International Journal of Innovative Research and Scientific Studies, 5(4) 2022, pages: 306-331

IJIRSS
International Journal of Innovative Research & Scientific Studies

ISSN: 2617-6548

URL: www.ijirss.com

Banking Risk in Selected MENA Countries

Lamya M. A. Gadou

Department of Economics, Faculty of Commerce, Zagazig University, Zagazig, Egypt.

(*Email: Lmagadou1512@gmail.com*)

Abstract

This study examines the influence of bank-specific variables on the individual risk of 58 banks in ten MENA countries over the period 2011-2019. Firstly, investigating the correlations among the banks' stock returns depicts that the banks with the highest correlations are in Saudi Arabia, the United Arab Emirates, and Qatar, either domestically or across countries. Then, the individual bank risk ranking for the entire sample based on estimated historical Value-at-Risk (VaR) and Estimated Shortfall (ES) shows that the corresponding positions of banks according to their riskiness differ slightly. Noticeably, the National Bank of Fujairah in the United Arab Emirates has the highest idiosyncratic risk level in terms of both risk measures. We lastly conducted fixed and random effects panel regression models to examine the impact of bank-specific balance sheet data and macroeconomic variables on bank risk levels captured by VaR and ES. The whole sample comprises publicly listed banks in 10 countries, which were further divided into 2 sub-samples for the Gulf Cooperation Council (GCC) region and Mediterranean Partner Countries (MPCs). The outcomes of the aggregate sample suggest that lower leverage, profitability, and economic growth may exacerbate idiosyncratic risk. Results also demonstrate that strengthening stability and regulatory capital positions would lower banking risk. Considering the GCC sub-sample for VaR and ES models, we found that both risk measures typically increase with greater liquidity.

Keywords: Bank-specific variables, Expected shortfall, Idiosyncratic risk, MENA region, Panel regression, Risk ranking, Systemic risk, Value at risk.

DOI: 10.53894/ijirss.v5i4.743
Funding: This study received no specific financial support.
History: Received: 29 July 2022/**Revised:** 16 September 2022/**Accepted:** 3 October 2022/**Published:** 13 October 2022

Competing Interests: The author declares that there are no conflicts of interests regarding the publication of this paper.
Transparency: The author confirms that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained.
Ethical: This study followed all ethical practices during writing.
Publisher: Innovative Research Publishing

1. Introduction

Over the past two decades, systemic risk has been extensively studied, particularly in the aftermath of the global financial crisis of 2007-09, and a plethora of theoretical and empirical papers have been rapidly growing to address this issue. Systemic risk (SR) in the banking sector has been commonly recognized as a key contributor to the recent crisis. Emerging from interconnected depository institutions, SR refers to the likelihood of simultaneous multiple bank failures causing not only severe turmoil in the financial sector but also deep economic recession. The widespread spillovers

accompanying SR necessitate public intervention considering the appropriate policies to help mitigate the adverse consequences. The literature dealing with banking risk encompasses various aspects such as the relevant prudential regulation either micro- or macro- approaches, theoretical models of single bank runs and contagion, measuring standalone risk level or idiosyncratic risk, and assessment of overall SR and the contribution of individual financial institutions to SR.

According to De Bandt and Hartmann [1], there are two fundamental features underlying the concept of systemic risk; *initial shocks* and *propagation*. Firstly, the *shocks* hitting the banking system could be *idiosyncratic* i.e. affecting a single institution or *systematic* that is disrupting a great portion of the sector. An *Idiosyncratic event* refers to an individual bank failure resulting from risks inherent in the banking activity that could negatively affect another bank (i.e. weak event) or cause several bank runs (strong event or contagion). However, the *systematic*[1] *event* indicates that several banks simultaneously suffer adverse effects (weak) or bank failures (strong) due to severe widespread imbalances. So only strong events can lead to systemic risk, but not for a limited number of distressed banks. The Domino effect lies at the heart of systemic risk resulting from idiosyncratic events when an initial bank run leads to disruptions incurred by other banks transmitted either through contractual claims against the failing bank or a decline of asset prices due to fire-sale [2]. The second important characteristic of systemic risk is *propagation*. It is the mechanism through which shocks are transmitted from one distressed bank to another or other sectors of the economy. For instance, shocks could transfer through connected balance sheets (interbank activities, fire sales and credit default swap (CDS)) or confidence loss attributed to asymmetric information problems (moral hazard and adverse selection). Another possible channel is through payments and the settlement system for clearing payment obligations.

2. MENA Region Economy

The MENA region owns a large portion of the world's energy resources and can strengthen global trade and economic ties. The region has vast amounts of oil and natural gas which constitute the world's reserves of about 60% and 45%, respectively. Other economies in the MENA region rely on raw material exports, thereby getting directly affected by volatile global commodity prices. The region still has the potential to boost economic development accompanied by more work on structural reforms for deeper economic diversification. This entails expanding sources of foreign exchange revenue, improving productivity, and strengthening the banking sector's resilience which are essential factors to withstand massive economic shocks.

Arab countries in the MENA region had relatively less direct exposure to the global financial crisis of 2007-09 due to weak engagement with international capital and trade. Notwithstanding, these economies were indirectly affected by declined major sources of income as the GDP rate of growth shrunk from 5.77% in 2008 to 0.64 in 2009. This emanated from reduced tourism revenues, remittances in low- and middle-income economies, lower FDI inflows, and sharp fall of oil prices in GCC countries. FDI net inflows dropped to $44.8 billion in 2011 compared to its peak of $88.7 billion in 2008, it averaged below $45 billion over the last decade. In recent years, local governments have experienced budgetary pressures which contributed to the slow pace of economic recovery. A crucial challenge was the volatility of oil prices that began in 2014 with crude oil plummeting to $30 per barrel in 2016 after a relatively stable four years of around $100 a barrel.

The high sovereign debt level as a share of GDP was noticeable in the Arab region attributable to the widening fiscal and current account deficits and currency devaluation. The average value of this ratio rose from 48.6% in 2015 to 60.8% in 2018. in which the developing economies contribute more, especially Lebanon was on an upward trend above 140% of debt level. However, the GCC countries experienced a rapid rise in their debt levels from 21.79% of GDP in 2015 to 38.35% in 2018, where the Bahraini economy is the highest contributor recording percentages of 55.4 and 80 in 2015 and 2018, respectively. The onset of the COVID-19 pandemic in late 2019 slowed down the world economy, as trade and investment were severely hit by the dramatic disruptions of supply-chain and demand shocks. The global economic recession is already affecting MENA, primarily through fluctuating oil prices, which reduces oil export revenue and complicates spending decisions. The region experienced slower economic growth of 2.66% in 2020 from 4.2% in 2019, also an inflationary surge represented by hitting the highest rate over the last decade 8% increase in the consumer price index in 2020 compared to 1.6% in the previous year. Additionally, public debt rose from 53.47% of GDP in 2019 to 63.6% in 2020.

These vulnerabilities coinciding with the Coronavirus pandemic-related stress that started in early 2020 have far exacerbated sovereign debt levels and pose growing future risks confronting the emerging markets within the MENA region, in addition to the adverse consequences of the Ukraine war that further aggravate uncertainty regarding the pace of economic recovery due to accumulating macroeconomic imbalances which also threaten financial stability.

During the period 2015-2020 Figure 1, the MENA region had the lowest average economic growth of 0.4% relative to the Organisation for Economic Co-operation and Development (OECD) and the Association of Southeast Asian Nations (ASEAN) areas, having 1.66% and 3% respectively. However, in 2020 the COVID-19 pandemic and lockdown measures caused a severe global economic contraction. Despite being on average below OECD, the contribution of the banking sector to GDP in MENA increased over time from 72% in 2018 to 106% in 2020 surpassing OECD which recorded 103% in 2020. With internationally surging public deficits, the government borrowing from domestic banks (as % of GDP) increased significantly with the outbreak of the pandemic. MENA recorded the highest level of an average of 28% compared to 15.6% and 12% for OECD and ASEAN, respectively. Government debt is the highest in the OECD close to 80% of GDP in 2020, nevertheless, it rose in the same year by 16.3% (up to 62%) while it decreased by 9.5% in 2019. In

[1] Systematic risk is an uncontrollable risk that could not be managed through diversification, i.e. undiversifiable risk or market risk. In systemic risk however, potential loss arises from the transmission of financial distress from one bank to others including banks, financial institutions, and other sectors of the economy.

six years, MENA's share of domestic credit to the private sector as %of GDP slightly rose by 10.7% (from 56% in 2015 to 62% in 2020), higher than the ASEAN region but still much lower than OECD levels.

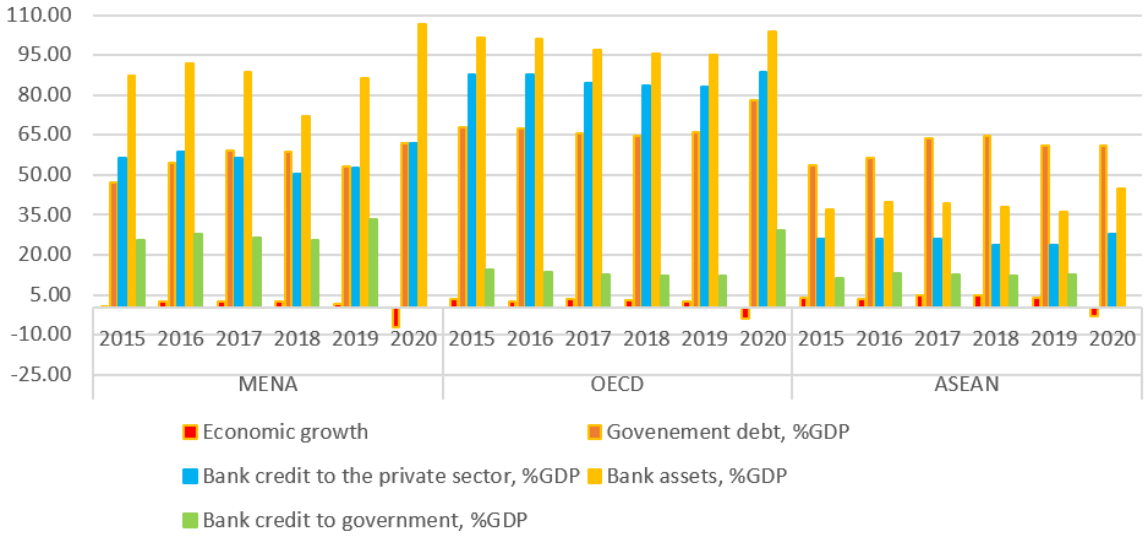

Figure 1.
Economic indicators in selected regions worldwide, 2015-2020.
Note: data are collected from theglobaleconomy.com and the author's calculations. In 2020, no available data exist for bank credit to government, %GDP in MENA and ASEAN regions.

In comparison with MENA's banking industry which had a concentration ratio of 76.5% on average Figure 2, banking sectors in OECD and ASEAN are deemed mildly less concentrated with 73% and 72% of the assets being held by the three largest banks. However, to a small extent, MENA had relatively the lowest average regulatory capital ratio of about 17% compared to OECD and ASEAN areas, 19% and 20%, respectively.

MENA has a relatively stable banking system represented by the z-score record that was 25% in 2020, which reflects a low likelihood of insolvency. Despite being stable in 2019 and 2020 at 47%, the liquidity ratio captured by liquid assets-to-deposits grew by 23.6% since 2015. While ASEAN's ratio declined from 50% in 2018 to 43% in 2020, in OECD this ratio rose gradually to reach 42.5% in 2020, from 29% in 2015. Low liquidity in OECD's banking industry was induced by extremely high loan-deposit ratios (mostly above 105%) and was 97% in 2020, as it had reduced by 15.6% since 2015.

However, the share of bank credit to deposits remained nearly stable in MENA below 75% and decreased by 14% in ASEAN countries to 62.5% in 2020 from 72.7% in 2015. Moreover, MENA's profitability remained steady measured by return on assets (ROA) in six years was 1.6% on average which is significantly higher than the 0.8% of the OECD area, but still far below the 2.6% of ASEAN.

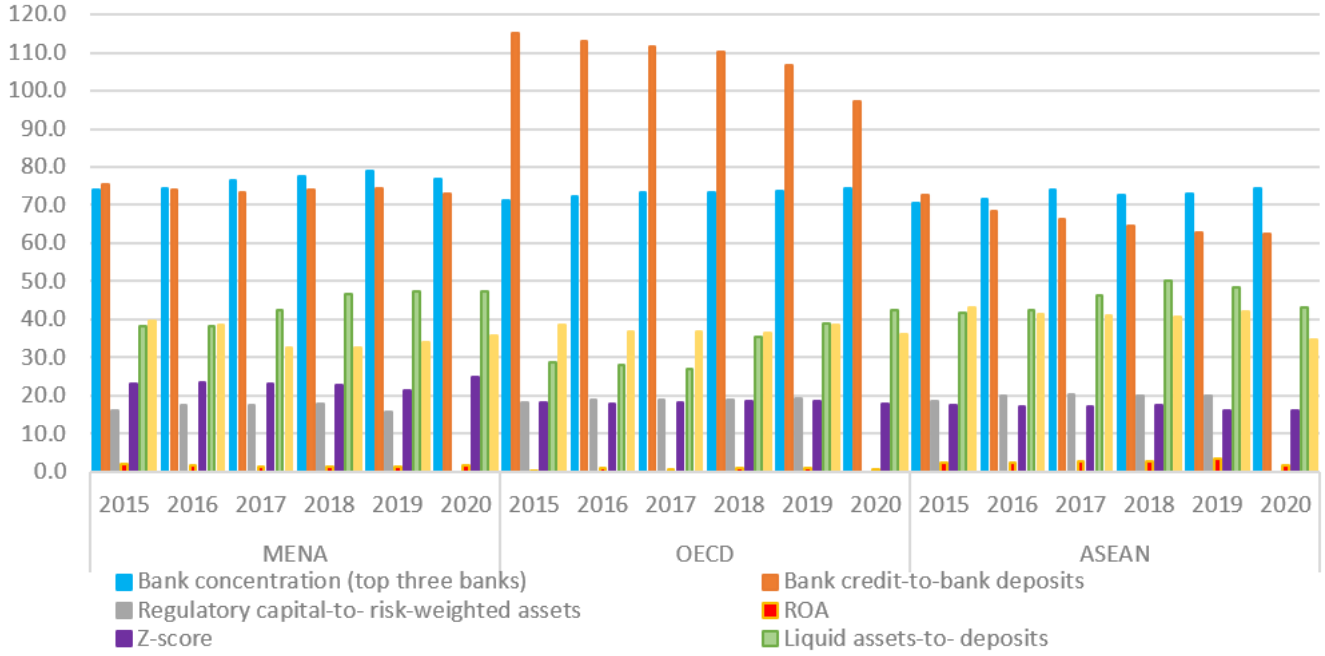

Figure 2.
Banking sector indicators in selected regions worldwide, 2015-2020.
Note: data are collected from theglobaleconomy.com and the author's calculations. In 2020, no available data exist for regulatory capital-to-risk weighted assets in all regions.

The remainder of this paper is organized as follows: Section 3 briefly overviews the literature review and the main outcomes of previous studies. Section 4 describes the selected sample and sources of data and specifies the adopted model. Section 5 identifies the variables and hypotheses formation. Section 6 contains the results of the empirical analysis and the interpretations. Finally, Section 7 summarizes the concluding remarks.

3. Literature Review

A broad strand of recent papers furtherly studies the factors influencing SR. These empirical studies extend a model analyzing the main drivers that matter to the overall banking SR and individual banks' contribution to it. Bank's ratios are internally affected by management decisions, whereas these indicators could help identify systemically important institutions and thus could serve as early warning indicators. Thus, studies used banks' balance sheet information and macroeconomic factors as explanatory variables in the Ordinary Least Squares (OLS) regression model. Nevertheless, the final results are mixed because of alternative SR methodologies and datasets. The reviewed literature can be divided into two categories. *Firstly*, the empirical studies are devoted to examining idiosyncratic bank risk and its determinants as being an endogenous factor of the whole systemic risk. This part includes several studies utilizing different individual bank risk metrics, e.g. Balogh [3]; Alber [4]; Battaglia and Gallo [5], and Hunjra, et al. [6] (Check Table 1 in Appendix A for a more detailed review of alternative banking risk measures applied in various studies). Balogh [3] examined the influence of macroeconomic variables on a couple of SR indicators for the banking sector of 27 European countries during 2001-2010. The first dependent variable non-performing loans (NPL) is directly related to the rate of unemployment and negatively associated with the growth rate of GDP, government deficit (% of GDP), and lending interest rate. Then, the capital adequacy ratio (CAR) is positively linked to government deficit and inversely related to inflation, total reserves and GDP.

Alber [4] used VaR as an SR measure for 11 Egyptian banks from 2003 to 2013. The more likely banks are stable, the higher the z-score value, which will reduce SR but larger banks are riskier. Employing distance to default (DD) proxied for idiosyncratic risk, Vallascas and Keasey [7] applied the DD model for 153 banks in the Eurozone 1992-2008 and included some bank-specific and country-level variables. Eight variables exerted a positive effect on DD namely size, non-interest income-to-total operating income, banking growth, off-balance sheet items-to-total assets (TA), TA-to- book value of equity (leverage), the market value of equity-to- book value of equity (leverage), the market value of equity-to-- book value of equity (MTB or bank charter value), real GDP and growth rate of inflation. However, DD is adversely influenced by both the Herfindahl Hirschman index (HHI) of bank TA (concentration degree in domestic banking) and CAR.

Laeven, et al. [8] employed bank stock returns as a proxy for bank risk for 1343 banks in 52 countries through the period July 2007- December 2008. Applying the fixed effect-regression model, the study concluded that the bank's size elevates its level of risk as well as unstable funding (more short-term wholesale funding relative to long-term funding) and core-banking activities (higher share of loans to total assets compared to securities trading).

Turning to key variables and financial ratios that are statistically significant to explain banking risk. Size is directly affecting the risk measure (e.g. Alber [4]; Kleinow and Nell [9]; Khiari and Nachnouchi [10]), however, Hunjra, et al. [6] and Weiß, et al. [11] determined that larger banks tend to be associated with lower risk. In contrast to most studies considering leverage positively influencing bank risk (such as Anghelache and Oanea [12]; Borri, et al. [13]; Sengul and Yilmaz [14]); Cicak [15] and Qin and Zhou [16] reached a result that less leveraged banks are connected to greater risk.

Kleinow and Nell [9] concluded that more capitalization increases bank risk, while Battaglia and Gallo [5] support the opposite conclusion. Contrary to Idier, et al. [17], greater profitability is figured out to be related to riskier banks according to Buch, et al. [18] and Qin and Zhou [16]. The non-traditional business model is captured by the ratios of either non-interest income-to-net income or loans-to-total assets. Alber [4] along with Vallascas and Keasey [7] and Kleinow and Nell [9] found that bank risk surges with a greater extent of non-traditionality, which means less traditional commercial banking activities. Yet, other studies reveal that greater tendency for traditional or core-banking activities would reduce the level of bank risk.

4. Sample Selection and Model Specification

In order to calculate our idiosyncratic risk proxy, we gathered stock price data about the publicly listed banks from Thomson Reuters Financial Datastream. The whole sample contains 58 banks from 10 MENA countries for the period 2011-2019 with 522 annual bank observations (unbalanced panel). The countries are Qatar, Saudi Arabia, the United Arab Emirates, Kuwait, Bahrain, Oman, Egypt, Jordan, Lebanon, and Morocco. The full dataset is then divided into 2 sub-samples one for GCC countries with 34 banks and the second for MPCs with 24 banks. To examine the determinants of idiosyncratic risk, our econometric model includes seven bank-specific and two macroeconomic variables. The first category is related to the main financial statements obtained from the Orbis BankFocus database by Bureau van Dijk. The latter is received from World Development Indicators by the World Bank.

To investigate the sources of idiosyncratic risk, we conduct panel regression analysis to check the variables, either idiosyncratic bank ratios or country-level that may have an impact on systemic risk through the following equation:

$$SR_{it} = \beta_0 + \beta_1 Size_{it} + \beta_2 Leverage_{it} + \beta_3 Stability_{it} + \beta_4 Income\ diversification_{it} + \beta_5 Profitability_{it} + \beta_6 Liquidity_{it} + \beta_7 Regulatory\ capital_{it} + \beta_8 Economic\ growth_{it} + \beta_9 Inflation_{it} + \beta_{10} Government\ debt_{it} + u_{it}$$

In which *Size* is log assets, *Leverage* is total equity-to-total assets, *Stability* is z-score, *Income diversification* is non-interest income-to-total income, *Profitability* is net interest margin, *Liquidity* is liquid assets-to-deposits, *Regulatory Capital* is tier 1 ratio, *Economic growth* is GDP rate of growth, *Inflation* is the change of consumer price index (CPI),

Government debt is government debt as a percentage of GDP and *u* is the error term. The subscripts *i* and *t* denote bank and year, respectively.

5. Variables Identification and Hypotheses Development

5.1. Idiosyncratic Risk Measures

Following Alber [4] and Battaglia and Gallo [5], banks' risk profile is proxied by two dependent variables: Value at Risk (VaR) and Expected Shortfall (ES). Both are used for banks with market risk exposure based on the 99th percentile of the bank's daily stock return distribution (X). We resort to both convenient quantitative bank risk measures because of unavailable highly frequent data necessary for recent systemic risk assessment methodologies. Historical simulation is applied by straightforward computation with unrequired distribution assumption [19]. VaR is defined as the maximum loss for a bank's (i) stock returns (X) will incur over a certain period of time and given the level of confidence (q). For a bank's return (X) distribution, VaR as a statistical measure is defined as:

$$Pr\,(X_i \leq VaR_q^i) = q$$

VaR is the loss of stock returns over a year with a confidence level of 99%, in other words, VaR is the loss at the 99th percentile. In terms of probability theory, VaR at the q percent confidence level is the (1−q)% quantile of the profit-loss distribution, indicated as a percentage loss. It shows the range of a bank's potential loss, e.g. VaR (99%)=5.27% is interpreted as that we are 99% confident that maximum loss in a day will not exceed 5.27% and this also means that there is a 1% chance that the minimum daily loss could be 5.27% or more.

Moreover, ES is adopted providing the expected loss conditional on going beyond the VaR level calculated at the confidence level (q=99%) and thus it could be equal to VaR or exceeds it. This average expected loss can be a more accurate lower approximation of the left-tail risk of the return distribution [20].

For instance, ES(99%)=3.56% means that in the worst-case scenario 1% of returns will lead to an average loss of 3.65%. Thus, ES is formally defined as:

$$ES_q = E[X \mid X \leq VaR_q^i]$$

VaR and ES are calculated based on historical data of daily bank stock prices. Here we employ 2,347 daily log stock returns from 3rd January 2011 to 31st December 2019 for 58 banks in 10 different MENA countries. Considering the daily log return series VaR and ES are calculated for each bank using a confidence level q which is set to 99%. Therefore, there is a probability of 1% (1- q) that daily loss might exceed VaR. *The returns are calculated as follows:*

$$X_t = ln(P_t) - ln(P_{t-1})$$

5.2. Idiosyncratic Risk Determinants and Hypothesis

As per mixing the conclusions of previous studies, we do not impose restrictions on the signs of coefficient estimates of potential drivers of the banking risk level. The first category is micro-prudential variables:

Size is measured as the square root of the total value of bank assets. Too-Big-To-Fail (TBTF) suggests that the government bail-out policy is strongly related to a bank's size. Because larger banks are deemed systemically important, in case of collapse they would pose serious risks to the banking sector and the entire economy. Large banks enjoying their competitive advantage are more incentivized to involve in risky activities relative to smaller ones. That is, larger banks increase risk measures [9, 13]. On the contrary, other studies conclude a negative impact of bank size [4, 6, 11].

Leverage is expressed by the ratio of equity to assets, in which a more capitalization ratio refers to lower leverage. In banks, excessive reliance on debt financing relative to capital might elevate a firm-risk level that is dangerous if not managed well. However, higher levels of capitalization and less borrowing increase bank creditworthiness and the ability to absorb potential losses. This is because a larger capitalization ratio implies a less leveraged bank and eventually reduces risk level. On one side various studies find that banking risk would stem from high levels of leverage (such as Papanikolaou and Wolff [21]; Anghelache and Oanea [12] and Borri, et al. [13]). On the other side, some empirical analyses conclude an adverse relationship between leverage and bank risk [15, 16]. Hence, banks may use their debt efficiently to generate sufficient cash flows.

Stability is captured by Z-score indicator. The Z-score is an accounting-based measure that captures the insolvency risk of a bank. It reveals how much return (ROA) volatility can be absorbed by capital without the bank turning insolvent. A higher Z-score corresponds to a lower probability of insolvency and higher bank stability [22]. Individual bank's Z-score is derived as follows:

$$Z - score = \frac{RoA + (Equity/Total\ Assets)}{\sigma(ROA)}$$

Where $\sigma(RoA)$ is the standard deviation of RoA over the period of study. The ratio $Equity/Total\ Assets$ is the bank's leverage or capitalization and ROA represents profitability. ROA is the ratio of net income to total assets. Greater bank stability or lower insolvency risk can mitigate risk measures [4].

Income diversification reflects bank activities, it is the share of noninterest income in total income. A higher share of noninterest income certifies more bank engagement in market-based or non-traditional banking transactions (like investment banking and trading). Thus, relatively high non-interest income is associated with more risk exposure (Köhler [23] and Vallascas and Keasey [7]). Nevertheless, other empirical evidence exists for a negative relationship (like Kleinow, et al. [24]; Lee, et al. [25]; and Buch, et al. [18]).

Profitability is proxied by the net interest margin (NIM) indicator. It is the ratio of net interest income to earning assets, it reveals the difference between investment or interest income and interest expenses. A higher NIM means that a bank operates profitably with more market power and is less sensitive to changes in market interest rates. Lower bank risk is likely to be associated with high-profit margins [18].

Liquidity is measured as the ratio of liquid assets to deposits and short-term funding. Better liquidity reserves strengthen a bank's ability to withstand stress. More liquidity is supposed to be beneficial and enable banks to face liquidity shortages in the interbank market and eventually might reduce banking risk. Khiari and Nachnouchi [10] figure out that higher liquidity decreases risk levels. However, Kleinow, et al. [24] and Battaglia and Gallo [5] conclude that liquidity is insignificant in explaining the variation of banking risk measures.

*Regulatory Capital i*s the Basel core capital requirement of a bank determining its loss absorption capability, i.e. the ratio of core equity capital to total risk-weighted assets. On one hand, by enhancing capital buffer, a higher Tier1 ratio would imply that banks are resilient to withstand negative shocks in the future so it is more likely to mitigate the bank's risk [5]. On the other hand, results have been revealed by Kleinow and Nell [9], as the Tier 1 ratio is significantly a positive source of risk.

The second group of regressors is macroeconomic indicators, as it is generally recognized that bank risk-taking behavior is influenced by the economic environment. Consequently, our analysis includes the following country-level variables. Firstly, economic development is proxied by *GDP growth* the annual percentage growth rate of GDP (Gross Domestic Product) valued in U.S. dollars. Secondly, price stability expressed as *Inflation is* the yearly change of the consumer price index (CPI). Papanikolaou and Wolff [21] find a negative impact on economic growth and inflation on banking risk. While Sengul and Yilmaz [14] reveal a positive association between economic growth and risk measure. And according to Vallascas and Keasey [7], economic growth and inflation are insignificant.

6. Empirical Analysis

6.1. Interconnectedness among Daily Stock Returns of Banks

This section analyzes daily stock returns for the publicly listed banks in each country within our sample to be categorized into 2 groups GCC and MPC (Appendix D lists all included banks by country).

Table 1 (Appendix B) depicts the descriptive statistics for banks' stock return series over the period January 2011 to December 2019 (2347 daily observations) in the GCC region. In the Qatar banking sector, the maximum daily return values are around 10% and the daily loss does not exceed 10% except for Qatar National Bank's (QNB) daily stock return with a minimum value of 6% loss. The skewed distribution of both Commercial bank of Qatar and Doha bank shows a long left tail. Standard deviation (St.dev.) is the common tool to determine investment risk (the dispersion of returns about the mean), Ahli Bank reveals the highest stock volatility 2.4%. The United Arab Emirates' banking sector reveals positive skewness with a higher probability of significantly good returns on the right-hand side of stock returns distribution. The National Bank of Fujairah shows the largest wide range of datasets and volatility (2.9%). Also, high stock return volatility is observed for Commercial Bank International, National Bank of Um-Al Qaiwain, and Mashreq Bank. Saudi banks are positively skewed, whereas returns distribution has a longer right tail. Banks have close highest and lowest values of stock returns. Banque Saudi Fransi and The Saudi British Bank have the highest stock return volatility 1.6%.

In the Kuwait banking sector, only the National Bank of Kuwait has a negatively skewed return distribution. Its highest daily return is 7% but the stock return is the least volatile (St.dev. 1.3%). Despite the maximum value of 14%, the Commercial bank of Kuwait is risky with volatile stock returns of about 2.2%. The return data for Bahraini banks behave similarly considering max. and min. values and also stock volatility, whereas the highest variation of returns is observed for Arab Banking Corporation. In the Omani banking sector, The Hong Kong and Shanghai Banking Corporation Limited (HSBC) and Sohar banks have the lowest returns of -15% and also they are more volatile at 2.3% and 2.7%, respectively.

Table 2 (Appendix B) reports descriptive statistics for MPC banks. For Egyptian banks, Societe Arabe has a negatively skewed distribution but it displays the highest stock return value (17.8%) and the least volatility among other banks. The stock returns of both the Suez Canal and the National bank of Kuwait tolerate higher St.dev. In Morocco, only Credit du Maroc has a negatively skewed distribution of stock returns. Credit du Maroc's most volatile stock maintains the best daily return value of 19%.

Besides the level of volatility, Jordanian banks' stocks also share nearly close highest and lowest values of returns. However, 3 banks have long left tails of the return distribution, namely Arab banking corporation, Housing bank for trade and finance, and Jordan Ahli Bank. Unlike other countries, Lebanese banks' return series show negative skewness relative to normal distribution. Except for Bemo bank which has a long right tail with an extremely high kurtosis (peaked-curve) and the highest variation of returns.

6.1.1. Correlation Coefficients between Banks' Stock Returns

The bivariate correlations between banks within and across countries of the GCC region are depicted in Table 3 (Appendix B). The examination depicts statistically significant positive correlations among daily returns either in the domestic stock market or across countries in the GCC region. Nevertheless, Bahraini banks' daily stock returns are neither correlated with each other nor cross-board. Saudi Arabia (banks 16-20) has the strongest co-movements of stock returns among banks with correlation coefficients mostly above 50%. Especially the robust correlated returns of banks (numbers 16, 19) Banque Saudi Fransi and Saudi British (59%). Qatari banks' stock returns (banks 1-5) are all correlated except Ahli Bank (number 5), ranging from 16% (between banks 2 and 4) to 33% (between banks 2 and 3). In the United Arab Emirates only banks 6, 9, 11, and 15 have correlated returns and the highest value of 41% is between Abu Dhabi

Commercial and First Abu Dhabi (banks 6 and 9). However, banks in Kuwait (banks 21-25) and Oman (banks 31-34) appear to have weak within-country correlation coefficients.

The findings further reveal that there are regional relationships considering co-movements of daily bank stock returns. The first 3 Qatari banks are weakly correlated to banks in the United Arab Emirates (6 and 9), Saudi Arabia, and Oman. Only 2 banks in the United Arab Emirates (6 and 9) have low cross-correlations with some Saudi and Omani banks. The stock return of Burgan Bank (24) in Kuwait has a weak association with Ahli United Bank (26) and Bank Muscat (34) in Bahrain and Oman, respectively.

Regarding MPCs, Table 4 (Appendix B) shows that Egyptian banks' daily stock returns (banks from 1 to7) are moderately correlated. Particularly CIB (7) has relationships of more than 30% with banks 2, 3, 4, and 5. Banks in Jordan (11-20) have low correlation coefficients among each other. Only Attijariwafa Bank (8) and (10) Banque Populaire in Morocco are significantly correlated with 34%. However, no evidence for cross-country correlation among stock returns exits.

6.2. Idiosyncratic Risk Ranking

In this section, we identify the riskiest financial entities explained by measuring their historical VaR and ES as bank risk indicators. We consider the entire period 2011-2019 for the aggregate 58 banks to be ranked in terms of their individual risk in descending order. Table 1 displays the varying rankings based on their VaR and ES. Banks with higher losses of both measures are considered riskier compared to other entities. Obviously, the positions of banks change based on the VaR and ES estimates of each bank. National Bank of Fujairah has the largest records in both measures, VaR=10.49, and ES=11.44. However, the Bank of Jordan and Attijariwafa Bank have the lowest risk measures of VaR=2.96 and ES=4.21, respectively. Interestingly, BEMO bank is ranked 53rd as per VaR=3.28, while it is the second most risky bank according to its ES value of 10.54. Similarly, the National Bank of Kuwait is listed as the tenth according to its VaR=6.73, while it is less risky in terms of ES value of 4.68 and placed in the 54th. Moreover, the ES value of Bank of Bahrain and Kuwait (BBK) bank is larger than its VaR value and consequently positioned as 30th and 41st as per ES and VaR levels, respectively.

Table 1.
Bank rankings based on VaR and ES measures.

Rank	Bank Name	VaR99%	Bank Name	ES99%
1	Nat. Bank of Fujairah	-10.49%	Nat. Bank of Fujairah	-11.44%
2	Nb.of Umm Al-Qaiwain	-10.35%	Bemo Bank	-10.54%
3	Commercial Bank Intl.	-10.11%	Nb.of Umm Al-Qaiwain	-10.49%
4	Mashreq Bank	-9.62%	Commercial Bank Intl.	-10.47%
5	Sohar Internatioanl Bank	-9.16%	Mashreq Bank	-10.36%
6	Hsbc Bank Oman	-8.70%	Sohar Internatioanl Bank	-10.30%
7	Ahli Bank	-8.04%	Hsbc Bank Oman	-9.59%
8	Commercial Bank of Dubai	-7.67%	Ahli Bank	-9.35%
9	Bank Dhofar	-6.90%	Commercial Bank of Dubai	-9.24%
10	National Bank of Kuwait	-6.73%	National Bank of Kuwait	-9.16%
11	Arab Banking Corporation	-6.57%	Arab Banking Corporation	-8.71%
12	Commercial Bk.of Kuwait	-6.39%	Credit Du Maroc Ste	-8.12%
13	Suez Canal Bank	-6.29%	Soc.Arabe Intl.De Banque	-8.01%
14	Credit Du Maroc Ste	-6.18%	Qatar National Bank Alahly	-7.98%
15	Bank Of Sharjah	-6.04%	Bank Dhofar	-7.84%
16	Qatar National Bank Alahly	-5.81%	Commercial Bk.of Kuwait	-7.79%
17	National Bank of Ras Al Khaimah	-5.74%	Suez Canal Bank	-7.60%
18	National Bank of Oman	-5.41%	Bank Of Sharjah	-7.44%
19	Abu Dhabi Coml.Bank	-5.30%	Doha Bank	-7.32%
20	Al-Ahli Bank of Kuwait	-5.28%	Credit Agricole Egypt	-7.30%
21	Credit Agricole Egypt	-5.23%	National Bank of Ras Al Khaimah	-7.21%
22	First Abu Dhabi Bank	-5.10%	Abu Dhabi Coml.Bank	-7.03%
23	Coml.Intl. Bank (Egypt)	-5.03%	Al-Ahli Bank of Kuwait	-7.03%
24	Jordan Commercial Bank Psc	-5.00%	Egyptian Gulf Bank	-6.81%
25	Emirates Nbd	-4.92%	First Abu Dhabi Bank	-6.69%
26	Egyptian Gulf Bank	-4.82%	The Hsg. Bank for Tr&F.	-6.61%
27	Doha Bank	-4.79%	National Bank of Oman	-6.61%
28	Bank Al Etihad	-4.57%	Emirates Nbd	-6.60%
29	National Bank of Bahrain	-4.55%	Coml.Intl. Bank (Egypt)	-6.48%
30	The Saudi British Bk.	-4.44%	Bbk	-6.41%

31	Commercial Bk.of Qatar	-4.37%	Commercial Bk.of Qatar	-6.23%
32	Banque Saudi Fransi	-4.35%	Al Khalij Coml.Bank	-6.20%
33	Gulf Bank of Kuwait	-4.26%	Bank Audi	-6.03%
34	The Hsg. Bank For Tr&F.	-4.26%	Banque Saudi Fransi	-6.02%
35	Al Khalij Coml.Bank	-4.15%	Jordan Commercial Bank Psc	-6.01%
36	Bank Audi	-4.09%	Ahli United Bank	-5.98%
37	Burgan Bank	-4.08%	National Bank of Bahrain	-5.95%
38	Capital Bank of Jordan	-4.00%	Bank Muscat	-5.73%
39	Ahli United Bank	-3.93%	The Saudi British Bk.	-5.55%
40	Cairo Amman Bank	-3.79%	Arab National Bank	-5.45%
41	Bbk	-3.77%	Byblos Bank	-5.42%
42	Arab National Bank	-3.74%	Blom Bank	-5.33%
43	National Bank of Kuwait	-3.74%	Cairo Amman Bank	-5.32%
44	The Saudi Investment Bk.	-3.74%	Bank Al Etihad	-5.29%
45	Byblos Bank	-3.73%	Gulf Bank of Kuwait	-5.22%
46	Bank Muscat	-3.64%	Arab Banking Corporation Jordan	-5.19%
47	Riyad Bank	-3.62%	Burgan Bank	-5.17%
48	Qatar National Bank	-3.57%	Capital Bank of Jordan	-5.12%
49	Jordan Kuwait Bank	-3.47%	Riyad Bank	-5.09%
50	Arab Bank	-3.44%	Jordan Kuwait Bank	-5.05%
51	Jordan Ahli Bank	-3.32%	The Saudi Investment Bk.	-4.99%
52	Arab Banking Corporation Jordan	-3.28%	Bank of Jordan	-4.94%
53	Bemo Bank	-3.28%	Jordan Ahli Bank	-4.83%
54	Attijariwafa Bank	-3.23%	National Bank of Kuwait	-4.68%
55	Blom Bank	-3.19%	Arab Bank	-4.63%
56	Soc.Arabe Intl.De Banque	-3.04%	Qatar National Bank	-4.50%
57	Banque Populaire	-2.98%	Banque Populaire	-4.32%
58	Bank of Jordan	-2.96%	Attijariwafa Bank	-4.21%

Note: VaR and ES calculations are based on daily stock returns for the period 2011-2019.

6.3. Panel Data Modeling

6.3.1. Descriptive Statistics for Panel Datasets

Table 2 shows summary statistics for the full sample (panel A). As per kurtosis and skewness values, we can assume that all variables are not normally distributed exhibiting peaked curves (leptokurtic), and are positively skewed (except size). The highest loss recorded according to the values of VaR and ES for banks during the period was 10.65% and 17.19%, respectively. Interestingly, banks in our sample are in a good liquidity position as depicted by the average liquidity ratio of 35.6%, in which the greatest value is 84.1%.

The summary statistics for panels B and C are in Appendix C. The maximum daily losses found in the GCC sample, where VaR and ES values are the same as panel A. GCC banks are more capitalized with a mean of 14.25%, and the highest record of 33.36%. MPCs are more leveraged with a lower average capitalization ratio compared to GCC's sample and the same is true for all bank characteristics except for profitability and liquidity. Furthermore, macroeconomic variables are generally weaker in MPCs than GCC region.

6.3.2. Panel Unit Root Testing

Preceding the econometrics analysis, it is crucial to identify the order of integration, and stationarity status, of the variables. We resort to four different tests named as: Levin, et al. [26]; I'm, et al. [27]; Augmented Dickey–Fuller (ADF), and Phillips-Perron (PP). Table 3 summarizes the results of unit root tests for individual time series in the three groupings (panels A, B, and C). Some of these tests assume cross-sectional independence such as LLC which is considered a drawback. Consequently, we rely particularly on the IPS test for the final decision as it allows for heterogeneity among cross-sections. Table 3 reports the results at the level and the final status at which variables are found to be stationary either at level or at first difference.

Table 2.
Summary statistics for panel A.

Variables	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis
VaR	4.62	4.19	10.65	0.00	2.24	0.71	3.30
ES	6.00	5.46	17.19	0.00	2.42	0.72	3.46
Size	131.93	109.04	509.44	2.96	84.64	1.38	5.58
Leverage	12.99	12.96	33.36	4.76	3.73	1.44	8.58
Stability	49.62	40.91	192.28	7.27	32.18	1.46	5.77
Income diversification	29.64	28.83	58.39	9.25	7.90	0.55	3.38
Profitability	3.36	3.12	10.34	1.03	1.18	2.11	10.54
Liquidity	35.59	34.16	84.08	7.51	14.41	0.70	3.34
Regulatory capital	15.67	15.29	37.10	7.08	4.41	1.85	8.70
Economic growth	3.03	2.66	13.38	-6.70	2.58	0.32	6.72
Inflation	3.30	2.30	29.50	-3.70	4.48	3.12	17.16

Table 3.
Summarized panel unit root test for A, B, and C.

Variables	Panel	LLC	IPS	ADF - Fisher Chi-square	PP - Fisher Chi-square	Final Status
VaR	A	-6.54***	-2.26***	164***	320***	I(0)
	B	-5.47***	-1.59	95.1**	152***	I(1)
	C	-3.57***	-1.62	69.1**	168***	I(1)
ES	A	-9.33***	-3.52***	188***	336***	I(0)
	B	-8.21***	-3.25***	117***	205***	I(0)
	C	-5.11***	-1.61	70.7**	131***	I(1)
Size	A	-22.6***	-3.23***	153**	217***	I(0)
	B	-6.39***	0.23	89.2**	156***	I(1)
	C	-33.6***	-5.30***	63.9	61.6	I(0)
Leverage	A	-10.0***	-1.59	170***	169***	I(1)
	B	-7.81***	-0.85	103***	88.3***	I(1)
	C	-6.24***	-1.47	66.6**	81.0***	I(1)
Stability	A	-9.44***	-1.03	161***	134	I(1)
	B	-7.65***	-0.56	97.9***	62.4	I(1)
	C	-5.93***	-0.94	62.8	71.5**	I(1)
Income diversification	A	-9.58***	-0.78	140	182***	I(1)
	B	-8.96***	-1.59	98.6***	102***	I(1)
	C	-2.85***	0.68	41.1	79.3***	I(1)
Profitability	A	-10.2***	-0.96	147**	116	I(1)
	B	-10.1***	-1.76**	95.8**	73.8	I(0)
	C	-2.72***	0.60	51.3	42.7	I(1)
Liquidity	A	-6.02***	1.01	111	129	I(1)
	B	-3.84***	0.46	73.1	90.0**	I(1)
	C	-4.88***	1.03	38.3	38.7	I(1)
Regulatory capital	A	-2.59***	0.20	142	151**	I(1)
	B	-1.85**	0.001	97.7**	87.9	I(1)
	C	-2.38***	0.31	44.3	63.5	I(1)
Economic growth	A	-0.74	2.45	78.2	190***	I(1)
	B	-1.22	0.86	61.9	143***	I(1)
	C	0.47	2.78	16.3	46.6	I(1)
Inflation	A	-9.36***	-2.77***	174***	214***	I(0)
	B	-0.18	0.19	61.6	124***	I(1)
	C	-13.0***	-4.52***	112***	90.9***	I(0)

Note: Statistical significance according to p-value: *** p<0.01, **p<0.05.

The tests were conducted for individual time series at level with intercept. All tests suggest a null hypothesis Ho of a unit root against a hypothesis of homogeneous stationarity (H1: time series is stationary). In panels A and C, all individual time series are non-stationary at a level, rather they are stationary at first difference I(1), except *size* and *inflation*, which are stationary at levels I(0). Only *profitability* is integrated at level I(0) in panel B, while the remaining variables are integrated in the first order I(1). Therefore most of the variables are non-stationary at the level exhibiting seasonality and trends which lead to varying variance and mean over time, respectively. Transforming the level series by differencing is a known method applied to remove trend and seasonality from a series, thus having time-invariant variance and mean.

Hence, to guarantee stationarity for all dataset series used in our regression model, the first differences are used instead of level data series for all variables integrated at I(1) other than those stationary at level I(0).

6.3.3. Results and Discussion[2]

To analyze the main determinants of individual bank risk levels, first, we use *VaR* as the dependent variable regressed on selected bank characteristics and interacting macroeconomic variables. Table 3 summarizes the results of regression estimations for the 3 panels. In the full sample (panel A) for 58 banks from 2011-2019, the fixed-effect regression model is applied as per suggested by the preliminary Breusch Pagan-Lagrange Multiplier (BP-LM) and Hausman tests (for more details see Baltagi and Baltagi [29] and Park [28]. All explanatory variables are at their first difference except *size* and *inflation are at levels.* Additionally, a lagged dependent variable VaR(-1) is included to avoid biased test results due to the contemporaneous correlation between banks. According to the Pasaran cross-sectional dependence (CD) test of cross-sectional dependence, we accept the null hypothesis that residuals are not correlated.

Table 4.
VaR estimation results.

Dependent Variable: VaR 99%			
	Panel A	**Panel B**	**Panel C**
VaR(-1)	0.08 (0.13)	0.09 (0.18)	
VaR(-2)		-0.15 (0.14)	
Size	-0.00 (0.01)	-0.01 (0.01)	-0.00 (0.01)
Leverage	0.21** (0.09)	0.19 (0.16)	0.20 (0.15)
Stability	-0.05** (0.02)	-0.03 (0.04)	-0.04 (0.03)
Income diversification	-0.01 (0.02)	-0.04 (0.03)	0.01 (0.02)
Profitability	0.44** (0.23)	0.22 (0.19)	0.57** (0.27)
Liquidity	0.01 (0.01)	0.05** (0.02)	0.00 (0.02)
Regulatory capital	-0.02 (0.04)	-0.03 (0.09)	-0.09 (0.05)
Economic growth	0.06** (0.03)	0.06 (0.05)	0.08 (0.06)
Inflation	-0.02 (0.02)	0.03 (0.08)	0.02 (0.02)
Constant	4.40*** (1.03)	5.09 (1.13)	3.49 (1.10)
Observations	464	238	192
R-squared	0.66	0.66	0.05
Year dummies	No	No	No
Bank-specific dummies	yes	Yes	Yes
Fixed Effect	Yes	Yes	no
Random Effect	No	No	yes

Notes: Statistical significance according to p-value: *** p<0.01, **p<0.05.

Table 4 reports FE and RE regressions for the full sample panel A (2011–2019) that are based on yearly data of publicly listed banks in GCCs and MPCs. The dependent variables: are VaR in Columns (1) and (2), and ES in columns (3). The explanatory variables include bank-level variables: size (square root of total assets), leverage (total equity-to-total assets), stability (z-score), income diversification (non-interest income-to-total income), profitability (net interest margin), liquidity (liquid assets-to-deposits), regulatory capital (tier 1 ratio) as well as macroeconomic variables: economic growth (GDP rate of growth) and Inflation (change of consumer price index). The regressions take into account bank fixed effects in panels A and B. Bank random effects are considered in panel C. Robust standard errors PCSE is indicated in parentheses.

Leverage, profitability, and economic growth are significant and positively affect VaR. A larger capitalization ratio implies lower leverage increases the bank's VaR, in line with the findings of Cicak [15] and Qin and Zhou [16]. Contrarily

[2] In this analysis, the panel corrected standard errors (PCSE) technique is applied as suitable for short panels with individuals exceeding the time period (where time, T < cross-sections, N). So based on our panel structure, PCSE robust standard error estimates are applied to FEM to overcome the problem of cross-sectional dependence. Furthermore, lagged dependent variables are utilized in some models to ensure cross-sectional independence. It is worth mentioning that Generalized Least Squares (GLS) method is more consistent when dealing with long panels with time periods greater than individuals (N<T) [28].

to the expected positive relationship between leverage and bank risk measure concluded by various studies (like Borri, et al. [13]; Battaglia and Gallo [5]; Mayordomo, et al. [30]). Also similar to the results of Sengul and Yilmaz [14] and Buch, et al. [18], a more profitability ratio elevates the risk measure. This more profitability implies the reduction of banks' funding costs which might incentivize banks to borrow more and take the risk. Banks are encouraged to engage in excessive risk-taking investments such as market-based activities (non-core banking activities). Furthermore, increasing real economic activity result in a greater risk level [14]. This propensity is generally characterized by a considerable credit expansion and eased loan standards which may also increase credit risk. Nevertheless, the VaR level is negatively influenced by stability which implies that more solvent banks and thus lower bank risk, as per [4].

The second column reports the regression model for sub-sample panel B generated separately with 34 banks in the GCC region. Fixed effect (FE) regression models are performed according to BP-LM and Hausman tests. Only profitability is at level but all remaining regressors are at their first difference and the regressand is lagged by two periods (VaR(-1) and VaR(-2)) to get robust estimates. No error cross-section dependence is detected according to the Bias-Corrected CD test. Although liquidity is an insignificant estimate in the whole sample panel A, there is a significant direct association between liquidity and bank risk level in the GCC banking sector. That is, extra liquid assets may induce banks to engage in riskier activities whose results are different from the results by Khiari and Nachnouchi [10] and the insignificant relationship concluded by Kleinow, et al. [24] and Battaglia and Gallo [5].

The third panel C with 24 banks in MPCs is represented in the third column, in which the random effect-regression model was carried out as recommended by BP-LM and Hausman tests. This sample is similar to the main full sample A, all variables are differenced but size and inflation are used at levels. However, there is no need to involve period lags for the dependent variable, and the Ho of cross-section independence is accepted as per the Pesaran CD test. The outcomes show that VaR tends to increase with more profitable banks, which is convenient to those reached by Buch, et al. [18] and Qin and Zhou [16] but unlike Idier, et al. [17]. This is, the risk measure in the MPCs banking sector is significantly influenced by profitability.

Table 5.
ES estimation results.

Dependent Variable: ES 99%			
	Panel A	**Panel B**	**Panel C**
ES(-1)	0.07 (0.14)	0.02 (0.2)	
ES(-2)		-0.2 (0.14)	
Size	0.00 (0.01)	-0.02 (0.01)	0.0 (0.01)
Leverage	0.24** (0.11)	0.04 (0.12)	0.37* (0.20)
Stability	-0.05* (0.03)	-0.01 (0.03)	-0.06 (0.04)
Income diversification	-0.00 (0.02)	-0.02 (0.03)	0.02 (0.02)
Profitability	0.35 (0.3)	0.46 (0.63)	0.41 (0.37)
Liquidity	0.02 (0.02)	0.05*** (0.02)	0.00 (0.02)
Regulatory capital	-0.11* (0.06)	-0.10 (0.10)	-0.17** (0.08)
Economic growth	0.03 (0.04)	0.07 (0.06)	-0.15 (0.13)
Inflation	-0.01 (0.03)	0.07 (0.09)	-0.00 (0.03)
Constant	5.40*** (1.26)	7.71*** (1.9)	4.47*** (0.66)
Observations	464	238	192
R-squared	0.61	0.68	0.51
Year dummies	no	No	No
Bank-specific dummies	yes	Yes	Yes
Fixed Effect	yes	Yes	Yes
Random Effect	no	No	No

Notes: Statistical significance according to p-value: *** p<0.01, **p<0.05, * p<0.1.

Table 5 reports VaR regressions for 3 samples (2011–2019) that are based on yearly data of publicly listed banks in selected MENA countries. The explanatory variables include bank-level variables: size (square root of total assets),

leverage (total equity-to-total assets), stability (z-score), income diversification (non-interest income-to-total income), profitability (net interest margin), liquidity (liquid assets-to-deposits), regulatory capital (tier 1 ratio) as well as macroeconomic variables: economic growth (GDP rate of growth), Inflation (change of consumer price index). The regressions take into account bank fixed effects. Robust standard errors PCSE are indicated in parentheses.

We further employ ES as a regress and to observe the impact of the same bank-specific and country-level variables. The estimations result of the 3 groupings are presented below in Table 5 Employing identical variables specification, the fixed-effect regression model is applied for all panels as revealed by statistical tests both BP-LM and Hausman tests. In addition to accepting the null hypothesis of Bias Corrected CD test for cross dependence, entailing the absence of cross-section dependence in the FE-models. In viewing the whole sample, A, the estimation outcomes for ES are similar to VaR considering a significant positive effect for capitalization and a negative effect for stability. Unlike VaR which is unaffected by regulatory capital, ES has a significant negative relationship with regulatory capital. Generally, all banks in the entire sample are maintaining buffers over minimum capital requirements. Thus, strengthening the bank's position to absorb potential losses in stressed periods and eventually mitigates individual risk levels. This result is in line with Battaglia and Gallo [5] while different from what has been proved by Kleinow and Nell [9].

In an attempt to compare the key indicators influencing VaR and those affecting ES in both the GCC region and MPCs. We observe that the final result for the GCC banking sector, panel B, does not change compared to the previous one. Still the risk measure ES tends to rise with a higher liquidity ratio. Contrarily, the outcomes vary regarding the MPCs sample C in which leverage and regulatory capital are significantly explaining ES instead of profitability (as in the VaR indicator). Higher equity-to-asset or less leveraged banks are accompanied by more bank risk levels, ES, and higher regulatory capital curbs the level of risk, ES.

In sum, the regressions for VaR and ES give mixed outcomes in the main panel A combining the features of banks in ten MENA countries as well as panel C which focuses on MPCs' banking sector. However, the final results regarding GCC banks in panel B for both risk measures are consistent where liquidity is the key ratio directly affecting the values of VaR and ES.

Broadly speaking, the basic indicators that were found to directly raise banking risk measures are leverage, profitability, liquidity, and economic growth. While stability and regulatory capital tend to adversely impact VaR and ES. It is worth mentioning that some explanatory variables are insignificant, either macroeconomic or bank-specific characteristics. Inflation is observed to have no significant effect on risk measures. Similarly, income diversification as well as the bank's size were found as insignificant explanatory variables and thus no confirmation of the TBTF claim.

7. Summary and Conclusion

This research investigates the correlation coefficients among the banks' stock returns in two groups; GCC countries and MPCs to recognize the linkages between banks. The findings showed that banks with the highest correlations are in Saudi Arabia, the United Arab Emirates, and Qatar either domestically or across countries. Whereas no inter-regional correlations are shown in the MPCs group, only weak within-country correlations appeared among banks' stock returns in Egypt and Jordan. Then, individual bank risk rankings were constructed for the entire sample consisting of 58 entities based on estimated historical VaR and ES. In general, the estimations show that the corresponding positions of banks according to their riskiness differ slightly. Noticeably, the National Bank of Fujairah in the United Arab Emirates has the highest idiosyncratic risk level in terms of both risk measures.

Lastly, we applied regression models to examine the impact of bank-specific balance sheet data and macroeconomic variables on bank risk levels captured by VaR and ES. The whole sample consists of 58 publicly listed banks in 10 countries. To allow for comparing different characteristics of banking sectors in the GCC region and MPCs, the entire sample is furtherly divided into 2 sub-samples. The outcomes of the aggregate sample suggest that lower leverage, profitability, and economic growth may exacerbate individual bank risk. While strengthening stability and regulatory capital positions would lower banking risk. Considering GCC sub-samples for VaR and ES, we found that both risk measures typically increase with greater liquidity. However, the results of both models regarding the MPCs sub-sample revealed inconsistent results. While VaR was positively associated with profitability, ES was directly related to leverage and inversely affected by regulatory capital. Implying that international regulatory standards should take into account the distinguishing features of social, institutional, and economic environments.

We tried to delve into the crucial sources of banking risk that might help in understanding how to enhance the resilience of the banking sector and maintain financial sector stability. Nevertheless, a caveat of the two risk measure methods is their simplicity due to the lack of data availability. Also, the adequacy and robustness of the empirical outcomes can be questioned because of utilizing a short-panel with a limited number of observations. It would be interesting for the future area of study to examine a larger sample that could enable us to employ alternative systemic risk methodologies.

References

[1] O. De Bandt and P. Hartmann, "Systemic risk: A survey," European Central Bank (ECB) Working Paper, No. 352000.

[2] M. F. Hellwig, "Systemic risk in the financial sector: An analysis of the subprime-mortgage financial crisis," *De Economist*, vol. 157, pp. 129-207, 2009.Available at: https://doi.org/10.1007/s10645-009-9110-0.

[3] P. Balogh, "Macro prudential supervision tools in the European banking system," *Procedia Economics and Finance*, vol. 3, pp. 642-647, 2012.Available at: https://doi.org/10.1016/s2212-5671(12)00208-0.

[4] N. Alber, "Determinants of systemic risk: The case of Egyptian banks," *International Business Research*, vol. 8, pp. 112-120, 2015.Available at: https://doi.org/10.5539/ibr.v8n3p112.

[5] F. Battaglia and A. Gallo, "Securitization and systemic risk: An empirical investigation on Italian banks over the financial crisis," *International Review of Financial Analysis*, vol. 30, pp. 274-286, 2013.Available at: https://doi.org/10.1016/j.irfa.2013.03.002.
[6] A. I. Hunjra, Q. Zureigat, T. Tayachi, and R. Mehmood, "Impact of non-interest income and revenue concentration on bank risk in South Asia," *Banks and Bank Systems*, vol. 15, pp. 15-25, 2020.Available at: https://doi.org/10.21511/bbs.15(4).2020.02.
[7] F. Vallascas and K. Keasey, "Bank resilience to systemic shocks and the stability of banking systems: Small is beautiful," *Journal of International Money and Finance*, vol. 31, pp. 1745-1776, 2012.Available at: https://doi.org/10.1016/j.jimonfin.2012.03.011.
[8] L. Laeven, L. Ratnovski, and H. Tong, "Bank size and systemic risk," IMF Discussion Note, No. SDN/14/042014.
[9] J. Kleinow and T. Nell, "Determinants of systemically important banks: The case of Europe," *Journal of Financial Economic Policy*, vol. 7, pp. 446-476, 2015.Available at: https://doi.org/10.1108/jfep-07-2015-0042.
[10] W. Khiari and J. Nachnouchi, "Banks' systemic risk in the Tunisian context: Measures and determinants," *Research in International Business and Finance*, vol. 45, pp. 620-631, 2018.Available at: https://doi.org/10.1016/j.ribaf.2017.07.181.
[11] G. N. Weiß, S. Neumann, and D. Bostandzic, "Systemic risk and bank consolidation: International evidence," *Journal of Banking & Finance*, vol. 40, pp. 165-181, 2014.Available at: https://doi.org/10.1016/j.jbankfin.2013.11.032.
[12] G.-V. Anghelache and D.-C. Oanea, "Romanian commercial banks' systemic risk and its determinants: A CoVaR approach," *International Journal of Academic Research in Accounting, Finance and Management Sciences*, vol. 6, pp. 96-109, 2016.Available at: https://doi.org/10.6007/ijarafms/v6-i3/2175.
[13] N. Borri, M. Caccavaio, G. D. Giorgio, and A. M. Sorrentino, "Systemic risk in the Italian banking industry," *Economic Notes: Review of Banking, Finance and Monetary Economics*, vol. 43, pp. 21-38, 2014.Available at: https://doi.org/10.1111/ecno.12015.
[14] S. Sengul and E. Yilmaz, "Measuring systemic risk in the Turkish banking sector," *Business and Economics Research Journal*, vol. 10, pp. 1071-1084, 2019.
[15] N. Cicak, "Measuring systemic risk in banking: The case of the Eurozone," Master's Thesis, University of Ljubljana, Ljubljana, Slovenia, 2015.
[16] X. Qin and C. Zhou, "Financial structure and determinants of systemic risk contribution," *Pacific-Basin Finance Journal*, vol. 57, p. 101083, 2019. Available at: https://doi.org/10.1016/j.pacfin.2018.10.012.
[17] J. Idier, G. Lame, and J. Mesonnier, "How useful is the marginal expected shortfall for the measurement of systemic exposure: A practical assessment," European Central Bank (ECB) WP, No. 15462013.
[18] C. M. Buch, T. Krause, and L. Tonzer, "Drivers of systemic risk: Do national and European perspectives differ?," *Journal of International Money and Finance*, vol. 91, pp. 160-176, 2019.Available at: https://doi.org/10.1016/j.jimonfin.2018.11.005.
[19] R. Kumar, *Strategies of banks and other financial institutions*. USA: Elsevier Inc, 2014.
[20] M. Dargiri, H. Shamsabadi, C. Thim, D. Rasiah, and B. Sayedy, "Value-at-risk and conditional value-at risk assessment and accuracy compliance in dynamic of Malaysian Industries," *Journal of Applied Sciences*, vol. 13, pp. 974-983, 2013.Available at: https://doi.org/10.3923/jas.2013.974.983.
[21] N. I. Papanikolaou and C. C. Wolff, "The role of on-and off-balance-sheet leverage of banks in the late 2000s crisis," *Journal of Financial Stability*, vol. 14, pp. 3-22, 2014.Available at: https://doi.org/10.1016/j.jfs.2013.12.003.
[22] H. Hesse and M. Cihak, "Cooperative banks and financial stability," IMF Working Paper, No. WP/07/"22007.
[23] M. Köhler, "Does non-interest income make banks more risky? Retail-versus investment-oriented banks," *Review of Financial Economics*, vol. 23, pp. 182-193, 2014.Available at: https://doi.org/10.1016/j.rfe.2014.08.001.
[24] J. Kleinow, A. Horsch, and M. Garcia-Molina, "Factors deriving systemic risk in Banks in Latin America," *Journal of Economics and Finance*, vol. 41, pp. 211-234, 2015.Available at: https://doi.org/10.1007/s12197-015-9341-7.
[25] C.-C. Lee, S.-J. Yang, and C.-H. Chang, "Non-interest income, profitability, and risk in banking industry: A cross-country analysis," *The North American Journal of Economics and Finance*, vol. 27, pp. 48-67, 2014.Available at: https://doi.org/10.1016/j.najef.2013.11.002.
[26] A. Levin, C. Lin, and C. Chu, "Unit root test in panel data: Asymptotic and finite sample properties," *Journal of Econometrics*, vol. 108, pp. 1-24, 2002.Available at: https://doi.org/10.1016/s0304-4076(01)00098-7.
[27] K. Im, M. Pesaran, and Y. Shin, "Testing for unit roots in heterogeneous panels," *Journal of Econometrics*, vol. 115, pp. 53-74, 2003.Available at: https://doi.org/10.1016/s0304-4076(03)00092-7.
[28] H. M. Park, "Practical guides to panel data modeling: A step-by-step analysis using stata," *Public Management and Policy Analysis Program, Graduate School of International Relations, International University of Japan*, vol. 12, pp. 1-52, 2011.
[29] B. H. Baltagi and B. H. Baltagi, *Econometric analysis of panel data* vol. 4. Chichester: John Wiley & Sons, 2001.
[30] S. Mayordomo, M. Rodriguez-Moreno, and J. Peña, "Derivatives holdings and systemic risk in the U.S. Banking Sector," *Journal of Banking and Finance*, vol. 45, pp. 84-104, 2014.Available at: https://doi.org/10.1016/j.jbankfin.2014.03.037.
[31] N. Borri, M. Caccavaio, G. Di Giorgio, and A. M. Sorrentino, "Systemic risk in the European banking sector. Available at SSRN 2112919," 2012.
[32] D. K. Patro, M. Qi, and X. Sun, "A simple indicator of systemic risk," *Journal of Financial Stability*, vol. 9, pp. 105-116, 2013.Available at: https://doi.org/10.1016/j.jfs.2012.03.002.

Appendix (A)

Table A1.
Studies examining bank risk measures.

Authors	Period (Frequency)	Sample	Estimation Method	SR measure	Predictors	Relevant Findings
Alber [4]	2003-2013 (Yearly)	11 banks in Egypt	Pooled OLS panel regression model	VaR	Square root of assets (size), deposits and loans, Financial stability (Z-score), Equity return (average change in stock price).	Size, loans, and z-score adversely affect SR.
Anghelache and Oanea [12]	2008-2015 (Quarterly)	4 Romanian banks	OLS regression	CoVaR	Size, Leverage, Volatility of share price, Market-to-book (value of capital).	All predictors directly affect SR.
Battaglia and Gallo [5]	2000-2009 (Yearly)	21 Italian banks	OLS and RE regression model	ES	Equity-Asset ratio, tier 1, ROE, Impaired loans-to-gross loans, Total loans-to-TA, Size, Liquid assets-to-customer, and short-term funding.	Positive impact by size. Equity and tier 1 ratios negatively affect ES.
Borri, et al. [31]	2000-2010 (yearly)	154 banks in Eurozone	Pooled OLS panel regression model	VaR and ΔCoVaR	Leverage, Long debt, Equity return, MV (TE), Price-to-BV, Turnover (ratio of total volume and MV), Beta, Concentration.	Positive effect for concentration, size, price-to-BV, and equity return.
Borri, et al. [13]	2000-2011 (Quarterly)	36 Italian Banks	Panel regression	ΔCoVaR	Size, Leverage, Maturity mismatch, Market beta and stock return volatility.	Positive effect by size, leverage and beta. Negative effect for volatility.
Buch, et al. [18]	2005-2013 (yearly)	75 banks in Euro counties	FE panel regression model	SRISK	GDP growth, Inflation, Size, Loan ratio, non-interest income ratio, ROA, NPL, Deposit ratio.	Positive impact for Size, ROA and NPL. Loan and non-interest income ratios have a negative effect.
Cicak [15]	2000-2012 (Yearly)	46 Euro Zone banks	Fixed Effect (FE) panel regression model	ΔCoVaR	Size, Leverage, Stock beta and VaR.	Significantly positive coefficients for Size and VaR. Leverage has a negative effect.
Hunjra, et al. [6]	2009-2018 (yearly)	85 South Asian banks	GMM regression model	Volatility of ROA	Non-interest income to total revenue, Size, Capital adequacy ratio, Loan growth, HHI.	Positive effect of HHI. Negative influence by size and non-interest income ratio.
Idier, et al. [17]	1996-2010 (Quarterly)	68 US banks	FE panel OLS regression model	MES	EAR, Tier 1, size, ROA, NPL, Liquid assets-to-TA, Wholesale funding-to-TL, Commercial loans, and Mortgage loans to TA.	Wholesale funding, Commercial loans, and NPL directly affect SR but ROA has a negative impact.

Khiari and Nachnouchi [10]	2009-2014 (Monthly)	11 Tunisian banks	Pooled Least Squares(PLS) regression model	Systemic risk implication composite index based on ES	Size (number of Branches, total assets, and share of credit market), Liquidity (the number of securities treated, number of exchanges and market capitalization), Interbank commitments (interbank deposits and assets, interbank claims), Technical efficiency (Bank revenue, net earnings, and operating expenses).	Three factors are directly related to SR which are size, interconnectedness, and technical efficiency. While liquidity adversely influences SR.
Kleinow and Nell [9]	2007-2012 (yearly)	60 European Banks	Random Effect-RE regression model (GLS)	CoVaR, MES, and SR-index based on CoVaR and MES	Size, Loan ratio, Non-interest income, NPL, Tier 1, Leverage, Deposit, Liquidity, Financial power, Operating margin, ROE, Income growth, MTB, Long-term rating(LTR), Political stability, Bank claim, Concentration, Regulatory quality, and Government debt.	Positive effects by Size, Loan, Non-interest income, Tier 1, LTR, Political stability, Bank claim. Negative impact by Regulatory quality and Government debt.
Kleinow, et al. [24]	2003-2014 (yearly)	50 banks from 18 Latin American countries	Random Effect-RE regression model (GLS)	Systemic Risk Index. SRI= [(CoVaR+MES)/2]	Size, Deposit-to-TL, Market-to-Book ratio (MTB), NPL, Leverage (debt-to-Equity), Operating margin, ROE, Loans-to-TA, Non-interest income-to-Total income, Net cash flows of operating activities-to-TL, Cash and tradeable securities-to-total deposits.	Deposit ratio, MTB, and Non-interest income ratios have a negative impact on SR. Bank size (log of TA) have a positive effect.
Mayordomo, et al. [30]	2002-2011 (Quarterly)	95 US banks	FE panel OLS regression model	Net Shapley Value	Size, share to TA for commercial paper, loan to banks, total loans, correlation with S&P500, net balances due to banks, net balances due to non-banks. Ratios of leverage, maturity mismatch, total deposits and non-performing loans, and banks holdings of derivatives (fair value of credit, interest rate, foreign exchange, equity, and commodity derivatives).	Positive influence by holdings of credit exchange rate derivatives, leverage, and NPLs. Negative effect by holdings of interest rate derivatives and total deposits ratio.
Papanikolaou and Wolff [21]	2002-2012 (Yearly)	20 US banks	2SLS fixed-effects regression model	TotalRisk and CoVaR	Leverage, Loans-to-TA, Demand deposits-to-TL, Inflation, and GDP.	Positive effects for leverage and negative effects for macroeconomic variables.
Patro, et al. [32]	1988-2008 (Daily)	22 US banks	Pair-wise Pearson correlations	Stock returns		SR is triggered by higher correlated investments

Qin and Zhou [16]	2003-2016 (Quarterly)	BRICs, Japan, and US banks	FE panel regression model	MES	Size, Leverage, Market-to-Book (MTB), ROA, NPL, Interbank Assets, and Off-balance sheet (OBS).	Non linear effect of size on SR. For BRICs and Japan, leverage has a negative effect and MTB is a positive. ROA is positive for all. NPL is positive for the US and negative for BRICs. Both IA and OBS directly affect SR in US banks.
Sengul and Yilmaz [14]	2000-2016 (Quarterly)	6 Turkish banks	POLS, FE, and RE Panel regression models	MES and CoVaR	VaR, log of equity, leverage ratio, loan-deposit ratio, return on assets, GDP, BIST (market index return, foreign exchange rate, volatility of foreign exchange rate, volatility of BIS, and housing index.	Positive effects for VaR, equity, leverage, and GDP.
Vallascas and Keasey [7]	1992-2008 (yearly)	153 banks in 17 Euro countries	Pooled OLS and FE regression models	Exposure to SR (Distance to Default DD)	Size, Deposit ratio, OBS, Leverage (TA-to-TE), Liquidity (Primary liquidity-to-TA), Growth of TA, Non-interest income ratio, Systemic (bank size-to-country size), Capital adequacy, Charter value of equity (MV-to-BV), HHI, Economic growth, and Inflation.	Positive effects by Size, asset growth, leverage, and the share of non-interest income.
Weiß, et al. [11]	1991-2009 (Yearly)	440 Worldwide banks	OLS with heteroskedasticity-consistent Huber–White standard errors.	MES	Size, ROA, Leverage, MTB, LLP, Non-interest income, Political stability, Rule of Law, HHI, and GDP.	Positive effect by rule of law. Negative effect by size and HHI.

Appendix (B)

Table B1.
Summary statistics of stock returns in the GCC region.

Sample: 1/03/2011 12/31/2019

	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Probability
_1_Commercial_Bk_Of_Qatar_Cbq	0.00	0	0.09	-0.10	0.01	-0.30	9.38	4010	0
_2_Doha_Bank_Dhb	0.00	0	0.09	-0.10	0.01	-0.83	11.5	7376	0
_3_Qatar_National_Bank_Qnb	0.00	0	0.10	-0.06	0.01	0.46	7.87	2397	0
_4_Al_Khalij_Coml_Bank_Kcb	0.00	0	0.10	-0.10	0.01	0.02	13	9752	0
_5_Ahli_Bank_Abq	0.00	0	0.10	-0.10	0.02	0.12	7.49	1980	0
_6_Abu_Dhabi_Coml_Bank_Acb	0.00	0	0.15	-0.10	0.02	0.60	11.1	6544	0
_7_Bank_Of_Sharjah_Bsh	0.00	0	0.13	-0.11	0.02	0.41	9.61	4344	0
_8_Commercial_Bank_Intl__Com	0.00	0	0.15	-0.11	0.03	1.30	15.7	16524	0
_9_First_Abu_Dhabi_Bank_Fab	0.00	0	0.15	-0.09	0.02	0.71	14.1	12176	0
_10_Nat_Bank_Of_Fujairah_Nfb	0.00	0	0.26	-0.24	0.03	1.18	20.0	28818	0
_11_National_Bank_Of_Ras_Al_Khaimah_Nbr	0.00	0	0.10	-0.10	0.02	0.26	12.0	8021	0
_12_Commercial_Bank_Of_Dubai_Com	0.00	0	0.15	-0.10	0.02	0.68	21.6	33944	0
_13_Mashreq_Bank_Mas	0.00	0	0.15	-0.10	0.02	1.09	18.6	24246	0
_14_Nb_Of_Umm_Al_Qaiwain_Nbu	0.00	0	0.15	-0.10	0.03	0.66	14.3	12702	0
_15_Emirates_Nbd_Enb	0.00	0	0.15	-0.10	0.02	0.85	11.2	6894	0
_16_Banque_Saudi_Fransi_Sal	0.00	0	0.10	-0.09	0.02	0.31	7.33	1873	0
_17_Arab_National_Bank_Snb	0.00	0	0.10	-0.10	0.01	0.27	8.11	2577	0
_18_Riyad_Bank_Rib	0.00	0	0.10	-0.08	0.01	0.57	12.9	9765	0
_19_The_Saudi_British_Bk__Sbb	0.00	0	0.09	-0.07	0.02	0.21	5.85	809	0
_20_The_Saudi_Investment_Bk__Sib	0.00	0	0.09	-0.08	0.01	0.57	9.49	4248	0
_21_Al_Ahli_Bank_Of_Kuwait_104	0.00	0	0.10	-0.10	0.02	0.30	9.30	3915	0
_22_Gulf_Bank_Of_Kuwait_102	0.00	0	0.12	-0.07	0.02	0.26	6.26	1065	0
_23_National_Bank_Of_Kuwait_101	0.00	0	0.07	-0.07	0.01	-0.07	5.54	635	0
_24_Burgan_Bank_107	0.00	0	0.08	-0.07	0.02	0.14	5.62	680	0
_25_Commercial_Bk_Of_Kuwait_103	0.00	0	0.14	-0.11	0.02	0.20	7.38	1890	0
_26_Ahli_United_Bank_Aub	0.00	0	0.09	-0.09	0.01	0.13	11.2	6603	0
_27_Arab_Banking_Corporation_Abc	0.00	0	0.12	-0.11	0.02	0.36	24.3	44568	0
_28_Bbk	0.00	0	0.11	-0.11	0.01	0.03	19.5	26523	0
_29_National_Bank_Of_Bahrain_Nbb	0.00	0	0.10	-0.09	0.02	0.69	13.1	10078	0

_30_National_Bank_Of_Oman_Nbo	0.00	0	0.10	-0.12	0.02	0.02	8.36	2807	0
_31_Bank_Dhofar_Bkd	0.00	0	0.13	-0.11	0.02	0.33	10.1	4974	0
_32_Sohar_Internatioanl_Bank_Sba	0.00	0	0.13	-0.15	0.03	0.26	9.89	4666	0
_33_Hsbc_Bank_Oman_Hbm	0.00	0	0.11	-0.15	0.02	0.17	11.6	7182	0
_34_Bank_Muscat_Bma	0.00	0	0.10	-0.09	0.02	0.04	7.35	1850	0

Table B1.
Summary statistics of stock returns in MPCs.

Sample: 1/03/2011 12/31/2019

	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Probability
_1_SOC_ARABE_INTL_DE_BANQUE_SOC	0.00	0	0.18	-0.15	0.01	-0.74	103	982518	0
_2_CREDIT_AGRICOLE_EGYPT_CIE	0.00	0	0.12	-0.10	0.02	0.30	10	5416	0
_3_EGYPTIAN_GULF_BANK_EGB	0.00	0	0.10	-0.10	0.02	0.27	8	2740	0
_4_SUEZ_CANAL_BANK_SCB	0.00	0	0.10	-0.12	0.02	0.59	6	831	0
_5_QATAR_NATIONAL_BANK_ALAHLY_QNB	0.00	0	0.10	-0.10	0.02	0.01	9	3791	0
_6_NATIONAL_BANK_OF_KUWAIT_AWB	0.00	0	0.10	-0.13	0.02	0.25	9	4115	0
_7_COML_INTL_BANK__EGYPT__CIB	0.00	0	0.10	-0.10	0.02	0.03	8	2031	0
_8_ATTIJARIWAFA_BANK	0.00	0	0.06	-0.06	0.01	0.11	7	1345	0
_9_CREDIT_DU_MAROC_STE	0.00	0	0.19	-0.17	0.02	-0.13	13	10267	0
_10_BANQUE_POPULAIRE	0.00	0	0.07	-0.09	0.01	0.04	11	6886	0
_11_ARAB_BANK__ABK_	0.00	0	0.08	-0.07	0.01	0.81	12	8333	0
_12_JORDAN_KUWAIT_BANK__JKB_	0.00	0	0.07	-0.07	0.01	0.21	9	3935	0
_13_BANK_OF_JORDAN_BOJ	0.00	0	0.07	-0.07	0.01	0.29	13	9604	0
_14_ARAB_BANKING_CORPORATION_JORDAN_PSC_ABC	0.00	0	0.07	-0.09	0.01	-0.54	12	7410	0
_15_CAIRO_AMMAN_BANK_CAI	0.00	0	0.08	-0.07	0.01	0.22	9	4123	0
_16_CAPITAL_BANK_OF_JORDAN	0.00	0	0.08	-0.07	0.01	0.50	7	1518	0
_17_JORDAN_COMMERCIAL_BANK_PSC_JCB	0.00	0	0.07	-0.07	0.02	0.21	8	2935	0
_18_THE_HSG_BANK_FOR_TR_F__HNB	0.00	0	0.07	-0.07	0.01	-0.36	34	96917	0
_19_JORDAN_AHLI_BANK_JAB	0.00	0	0.08	-0.08	0.01	-0.01	10	5428	0
_20_BANK_AL_ETIHAD_UBS	0.00	0	0.07	-0.07	0.01	0.17	7	1384	0
_21_BANK_AUDI_AUD	0.00	0	0.08	-0.10	0.01	-0.38	16	15576	0
_22_BLOM_BANK_BLM	0.00	0	0.09	-0.09	0.01	-1.53	41	145765	0
_23_BYBLOS_BANK_BYL	0.00	0	0.08	-0.10	0.01	-0.72	14	12652	0
_24_BEMO_BANK_BEO	0.00	0	0.63	-0.23	0.02	12.73	420	17042752	0

Table B3.
Correlation coefficients between banks' stock returns in the GCC region.
Covariance Analysis: Ordinary
Sample: 1/04/2011 12/31/2019
Included observations: 2346
Correlation
t-Statistic
Probability

	1- CBQ	2- DHB	3- QNB	4- KCB	5- ABQ	6- ACB	7- BSH	8- COM	9- FAB	10- _NFB	11- _NBR	12- CBD	13- MAS	14- NBU	15- ENB
1- CBQ	1.0														

2-DHB	0.3	1.0													
	16.8	-----													
	0.0	-----													
3-QNB	0.3	0.3	1.0												
	17.7	14.8	-----												
	0.0	0.0	-----												
4-KCB	0.2	0.2	0.2	1.0											
	9.2	7.9	11.5	-----											
	0.0	0.0	0.0	-----											
5-ABQ	0.1	0.1	0.0	0.1	1.0										
	2.6	2.4	2.4	3.6	-----										
	0.0	0.0	0.0	0.0	-----										
6-ACB	0.2	0.2	0.2	0.2	0.1	1.0									
	9.2	10.3	10.4	7.5	2.7	-----									
	0.0	0.0	0.0	0.0	0.0	-----									
7-BSH	0.1	0.0	0.1	0.0	0.0	0.1	1.0								
	2.9	1.0	3.1	2.0	1.7	3.1	-----								
	0.0	0.3	0.0	0.0	0.1	0.0	-----								
8-COM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0							
	0.9	1.0	0.9	1.7	0.3	1.2	0.6	-----							
	0.4	0.3	0.3	0.1	0.8	0.2	0.5	-----							

9-FAB	0.2	0.2	0.2	0.1	0.0	0.4	0.0	0.0	1.0						
	10.3	7.5	10.0	4.7	2.0	21.7	2.1	0.6	-----						
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	-----						
10-_NFB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0					
	0.3	-1.1	-0.8	-0.7	-1.0	0.4	-0.1	-0.4	0.2	-----					
	0.8	0.3	0.4	0.5	0.3	0.7	0.9	0.7	0.9	-----					
11-_NBR	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.1	0.0	1.0				
	1.2	2.4	1.1	3.2	1.4	7.3	3.1	2.0	4.3	0.9	-----				
	0.2	0.0	0.3	0.0	0.2	0.0	0.0	0.0	0.0	0.4	-----				
12-CBD	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	1.0			
	2.8	2.7	4.7	2.1	-0.4	2.9	0.2	-1.1	1.8	-0.3	-1.0	-----			
	0.0	0.0	0.0	0.0	0.7	0.0	0.8	0.3	0.1	0.8	0.3	-----			
13-MAS	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	1.0		
	0.9	0.0	-0.1	1.1	-0.8	-0.5	2.4	1.0	-0.4	-0.2	0.7	2.1	-----		
	0.4	1.0	0.9	0.3	0.4	0.6	0.0	0.3	0.7	0.8	0.5	0.0	-----		
14-NBU	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	1.0	
	2.1	1.5	2.0	1.2	0.7	0.2	0.3	1.5	1.2	-1.4	1.5	2.8	1.1	-----	
	0.0	0.1	0.0	0.2	0.5	0.8	0.8	0.1	0.2	0.2	0.1	0.0	0.3	-----	
15-ENB	0.1	0.1	0.1	0.1	0.0	0.3	0.1	0.1	0.2	0.0	0.1	0.1	0.0	0.0	1.0
	7.1	5.4	5.3	3.6	2.4	16.6	4.2	2.5	11.0	-0.4	4.6	3.2	1.5	1.7	-----
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.1	0.1	-----

Table B3.
Continued…
Covariance Analysis:
Ordinary
Sample: 1/04/2011 12/31/2019
Included observations: 2346
Correlation
t-Statistic
Probability

	16-SAL	17-SNB	18-RIB	19-SBB	20-SIB	21-ABK	22-GBK	23-NBK	24-BB	25-CBK	26-AUB	27-ABC	28-BBK	29-NBB	30-NBO	31-BKD	32-SBA	33-HBM	34-BMA
16-SAL	1.0																		
17-SNB	0.6	1.0																	
	33.8	-----																	
	0.0	-----																	

18-RIB	0.5	0.5	1.0																
	27.7	30.8	-----																
	0.0	0.0	-----																
19-SBB	0.6	0.6	0.5	1.0															
	35.0	32.4	26.5	-----															
	0.0	0.0	0.0	-----															
20-SIB	0.5	0.5	0.5	0.5	1.0														
	26.1	30.1	28.6	25.2	-----														
	0.0	0.0	0.0	0.0	-----														
21-ABK	0.0	0.0	0.0	0.0	0.0	1.0													
	1.1	1.4	1.9	1.5	1.5	-----													
	0.3	0.2	0.1	0.1	0.1	-----													
22-GBK	0.1	0.1	0.1	0.0	0.0	0.1	1.0												
	3.8	2.8	3.1	2.0	1.3	3.9	-----												
	0.0	0.0	0.0	0.0	0.2	0.0	-----												
23-NBK	0.1	0.1	0.1	0.1	0.1	0.1	0.2	1.0											
	3.0	3.0	4.7	2.8	4.2	4.0	8.3	-----											
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-----											
24-BB	0.1	0.1	0.1	0.0	0.1	0.1	0.2	0.2	1.0										
	3.8	3.2	3.3	2.0	3.4	5.1	8.3	9.6	-----										
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-----										
25-CBK	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	1.0									
	-0.1	-0.8	0.8	0.0	0.3	1.2	1.3	3.6	2.8	-----									
	0.9	0.4	0.4	1.0	0.8	0.2	0.2	0.0	0.0	-----									
26-AUB	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	1.0								
	1.5	0.5	1.4	2.0	0.8	2.4	2.5	4.3	4.0	0.3	-----								
	0.1	0.6	0.2	0.0	0.4	0.0	0.0	0.0	0.0	0.7	-----								
27-ABC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0							
	1.6	-0.2	0.8	0.2	-1.0	-0.9	0.0	1.0	-0.7	-0.7	0.9	-----							
	0.1	0.9	0.4	0.8	0.3	0.4	1.0	0.3	0.5	0.5	0.4	-----							
28-BBK	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0						
	1.2	2.1	1.0	1.0	0.9	-0.4	1.1	0.1	0.8	2.0	1.5	0.9	-----						
	0.2	0.0	0.3	0.3	0.4	0.7	0.3	0.9	0.4	0.0	0.1	0.4	-----						
29-NBB	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	1.0					
	1.1	1.4	1.0	0.7	1.7	-2.5	0.7	0.1	0.9	2.7	0.7	0.2	1.5	-----					
	0.3	0.2	0.3	0.5	0.1	0.0	0.5	0.9	0.4	0.0	0.5	0.8	0.1	-----					
30-NBO	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	1.0				
	2.9	4.5	4.9	3.0	4.9	2.2	2.0	3.7	2.5	2.6	0.8	0.9	0.4	-0.6	-----				
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.4	0.7	0.6	-----				
31-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.1	1.0			

BKD	0.9	0.6	2.2	1.5	0.6	2.2	0.2	3.4	0.4	-0.5	2.5	1.7	0.7	0.6	6.3	-----		
	0.4	0.6	0.0	0.1	0.6	0.0	0.9	0.0	0.7	0.6	0.0	0.1	0.5	0.6	0.0	-----		
32-SBA	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	1.0	
	3.2	1.9	2.0	1.9	3.0	-0.5	1.7	1.6	1.5	0.6	1.0	0.7	-0.8	1.3	5.7	4.0	-----	
	0.0	0.1	0.0	0.1	0.0	0.6	0.1	0.1	0.1	0.5	0.3	0.5	0.4	0.2	0.0	0.0	-----	
33-HBM	0.0	0.1	0.1	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	1.0
	1.1	2.4	2.7	1.9	2.1	2.7	1.4	3.1	1.1	1.6	0.6	1.6	0.9	-0.8	4.3	3.1	3.8	-----
	0.3	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.3	0.1	0.5	0.1	0.4	0.4	0.0	0.0	0.0	-----
34-BMA	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.2	0.1	1.0
	3.7	2.7	4.0	3.7	4.4	1.6	3.0	2.9	4.8	-0.1	2.2	0.7	1.3	-0.5	9.7	4.8	11.1	5.4	-----
	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.9	0.0	0.5	0.2	0.6	0.0	0.0	0.0	0.0	-----

Table B2.
Correlation coefficients between banks' stock returns in MPCs.
Covariance Analysis: Ordinary
Sample: 1/04/2011 12/31/2019
Included observations: 2346
Correlation
t-Statistic
Probability

	1-SOC	2-CIE	3-EGB	4-SCB	5-QNB	6-NBK	7-CIB	8-AWB	9-CDM	10-BP	11-ABK	12-JKB
1-SOC	1.0											
2-CIE	0.0	1.0										
	-0.1	-----										
	0.9	-----										
3-EGB	0.1	0.2	1.0									
	2.7	8.2	-----									
	0.0	0.0	-----									
4-SCB	0.0	0.2	0.2	1.0								
	0.4	11.2	9.4	-----								
	0.7	0.0	0.0	-----								
5-QNB	0.0	0.3	0.2	0.2	1.0							
	1.2	14.6	9.1	9.7	-----							
	0.2	0.0	0.0	0.0	-----							
6-NBK	0.1	0.1	0.1	0.1	0.1	1.0						
	3.3	6.0	6.1	7.0	2.8	-----						
	0.0	0.0	0.0	0.0	0.0	-----						
7-CIB	0.0	0.4	0.3	0.4	0.4	0.1	1.0					
	0.9	19.5	14.8	19.6	18.5	6.6	-----					
	0.4	0.0	0.0	0.0	0.0	0.0	-----					
8-AWB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0				
	0.1	-0.5	1.7	-0.4	1.8	-0.2	0.8	-----				

	0.9	0.6	0.1	0.7	0.1	0.9	0.4	-----				
9-CDM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0			
	-0.9	0.9	0.5	0.3	-0.6	0.4	0.6	0.4	-----			
	0.3	0.4	0.6	0.8	0.6	0.7	0.5	0.7	-----			
10-BP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	1.0		
	-0.5	0.4	1.0	0.0	-0.4	-1.0	1.5	17.5	1.3	-----		
	0.7	0.7	0.3	1.0	0.7	0.3	0.1	0.0	0.2	-----		
11-ABK	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	
	0.1	0.5	0.7	-0.2	0.2	0.7	2.1	2.1	0.1	0.9	-----	
	0.9	0.6	0.5	0.8	0.9	0.5	0.0	0.0	0.9	0.4	-----	
12-JKB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.0
	0.5	0.1	-1.1	-0.7	-0.6	0.2	-0.4	0.5	0.9	0.6	5.5	-----
	0.6	0.9	0.3	0.5	0.6	0.8	0.7	0.6	0.4	0.5	0.0	-----

Table B4.
Continued.
Covariance Analysis: Ordinary
Sample: 1/04/2011 12/31/2019
Included observations: 2346
Correlation
t-Statistic
Probability

	13-BOJ	14-ABC	15-CAI	16-CBJ	17-JCB	18-HNB	19-JAB	20-UBS	21-AUD	22-BLM	23-BYL	24-BEO
13-BOJ	1.0											
14-ABC	0.1	1.0										
	3.9	-----										
	0.0	-----										
15-CAI	0.1	0.0	1.0									
	4.0	2.2	-----									
	0.0	0.0	-----									
16-CBJ	0.0	0.1	0.1	1.0								
	1.4	3.8	2.9	-----								
	0.1	0.0	0.0	-----								
17-JCB	0.0	0.0	0.0	0.0	1.0							
	1.1	2.0	0.6	-0.8	-----							
	0.3	0.0	0.5	0.4	-----							
18-HNB	0.0	0.0	0.0	0.0	0.0	1.0						
	2.1	1.2	2.1	2.2	-1.0	-----						
	0.0	0.2	0.0	0.0	0.3	-----						
19-JAB	0.1	0.1	0.1	0.1	0.0	0.0	1.0					
	4.1	6.3	4.7	4.0	1.3	1.4	-----					
	0.0	0.0	0.0	0.0	0.2	0.2	-----					

20-UBS	0.1	0.1	0.1	0.0	0.0	0.0	0.1	1.0				
	4.6	2.7	3.4	0.5	-0.3	0.5	3.0	-----				
	0.0	0.0	0.0	0.6	0.8	0.6	0.0	-----				
21-AUD	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0			
	-1.2	0.4	-0.9	0.4	-1.7	0.6	-1.4	1.5	-----			
	0.2	0.7	0.4	0.7	0.1	0.5	0.2	0.1	-----			
22-BLM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.0		
	0.5	-1.4	-0.7	1.3	-0.9	-1.2	1.0	0.9	3.6	-----		
	0.6	0.2	0.5	0.2	0.4	0.2	0.3	0.4	0.0	-----		
23-BYL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.0	
	0.8	0.7	2.2	-0.1	0.6	-1.4	0.4	0.3	1.8	2.5	-----	
	0.4	0.5	0.0	0.9	0.6	0.2	0.7	0.8	0.1	0.0	-----	
24-BEO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	1.0
	-1.5	-0.4	0.1	0.2	0.0	0.8	-0.4	1.7	-0.4	2.7	-0.4	-----
	0.1	0.7	0.9	0.8	1.0	0.4	0.7	0.1	0.7	0.0	0.7	-----

Appendix (C)

Table C1.
Summary statistics for panel B (GCC).

	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis
VaR	5.18	4.65	10.65	0.00	2.36	0.65	2.80
ES	6.46	5.97	17.19	0.00	2.44	0.53	3.12
Size	160	136	509	50.2	87.9	1.46	5.28
Leverage	14.3	13.8	33.4	8.11	3.64	2.26	10.9
Stability	52.7	46.2	127	8.59	27.9	0.68	2.68
Income diversification	30.8	30.5	54.7	11.8	7.27	0.33	3.14
Profitability	3.00	2.82	10.3	1.64	1.09	4.02	24.2
Liquidity	34.7	34.3	83.2	7.51	13.3	0.69	3.80
Regulatory capital	16.7	15.8	37.1	9.30	4.73	2.14	8.51
Economic growth	3.33	3.06	13.4	-4.71	2.89	0.49	4.65
Inflation	1.80	2.00	5.80	-2.10	1.57	-0.29	3.33

Table C2.
Summary statistics for panel C (MPC).

	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis
VaR	3.83	3.66	9.88	0.00	1.79	0.36	3.10
ES	5.33	4.92	14.34	0.88	2.24	1.11	4.81
Size	92.66	62.61	235.62	2.96	61.64	0.86	2.49
Leverage	11.19	10.75	17.63	4.76	3.06	0.27	2.17
Stability	45.24	35.26	192.28	7.27	37.24	2.05	7.38
Income diversification	27.96	26.01	58.39	9.25	8.47	0.96	4.05
Profitability	3.86	3.71	8.09	1.03	1.13	0.66	4.46
Liquidity	36.93	32.84	84.08	8.44	15.74	0.65	2.78
Regulatory capital	14.16	13.90	23.59	7.08	3.41	0.48	2.93
Economic growth	2.57	2.50	5.56	-6.70	1.87	-2.22	12.60
Inflation	5.41	4.50	29.50	-3.70	6.12	1.99	8.46

Appendix (D)

List of banks in GCC and MPC

Number	Banks in GCC sample	Country code
1- CBQ	COMMERCIAL BANK of Qatar (PQSC)	QA
2-DHB	DOHA BANK	QA
3-QNB	QATAR NATIONAL BANK	QA
4-KCB	AL KHALIJ COMMERCIAL BANK P.Q.S.C.	QA
5-ABQ	AHLI BANK QSC	QA
6-ACB	ABU DHABI COMMERCIAL BANK	AE
7-BSH	BANK OF SHARJAH	AE
8-COM	COMMERCIAL BANK INTERNATIONAL P.S.C.	AE
9-FAB	FIRST ABU DHABI BANK	AE
10-NFB	NATIONAL BANK OF FUJAIRAH PJSC	AE
11-NBR	NATIONAL BANK OF RAS AL-KHAIMAH (P.S.C.) (THE)	AE
12-CBD	COMMERCIAL BANK OF DUBAI P.S.C.	AE
13-MAS	MASHREQBANK PSC	AE
14-NBU	NATIONAL BANK OF UMM AL-QAIWAIN PSC	AE
15-ENB	EMIRATES NBD BANK PJSC	AE
16-SAL	BANQUE SAUDI FRANSI JSC	SA
17-SNB	ARAB NATIONAL BANK PUBLIC JOINT STOCK COMPANY	SA
18-RIB	RIYAD BANK	SA
19-SBB	SAUDI BRITISH BANK JSC (THE)	SA
20-SIB	SAUDI INVESTMENT BANK (THE)	SA

21-ABK	AL AHLI BANK OF KUWAIT (KSC)	KW
22-GBK	GULF BANK KSC (THE)	KW
23-NBK	NATIONAL BANK OF KUWAIT S.A.K.	KW
24-BB	BURGAN BANK KPSC	KW
25-CBK	COMMERCIAL BANK OF KUWAIT K.P.S.C. (THE)	KW
26-AUB	AHLI UNITED BANK BSC	BH
27-ABC	ARAB BANKING CORPORATION BSC	BH
28-BBK	BBK B.S.C.	BH
29-NBB	NATIONAL BANK OF BAHRAIN	BH
30-NBO	NATIONAL BANK OF OMAN (SAOG)	OM
31-BKD	BANK DHOFAR SAOG	OM
32-SBA	SOHAR INTERNATIONAL BANK SAOG	OM
33-HBM	HSBC BANK OMAN SAOG	OM
34-BMA	BANK MUSCAT SAOG	OM

Number	Banks in GCC sample	Country code
1-SOC	Societe Arabe Internationale de Banque	EG
2-CIE	CREDIT AGRICOLE EGYPT SAE	EG
3-EGB	EGYPTIAN GULF BANK SAE	EG
4-SCB	SUEZ CANAL BANK	EG
5-QNB	QNB ALAHLI BANK (S.A.E.)	EG
6-NBK	THE NATIONAL BANK OF KUWAIT - EGYPT SAE	EG
7-CIB	COMMERCIAL INTERNATIONAL BANK (EGYPT) S.A.E.	EG
8-AWB	ATTIJARIWAFA BANK	MA
9-CDM	CREDIT DU MAROC	MA
10-BP	BANQUE CENTRALE POPULAIRE SA	MA
11-ABK	ARAB BANK PLC	JO
12-JKB	JORDAN KUWAIT BANK	JO
13-BOJ	BANK OF JORDAN PLC	JO
14-ABC	ARAB BANKING CORPORATION (JORDAN)	JO
15-CAI	CAIRO AMMAN BANK	JO
16-CBJ	CAPITAL BANK OF JORDAN	JO
17-JCB	JORDAN COMMERCIAL BANK	JO
18-HNB	HOUSING BANK FOR TRADE & FINANCE (THE)	JO
19-JAB	JORDAN AHLI BANK PLC	JO
20-UBS	BANK AL ETIHAD	JO
21-AUD	BANK AUDI SAL	LB
22-BLM	BLOM BANK S.A.L.	LB
23-BYL	BYBLOS BANK S.A.L.	LB
24-BEO	BANQUE BEMO SAL	LB