), "Nontraditional activities and the efficiency of US commercial banks," *Journal of banking Finance* 22(4):467–482.

Saaid, A.R.E. (2003), "The X-efficiency of the Sudanese Islamic banks," *IIUM Journal of Economics and Management* 11(2):123-141.

Sairi, S., A. (2010), "Cost and profit efficiency of conventional and Islamic banks in GCC countries," *Journal of Productivity Analysis* 34(1):45-62

Samad, A. (1999), "Relative performance of conventional banking vis-à-vis Islamic bank in Malaysia," *IIUM. Journal of Economics and Management*, 7, 1−25.

Samad, A. and M. K. Hassan (1999), "The performance of Malaysian Islamic bank during 1984-1997: An exploratory study," *International Journal of Islamic Financial Services*, 1(3), 1-14.

Santos, J.A.C. (2000), Bank capital regulation in contemporary banking theory: a review of the literature, BIS Working Paper No. 90, Bank for International Settlements: Monetary and Economic Department, Basel

Shaffer, S. (1993), "Can megamergers improve bank efficiency?," *Journal of Banking and Finance* 17(2-3):423-436.

Sherman, H.D. and Gold, F. (1985), "Bank branch operating efficiency: evaluation with data envelopment analysis," *Journal of Banking and Finance* 9(2):297-315.

Srinivasan, A., (1992), "Are there cost savings from bank mergers?, *Federal Reserve Bank of Atlanta Economic Review* (Mar./Apr.):17-28.

Staikouras, C. and Wood, G. (2003), The determinants of bank profitability in Europe, paper presented at the European Applied Business Research Conference, Venice: 9-13.

Sufian, F. (2008), "Revenue shifts and non-bank financial institutions' productivity: Empirical evidence from Malaysia," *Studies in Economics and Finance* 25(2):76-92

Sufian, F. and Habibullah, M.S. (2009), "Assessing the impact of mergers and acquisitions on bank cost efficiency," *Capital Market Review* 17(1-2):21-41.

Sufian, F. and Majid, M.Z.A. (2007), "Banks' efficiency and stock prices in emerging markets: Evidence from Malaysia," *Journal of Asian-Pacific Business* 7(4):35-53

Sufian, F., Kamarudin, F. and Noor, N.H.H.M. (2012b), "Determinants of revenue efficiency in the Malaysian Islamic banking sector, *Journal of King Abdulaziz: Islamic Economics* 25(2): 195-224

Sufian, F., Muhamad, J., Ariffin, A.N.B., Yahya, M.H. and Kamarudin, F. (2012a), "Assessing the effect of mergers and acquisitions on revenue efficiency: Evidence from Malaysian banking sector," *Vision: The Journal of Business Perspective* 16(1): 1-11

Sufian, F., Noor, M.A.M. and Majid, M.Z.A. (2008), "The efficiency of Islamic banks: Empirical evidence from the MENA and Asian countries Islamic banking sectors," *The Middle East Business and Economic Review* 20(1):1-19

Tahir, I.M. and Haron, S. (2008), "Technical efficiency of the Malaysian commercial banks: A stochastic frontier approach," *Banks and Bank Systems* 3(4): 65-72

Wang,J.C. (2003), Merger-related cost savings in the production of bank services. *Federal Reserve Bank of Boston Working Paper no.03-8.*

Yudistira, D. (2004), "Efficiency in Islamic banking: An empirical analysis of 18 banks," *Islamic Economic Studies* 12(1), 1-19.

Zhu, J. (2009), Quantitative models for performance evaluation and benchmarking: Data Envelopment Analysis with Spreadsheets and DEA Excel Solver. International Series in Operations Research and Management Science.

Appendix 1: List of Islamic and Conventional Bank in GCC Countries 2007-2011

No.	Islamic Bank	No.	Conventional Bank
1	ABC Islamic Bank (E.C.)	1	Abu Dhabi Commercial Bank
2	Abu Dhabi Islamic Bank	2	Ahli Bank QSC
3	Ajman Bank	3	Ahli United Bank BSC
4	Al Rajhi Banking and Investment Corp	4	Ahli United Bank KSC
5	Albaraka Banking Group B.S.C.	5	Al Ahli Bank of Kuwait (KSC)
6	Albaraka Islamic Bank BSC	6	Al Khalij Commercial Bank
7	Alinma Bank	7	Arab Banking Corporation BSC
8	Al-Salam Bank-Bahrain B.S.C.	8	Arab National Bank
9	Arcapita Bank B.S.C.	9	Awal Bank
10	Bahrain Islamic Bank B.S.C.	10	Bank Al-Jazira
11	Bank AlBilad	11	Bank Dhofar SAOG
12	Bank Alkhair BSC	12	Bank Muscat SAOG
13	Boubyan Bank KSC	13	Bank of Bahrain and Kuwait B.S.C.(BBK)
14	Dubai Islamic Bank plc	14	Bank of Sharjah
15	Elaf Bank	15	Bank Sohar SAOG
16	Emirates Islamic Bank PJSC	16	Barwa Bank
17	Investors Bank BSC	17	Burgan Bank SAK
18	Islamic Development Bank	18	Commercial Bank International P.S.C.
19	Kuwait Finance House	19	Commercial Bank of Dubai P.S.C.
20	Kuwait International Bank	20	Commercial Bank of Kuwait SAK (The)
21	Noor Islamic Bank	21	Commercial Bank of Qatar (The) QSC
22	Qatar International Islamic Bank	22	Doha Bank
23	Qatar Islamic Bank SAQ	23	Emirates Bank International PJSC
24	Seera Investment Bank BSC	24	First Gulf Bank
25	Shamil Bank of Bahrain B.S.C.	25	Gulf Bank KSC (The)
26	Sharjah Islamic Bank	26	Gulf International Bank BSC
27	Venture Capital Bank BSC (c)-VCBank	27	International Bank of Qatar Q.S.C.
		28	International Banking Corporation BSC
		29	Invest Bank P.S.C.
		30	Mashreqbank
		31	National Bank of Abu Dhabi
		32	National Bank of Bahrain
		33	National Bank of Dubai Public Joint Stock Company
		34	National Bank of Fujairah
		35	National Bank of Kuwait S.A.K.
		36	National Bank of Oman (SAOG)

Appendix 1: List of Islamic and Conventional Bank in GCC Countries 2007-2011(cont.)

No.	Islamic Bank	No.	Conventional Bank
		37	National Bank of Ras Al-Khaimah (P.S.C.) (The)-RAKBANK
		38	National Bank of Umm Al-Qaiwain
		39	National Commercial Bank (The)
		40	Oman Arab Bank SAOG
		41	Oman International Bank
		42	Qatar National Bank
		43	Riyad Bank
		44	Saudi British Bank (The)
		45	Saudi Hollandi Bank
		46	Union National Bank
		47	United Arab Bank PJSC

Sources: Bankscope database

Appendix 2: Description of Bank specific, Macroeconomics and Interaction Variables

Variable	Description	Note
Bank Specific		
lnTA	Natural logarithm of total assets	Proxy of size of bank. This positive coefficient of size indicates positive relationship between size of banks and revenue efficiency where the larger the size of banks, the higher the revenue efficiency. This regression outcome may suggest that the large bank size is able to become more efficient due to the benefits obtained such as increasing in revenue, service quality and higher leverage from financial capital (Akhavein et al,1997; Sufian and Habibullah, 2009).
lnLLRGL	Loan loss reserve over gross loan	Proxy of asset quality. lnLLRGL is predicted to have negative coefficient (Sufian and Habibullah, 2009). Kosmidou (2008) showed that the ratio of loan loss reserves to gross loans (LLRGL) indicates how much of the total portfolio has been provided for, but not charged off, and is used as a measure of bank's asset quality. The coefficient is expected to be negative because bad loans (non-performing loans) could reduce the bank's efficiency level. A better quality asset is described as having lower non-performing loans or ratio of lnLLRGL (Ismail et al., 2009 and Wang, 2003). In this direction, Miller and Noulas (1997) asserted that the greater financial institutions exposure to high risk loans, the higher the accumulation of unpaid loans, and this lowers the profitability. Therefore, the asset quality will be better if the coefficient is lower. A lower coefficient contributes to a higher asset quality which can increase the revenue of the banks.

Appendix 2: Description of Bank specific, Macroeconomics and Interaction Variables (cont.)

Variable	Description	Note
lnETA	Earning over total assets	Proxy of capitalisation. This coefficient is expected to be positive (Abreu and Mendes, 2001; Casu and Girardone, 2004; Carvallo and Kasman, 2005; Athanasoglou et al., 2008). The positive coefficient of capitalisation signifies the positive relationship between capitalisation and revenue efficiency where the larger the capitalisation of the banks, the higher the revenue efficiency. The regression result may show that the well- capitalised banks would increase banks' revenue and profitability due to the lower expected costs of financial distress, lower expected bankruptcy costs, and lower risk of portfolio and such advantages will then be translated into high profitability (Bourke, 1989; Berger, 1995; Angbazo, 1997 and Demirguc-Kunt and Huizinga, 1999).
lnNIITA	Non-interest income over total assets	Proxy of non-traditional activities. This coefficient is expected to be positive relationship with revenue efficiency. According to Sufian and Habilbullah (2009) to recognise the financial in recent years have increasingly been generating income from "off-balance sheet" business and fee income generally, the ratio of lnNIITA is entered in the regression analysis as a proxy for non-traditional activities. Non-interest income contains of commission, service charges and fees, guarantee fees, net profit from sale of investment securities and foreign exchange profit. The ratio is also included in the regression model as a proxy measure of bank diversification into non-traditional activities.
lnNIETA	Non-interest expense over total assets	Proxy of management quality. lnNIETA is applied to provide the information on variation in operating costs across the financial system. It reflects employment, total amount of wages and salaries, as well as the cost of running branch office facilities. The lower or higher cost represents a good management quality. Bourke (1989) argued that reduced expenses tend to improve the profitability of the financial institutions. Therefore, a higher ratio of lnNIETA is assumed to affect performance negatively because efficient banks are expected to operate at lower costs. Moreover, the wages expenses (reduce labour) could be reduced due to the usage of the new technology such as automated teller machines (ATMs) and other automated means of delivering services. Nevertheless, Molyneux and Thornton (1992) showed a contradictory finding in which they observed a positive relationship, suggesting that higher profits earned by banks that are more efficient may be appropriated in the form of higher payroll expenditures paid to more productive human capital. Therefore, the expected coefficient could be negative and may have positive relationship with revenue efficiency. Among studies that employed the similar variables are Berger (1997), Berger and DeYoung (1997), Berger et al. (1999), Athanasoglou et al. (2008), and Sufian and Habibullah (2009).

Appendix 2: Description of Bank specific, Macroeconomics and Interaction Variables (cont.)

Variable	Description	Note
lnLOANSTA	Total loan over total assets	Proxy of liquidity. Bank loans are assumed to be the main source of revenue and are expected to affect performance positively. Nevertheless, the coefficient could also be negative which indicates a negative relationship between liquidity and revenue efficiency because loan-performance relationship depends significantly on the expected change of the economy. While in a strong economy, only a small percentage of loans will default (lower percentage of unpaid loans). On the other hand, banks may be depressingly affected during a weak economy as borrowers are likely to default on their loans. Preferably, banks should capitalise on favourable economic environments and shield themselves during adverse conditions (Sufian and Habibullah, 2009).
Macroeconomics		
lnGDP	Natural logarithm of gross domestic product	Proxy of gross domestic product. Kosmidou (2008) suggested that the coefficient of the lnGDP is expected to be positive with the bank efficiency which shows that higher lnGDP leads to the higher revenue efficiency.
lnINFL	Consumer price index	Proxy of Inflation. Flamini et al. (2009) measured the lnINFL based on the current period of customer prices index (CPI) growth rate. Inflation may have direct effects such as an increase in the price of labour, and indirect effects such as changes in interest rates and asset prices on bank performance (Staikouras and Wood, 2003). Abreu and Mandes (2001) suggested that inflation is negatively related to bank's profitability, implying that the higher inflation will contribute to the lower profit. However, Perry (1992) suggested that the effects of inflation on bank performance depend on whether the inflation is anticipated or unanticipated. In the anticipated case, the interest rates are adjusted accordingly, resulting in faster increase of bank revenues than costs and subsequently gives positive impact on bank performance. In the unanticipated case, banks may be slow in adjusting their interest rates, resulting in a faster increase of bank costs than revenue; consequently, gives negative effects on bank performance.
lnCR3	Concentration ratio of the three largest banks	The concentration ratio of the three largest banks in terms of assets is entered in the regression models as a proxy variable for the banking sector concentration on the profitability of GCC banks. The structure-conduct-performance (SCP) theory posits the banks in a highly concentrated market tend to collude, and therefore earn monopoly profits (Molynuex et al., 1996).

Appendix 2: Description of Bank specific, Macroeconomics and Interaction Variables (cont.)

Variable	Description	Note
Dummy Variable		
IB	Dummy Islamic bank	IB is a binary variable that takes a value of 1 for GCC Islamic bank, and it is 0 otherwise. As expected, this coefficient is to be in positive sign which indicates that the banking sector has been relatively more revenue efficient in GCC Islamic banks.
Interaction Variables		
lnTA*IB	Binary variable that takes a value of 1 for the Islamic bank, 0 otherwise.	lnTA*IB variable is expected to have positive coefficient that indicates positive relationship between size of banks and GCC Islamic banks. The positive relationship suggests that the larger the size of banks, the higher the revenue efficiency of the GCC Islamic banks.
lnLLRGL*IB (cont.)	Binary variable that takes a value of 1 for the Islamic bank, 0 otherwise.	lnLLRGL*IB variable is expected to be negative because bad loans (non-performing loans) could reduce the bank's efficiency level. Therefore, the asset quality in GCC Islamic bank will be better if the coefficient is lower. This could contribute to the higher asset quality and increase the revenue to the banking sector
lnETA*IB	Binary variable that takes a value of 1 for the Islamic bank, 0 otherwise.	lnETA*IB variable is expected to be positive between capitalisation and GCC banks. The positive relationship indicates that the larger capitalisation of banks, the higher the revenue efficiency of the GCC Islamic banks.
lnNIITA*IB	Binary variable that takes a value of 1 for the Islamic bank, 0 otherwise.	lnNIITA*IB is expected to have positive coefficient that indicates positive relationship between non-traditional activities and GCC Islamic bank. The positive relationship explains that higher the non-traditional activities will increase the revenue efficiency of the GCC Islamic banks
lnNIETA*IB	Binary variable that takes a value of 1 for the Islamic bank, 0 otherwise.	lnNIETA*IB variable is expected to be negative or positive because efficient banks are expected to operate at lower or higher costs that represent good quality management. The negative or positive coefficient indicates negative or positive relationship between the banks' cost management and GCC Islamic banks. Thus, lower expenses of banks will lead to higher revenue efficiency in the GCC Islamic banking sector
lnLOANSTA*IB	Binary variable that takes a value of 1 for the Islamic bank, 0 otherwise.	lnLOANSTA*IB is expected to have positive or negative coefficient that indicates positive or negative relationship between liquidity and GCC Islamic bank. The positive relationship explains that higher liquidity of the banks will increase the revenue efficiency of the GCC Islamic banking sector. The negative relationship indicates that the higher liquidity of the banks will reduce the revenue efficiency of the GCC Islamic banking sector.
lnGDP*IB	Binary variable that takes a value of 1 for the Islamic bank, 0 otherwise.	lnGDP*IB variable is expected to be positive with the bank efficiency. It shows that higher lnGDP leads to higher revenue efficiency in GCC Islamic banks.

Appendix 2: Description of Bank specific, Macroeconomics and Interaction Variables (cont.)

Variable	Description	Note
lnINFL*IB	Binary variable that takes a value of 1 for the Islamic bank, 0 otherwise.	lnINFL*IB is expected to be positive or negative with the bank efficiency which indicates that higher or lower inflation leads to higher or lower bank's revenue efficiency in GCC Islamic banks.
lnCR3*IB	Binary variable that takes a value of 1 for the Islamic bank, 0 otherwise.	lnCR3*IB is expected to be positive with the bank efficiency which indicates that higher concentration leads to higher bank's revenue efficiency in GCC Islamic banks.