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BANK EFFICIENCY DETERMINANT: EVIDENCE FROM THE GULF COOPERATION COUNCIL COUNTRIES

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Abstract. Using data from 2007 to 2014, we investigate the effects of inflation, unemployment rate and GDP per capita growth on bank efficiency for the Gulf Cooperation Council countries in an unbalanced panel consisting of 75 banks and 415 observations. Applying stochastic frontier estimation procedures, we compute cost efficiency taking account of both time and country effects directly. In second-stage regressions, we use the efficiency measures to investigate the influence of country risk variables and concentration ratio applying Generalized Method of Moments technique with respect to the impact of political risk, credit ratings and debt in default. The finding suggests that banks in countries with low country risk, and low concentration tend to perform more efficiently. Furthermore, a negative but insignificant relationship between total assets and bank efficiency reflects the fact that larger banks in developing countries suffer from diseconomies of scale.
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1. Introduction

Financial markets witnessed several environmental changes in the last two decades in the Middle Eastern countries to facilitate the process of financial integration. These changes were designed to liberalize the provision of services and the degree of economic stability, as well as to increase competition in strengthening the efficiency of the financial markets. In the context of the Gulf Cooperation Council (GCC) countries, they intend to form an union in the near future to promote financial integration (Laabas and Limam 2002; Sturm and Siegfried 2005; Takagi 2012). One of the main criteria of forming a union is that member countries ought to have similar levels of economic performance, particularly in the banking system. Therefore, the potential Gulf union should ensure that their banking sector has an ability to compete within the GCC members. Banking efficiency is an important issue for policy makers to ensure economic stability and for the development of the economy. The primary goal of banks is to stabilize target markets by making efficient use of available resources. Banks endeavour to allocate resources to the most productive projects that contribute towards realising these objectives. Managerial decisions and the environment play a critical role in ensuring proper and efficient allocation of the resources. Earlier studies have investigated the impact of internal environments as well as economic conditions on the efficiency of banking sector.

How efficient is the banking sector within the GCC countries is very interesting issues to explore because the region is still at the developing stage, in which warrants special attention to improve the levels of banking performance and monitoring the operations of banks. In fact, the GCC intends to transform from cooperation to a union to enhancing economic integration, strengthening the economy and eliminating the barriers across country. Moreover, efficiency of the GCC banks is an imperative for monetary establishments to successfully maintain their businesses in the face of increasing competition within the financial markets and rapid technological advances in banking operations and services. GCC began the program of liberalization of the banking sector and privatization since the early 1990s. The objective was to increase efficiency and avoid future financial crises, as well as to promote economic stability.

In order for the GCC countries to have a successful union in the near future, the government and policy makers in these countries should aware the role of country risk and the levels of competition in influencing their banking sector (Al-Gasaymeh et al 2014). This is an essential consideration due to the fact that presence of different governmental regulations across countries in which could affect the level of

efficiency among the banks in the GCC countries. Hence, banks' efficiency measures are good indicators of the success of the potential Gulf union in future. It is natural that banks, which are less efficient, would lose their market share and be replaced by banks that are more efficient. Thus, it is vital to policy maker in examining the main factors that can influence the banking efficiency in the GCC countries. This is essential to the authorities and policy makers in recognizing the environmental variables such as political risks, credit ratings, debit indicator and the degree of concentration in identifying and formulating policies to improve the efficiency of their banking sector. The comparison of banking efficiency across countries is important to allow not only for variations in relative factor prices but also for country-level variables that could influence the level of efficiency of the banks. The efficiency level across countries could differ due to the environment, macroeconomic conditions or the degree of country risk, apart from the level of competition in the country. Therefore, it essential to focus on the determinants of efficiency such as macroeconomic variables, including gross domestic product, inflation, population density, gross national income, and country risk variables. Cross-border efficiency might also be affected by the market conditions and policies of the home country (Berger 2003).

The effect of high country risk would be greater if the countries are in the form of union. However, no studies have been done on union countries. Therefore, this paper will determine the effect of country risk and concentration level on GCC countries, as GCC is potentially to form a union. Moreover, a successful union requires member countries to have similar characteristics including the banking sectors performance.This will compare the six GCC countries in effort to see the performance of banks in the potential Gulf union. Previous study investigate the determinants of bank efficiencies in the GCC countries used bank specific and macroeconomics variables and did not take into account country risk variables and competition level. Hence, this paper will test the influence of country risk and concentration level on efficiency of the potential GCC union countries by employing the Generalized Method of Moments (GMM) technique in a dynamic panel data. The results show that country risk and bank concentration are positively influence bank efficiencies. Moreover, banks in countries with low country risk, and high competition levels tend to perform more efficiently. It is therefore, important for policy makers in the potential GCC union countries to decrease country risk and increase competition in order to have higher banking efficiency. This paper would contribute towards reducing the gap by providing new empirical evidence on the impact of country risk and competition on bank efficiency in the potential GCC union members.

The rest of the paper is organized as follow. The next section presents the literature review, while section 3 outlines the methodology. The data and empirical specifications are explained in section 4 and the empirical results are given in section 5. Finally, section 6 provides the summary and conclusions.

2. Literature review

To predict the effects of the expected escalation in cross-border country risk and competition, it is important to determine the differences and similarities in the current efficiency of banks in different countries. However, cross-border comparisons have to account for potential differences arising from certain country-specific aspects of banking technology on one hand, and the environmental and regulatory conditions on the other. In particular, the economic environments are likely to differ significantly across countries, and could induce important differences in levels of bank efficiency through various channels. For instance, differences in country risks and competition level across countries could produce significant variances in the demand for banking products and services among households. Over the last two decades, an extensive research by financial economists measuring financial institutions' efficiency Fries and Taci (2006); Abdul Majid et al (2012); Goddard et al. (2011), Alshammari (2003); Jarrah and Molyneux (2005); using alternative methodological approaches. Some of these studies have considered country-specific environmental conditions such as inflation and population density (Abdul-Majid et al. 2011; Bos and Kool 2006). While, some studies have assessed the effects of deregulation and liberalisation on banks' efficiency (Barth et al. 2004; Chen et al. 2005; Demirguc-Kunt et al. 2003; Pasiouras et al. 2009). As control, variables explain differences in efficiency levels among banks. Country-specific control variables, such as country risk and macroeconomic conditions have significant influences on cross-county studies. The variables take account of heterogeneity as well as the different technologies in those countries. There have been a large number of studies on the impact of on economic growth in developed countries (De Haan and Siermann 1998; De Haan and Sturm 2000, 2003).

An important issue that affects banking efficiency is country risk, when business transactions take place across borders, they carry additional risks in domestic transactions which finally will affect bank efficiency

(Meldrum 2000). These risks, called country risks, usually include political risks arising from a variety of national differences in policies, socio-political institutions, geography, economic structures, and currencies. A political risk identifies the potential for these risks to affect the expected returns of a cross-border investment. Moreover, political risk is a change in government control or other non-economic factors, which may lead to inefficiency banking sector due to instability economic conditions (Meldrum 2000). Leibenstein (1966) argues that inefficiencies reduced by increased competition as manager's respond to the challenge. Goddard and Wilson (2009) suggest that, competition in the banking sector changes gradually over time. Some of the studies focused on cross-country comparison in developed countries (De Bandtand Davis 2000; Yildirim and Philippatos 2007). De Bandt and Davis (2000) suggest that, banks operate more efficiently when competition is high. However, Yildirim and Philippatos (2007) indicated that banks in 11 Latin American countries are operating efficiently under competitive pressure.

Moreover, country risk, which comprise of a measure of credit rating and debt in default. The higher value of country risk is associated with better positions and less risks (Euromoney 2013; Saini & Bates 1984). Credit ratings bring about changes in relative asset demands and bond prices, that would affect bank performance, as banks have to incur extra interest charges when the ratings are low (Cantor & Packer 1996; Reisen & Von Maltzan 1999). Moreover, credit ratings adversely affect banks' performance due to the pervasive role of government debt in the financial system. The second factor in country risk is debt defaults, the failure to promptly pay interest or principal when due. Default occurs when a debtor is unable to meet the legal obligation of debt repayment. When the lenders are unable to assess the extent of outstanding loans which may affect bank performance (Reisen & Von Maltzan 1999).

In the context of GCC countries, study relating to bank efficiency is still limited in the literature. Srairi (2010) examines the impact of macroeconomic conditions on the profitability of conventional and Islamic banks operating in the GCC and found a significant and positive in all cases and strong relationship between economic growths and banking sector performance. While, Al-Obaidan (2008) examine the impact of competitive pressure on bank efficiency for local banks in the GCC countries and found that increased competitive pressures will ultimately affect the ability of banks to maintain their current market share and expand and enhance their market power. Another study for Al-Obaidan (2008) attempts to measure the efficiency effect of openness in the commercial banking of the Gulf region and suggests that openness enhances technical efficiency. EL Moussawi (2010) provide a measure of the technical efficiency, allocative efficiency and cost efficiency of 23 Islamic banks operating in the GCC and suggests that internal and external factors contribute significantly to the evolution of efficiency of Islamic banks operating in the GCC.

The above literature reveals the following research gaps. There are no studies done to examine the impact country risk on the banking sector in potential union countries. In the light of these knowledge gaps, the present paper provides new empirical evidence on the impact of country risk levels on the banking efficiency in the potential GCC union.

3. Methodology

3.1. Efficiency measures

This paper employs Stochastic Frontier Analysis (SFA) to estimate a total cost function for the GCC commercial banks. A single-equation stochastic cost function model could be described as

$$lnC_{n,t} = f\left(Y_{n,t}W_{n,t}Z_{n,t}\right) + \varepsilon_{n,t} \quad (1)$$

Where $C_{n,t}$ is the observed total cost of production for the *n-th* firm at time *t*.$Y_{n,t}$ is a vector of outputs including total loan and other earning assets. $W_{n,t}$ is an input price vector including the price of labour, price of physical capital and price of financial capital. $Z_{n,t}$ is a vector of control variables including country risk, macroeconomics and market structure variables. Following Aigner et al. (1977) a composed error term is written as follow.

$$\varepsilon_{n,t} = V_{n,t} + u_{n,t} \quad (2)$$

where $V_{n,t}$ represents random uncontrollable error and is assumed to be normally distributed with zero mean and σ_v^2variance. $u_{n,t} \geq 0$ is drawn from a one-sided distribution that is assumed to capture inefficiency and also$u_{n,t}$assumed to be drawn from a half-normal distribution with mean zero and variance (Berger and Mester 1997; Mester 1996). $V_{n,t}$ and $u_{n,t}$ are independently distributed. Given this assumption, the log likelihood for inefficiency is expressed in terms of the two variance parameters, $\sigma^2 = \sigma_v^2 + \sigma_u^2$in which captures the variance of composed error and, which is a measure of the amount of variation originating from

inefficiency relative to statistical noise (Jondrow et al. 1982). Maximum-likelihood estimates are obtained by estimating a translog cost function after including environmental variables, imposing the standard assumption of homogeneity in input prices, and allowing for the composed error terms. The cost efficiency (CE) could be measured using the efficiency component $(u_{n,t})$ of the error term $(\varepsilon_{n,t})$as in Equation 3:

$$\mathrm{CE}_{\mathrm{n,t}} = {}^{1}/_{\exp(\mathrm{u}_{\mathrm{n,t}})} \qquad (3)$$

The efficiency measure ranges from zero to one with a score of one indicating full efficiency. The output and input prices for conventional and Islamic banks were collected from Bankscope database over the period 2007 to 2014. Due to the missing data, this study obtains an unbalanced panel dataset of 415 observations, which includes 75 banks operating in the six GCC countries, namely Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates. The data is expressed in international Dollars and adjusted for inflation using the country GDP deflator. The selection of output and input variables follows the existing literature which normalized around their mean values (Abdul-Majid et al. 2011; Allen and Rai 1996; Casu and Girardone 2002; Mester 1996). Total costs are defined as operating and financial costs and calculated as the sum of labor expenses, physical capital expenses, and either income paid to depositors of Islamic banks or interest expenses of conventional banks. Two outputs and three inputs are used in this study. The outputs are total loans (Y1) and other earning assets (Y2), while the inputs are price of labor (W1), price of physical capital (W2) and price of financial capital (W3). Accordingly, (W1) is personal expense over total assets, (W2) is non-interest expense over fixed assets and W3 is the interest expense over the total deposits.

3.2 Econometric specification using GMM

The methodology in this study follows the work by (Berger 1995; Claeys and Vander Vennet 2008; Goldberg and Rai 1996) to examine the determinants of bank efficiencies in the GCC countries. It focuses on the role of country risk factors and employs a dynamic panel data approach in GMM procedure. There are four advantages of using GMM model. First, dynamic panel has ability to acknowledge both the time and cross-sectional variations in the model. Second, it allows for avoidance of any bias between cross-country regressions. Third, this method has a possibility of using instrumental variables to produce more precise and accurate estimators. Fourth, this method is useful for panels that are characterized by a relatively low number of years and a large number of cross-sections per year. A recent approach for the employment of dynamic panel data is the GMM approach that was first proposed by Arellano and Bond (1991) and then developed by Arellano and Bover (1995) and Blundell and Bond (1998).

A part of the current inefficiency could be explained by past performances. For instance, inefficiency level of a bank in 2013 contains valuable information to explain inefficient performance of the bank in 2014. Banks that produce loans by accepting term deposits are supposed to be long-standing financial institutions with long-run strategies. In other words, their current performance reflects their historical decisions and performances which should be taken into consideration in any study of efficiency determinants (Matthews 2010). Therefore, the dynamic behavior of the determinants of banks efficiency after considering a lagged of efficiency score is written as follow:

$$EFF_{it} = \alpha EFF_{i,t-j} + \beta_1' X_{1it} + \beta_2' X_{2kt} + \delta_1' SX_{1it} + \delta_2' SX_{2\mathrm{kt}} + \sum_{t=2007}^{2014} \tau_t Time_t + \eta_i + v_{it} \qquad (4)$$

Where, $EFF_{it}$is the estimated cost efficiency scores from Equation (3) as the dependent variable, $EFF_{i,t-j}$ is lagged dependent variable (past inefficiencies) and assumed to be predetermined and $X_{1it}$and $X_{2kt}$are weakly exogenous (endogenous) or predetermined bank and country-specific variables, respectively. It is assumed that SX_{1it} (total assets and loan concentration ratio) and SX_{2kt} (country risk and GDP per capita) are strictly exogenous bank and country-specific variables, respectively. In addition, i=1…75, t is time as t =2007... 2014, and k denotes 6 countries as k =1…6. By including, Time in the equation, which indicates, the vector of time dummy variables. The explanation of explanatory variables and their expected sign is as below. In addition, it is assumed that the error term $(\varepsilon_{it} = \eta_i + v_{it})$ follows a one-way error component model. η_i is an unobserved firm specific time-invariant effect which allows for heterogeneity in the means of the EFF_{it} series across individuals where $\eta_i \sim IID(0, \sigma_\eta^2)$, and v_{it} is the stochastic disturbance term which is assumed independent across individuals, where $\eta_i = IID(0, \sigma_V^2)$[1].

[1]In probability theory and statistics, a sequence or other collection of random variables is independent and identically distributed (*IID*) if

The inclusion of the lagged dependent variables in equation (4) implies that there is correlation between the regressors and the error term since the lag of firm inefficiency $EFF_{i,t-1}$, depends on $\varepsilon_{i,t-1}$. The presences of lagged dependent variables show that OLS, fixed effects and random effects are biased and inconsistent for a fixed time period (*T)* as the number of firms (*N)* gets large. The OLS estimator would result in an upward estimate of the coefficient while the within-group estimator would be downward biased (Blundell and Bond 1998). A natural technique for dealing with variables that are correlated with the error term is to instrument them. Hence, due to this correlation, the dynamic panel data estimation in equation (1) suffers from Nickell (1981) bias, which disappears only if *T* is large or approaches infinity.

In order to deal with the endogeneity issue, this study used the Generalized Method of Moments (GMM) estimators, which was developed by Arellano and Bond (1991), Arellano and Bover (1995) and extended by Blundell and Bond (1998). This estimator is designed for data set with a large number of individual observations (N) over a limited number of time periods (T). Arellano and Bond (1991) proposed an efficient Generalized Methods of Moments estimator that uses instruments of which the validity is based on the orthogonality between the lagged values of the dependent variable and the errors. The technique eliminates the unobserved bank heterogeneity by estimating the equation in first-differences and control for possible endogeneity problem by using the model's variables lagged by one or more periods as instruments. This study employs the GMM estimator as proposed by Arellano and Bond (1991) to ensure the efficiency and consistency of the estimations.

3.3 Instrument choice

To deal with endogenous and predetermined variables, it assumed that$EFF_{i,t-j}$is predetermined variable, X_{1it} and X_{2kt} are weakly exogenous (endogenous). SX_{1it} and SX_{2kt} are strictly exogenous.GMM adopts instrumental variables (IV) which are highly correlated with the variables but uncorrelated with residuals. In order to conduct a test of validity on IV, this study employs a set of moment conditions for first difference equation part of the system GMM as in Equations 5-9 and level equation part of the system GMM as in Equations 10-14. The set of moment conditions for the lagged dependent variable predetermined $(EFF_{i,t-1})$, X_{1it}bank-specific endogenous variables, and X_{2kt}country-specific endogenous variables are as follows:

$$E\left[EFF_{i,t-s}(\varepsilon_{it}^{*}\right] = 0 \qquad for\ t = 3, \ldots . T; s \geq 2 \tag{5}$$

$$E\left[X_{1i,t-s}(\varepsilon_{it}^{*}\right] = 0 \qquad for\ t = 3, \ldots . T; s \geq 2 \tag{6}$$

$$E\left[X_{2k,t-s}(\varepsilon_{it}^{*}\right] = 0 \qquad for\ t = 3, \ldots . T; s \geq 2 \tag{7}$$

Where, the standard treatment to deal with endogenous variables is to start with year 3. $\varepsilon_{it}^{*}$is the first difference form of the residual which should be uncorrelated with IV. Valid instruments for a predetermined variable are comprised of lagged values of that variable starting from 1 lag. For instance, valid IV for $EFF_{i,t-1=9}$ could be $EFF_{i,t-s}$ where *t-s* = 8, 7… 1. Valid instruments for an endogenous variable consist of lagged values of that variable starting from two lags. For instance, valid instruments for $X_{2k,t=10}$ could be $X_{2k,t-s}$ where *t-s* = 8, 7… 1. With regard to strictly exogenous variables, the additional set of moment conditions is:

$$E\lfloor SX_{1it-s}(\varepsilon_{it}^{*})\rfloor = 0 \ \ for\ t = 1, \ldots, T; s = 0 \tag{8}$$

$$E\lfloor SX_{2kt-s}(\varepsilon_{it}^{*})\rfloor = 0 \ \ for\ t = 1, \ldots, T; s = 0 \tag{9}$$

Where, SX_{1it} and SX_{2kt} are a vector of strictly an exogenous bank- and country-specific variables. Equations (8)-(9) indicate that the level form of the transformed variable could be a valid instrument. Equations (5)-(8) show that the predetermined and endogenous variables in the transformed equation would be instrumented with the lagged level of the regressors. The GMM estimator based on moment conditions in 5-9 is known as the difference GMM.

However, Alonso-Borrego and Arellano (1999) and Blundell and Bond (1998) showed that if the lagged dependent and the explanatory variables are persistent over time or nearly a random walk[2], then lagged levels of these variables are weak instruments for the regression equation in differences. To put it another way, lagged level instruments are hardly able to provide sufficient information for a first difference variable if it is not stationary. Hence, to decrease the potential bias and imprecision associated with the difference estimator, Blundell and Bond (1998) proposed a system GMM approach by combining regressions in differences and in levels. In addition to

each random variable has the same probability distribution as the others and all are mutually independent.

[2]The theory that changes have the same distribution and are independent of each other, so the past movement or trend of market cannot be used to predict its future movement

the regression in differences, the instruments for the regression in levels are the lagged differences (transformed) of the corresponding instruments. Consequently, the extra moment conditions for the second part of the system or level equation which also contains predetermined, endogenous, and strictly exogenous explanatory variables could be written as follows to examine whether those IV are valid :

$$E\left[EFF^{*}_{i,t-s}(\eta_i + v_{i,t})\right] = 0 \quad for\ s = 1; t = 3,4, \ldots . T \quad (10)$$

$$E\left[X^{*}{}_{1i,t-s}(\eta_i + v_{i,t})\right] = 0 \quad for\ s = 1; t = 3,4, \ldots . T \quad (11)$$

$$E\left[X^{*}{}_{2k,t-s}(\eta_i + v_{i,t})\right] = 0 \quad for\ s = 1; t = 3,4, \ldots . T \quad (12)$$

$$E\left[SX^{*}{}_{1i,t-s}(\eta_i + v_{i,t})\right] = 0 \quad for\ s = 0; t = 2,3,4, \ldots . T \quad (13)$$

$$E\left[SX^{*}{}_{2k,t-s}(\eta_i + v_{i,t})\right] = 0 \quad for\ s = 0; t = 2,3,4, \ldots . T \quad (14)$$

The set of moment conditions in the transformed equations (5)-(9) and in the levels equations (10)-(14) represent the validity of adopted instruments in the system GMM which could generate moment conditions prolifically (Roodman 2009). Too many instruments in a system GMM over fit endogenous variables even as it weakens the Hansen test of the instruments' joint validity. To limit the number of instruments, this study would use two main techniques. The first technique uses only certain lags instead of all available lags for instruments, while the second technique combines instruments through addition into smaller sets by collapsing the block of the instrument matrix. These two techniques were proposed by (Beck and Levine 2004; Calderon et al. 2002; Karim et al. 2011; Roodman 2009).

As argued by Baltagi (2009), the parameters are asymptotically similar if the $\varepsilon_{it}$is *i.i.d*. However, Bond (2002) stated that a one-step result is to be preferred to two-step results. This is because his simulation studies showed that the two-step estimator is less efficient when the asymptotic standard error is too small or the asymptotic t -ratio is too big. Therefore, Windmeijer (2005) provided a bias correction for the standard errors in the two-step estimators. As noted by Windmeijer (2005), the performance of the two-step GMM is better than the one-step GMM in estimating the coefficients, with lower bias and standard errors. In fact, the reported two-step standard errors with the correction work well and appear to be modestly superior to the cluster robust one-step estimation. Hence, this study would use the one-step and two-step difference and system GMM in the baseline multifactor model.

4. The data and empirical specifications

Cross-country efficiency study requires proper definition of a common frontier that incorporates country-specific environmental conditions. Moreover, integration of environmental variables into the analysis allows researchers to verify the degree of similarity among banking technologies. This has been addressed in the developed countries but not given much attention in the developing countries. This study focuses on the GCC countries. This study examines the influence of environmental conditions on the efficiency of the GCC banking industries. In particular, several categories of environmental variables are taken into account namely, political risk, credit rating, debit indicator and competition level, macroeconomic condition and bank specific variables. This paper employs an unbalanced annual bank level data of banks operating in the GCC countries, covering the period of 2007-2014. The financial statements of banks were collected from the Bankscope database of Bureau van Dijk's company. The country risk index was drawn from Euromoney database. The macroeconomic variables are retrieved from the IMF Financial Statistics (IFS) and the World Bank, World Development Indicator (WDI) databases.

Table 1 describes the sample distribution of banks by type of bank for each country under study. The number of banks is 75 operating in the GCC countries, including conventional and Islamic banks, with 415 observations. Table 1 report that all countries except Oman have both Islamic and conventional banks, which indicates that the GCC countries have the advantage of diversified banking operations. The United Arab Emirates has 8 Islamic banks and 15 conventional banks, followed by Bahrain with 5 Islamic banks. Further, it is noted that the number of both Islamic and conventional banks have increased over time. This implies that banks in this region are operating under monopolistic competition except Oman, as the numbers of banks have not changed over time and there are no Islamic banks present. The concentration ratio and competition level contain crucial information required to estimate the common frontier and efficiency.

Table 1: Sample of Commercial and Islamic Banks, 2007-2014

4.1 Definitions and explanations of the variables

There are considerable variations across countries in relation to bank outputs and inputs, as well as the size of the country-specific control variables. Table 2 provides the variables included in this study. Country risk takes into account government stability, non-

corruption perception, financial payments, capital mobility and regulatory environment. A higher index indicates lower country risk. Hence, a positive coefficient is expected for country risk variables (political risk, credit ratings and debit in default) on efficiency (Saini and Bates 1984). In addition, the loan concentration ratio is calculated as the percentage of total loans of the five largest banks in the country. Higher concentration could be associated with either higher or lower efficiency. If higher concentration is a result of market power, than concentration and costs would move in the same direction. From Table 2, it showed that markets in Bahrain, Oman, Kuwait and Qatar could be described as 'concentrated'. However, markets in Saudi Arabia and United Arab Emirates could be termed as 'moderately concentrated markets'. Hence, a negative sign for loan concentration ratio is expected.

Table 2: Average Values of Country-Specific Variables by Country, 2007-2014

Table 2 also highlights some differences among countries in terms of their total assets. Bahrain and Oman have the lowest total assets. Oman has the lowest political risk while Saudi Arabia has the highest compared to other GCC countries and records the lowest GDP growth rates along with the United Arab Emirates. The loan concentration ratio is quite similar in all countries except Saudi Arabia and United Arab Emirates, which recorded the lowest ratio indicating that competitive conditions are dissimilar among countries

Country risk is the main contribution of this paper, which means that there is no background on the relationship between this variable and other explanatory variables. This fact highlights that it is crucial to investigate the nature of this variable to determine whether it is an endogenous or strictly exogenous variable. The degree of correlations between the explanatory variables employed in the panel regression analysis is presented in Table A1 in the Appendix. The matrix reveals that the correlations between country risk and other explanatory variables are not strong, implying that multicollinearity problems are not severe. Kennedy (2003) stated that multicollinearity is a problem when the correlation is above 0.80 which is not the case here. Therefore, country risk is an explanatory variable that could be strictly considered as exogenous.

5. Empirical results

Table 3 summarized the estimations results of the cost functions by using SFA framework. The results report significant positive coefficients for inputs and outputs, implying that higher bank inputs and outputs lead to higher costs. For example, 1 per cent increase in financial capital prices leads to 0.411 per cent rise in costs, because banks would pay higher interests on deposits. Although technology has improved in the sample countries, it is not significant enough to reduce costs, and the coefficient of time (*T)* is negatively insignificant at -0.016. Therefore, banks still have potential capacity to improve efficiencies by investing in technologies, which could minimize costs.

Table 3: SFA estimates for Parameters of Cost Function

To demonstrate the effect of country features on bank's underlying technology, this paper also includes country level variables in the estimation of the stochastic frontier, in which could be associated with the variations of inefficiency measures across banks and affect managerial incentives and decisions. In other words, introducing country-specific variables in the estimated cost frontier is necessary, as it would indicate which variables contribute to the differences in the banking sectors across countries. The characteristics of the operating environment are beyond the control of bank managers, thus effectively conditioning the frontier of the banking sector in each country in a way that is amenable for cross-country comparisons. These variables include macroeconomic variables are inflation and population density and the GDP per capita growth. The results in Table 3 also confirm that country-specific variables comprise measures of inflation and population density. The coefficient of inflation is positive and significant, which indicates that the banks in countries with higher inflation levels have higher potential costs. As expected, the population density is negative, which suggests that the retail distribution of banking services is less costly (Abdul-Majid et al. 2010). The GDP per capita -0.772 indicates that the higher the GDP the lower cost of the banking sectors (Dietsch and Lozano-Vivas 2000; Leibenstein 1966).

5.1 The main results of GMM

Table 4 reports the estimation results of the determinants of bank efficiencies in the GCC countries using Generalized Method of Moments (GMM) technique. The focal point is to examine the role of country risk factors and competition on bank efficiency. To predict the effects of the expected escalation in cross-border competition, it is important to determine the differences and similarities in the current performances of banks in different countries. However, cross-border comparisons have to account for potential differences arising from certain country-specific aspects of banking technology on one hand,

and the environmental and regulatory conditions on the other. In particular, the economic environments are likely to differ significantly across countries, and could induce important differences in levels of bank efficiency through various channels. For instance, differences in country risks or macroeconomic conditions across countries could produce significant variances in the demand for banking products and services among households.

After controlling for time effects and potential differences between the GCC countries, the country risk variables namely political risk, credit ratings and debt default have a positive value and significant at 1 percent level (0.002) (0.003), (0.004) respectively, in which indicate that the country risks play an important role in influencing the bank efficiency in the GCC countries. The lower risks creates a conducive and efficient working environment where banks perform better based on stability, monetary/currency equilibrium and sustained GDP growth (Saini and Bates 1984). In addition, concentration ratio plays a pivotal role in increase efficiency (Chortareas et al. 2012). As expected, the coefficient concentration ratio is a negative (-0.259) and statistically significant at the 1 per cent level suggesting that greater competition positively influence efficiency levels (Al-Muharrami et al. 2006; Matthews et al. 2007; Yildirim and Philippatos 2007). higher concentration cause inefficiencies in the banking sector (Yildirim and Philippatos 2007). Berger and Hannan (1998) argued that the monopoly power generated from market concentration might lead bank managers to slacken their efforts and enjoy a quiet life. Hence, they argue that banks are generally more efficient in a competitive banking environment.

Table 4: Panel Generalized Methods of Moments Regression Results

With regard to the total assets coefficient results, the empirical findings yield a negative value (-0.004) and significant at the 1 per cent level, which suggests that larger banks suffer from diseconomies of scale. The results are consistent with expectations that banks in developing countries suffer from the problem of size because it hinders them from investing in new technologies and banking techniques that are necessary to diversify their risks and reduce their total costs (Fathi 2010). The size would be a factor which handicap banks to compete in the market. Moreover, given increased competition among banks, the smaller banks could be forced to compete with the larger ones to survive and thereby increase their efficiency. The earlier studies had concluded that the size of the banks does not influence efficiency and small banks are more efficient than the larger ones and beyond this point the effect of size could be negative due to bureaucratic and other reasons (Ariff and Can 2008; Bader et al. 2008; Matoušek and Taci 2004; Mostafa 2007).

Both specification tests, that is AR(2) for testing the serial correlations and the Hansen test for the validity of instrument adopted, are also valid. As shown, the p values for AR(2) and Hansen tests are higher than 0.10, that is, statistically insignificant at the 10% significance level. This implies that, there is no serial correlation (autocorrelation) in the transformed residuals, and the instruments (moment conditions) used in the models are valid. The additional moment conditions such as difference in Hansen tests are also statistically insignificant. Furthermore, the highly significant coefficient of lagged dependent variable confirms the dynamic character of the model specification, thus justifying the use of dynamic panel data model estimation. Additionally, the two-step system GMM is robust against heteroskedasticity and autocorrelation, and it employs more instrumental variables than two-step difference GMM, which results in more efficient estimators. Furthermore, the highly significant coefficient of lagged dependent variable (0.812) affirms the application of a dynamic model, which implies that past inefficiencies significantly influence the current one.

6. Summary and conclusion

This paper investigates the determinants of bank efficiencies focusing on the role of country risk factors and concentration for the potential GCC union for the period 2007-2014. This paper employs SFA to estimate efficiency scores before adopting GMM technique to find the efficiency determinants. The results indicate that the lower political risk which represents country risk improves banks' efficiency. This suggests that countries with low political risks tend to perform more efficient banking sector. Higher concentration within banking sector in potential GCC union leads to lower efficiency. Following this further, a negative relationship between size and efficiency reflects that larger banks suffer from diseconomies of scale.

The policy implications from this study indicate that the government should play an active role in adopting new strategies to enhance political stability and competition. As the GCC countries are in the process of shifting from cooperation to union stage, it is imperative that the policy makers in these countries improve their quality of governance and transparency, and the level of competition is a crucial consideration for the union countries. Thus, it could be concluded that an open banking environment encourages

competition. It is therefore essential for the governments and policy makers in the GCC countries to decrease political risk and increase competition in order to have higher banking efficiency for potential GCC union countries.

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Table 1: Sample of Commercial and Islamic Banks, 2007-2014

Country		2007	2008	2009	2010	2011	2012	2013	2014	Total Banks
Bahrain	Conventional	7	7	7	7	7	7	7	7	7
	Islamic	5	5	5	5	5	5	5	5	5
Oman	Conventional	10	10	10	10	10	10	10	10	10
	Islamic	0	0	0	0	0	0	0	0	0
Qatar	Conventional	5	5	5	5	5	6	6	6	6
	Islamic	2	2	2	2	3	3	3	3	3
Kuwait	Conventional	6	6	6	7	8	8	8	8	8
	Islamic	1	1	1	1	1	2	2	2	2
Saudi Arabia	Conventional	8	8	8	8	8	8	8	8	8
	Islamic	3	3	3	3	3	3	3	3	3
United Arab Emirates	Conventional	10	10	12	15	15	15	15	15	15
	Islamic	3	3	4	4	5	8	8	8	8
All Countries	Conventional	46	46	48	50	51	54	54	54	54
	Islamic	17	16	15	16	19	21	21	21	21

Source: Bankscope

Table 2: Average Values of Country-Specific Variables by Country, 2007-2014

	Bank Specific variables	Country risk	Macroeconomic variable

Countries	Total Assets	Concentration Ratio	Political Risk	Credit Ratings	Debt default	GDP Per Capita
Bahrain	4.76	0.91	16.88	7.45	9.50	2.32
Oman	1455.23	0.83	22.99	7.25	9.22	2.27
Qatar	3474.35	0.89	18.63	8.5	9.88	0.45
Kuwait	8498.16	0.90	18.57	8.5	9.95	2.73
Saudi Arabia	5378.29	0.66	16.01	8.00	9.90	0.91
United Arab Emirates	14973.7	0.68	19.26	8.75	9.85	-5.39

Source: Bankscope, Heritage foundation, Euromoeny Database, and Worldbank database.
Political Risk ranges between 0 and 25 with the higher value representing less risk
Credit Rating and Debt Default Range between 0 and 10 with the highier value representing less risk.

Table 3: SFA estimates for Parameters of Cost Function

Parameters	Coefficient	Estimated value	Standard Error
φ	Constant	1.614***	0.327
β_1	Y1	0.5403***	0.041
β_2	Y2	0. .521***	0.037
α_1	P1	0. 413***	0.026
α_3	P3	0. 361***	0.034
$\beta_{1,2}$	Y1Y2	-0. 285***	0. 031
$\beta_{1,1}$	Y1Y1	0. 319***	0. 038
$\beta_{2,2}$	Y2Y2	0. 245***	0. 030
$\alpha_{1,1}$	P1P1	0. 019	0. 013
$\theta_{1,1}$	P1Y1	-0. 140***	0.022
$\theta_{1,2}$	P1Y2	0.033*	0.020
$\alpha_{3,3}$	P3P3	-0.077***	0.020
$\theta_{3,1}$	P3Y1	0.004	0.023
$\theta_{3,2}$	P3Y2	0.104***	0.019
$\alpha_{1,3}$	P1P3	0.029**	0.013
λ_1	T	- 0.016	0.014
λ_{11}	T2	0.047***	0.009
ψ_1	Y1T	-0.049***	0.011
ψ_2	Y2T	0.034***	0.009
δ_1	P1T	0.008	0.008
δ_3	P3T	-0.003	0.007
ξ_4	Inflation	0. .099***	0.002
ξ_5	Population density	- 0. 017***	0.494
ξ_6	GDP per capita growth	-0.772***	0.241
Lambda		0.574***	0.114
Sigma		0.451***	0.0006
Log Likelihood		-327.813	

[1] Y1, Y2, W1, W3 and *t* refer to loans, other earning assets, price of labor, price of financial capital, and year.
[3] *, **, *** Significant at the 10%, 5% and 1% level

Table 4: Panel Generalized Methods of Moments Regression Results

	One step system		Two step system	
Variables	**Coefficient**	**Robust Std. Err.**	**Coefficient**	**Corrected Std. Err.**
EFF_{t-1}	0.726***	0.111	0 .7341***	0.096
Political Risk	0.002***	0.001	0.002**	0.0009
Credit Ratings	0.004***	0.001	0.003***	0.001
Debt Default	0.006***	0.002	0.004***	0.002
Loan Concentration ratio	-0.235***	0.090	-0.259***	0.090
Total Asset	-0.005***	0.001	-0.004***	0.002
AR(1)	-4.08***		-3.90***	
AR(2)	0.63		0.64	
Hansen test excluding group	0.98		0.97	
Difference (null H = exogenous)	0.85		0.72	
Wald chi2	155.32***		243.95***	
No. of observations	415		415	
No. of instruments	30		30	
No. of group	75		75	

***, **, * Significant at 1%, 5%, and 10%, respectively;
Sargan is the *p*-value for the Sargan test for the validity of the over-identifying restrictions for the GMM estimates
AR(2) is the *p*-value for the test for 2nd order autocorrelation for the GMM first-difference estimate residuals

Appendix A

Table A1: Correlation Matrix for the Explanatory Variables

	CR	**PR**	**CR**	**DD**	**TA**	**EFF**
CR	1.000	0.064	-0.021	0.049	-0.207	0.031
PR		1.000	-0.103	0.041	-0.491	-0.053
CR			1.000	-0.007	0.049	0.218
DD				1.000	-0.046	-0.005
TA					1.000	-0.254
EFF						1.000

(CR): concentration ration for the largest bank on loan. (PR): Political risk,
(CR) Credit ratings, (DD) Debt default.(TA) Total assets, (EFF): Efficiency score,

10/16/2022