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# An Empirical Study of the Key Profitability Factors of Interest-free Banking vs. Conventional Banking in the MENA Region Following the 2008 Financial Crisis

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## Abstract

The stability of any economy is closely tied to the stability of its banking sector, necessitating continuous evaluation and efficiency enhancement. The recent emergence of Interest-free banking in the MENA region and globally has seen rapid growth, attracting global interest. However, limited research has compared the financial performance of this new type of banking with conventional banks, particularly in the MENA region. To address this gap, this study aims to measure and compare the financial performance of 55 conventional banks and 26 interest-free banks across the MENA region from 2008 to 2014, using the CAMELS rating system. Descriptive statistics will be employed to analyze time series data, followed by the One-Way ANOVA analysis to identify significant differences between the two banking systems. Pearson's correlation coefficient will be used to assess correlations among independent variables and test for multi-collinearity problems. Ultimately, the fixed-effects model will determine how internal factors like capital adequacy, asset quality, management quality, earnings quality, and liquidity impact the financial performance of both banking system types in the MENA region. The study's findings reveal that asset quality, earnings quality, and liquidity are the key drivers of profitability for both interest-free and conventional banks in the MENA region.

**Keywords:** Interest-free banking, Conventional banking, CAMELS rating system, MENA Region, Financial institutions, Financial intermediaries, Financial crisis.

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# 1. Introduction

The banking sector plays a vital role in driving any country's economic wellbeing and stability. Banking entities, as financial intermediaries, facilitate the flow of funds, contributing to the overall development of a nation's economy. According to Siraji et al. (2012), the growth and stability of an economy heavily relies on the financial and banking sectors. In recent years, the banking sector has witnessed significant changes, with increasing government regulations and the emergence of a new type of interest-free banking, referred to as Islamic banking and adopted by banks globally, both in Islamic and non-Islamic countries. This interest-free banking system or Islamic banking has emerged as a strong competitor to conventional banking (Rose and Hudgins, 2013). In 1963, the first interest-free bank, "Mit Ghamar", was established in Egypt under the rules of Islamic Sharia. Since then, numerous Islamic banks have appeared across the Middle East, Gulf region, and the world. Due to the growing demand for interest-free financial products, the Islamic banking sector is projected to encompass over 614 banks in 75 countries worldwide, (Merchant, 2012). Large international conventional banks like Citigroup and HSBC have also incorporated interest-free Islamic financial products into their services (Siddiqi, 2008). Additionally, studies comparing Islamic banks and conventional banks, notably those by Merchant (2012) and Rashwan (2012), suggest that Islamic banking showed greater efficiency during the 2008 financial crisis. Consequently, Islamic banks significantly expanded in the MENA region, contributing to the region's financial sector stability after the late global crisis. Reports by (Pizzi, 2013) and (Ernst and Young, 2012) indicate that Islamic finance is expanding at a faster rate than conventional banking with Islamic banking assets growing substantially. Despite this growth, few studies have explored the comparative efficiency and success factors of Islamic banking, necessitating further research in this area.

The aim of this study is to empirically compare and determine the drivers of success for interest-free Islamic and conventional banks in the MENA region from 2008 to 2014, utilizing a sample of 81 banks, including 55 conventional banks and 26 Islamic banks. The study covers the following countries: UAE, Egypt, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, and Bahrain.

Three quantitative tools were employed to analyze the data. First, descriptive statistics were used as an initial step in the data analysis. Next, the One-Way ANOVA test was conducted to assess the significance of differences in the internal characteristics or "CAMELS" between the two types of banking systems. The third tool utilized was a fixed-effects model to determine the impact of the "CAMELS" factors (capital adequacy, asset quality, management quality, earnings quality, liquidity, and sensitivity to market) on the overall financial performance of both banking system types.

## 2. Literature Review

As profitability is the main objective of any bank regardless of its type, many studies have been conducted in the past to determine what makes a certain bank more profitable than another in terms of internal factors such as the "CAMELS" and/or other macroeconomic factors. However, with the emergence of the Islamic banking system, the need to analyze and compare the profitability of this new type of banking system relative to the conventional one is now more important than ever.

Indeed, there seems to be a general agreement among many scholars that the Islamic banking system today has become superior to its conventional counterpart in terms of profitability, as stated by Samad (2004) in his article "Performance of Interest-free Islamic banks vis-à-vis Interest-based Conventional Banks of Bahrain". On the other hand, many other studies have argued that the difference in the performance of Islamic and conventional banks is not related to their banking system type.

The main objective of most studies that have attempted before to compare the Islamic model of banking was to identify weaknesses of the conventional banking system and determine whether Islamic banking can become a better alternative to it. According to Alam (2009), the main assumption behind all these studies was that almost all elements that have led to past financial crises, such as direct lending and borrowing, are prohibited under the Islamic Sharia law, allowing the Islamic financial system to demonstrate a great deal of stability during the 2008 global financial crisis, hence its attractiveness in global markets today.

Another study by Alam et al. (2011) attempted to examine whether the Islamic banking model is strong enough to resist a financial crisis using data collected from a sample of 10 Islamic banks and 10 conventional banks across the Gulf region during the period of 2006 to 2009. The results of this study illustrated the outstanding performance of Islamic banks relative to their counterparts during the recent global financial crisis. Also, it has indicated that while the conventional banking system suffered losses of billions of dollars, the Islamic banking system incurred little to no losses. Indeed, this study concluded that the Islamic banking system clearly provides a sustainable alternative to the banking industry. However, these results were criticized because this study was limited to the Gulf region alone and used a small data size.

Furthermore, in their article "The effects of the Global Crisis on Islamic and Conventional banks", Hasan and Dridi (2010) tried to analyze and compare the performance of both Islamic and conventional banks during the global financial crisis of 2008 by examining the influence of the crisis on the banks' growth and overall performance. Their study concluded that Islamic banks have grown faster in terms of assets and have demonstrated more liquidity relative to conventional banks in the period of 2008 and 2009, contributing to the economic stability of the different nations where they operate.

Nevertheless, in a study by Ali et al. (2011), the authors tried to evaluate the different factors that influence the performance of banks in Pakistan using different internal and external factors. The study concluded that the GDP, the annual inflation,

capital adequacy ratio, and asset management were the primary factors that directly influence the profitability of banks in terms of their return on assets and return on equity.

In 2011, Faizulayev (2011) further compared the performance of Islamic banks with conventional banks using the CAMELS rating system, regression models, and the ANOVA analysis to assess the impact of the CAMELS on the banks' profitability and to also assess their significance. This study concluded that Islamic banks have a different structure of CAMELS than conventional banks; also, Islamic banks are less liquid than conventional banks due to their investments that are often long-term. The results of this study also suggest that the banking system type has a direct relationship to the banks' overall profitability and performance.

However, another study conducted by Imam and Kpodar (2010) aimed to determine the different factors that have contributed to the success of Islamic banking on the international level using data gathered from 1992 until 2006. The conclusion they have drawn from their study clearly showed that the growth of Islamic banking in any country mainly depends on the proportion of Muslims in the population and the income per capita. Moreover, they have also concluded that increasing interest rates negatively affect the Islamic banking system because they result in a high opportunity cost for individuals who chose to deposit their money in an Islamic bank relative to a conventional bank.

In contrast, a study by Atzori (2010) rejected the idea that Islamic banking can represent an effective and more profitable alternative to the conventional banking system, claiming that although the Islamic banking sector has known fast growth in recent years and has proven to be resistant to financial crises, its rapid growth and stability were mainly due to the fact that Muslims constantly try to impose their identity on the rest of the world through what is called the Islamization of modernity. The author also claimed that the development of Islamic banking is clearly related to the emergence of terrorist groups and many political movements that are against the Western interests. Finally, Atzori also claimed that the Islamic banking model is not much different from the conventional banking model in many perspectives.

# 3. Purpose of the Study

## 3.1 Objectives of the Study

The aim of this study is to quantitatively compare the financial performance of the two types of banking systems in the MENA region: the Islamic banking system and the conventional banking system. The comparison will focus on various internal factors, known as the "CAMELS" which stands for capital adequacy, assets quality, management quality, earnings quality, liquidity, and sensitivity to market. Additionally, this study will seek to determine if there are any significant differences between the internal characteristics (CAMELS) of the two banking system types and identify their drivers of profitability.

### 3.2 Hypotheses

*H1:* Islamic banks are more profitable than conventional banks in terms of ROE, ROA, and ROIC.

*H2:* The capital adequacy of Islamic banks is better than the capital adequacy of conventional banks.

*H3:* The asset quality of Islamic banks is better than the asset quality of conventional banks.

*H4:* The management quality of Islamic banks is better than the management quality of conventional banks.

*H5:* The earnings quality of Islamic banks is higher than the earnings' quality of conventional banks.

*H6:* The liquidity of Islamic banks is more efficient than the liquidity of conventional banks.

*H7:* The profitability of both financial systems is significantly influenced by the CAMELS.

## 4. Methodology

### 4.1 Data Collection

The time series data of all banks used in this study were retrieved from the DataStream database. The data was then organized into different Excel sheets and used to calculate various financial ratios to measure the financial performance of the selected sample of banks. To conduct a comparative analysis of the financial well-being of this sample, the study utilizes the CAMELS rating system, which is the most common way to measure and compare the performance of banks. However, due to a lack of available data, we will exclude the "sensitivity to market" rating from our CAMELS framework and, instead, focus only on the following five ratings in our analysis: capital adequacy, asset quality, management quality, earnings quality, and liquidity.

### 4.2 Sample and Data Description

#### 4.2.1 Sample

The sample was first selected based on the following characteristics: the country, which must be within the MENA region, and the bank's size, which must be large based on its market capitalization and total assets size. Then, the second step in our sample selection was to choose only banks for which complete and accurate financial data is available. To achieve this, we tried to limit our sample to only publicly traded banks. The third step was to identify the bank's type and classify

each selected bank as either an Islamic or conventional bank. Finally, after following all our selection criteria, the sample of banks that we selected consists of a total of 81 banks, with 55 conventional banks and 26 Islamic banks across the MENA region, covering the following countries: UAE, Egypt, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, and Bahrain.

**Table 1: Sample of 81 banks selected (55 conventional banks, 26 Interest-free banks)**

| Country | Conventional Banks | Interest-free Banks |
|---|---|---|
| UAE | Abu Dhabi Commercial Bank | Abu Dhabi Islamic Bank |
| | Bank of Sharjah | Sharjah Islamic Bank |
| | Commercial Bank Int | Dubai Islamic Bank |
| | Union National Bank | Emirates Islamic Bank |
| | First Gulf Bank | Ajman Bank |
| | National Bank of UMM | |
| | Invest Bank PSC | |
| | Commercial Bank of Dubai | |
| | Mashreq Bank | |
| | Emirates NBD | |
| | Union National Bank | |
| Egypt | Bank of Alexandria | Al Baraka Egypt Bank |
| | Credit Agricole | Suez Canal Bank |
| | Qatar National Bank | Abu Dhabi Islamic Bank |
| | Commercial Intl Bank | |
| Israel | First Intl Bank of ISR | |
| | F.I.B.I. Holdings | |
| | Mizrahi Tefahot | |
| | Bank of JER | |
| | Union Bank of Israel | |
| | Bank Leumi Le-Israel | |
| | Bank Hapoalim B.M | |
| | Israel Discount Bank | |
| Jordan | Arab Bank Group | Jordan Islamic Bank |
| | Jordan Kuwait Bank | |
| | Bank of Jordan | |
| | Capital Bank | |
| | Jordan Commercial Bank | |
| | Housing Bank | |
| | Jordan Ahli Bank | |
| | Bank al Etihad | |
| Kuwait | Al Ahli Bank of Kuwait | Kuwait Finance House |
| | Gulf Bank of Kuwait | Boubyan Bank KSC |
| | National Bank | |
| | Burgan Bank Sak | |
| Lebanon | Bank Audi SAL | |
| | Blom Bank SAL | |

| | | |
|---|---|---|
| | Byblos Bank SAL | |
| Oman | Bank Dhofar Saog | National Bank of Oman |
| | HSBC Bank Oman Saog | Bank Nizwa |
| | Bank Muscat | Arab Islamic Bank |
| Qatar | Commercial Bank of Qatar | Qatar Islamic Bank |
| | Doha Bank | Masraf Al Rayan |
| | Qatar National Bank | Qatar Int Islamic Bank |
| | Al Khalij Commercial | |
| | Ahli Bank QSC | |
| Saudi Arabia | Banque Saudi Fransi | Bank Albilad |
| | Arab National Bank | Alinma Bank |
| | Bank Al-Jazira | Al Rajhi Bank |
| | Samba Financial Group | Riyad Bank |
| | Saudi British Bank | |
| | Saudi Investment Bank | |
| | Saudi Hollandi Bank | |
| Bahrain | BBK BSC | Bahrain Islamic Bank |
| | National Bank of Bahrain | Gulf Finance House |
| | | Al Salam Bank |
| | | Ithmaar Bank BSC |
| | | Albaraka Banking |

### 4.2.2 Data

The type of data that we have managed to gather about our sample of banks can be described as multi-dimensional data or panel data, meaning that it can be characterized as both cross-sectional and time-series data. The data is gathered from multiple units (81 banks) observed over multiple successive periods from 2008 to 2014.

## 4.3 Statistical Techniques

### 4.3.1 Descriptive Statistics

The first step used to analyse the data collected in this study is descriptive statistics which include the mean, std. deviation, variance, maximum, minimum, skewness, and Kurtosis.

### 4.3.2 One-Way ANOVA

The One-Way ANOVA will be used to determine if there is any significant difference in the performance of both types of banking system using the CAMELS framework.

### 4.3.3 Correlation Analysis

The Pearson's correlation coefficient will be used to measure the correlation among the independent variables and to test for multi-collinearity problems.

### 4.3.4 Fixed-effects Model

The fixed-effects model will be used to determine the effect of different internal factors (capital adequacy, asset quality, management quality, earnings quality, and liquidity) on the overall financial performance of both banking system types in the MENA region.

## 4.4 Regression Models

To perform our panel data analysis, the following models will be estimated:

**Model 4.1** Pooled OLS regression model

ROE = β0
+ β1(Capital Adequacy of bank i at time t)
+ β2(Asset Quality of bank i at time t)
+ β3(Management Quality of bank i at time t) (1)
+ β4(Earnings Quality of bank i at time t)
+ β5(Liquidity of bank i at time t)
+ β6(Bank type) + $\varepsilon$

ROA = β0
+ β1(Capital Adequacy of bank i at time t)
+ β2(Asset Quality of bank i at time t)
+ β3(Management Quality of bank i at time t) (2)
+ β4(Earnings Quality of bank i at time t)
+ β5(Liquidity of bank i at time t)
+ β6(Bank type) + $\varepsilon$

ROIC = β0
+ β1(Capital Adequacy of bank i at time t)
+ β2(Asset Quality of bank i at time t)
+β3(Management Quality of bank i at time t) (3)
+ β4(Earnings Quality of bank i at time t)
+ β5(Liquidity of bank i at time t)
+ β6(Bank type) + $\varepsilon$

Where
β0 = Intercept
β1, β2, β3, β4, β5, β6 = Coefficients of the independent variables.
Bank type = Dummy variable [1=Islamic Bank; 0=Conventional Bank]
$\varepsilon$ = Error

Model 4.1 assumptions:

1. Normality: to ensure that the model residuals follow a normal distribution, we used normal probability plot for the residuals. Z-score and residuals appear to

have a linear relationship. Thus, we conclude that the residuals follow a normal distribution. Please refer to Appendix 10, 11 and 12.

2. Multi-collinearity: Pearson's Correlation Coefficient matrix was used to measure the correlation between the different independent variables. Refer to table 6.

**Model 4.2** Fixed-effects model

ROE = β0
+ β1(Capital Adequacy of bank i at time t)
+ β2(Asset Quality of bank i at time t)
+ β3(Management Quality of bank i at time t) (4)
+ β4(Earnings Quality of bank i at time t)
+ β5(Liquidity of bank i at time t)
+ β6(Bank type) + Fi + Tt + Vit

ROA = β0
+ β1(Capital Adequacy of bank i at time t)
+ β2(Asset Quality of bank i at time t)
+ β3(Management Quality of bank i at time t) (5)
+ β4(Earnings Quality of bank i at time t)
+ β5(Liquidity of bank i at time t)
+ β6(Bank type) + Fi + Tt + Vit

ROIC = β0
+ β1(Capital Adequacy of bank i at time t)
+ β2(Asset Quality of bank i at time t)
+ β3(Management Quality of bank i at time t) (6)
+ β4(Earnings Quality of bank i at time t)
+ β5(Liquidity of bank i at time t)
+ β6(Bank type) + Fi +Tt + Vit

Where
β0 = Intercept
β1, β2, β3, β4, β5, β6 = Coefficients of the independent variables.
Bank type = Dummy variable [1=Islamic Bank; 0=Conventional Bank]
Fi = Individual-specific, time-invariant effects of each individual bank i {1,..., 81}
Tt = Time period's fixed effects for each individual bank where t {2009,…, 2014}
Vit = The individual-specific error i {1,…, 81} and t {2008,…, 2014}

Model 4.2 assumptions:

1. The individual specific effect is correlated with the independent variables.

**Model 4.3** Random-effects model

ROE = β0
+ β1(Capital Adequacy of bank i at time t)
+ β2(Asset Quality of bank i at time t)
+ β3(Management Quality of bank i at time t) (7)
+ β4(Earnings Quality of bank i at time t)
+ β5(Liquidity of bank i at time t)
+ β6(Bank type)
+ Ui + Tt + Wit

ROA = β0
+ β1(Capital Adequacy of bank i at time t)
+ β2(Asset Quality of bank i at time t)
+ β3(Management Quality of bank i at time t) (8)
+ β4(Earnings Quality of bank i at time t)
+ β5(Liquidity of bank i at time t)
+ β6(Bank type) + Ui + Tt + Wit

ROIC = β0
+ β1(Capital Adequacy of bank i at time t)
+ β2(Asset Quality of bank i at time t)
+ β3(Management Quality of bank i at time t) (9)
+ β4(Earnings Quality of bank i at time t)
+ β5(Liquidity of bank i at time t)
+ β6(Bank type) + Ui + Tt + Wit

Where
β0 = Intercept
β1, β2, β3, β4, β5, β6 = Coefficients of the independent variables.
Bank type = Dummy variable [1=Islamic Bank; 0=Conventional Bank]
Ui = Bank specific random effects i {1,..., 81}
Tt = Time period's random effects for each individual bank where t {2009,…, 2014}
Wit = The individual-specific error i {1,…, 81} and t {2008,…, 2014}

Model 4.3 assumptions:
1. The individual specific effects are uncorrelated with the independent variables.

### 4.4.1 Dependent Variables

**ROA:** The return on assets (ROA) is one of the indicators of a bank's profitability. It indicates the bank's ability to generate profits using its assets efficiently.

$$\text{ROA} = \text{Net Income} / \text{Total Assets} \quad (10)$$

**ROE:** The return on equity (ROE) measures the banks' profitability through indicating its ability to generate profits using money invested by its shareholders.

$$\text{ROE} = \text{Total Income} / \text{Total Shareholders' Equity} \quad (11)$$

**ROIC:** The return on invested capital (ROIC) indicates how well a bank is generating profits through measuring its ability to allocate its capital to profitable investments.

$$\text{ROIC} = (\text{Net Income} - \text{Dividends}) / \text{Total Capital} \quad (12)$$

### 4.4.2 Independent Variables

**Capital Adequacy:** Capital adequacy refers to the bank's ability to absorb losses resulting from different kind of risk, mainly default risk and operational risk. High capital adequacy indicates the efficiency and stability of the banking system. To measure capital adequacy, we use the "Capital Adequacy Ratio (CAR)" which is equal to

$$\text{CAR} = (\text{Tier 1 Capital} + \text{Tier 2 Capital}) / \text{Risk Weighted Assets} \quad (13)$$

**Asset Quality:** Asset quality rating is used to measure the default risk associated with the bank's assets. It indicates the bank's management efficiency in controlling its default risk. To measure the asset quality, we use the "Loan Loss Reserve Ratio (LLR)" which is equal to

$$\text{LLR} = (\text{Tier 1 Capital} + \text{Tier 2 Capital}) / \text{Risk Weighted Assets} \quad (14)$$

**Management Quality:** Management quality rating is used primarily to measure the efficiency and productivity of the bank's management. To measure management quality, we use the "Operating Expense Ratio (OER)" that measures the costs of operating a bank to the income its operations generate.

$$\text{OER} = \text{Total Operating Costs} / \text{Total Operating Income} \quad (15)$$

**Earnings Quality:** The earnings quality rating is mainly used to measure the bank's ability and efficiency in controlling its total costs while increasing its overall productivity. To measure the earnings' quality, we will use the "Cost to Income

Ratio" which measures how costs are changing relative to income; in other words, how much it costs to generate $1 of revenue.

$$\text{Cost / Income Ratio} = \text{Total Expenses / Net Sales} \quad (16)$$

**Liquidity:** Liquidity rating measure to what degree a bank is maintaining liquid assets and the bank assets' ability to get converted into cash quickly. To measure the liquidity of banks we will be using the "Loan to Deposit Ratio" which is equal to

$$\text{Loan / Deposit Ratio} = \text{Net Loans / Total Deposits} \quad (17)$$

### 4.5 Descriptive Statistics

The following descriptive statistics were computed: mean, standard deviation, variance, maximum, minimum, skewness and kurtosis to analyze and compare the overall performance between both types of banking.

**Table 2: Descriptive statistics (mean, standard deviation, variance, maximum, minimum, skewness, and kurtosis) for all banks**

| | **ROE** | **ROIC** | **ROA** | **CAR** | **Loan Loss Reserve Ratio** | **Operating Expense ratio** | **Cost to Income ratio** | **Loan to Deposit ratio** |
|---|---|---|---|---|---|---|---|---|
| Mean | 0.103 | 0.063 | 0.014 | 0.175 | 0.138 | 5.420 | 0.736 | 0.972 |
| Std. Deviation | 0.178 | 0.083 | 0.012 | 0.048 | 0.402 | 28.715 | 0.220 | 0.241 |
| Variance | 0.031 | 0.006 | 0.0001 | 0.002 | 0.162 | 824.601 | 0.048 | 0.058 |
| Kurtosis | 64.884 | 53.623 | 15.888 | 3.571 | 39.405 | 202.818 | 9.908 | 2.254 |
| Skewness | -7.466 | -5.970 | -2.852 | 1.357 | 4.842 | 13.324 | 2.043 | 0.429 |
| Minimum | -1.747 | -0.748 | -0.072 | 0.006 | -1.134 | -80.890 | 0.281 | 0.313 |
| Maximum | 0.318 | 0.25 | 0.048 | 0.431 | 4.374 | 470.769 | 2.192 | 2.296 |
| Sample Size | 368 | 368 | 368 | 368 | 368 | 368 | 368 | 368 |

**Table 3: Descriptive statistics (mean, standard deviation, variance, maximum, minimum, skewness, and kurtosis) for conventional banks**

| | ROE | ROIC | ROA | CAR | Loan Loss Reserve Ratio | Operating Expense ratio | Cost to Income ratio | Loan to Deposit ratio |
|---|---|---|---|---|---|---|---|---|
| Mean | 0.119 | 0.070 | 0.014 | 0.172 | 0.154 | 6.385 | 0.728 | 0.974 |
| Std. Deviation | 0.104 | 0.044 | 0.009 | 0.044 | 0.421 | 31.544 | 0.176 | 0.232 |
| Variance | 0.011 | 0.001 | 0.00 | 0.001 | 0.177 | 995.044 | 0.031 | 0.054 |
| Kurtosis | 135.45 | 10.446 | 27.475 | 1.883 | 39.963 | 173.611 | 14.851 | 0.332 |
| Skewness | -9.628 | -0.479 | -3.078 | 1.000 | 5.085 | 12.623 | 1.817 | 0.069 |
| Minimum | -1.360 | -0.250 | -0.072 | 0.006 | -1.134 | -21.336 | 0.361 | 0.313 |
| Maximum | 0.280 | 0.25 | 0.030 | 0.343 | 4.374 | 470.769 | 2.192 | 1.752c |
| Sample Size | 293 | 293 | 293 | 293 | 293 | 293 | 293 | 293 |

**Table 4: Descriptive statistics (mean, standard deviation, variance, maximum, minimum, skewness, and kurtosis) for Islamic banks**

| | ROE | ROIC | ROA | CAR | Loan Loss Reserve Ratio | Operating Expense ratio | Cost to Income ratio | Loan to Deposit ratio |
|---|---|---|---|---|---|---|---|---|
| Mean | 0.038 | 0.037 | 0.011 | 0.187 | 0.078 | 1.649 | 0.764 | 0.963 |
| Std. Deviation | 0.330 | 0.161 | 0.019 | 0.063 | 0.314 | 12.045 | 0.342 | 0.273 |
| Variance | 0.109 | 0.025 | 0.0003 | 0.003 | 0.099 | 145.083 | 0.117 | 0.074 |
| Kurtosis | 18.101 | 15.385 | 4.247 | 3.391 | 10.522 | 31.985 | 2.850 | 6.553 |
| Skewness | -4.170 | -3.690 | -1.790 | 1.537 | 1.798 | -3.691 | 1.579 | 1.349 |
| Minimum | -1.747 | -0.748 | -0.064 | 0.075 | -0.871 | -80.890 | 0.281 | 0.473 |
| Maximum | 0.318 | 0.214 | 0.048 | 0.431 | 1.732 | 42.097 | 1.945 | 2.296 |
| Sample Size | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 |

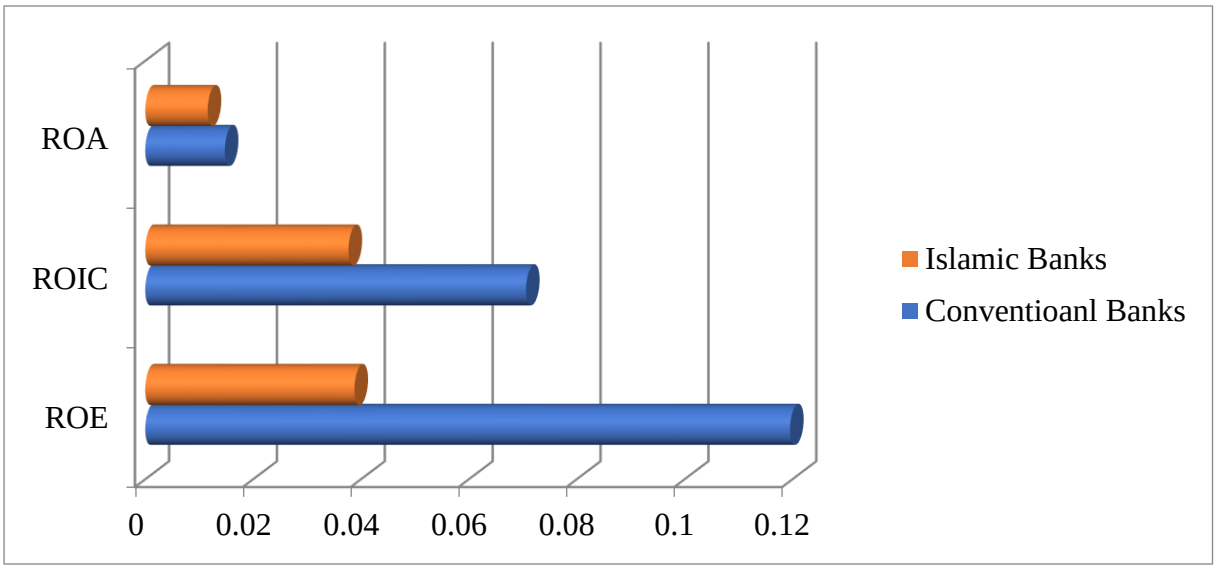



**Figure 1: The mean ROA, ROIC, AND ROE of Islamic and conventional Banks**

ROE, ROIC, and ROA provide a good measure of our banks' profitability regardless of their banking system type. The mean ROE of Islamic banks is 3.87% which is lower than the mean ROE of conventional banks of 11.95% demonstrating that conventional banks are more profitable in terms of profits generated with money invested by the bank's shareholders. The mean ROIC of Islamic banks is 3.76% which is lower than the mean ROIC of conventional banks of 7.06% indicating that conventional banks are more efficient at allocating the banks' capital to profitable investments. Moreover, the mean ROA of Islamic banks is 1.15% which is lower than the mean ROA of conventional banks of 1.47% indicating that the management of conventional banks is more efficient at using its assets to generate earnings.

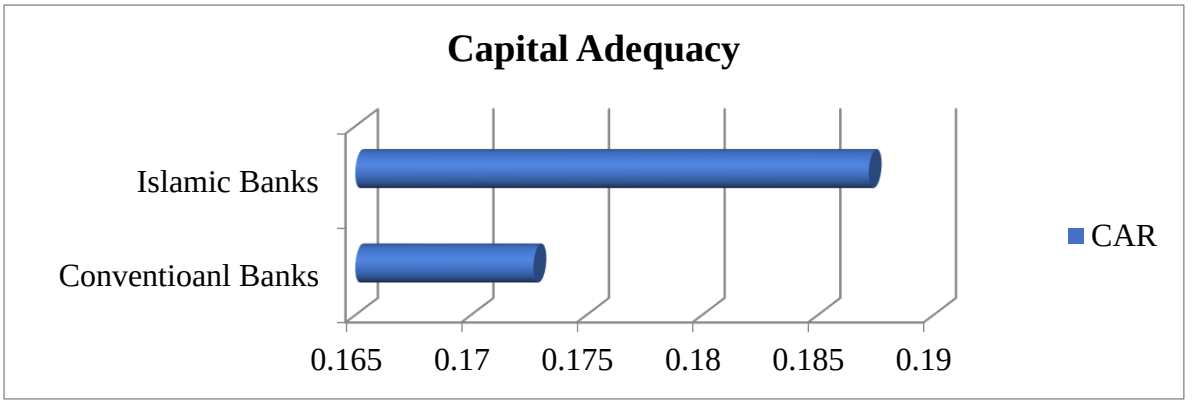



**Figure 2: The mean Capital Adequacy Ratio (CAR) or Capital Adequacy of Islamic and conventional banks**

The mean capital adequacy ratio (CAR) of Islamic banks is 18.72% which is higher than the mean capital adequacy ratio (CAR) of conventional banks which is 17.27%. This clearly indicates that Islamic banks are more capable of absorbing potential losses resulting from credit risk, operational risk, etc. than conventional banks in the MENA region.

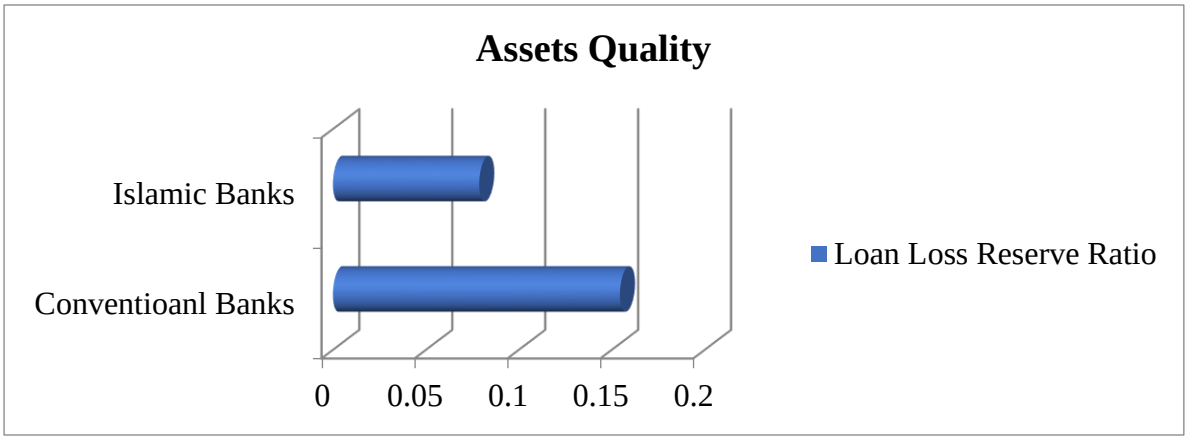



**Figure 3: The mean Loan Loss Reserve Ratio or Asset Quality of Islamic and conventional banks**

The mean Loan Loss Reserve Ratio of Islamic banks is 7.86% which is way lower than the mean loan loss reserve ratio of conventional banks of 15.44% meaning that Islamic banks have better assets quality relative to conventional banks in the MENA region. In other words, conventional banks suffer from higher estimated loan losses or loans defaults compared to Islamic banks.


**Figure 4: The mean Operating Expense Ratio or Management Quality of Islamic and conventional banks**

The mean operating expense ratio of Islamic banks is 164.98% which is lower than the mean operating expense of conventional banks which is 638.59%. This indicates that Islamic banks are dominating in management quality in the MENA region because the costs of operating an Islamic bank compared to the operating revenues it generated are almost six times lower relative to conventional banks and the lower the operating expense ratio, the more effective the bank's management.

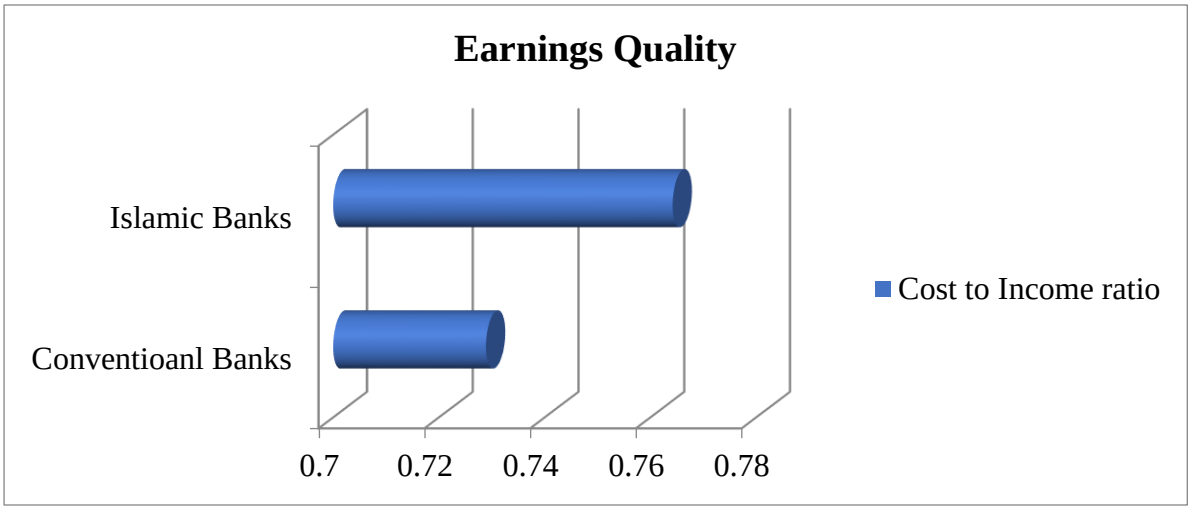



**Figure 5: The mean Cost to Income Ratio or Earnings Quality of Islamic and conventional banks**

Concerning the earnings quality, conventional banks have a cost to income ratio of 72.88% which is lower than the cost to income ratio of Islamic banks of 76.42% which indicated that conventional banks incur less cost to generate one dollar of revenue meaning that conventional banks are better in controlling their costs relative to Islamic banks in the MENA region.

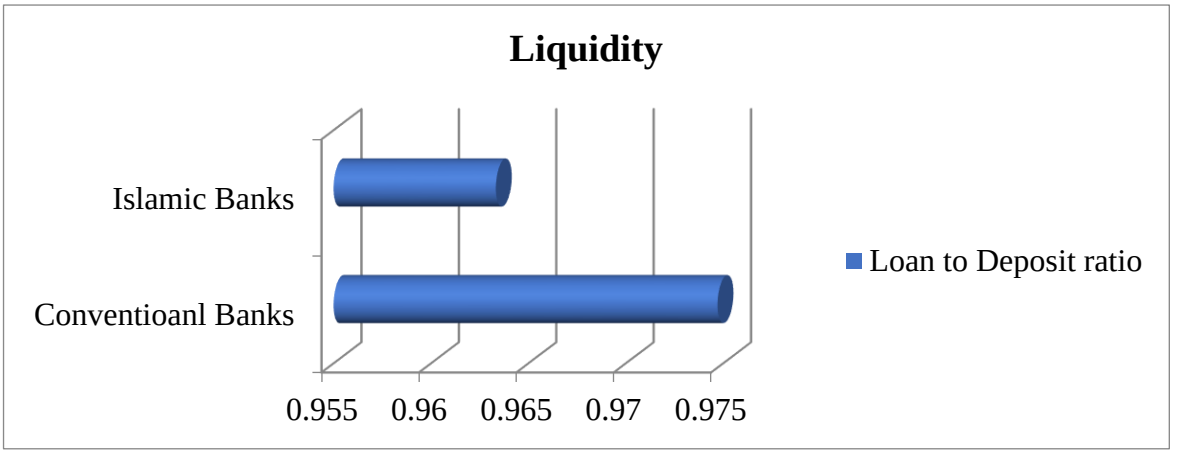



**Figure 6: The mean Loan to Deposit Ratio or the Liquidity of Islamic and conventional banks**

Islamic banks have a loan to deposit ratio of 96.33% which is lower than the loan to deposit ratio of conventional banks of 97.47% indicating that Islamic banks are more liquid than conventional banks in the MENA region because the lower the loan to deposit ratio, the more liquid a bank is. Also, since conventional banks have a higher loan to deposit ratio, this means that they face a larger risk of defaults.

**Table 5: Comparative analysis summary**

| | | **Conventional Banks** | **Islamic Banks** | |
|---|---|---|---|---|
| | ROE | 11.95% | 3.87% | Conventional banks generate higher ROE |
| | ROIC | 7.06% | 3.76% | Conventional banks generate higher ROIC |
| | ROA | 1.47% | 1.15% | Conventional banks generate higher ROA |
| Capital Adequacy | CAR | 17.27% | 18.72% | Islamic banks have better capital adequacy |
| Asset Quality | Loan Loss Reserve Ratio | 15.44% | 7.86% | Islamic banks have better Asset quality |
| Management Quality | Operating Expense Ratio | 638% | 164% | Islamic banks have better Management Quality |
| Earnings Quality | Cost to Income Ratio | 72.88% | 76.42% | Conventional banks have better earnings quality |
| Liquidity | Loan to Deposit Ratio | 97.47% | 96.33% | Islamic banks are more liquid than conventional banks |

Indeed, the results of this comparative analysis clearly support the findings of a study by Javaid et al. (2011) that suggested Islamic banks are better in Assets Quality and Capital Adequacy. Our findings also support the results of a study by Rozzani (2013) that suggests Islamic banks are more liquid than conventional banks. In addition, the results of our analysis indicate that Islamic banks have better management quality than conventional banks which clearly does not support the findings of Rozzani (2013) who claimed that there is a lack of management ability in the Islamic banking system.

### 4.6 Correlation Analysis

In this section, Pearson's correlation coefficient was used to measure the correlation among the independent variables and whether this correlation is positive or negative. It is also used to test for multi-collinearity to determine if there are any independent variables that are highly correlated. Since all the independent variables have a weak correlation between each other, multi-collinearity is not a problem in this data.

**Table 6: Correlation Coefficient Matrix**

| | ROE | ROIC | ROA | CAR | Loan Loss Reserve Ratio | Operating Expense Ratio | Cost to Income Ratio | Loan to Deposit Ratio |
|---|---|---|---|---|---|---|---|---|
| ROE | 1 | | | | | | | |
| ROIC | 0.921 | 1 | | | | | | |
| ROA | 0.828 | 0.806 | 1 | | | | | |
| Capital Adequacy | 0.173 | 0.158 | 0.294 | 1 | | | | |
| Asset Quality | -0.059 | -0.060 | -0.142 | -0.011 | 1 | | | |
| Management Quality | -0.037 | -0.052 | -0.105 | 0.099 | 0.012 | 1 | | |
| Earnings Quality | -0.721 | -0.682 | -0.924 | -0.302 | 0.117 | 0.117 | 1 | |
| Liquidity | 0.161 | 0.054 | 0.288 | 0.228 | -0.092 | 0.014 | -0.278 | 1 |

Capital adequacy is positively correlated to ROE, ROA and ROIC which seems reasonable because the more a bank can absorb potential losses resulting from credit risk and operational risk, the higher its returns are going to be.
Liquidity is also positively correlated to ROE, ROA and ROIC because the higher the loan to deposit ratio of a bank, the more returns this bank is going to generate. However, this positive correlation between Capital Adequacy, Liquidity, and ROE, ROA, ROIC is weak.
On the other hand, Asset Quality is negatively correlated to ROE, ROA, and ROIC which is logical because as loan loss reserves ratio of a bank increases, the bank's returns decrease, and profitability decreases as well. However, this negative correlation is weak.
Furthermore, Management Quality also has a weak negative correlation between ROE, ROA and ROIC which appears to be logical because the higher the operating costs of a bank to its operating revenues, the more difficult it would be able on the bank to control its costs and to generate profits thus resulting in lower revenues.
Finally, Earnings Quality has a strong negative correlation with ROE, ROA, and ROIC which also appears reasonable because the higher the cost to income of a bank, the lower its revenues are going to be.

# 5. Analysis of the Data

## 5.1 One-Way ANOVA

In this study, the One-Way ANOVA will be used to determine if there is a significant difference in the performance of the two types of banking systems using the CAMELS framework.

**Hypotheses 5.1** Hypotheses for the One-Way ANOVA test

H1: There is a significant difference between the two types of banks.
H0: There is no significant difference between the two types of banks.
Reject H0 if P-value < 0.05
Do not reject H0 is P-value > 0.05

**Table 7: One-way ANOVA table**

| | | **Sum of squares** | **Df** | **Mean square** | **F** | **P-Value** |
|---|---|---|---|---|---|---|
| ROE | Between Groups | 0.4049 | 1 | 0.4049 | 13.0714 | 0.0003 |
| | Within Groups | 11.2760 | 364 | 0.0310 | | |
| | Total | 11.6809 | 365 | | | |
| ROIC | Between Groups | 0.0663 | 1 | 0.0663 | 9.6972 | 0.0020 |
| | Within Groups | 2.4902 | 364 | 0.0068 | | |
| | Total | 2.5566 | 365 | | | |
| ROA | Between Groups | 0.0006 | 1 | 0.0006 | 4.3050 | 0.0387 |
| | Within Groups | 0.0534 | 364 | 0.0001 | | |
| | Total | 0.0540 | 365 | | | |
| Capital Adequacy | Between Groups | 0.0137 | 1 | 0.0137 | 5.8099 | 0.0164 |
| | Within Groups | 0.8591 | 364 | 0.0024 | | |
| | Total | 0.8728 | 365 | | | |
| Asset Quality | Between Groups | 0.3351 | 1 | 0.3351 | 2.0624 | 0.1518 |
| | Within Groups | 59.1379 | 364 | 0.1625 | | |
| | Total | 59.4730 | 365 | | | |
| Management quality | Between Groups | 1330.6104 | 1 | 1330.6104 | 1.6076 | 0.2056 |
| | Within Groups | 301288.5207 | 364 | 827.7157 | | |
| | Total | 302619.1312 | 365 | | | |
| Earnings quality | Between Groups | 0.0775 | 1 | 0.0775 | 1.5912 | 0.2080 |
| | Within Groups | 17.7357 | 364 | 0.0487 | | |
| | Total | 17.8132 | 365 | | | |
| Liquidity | Between Groups | 0.0086 | 1 | 0.0086 | 0.1496 | 0.6992 |
| | Within Groups | 21.0287 | 364 | 0.0578 | | |
| | Total | 21.0374 | 365 | | | |

**Table 8: Results of the One-Way ANOVA analysis**

| | **Results** |
|---|---|
| Capital Adequacy | P-value = 0.01 < 0.05 |
| | Reject H0 |
| | There is a significant difference between Islamic and conventional banks in terms of Capital Adequacy |
| Asset Quality | P-value = 0.15 > 0.05 |
| | Do not reject H0 |
| | There is no significant difference between Islamic and conventional banks in terms of Asset Quality |
| Management | P-value = 0.20 > 0.05 |
| Quality | Do not reject H0 |
| | There is no significant difference between Islamic and conventional banks in terms of Management Quality |
| Earnings quality | P-value = 0.20 > 0.05 |
| | Do not reject H0 |
| | There is no significant difference between Islamic and conventional banks in terms of Earnings Quality |
| Liquidity | P-value = 0.69 > 0.05 |
| | Do not Reject H0 |
| | There is no significant difference between Islamic and conventional banks in terms of Liquidity |

## 5.2 Model Estimation

The following models show the impact of the CAMELS and bank type on ROE, ROA and ROIC of both banking types:

**Model 5.1** Pooled OLS regression model

Assumption:

1. Ignoring the cross-sectional effect
2. Ignoring the time series effect

**Table 9: Impact of the CAMELS on ROE of both conventional and Islamic banks in the MENA region using the pooled OLS regression model.**

| | ROE | P-value | Conclusion |
|---|---|---|---|
| Constant | 0.6013 | 0.00 | |
| Capital Adequacy | -0.1107 | 0.433 | Insignificant |
| Asset Quality | 0.0056 | 0.722 | Insignificant |
| Management Quality | 0.0002 | 0.218 | Insignificant |
| Earnings Quality | -0.5996 | 0.00 | Significant |
| Liquidity | -0.0290 | 0.297 | Insignificant |
| Bank type | -0.0565 | 0.00 | Significant |
| $R^2$ | 0.5437 | | |
| R Adjusted | 0.5362 | | |
| SSE | 5.33 | | |
| F-test | 71.70 | | |

**Table 10: Impact of CAMELS on ROA of both conventional and Islamic banks in the MENA region using the pooled OLS regression model.**

| | ROA | P-value | Conclusion |
|---|---|---|---|
| Constant | 0.0487 | 0.00 | |
| Capital Adequacy | 0.0054 | 0.312 | Insignificant |
| Asset Quality | -0.0011 | 0.062 | Insignificant |
| Management Quality | -0.00000209 | 0.807 | Insignificant |
| Earnings Quality | -0.0496 | 0.00 | Significant |
| Liquidity | 0.0014 | 0.176 | Insignificant |
| Bank type | -0.0015 | 0.010 | Insignificant |
| $R^2$ | 0.8587 | | |
| R Adjusted | 0.8564 | | |
| SSE | 0.0076 | | |
| F-test | 368 | | |

**Table 11: Impact of CAMELS on ROIC of both conventional and Islamic banks in the MENA region using the pooled OLS regression model.**

| | ROIC | P-value | Conclusion |
|---|---|---|---|
| Constant | 0.3247 | 0.00 | |
| Capital Adequacy | -0.0296 | 0.668 | Insignificant |
| Asset Quality | 0.00039 | 0.960 | Insignificant |
| Management Quality | 0.000086 | 0.436 | Insignificant |
| Earnings Quality | -0.2747 | 0.00 | Significant |
| Liquidity | -0.0506 | 0.00 | Significant |
| Bank type | 0.3247 | 0.004 | Significant |
| $R^2$ | 0.5008 | | |
| R Adjusted | 0.4925 | | |
| SSE | 1.2764 | | |
| F-test | 368 | | |

**Model 5.2** Fixed-effects model /LSVM

Assumptions:

1. The individual specific effect is correlated with the independent variables.

Input:
Panel variable: Individual Banks (unbalanced)
Time variable: Year, 2008 to 2014, but with gaps

**Table 12: Impact of CAMELS on ROE of both conventional and Islamic banks in the MENA region using the fixed-effects model.**

| | ROE | P-value | Conclusion |
|---|---|---|---|
| Constant | 0.6408 | 0.00 | |
| Capital Adequacy | -0.1954 | 0.246 | Insignificant |
| Asset Quality | -0.0213 | 0.090 | Insignificant |
| Management Quality | 0.00011 | 0.510 | Insignificant |
| Earnings Quality | -0.7872 | 0.00 | Significant |
| Liquidity | 0.0806 | 0.024 | Significant |
| F-test | 71.20 | | |
| Probability of F-test | 0.00 | | |

**Table 13: Impact of CAMELS on ROA of both conventional and Islamic banks in the MENA region using the fixed-effects model.**

| | ROA | P-value | Conclusion |
|---|---|---|---|
| Constant | 0.0442 | 0.00 | |
| Capital Adequacy | 0.0046 | 0.482 | Insignificant |
| Asset Quality | -0.0010 | 0.036 | Significant |
| Management Quality | -0.000002 | 0.726 | Insignificant |
| Earnings Quality | -0.0537 | 0.00 | Significant |
| Liquidity | 0.0089 | 0.00 | Significant |
| F-test | 223.92 | | |
| Probability of F-test | 0.00 | | |

**Table 14: Impact of CAMELS on ROIC of both conventional and Islamic banks in the MENA region using the fixed-effects model.**

| | ROIC | P-value | Conclusion |
|---|---|---|---|
| Constant | 0.3078 | 0.00 | |
| Capital Adequacy | -0.0946 | 0.228 | Insignificant |
| Asset Quality | -0.0067 | 0.252 | Insignificant |
| Management Quality | 0.000055 | 0.483 | Insignificant |
| Earnings Quality | -0.3255 | 0.00 | Significant |
| Liquidity | 0.0133 | 0.421 | Insignificant |
| F-test | 55.93 | | |
| Probability of F-test | 0.00 | | |

**Model 5.3** Random-effects GLS model

Assumptions:

1. The individual specific effects are uncorrelated with the independent variables.

Input:
Panel variable: Individual Banks (unbalanced)
Time variable: Year, 2008 to 2014, but with gaps

**Table 15: Impact of CAMELS on ROE of both conventional and Islamic banks in the MENA region using the random-effects model.**

| | ROE | P-value | Conclusion |
|---|---|---|---|
| Constant | 0.6430 | 0.00 | |
| Capital Adequacy | -0.1771 | 0.241 | Insignificant |
| Asset Quality | -0.0148 | 0.230 | Insignificant |
| Management Quality | 0.00014 | 0.386 | Insignificant |
| Earnings Quality | -0.7011 | 0.00 | Significant |
| Liquidity | 0.0260 | 0.403 | Insignificant |
| F-test | 431.67 | | |
| Probability of F-test | 0.00 | | |

**Table 16: Impact of CAMELS on ROA of both conventional and Islamic banks in the MENA region using the random-effects model.**

| | ROA | P-value | Conclusion |
|---|---|---|---|
| Constant | 0.0474 | 0.00 | |
| Capital Adequacy | 0.00247 | 0.666 | Insignificant |
| Asset Quality | -0.0009 | 0.062 | Insignificant |
| Management Quality | -0.0000007 | 0.915 | Insignificant |
| Earnings Quality | -0.0519 | 0.00 | Significant |
| Liquidity | 0.0052 | 0.00 | Significant |
| F-test | 1812.91 | | |
| Probability of F-test | 0.00 | | |

**Table 17: Impact of CAMELS on ROIC of both conventional and Islamic banks in the MENA region using the random-effects model.**

| | ROIC | P-value | Conclusion |
|---|---|---|---|
| Constant | 0.315 | 0.00 | |
| Capital Adequacy | -0.0898 | 0.203 | Insignificant |
| Asset Quality | -0.0051 | 0.369 | Insignificant |
| Management Quality | 0.00006 | 0.431 | Insignificant |
| Earnings Quality | -0.2977 | 0.00 | Significant |
| Liquidity | -0.0076 | 0.602 | Insignificant |
| F-test | 347.48 | | |
| Probability of F-test | 0.00 | | |

### 5.3 Durbin-Wu-Hausman Test

**Hypotheses 5.2** Hypotheses for the Hausman test

H0: Random-effects model is appropriate.
H1: Fixed-effects model is appropriate.

#### 5.3.1 Decision

If the Hausman test results in a significant P-value > 5%, we cannot reject H0 meaning that the random-effects model would be more appropriate; otherwise, the fixed-effect model would be more appropriate.

#### 5.3.2 Stata Results

```
. hausman Fixed1 .
```

| | Coefficients | | | |
|---|---|---|---|---|
| | (b) Fixed1 | (B) Random3 | (b-B) Difference | sqrt(diag(V_b-V_B)) S.E. |
| Capital | -.1954985 | .002479 | -.1979775 | .1680586 |
| Assets | -.0213454 | -.0009089 | -.0204365 | .0125534 |
| Management | .0001126 | -7.17e-07 | .0001133 | .0001707 |
| Equity | -.7872034 | -.0519673 | -.7352361 | .0425949 |
| Liquidity | .0806778 | .0052562 | .0754216 | .0355123 |

```
                b = consistent under Ho and Ha; obtained from xtreg
     B = inconsistent under Ha, efficient under Ho; obtained from xtreg

 Test:  Ho:  difference in coefficients not systematic

           chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                   =      310.31
         Prob>chi2 =      0.0000
```

**Figure 7: Results of Stata of the first Hausman test for ROE**

```
. hausman Fixed2 .
```

| | Coefficients (b) Fixed2 | (B) Random3 | (b-B) Difference | sqrt(diag(V_b-V_B)) S.E. |
|---|---|---|---|---|
| Capital | -.0946294 | .002479 | -.0971084 | .0781279 |
| Assets | -.006723 | -.0009089 | -.0058142 | .0058323 |
| Management | .0000558 | -7.17e-07 | .0000566 | .0000793 |
| Equity | -.3255859 | -.0519673 | -.2736186 | .0198089 |
| Liquidity | .0133446 | .0052562 | .0080883 | .0165111 |

```
                b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                        =      197.62
              Prob>chi2 =      0.0000
```

**Figure 8: Results of Stata of the second Hausman test for ROA**

```
. hausman Fixed3 .
```

| | Coefficients (b) Fixed3 | (B) Random3 | (b-B) Difference | sqrt(diag(V_b-V_B)) S.E. |
|---|---|---|---|---|
| Capital | .0046615 | .002479 | .0021826 | .0033055 |
| Assets | -.0010447 | -.0009089 | -.0001358 | .0000844 |
| Management | -2.36e-06 | -7.17e-07 | -1.64e-06 | 7.20e-07 |
| Equity | -.0537646 | -.0519673 | -.0017973 | .0010302 |
| Liquidity | .0089743 | .0052562 | .0037181 | .0007544 |

```
                b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                        =       27.57
              Prob>chi2 =      0.0000
```

**Figure 9: Results of Stata of the third Hausman test for ROIC**

### 5.3.3 Hausman Test Results

Since the P-value of all the 3 of our Hausman tests are less than 5%, the fixed-effects model is more appropriate to use in the analysis of our data.

### 5.4 Model Analysis Results

Since we are dealing with panel data, we could not estimate our model using the pooled OLS model that will result in omitted variable bias meaning that unobserved factors that correlate with the variables included in the regression. Indeed, we preferred to use the fixed-effects regression model to eliminate this omitted variable bias that we believe is time-invariant. The Hausman test that we conducted on all the 3 regression models also confirmed that the fixed-effects model is the most appropriate one to use to analyze our data. Consequently, we will ignore the random-effects model in this case. Moreover, for our fixed-effects model, we considered the time fixed effect and the individual-specific, time-invariant effects of each individual bank.

From table 12, it is clear to us that the return on equity (ROE) of both Islamic and conventional banks in the MENA region is significantly influenced by both the earnings' quality and liquidity. However, the earnings quality has a significant negative impact on the ROE of our sample of banks while the liquidity has a significant positive impact on the ROE. Moreover, capital adequacy, assets quality and management quality have no significant impact on the ROE of our sample of banks.

From table 13, we conclude that both capital adequacy and management quality have no significant impact on the return on assets (ROA) of both Islamic and conventional banks in the MENA region, while both assets quality and earnings quality have a significant negative impact on the ROA of our sample of banks. On the other hand, the liquidity of a bank has a significant positive impact on the ROA of our sample of banks.

From table 14, we notice that only the earnings' quality significantly impacts the return on invested capital (ROIC) negatively; while all the other variables such as capital adequacy, assets quality, management quality, and liquidity have no significant impact on the ROIC of our sample of banks.

Finally, we can indeed say that the overall profitability of both banking system types in the MENA region in terms of ROE, ROA, and ROIC, largely depends on the bank's assets quality, earnings quality, and liquidity, while capital adequacy and management quality have no significant impact on the overall profitability of both types of the banking system.

## 6. Conclusion

### 6.1 Findings of the study

As the banking sector in any country plays an important role in the growth and well-being of the country's overall economic performance, it is important to constantly measure its performance and find new ways to improve its efficiency. Therefore,

the objective of this study was to analyze and compare the drivers of profitability of the two types of banking systems in the MENA region over the period of 2008 to 2014 using the CAMELS rating system. To achieve the objectives of this study, descriptive statistics were initially used to compare the performance of Islamic banks vs. conventional banks. Moreover, the One-Way ANOVA was then used to identify any significant differences in these banks' performances. Finally, the fixed-effects regression model was employed to identify the drivers of profitability for both types of banking in the MENA region.

The results of our descriptive statistics indicated that conventional banks generate higher revenue on their shareholders' equity, total assets, and invested capital and have better earnings quality relative to the interest-free Islamic banks, which have better capital adequacy, asset quality, management quality, and are more liquid than their counterparts.

The results of the One-Way ANOVA test demonstrated that there is a significant difference between Islamic and conventional banks in terms of capital adequacy. However, there was no significant difference in terms of their asset quality, management quality, earnings quality, and liquidity.

Moreover, the results of the Pearson's correlation coefficient indicated that capital adequacy and liquidity have a weak positive correlation with ROE, ROA, and ROIC. Also, asset quality and management quality have a weak negative correlation with ROE, ROA, and ROIC. Additionally, earnings quality has a strong negative correlation with ROE, ROA, and ROIC.

Finally, the results of the fixed-effects regression analysis clearly indicate that the most important drivers of profitability for both Islamic and conventional banks in the MENA region were their asset quality, earnings quality, and liquidity.

### 6.2 Limitations of This Study

The first limitation of this study was the lack of complete time series data for the sample of banks considered. The second limitation pertains to the location of our sample of banks; we could not include banks from certain countries in the MENA region, such as Morocco, Algeria, and Tunisia, etc., due to insufficient financial data available in those countries. Additionally, this study did not consider other factors that could influence banks' performance in different countries of the MENA region, such as economic, political, environmental, and social factors. Finally, the empirical results of our study indicated that neither capital adequacy nor management quality had a significant impact on any of the banking systems' overall profitability in terms of ROE, ROA, and ROIC. This finding does not make a lot of sense and may be attributed to some other factors that were not considered in this study.

### 6.3 Recommendations for Future Research

As each of the previous studies that have attempted to compare the performance of Islamic banks vs. conventional banks provides different results due to various factors, further studies need to be conducted to provide accurate and consistent

results that can help unify the Islamic banking model. Moreover, since this study has shown that conventional banks in the MENA region are superior to Islamic banks in terms of profitability, effective solutions need to be developed to improve the efficiency of Islamic banks across different MENA countries. Therefore, more studies need to be undertaken to better understand the drivers of success for both Islamic and conventional banking systems in the MENA countries and explore how their efficiency can be improved.

## References

[1] Siraji, K., Pillai, P. S. (2012). Comparative Study on Performance of Islamic Banks and Conventional Banks in GCC region. Journal of Applied Finance & Banking, 2(3), 123-161.

[2] Rose, S., Hudgins, C. (2013). Bank Management and Financial Services. (8th ed.). New York: McGraw Hill International Edition.

[3] Merchant, I. P. (2012). Empirical Study of Islamic Banks Versus Conventional Banks of GCC. Global Journal of Management and Business Research, 12(20).

[4] Siddiqi, M. (2008). The Comparative Advantages of Islamic Banking and Finance. (pp. 183-188). Massachusetts: Center for Middle Eastern Studies.

[5] Rashwan, M. H. (2012). How did listed Islamic and Traditional Banks Performed: pre and post the 2008 financial crisis? Journal of Applied Finance & Banking, 2 (2).

[6] Pizzi, M. (2013). Cameron: London can be a world capital for Islamic finance. Aljazeera America.

[7] Ernst and Young. (2012). World Islamic Banking Competitiveness Report. Growing Beyond DNA of Successful Transformation.

[8] Samad, A. (2004). Performance of Interest-free Islamic banks vis-à-vis Interest-based Conventional Banks of Bahrain. IIUM Journal of Economics and Management, 12(2), 1-15.

[9] Alam, S. (2009). Islamic finance: An Alternative to the Conventional Financial System. Korea Review of International Studies. p37-53.

[10] Alam, H., Noreen, H., Ilyas, M. (2011). Islamic Banking: Insulation against US Credit Crisis, in International Journal of Business and Social Science, 2(10), 193-201.

[11] Hasan, M., Dridi, J. (2010). The effects of the Global Crisis on Islamic and Conventional banks: A comparative study. International Monetary Fund.

[12] Ali, K., Akhtar, M. F., Zafar, A. (2011). Bank-Specific and Macroeconomic Indicators of Profitability - Empirical Evidence from the Commercial Banks of Pakistan. International Journal of Business and Social Science, 2(6), 235-242.

[13] Faizulayev, A. (2011). Comparative Analysis between Islamic Banking and Conventional Banking Firms in terms of Profitability. Jeddah: Eastern Mediterranean University.

[14] Imam, P., Kpodar, K. (2010). Islamic Banking: How it has spread. Washington: International Monetary Fund.
[15] Atzori, D. (2010). Moral values and financial markets: Islamic finance against the financial crisis? Milan: Policy Brief to Fondazione Eni Enrico Mattei.
[16] Javaid, S., Jamil, A., Zaman, K., Gafoor, A. (2011). Determinants of Bank Profitability in Pakistan: Internal Factor Analysis. Mediterranean journal of social sciences, 2(1), 2039-2117.
[17] Rozzani, N., Rahman, R. (2013). Camels and Performance Evaluation of Banks in Malaysia: Conventional Versus Islamic. Journal of Islamic Finance and Business Research, 2(1). 36-45.

# Appendices

**Appendix 1: Stata output for 'Table 9: Impact of CAMELS on ROE of both conventional and Islamic banks in the MENA region using the pooled OLS regression Model.'**

```
. regress ROE Capital Assets Management Equity Liquidity Type
```

| Source | SS | df | MS | | |
|---|---|---|---|---|---|
| Model | 6.35526183 | 6 | 1.05921031 | Number of obs | = 368 |
| Residual | 5.33292424 | 361 | .014772643 | F( 6, 361) | = 71.70 |
| | | | | Prob > F | = 0.0000 |
| Total | 11.6881861 | 367 | .031847918 | R-squared | = 0.5437 |
| | | | | Adj R-squared | = 0.5362 |
| | | | | Root MSE | = .12154 |

| ROE | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Capital | -.1107257 | .1409118 | -0.79 | 0.433 | -.3878369 | .1663854 |
| Assets | .0056917 | .0159718 | 0.36 | 0.722 | -.0257177 | .0371012 |
| Management | .0002786 | .000226 | 1.23 | 0.218 | -.0001657 | .000723 |
| Equity | -.5996198 | .0317964 | -18.86 | 0.000 | -.6621493 | -.5370903 |
| Liquidity | -.0290425 | .0278228 | -1.04 | 0.297 | -.0837576 | .0256726 |
| Type | -.056572 | .0160803 | -3.52 | 0.000 | -.0881948 | -.0249492 |
| _cons | .601398 | .0477117 | 12.60 | 0.000 | .5075702 | .6952259 |

**Appendix 2: Stata output for 'Table 10: Impact of CAMELS on ROA of both conventional and Islamic banks in the MENA region using the pooled OLS regression model.'**

```
. regress ROA Capital Assets Management Equity Liquidity Type
```

| Source | SS | df | MS | | |
|---|---|---|---|---|---|
| Model | .046394998 | 6 | .0077325 | Number of obs | = 368 |
| Residual | .007633869 | 361 | .000021146 | F( 6, 361) | = 365.66 |
| | | | | Prob > F | = 0.0000 |
| Total | .054028867 | 367 | .000147218 | R-squared | = 0.8587 |
| | | | | Adj R-squared | = 0.8564 |
| | | | | Root MSE | = .0046 |

| ROA | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Capital | .005401 | .0053313 | 1.01 | 0.312 | -.0050834 | .0158855 |
| Assets | -.0011323 | .0006043 | -1.87 | 0.062 | -.0023207 | .0000561 |
| Management | -2.09e-06 | 8.55e-06 | -0.24 | 0.807 | -.0000189 | .0000147 |
| Equity | -.049614 | .001203 | -41.24 | 0.000 | -.0519797 | -.0472482 |
| Liquidity | .0014264 | .0010527 | 1.36 | 0.176 | -.0006437 | .0034965 |
| Type | -.0015854 | .0006084 | -2.61 | 0.010 | -.0027818 | -.0003889 |
| _cons | .0487801 | .0018052 | 27.02 | 0.000 | .0452302 | .05233 |

**Appendix 3: Stata output for 'Table 11: Impact of CAMELS on ROIC of both conventional and Islamic banks in the MENA region using the pooled OLS regression model.'**

```
. regress ROIC Capital Assets Management Equity Liquidity Type
```

| Source | SS | df | MS | | |
|---|---|---|---|---|---|
| Model | 1.28043213 | 6 | .213405355 | Number of obs | = 368 |
| Residual | 1.27645734 | 361 | .003535893 | F( 6, 361) | = 60.35 |
| | | | | Prob > F | = 0.0000 |
| Total | 2.55688947 | 367 | .006967001 | R-squared | = 0.5008 |
| | | | | Adj R-squared | = 0.4925 |
| | | | | Root MSE | = .05946 |

| ROIC | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Capital | -.0296242 | .0689395 | -0.43 | 0.668 | -.1651976 | .1059492 |
| Assets | .0003925 | .007814 | 0.05 | 0.960 | -.0149742 | .0157592 |
| Management | .0000863 | .0001105 | 0.78 | 0.436 | -.0001311 | .0003037 |
| Equity | -.2747923 | .015556 | -17.66 | 0.000 | -.3053841 | -.2442005 |
| Liquidity | -.0506673 | .013612 | -3.72 | 0.000 | -.077436 | -.0238986 |
| Type | -.0229242 | .0078671 | -2.91 | 0.004 | -.0383953 | -.0074531 |
| _cons | .3247941 | .0233424 | 13.91 | 0.000 | .27889 | .3706983 |

**Appendix 4: Stata output for 'Table 12: Impact of CAMELS on ROE of both conventional and Islamic banks in the MENA region using the fixed-effects model.'**

```
. xtreg ROE Capital Assets Management Equity Liquidity Type, fe
note: Type omitted because of collinearity

Fixed-effects (within) regression               Number of obs      =       368
Group variable: Bank                            Number of groups   =        72

R-sq:  within  = 0.5502                         Obs per group: min =         1
       between = 0.5904                                        avg =       5.1
       overall = 0.5099                                        max =         7

                                                F(5,291)           =     71.20
corr(u_i, Xb)  = -0.4394                        Prob > F           =    0.0000
```

| ROE | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Capital | -.1954985 | .1681566 | -1.16 | 0.246 | -.5264558 | .1354588 |
| Assets | -.0213454 | .0125629 | -1.70 | 0.090 | -.046071 | .0033803 |
| Management | .0001126 | .0001708 | 0.66 | 0.510 | -.0002236 | .0004487 |
| Equity | -.7872034 | .0426156 | -18.47 | 0.000 | -.8710772 | -.7033296 |
| Liquidity | .0806778 | .0355319 | 2.27 | 0.024 | .0107458 | .1506099 |
| Type | 0 | (omitted) | | | | |
| _cons | .6408059 | .0574762 | 11.15 | 0.000 | .5276841 | .7539278 |
| sigma_u | .13222642 | | | | | |
| sigma_e | .07883141 | | | | | |
| rho | .73776968 | (fraction of variance due to u_i) | | | | |

```
F test that all u_i=0:     F(71, 291) =     8.40                 Prob > F = 0.0000
```

**Appendix 5: Stata output for 'Table 13: Impact of CAMELS on ROA of both conventional and Islamic banks in the MENA region using the fixed-effects model.'**

```
. xtreg ROA Capital Assets Management Equity Liquidity Type, fe
note: Type omitted because of collinearity

Fixed-effects (within) regression               Number of obs      =       368
Group variable: Bank                            Number of groups   =        72

R-sq:  within  = 0.7937                         Obs per group: min =         1
       between = 0.9029                                        avg =       5.1
       overall = 0.8410                                        max =         7

                                                F(5,291)           =    223.92
corr(u_i, Xb)  = -0.3816                        Prob > F           =    0.0000
```

| ROA | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Capital | .0046615 | .0066247 | 0.70 | 0.482 | -.0083769 | .0176999 |
| Assets | -.0010447 | .0004949 | -2.11 | 0.036 | -.0020188 | -.0000706 |
| Management | -2.36e-06 | 6.73e-06 | -0.35 | 0.726 | -.0000156 | .0000109 |
| Equity | -.0537646 | .0016789 | -32.02 | 0.000 | -.0570689 | -.0504603 |
| Liquidity | .0089743 | .0013998 | 6.41 | 0.000 | .0062192 | .0117293 |
| Type | 0 | (omitted) | | | | |
| _cons | .0442919 | .0022643 | 19.56 | 0.000 | .0398354 | .0487485 |
| sigma_u | .00453614 | | | | | |
| sigma_e | .00310564 | | | | | |
| rho | .6808561 | (fraction of variance due to u_i) | | | | |

```
F test that all u_i=0:     F(71, 291) =     7.26                 Prob > F = 0.0000
```

**Appendix 6: Stata output for 'Table 14: Impact of CAMELS on ROIC of both conventional and Islamic banks in the MENA region using the fixed-effects model.'**

```
. xtreg ROIC Capital Assets Management Equity Liquidity Type, fe
note: Type omitted because of collinearity

Fixed-effects (within) regression               Number of obs      =       368
Group variable: Bank                            Number of groups   =        72

R-sq:  within  = 0.4901                         Obs per group: min =         1
       between = 0.5257                                        avg =       5.1
       overall = 0.4590                                        max =         7

                                                F(5,291)           =     55.93
corr(u_i, Xb)  = -0.2785                        Prob > F           =    0.0000
```

| ROIC | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Capital | -.0946294 | .0783385 | -1.21 | 0.228 | -.2488113 | .0595525 |
| Assets | -.006723 | .0058526 | -1.15 | 0.252 | -.0182419 | .0047958 |
| Management | .0000558 | .0000796 | 0.70 | 0.483 | -.0001008 | .0002124 |
| Equity | -.3255859 | .0198532 | -16.40 | 0.000 | -.3646599 | -.2865119 |
| Liquidity | .0133446 | .0165531 | 0.81 | 0.421 | -.0192345 | .0459236 |
| Type | 0 | (omitted) | | | | |
| _cons | .3078394 | .0267763 | 11.50 | 0.000 | .2551397 | .3605391 |
| sigma_u | .06061953 | | | | | |
| sigma_e | .03672492 | | | | | |
| rho | .73151514 | (fraction of variance due to u_i) | | | | |

```
F test that all u_i=0:     F(71, 291) =     9.54                 Prob > F = 0.0000
```

**Appendix 7: Stata output for 'Table 15: Impact of CAMELS on ROE of both conventional and Islamic banks in the MENA region using the random-effects model.'**

```
. xtreg ROE Capital Assets Management Equity Liquidity Type, re

Random-effects GLS regression                   Number of obs      =       368
Group variable: Bank                            Number of groups   =        72

R-sq:  within  = 0.5467                         Obs per group: min =         1
       between = 0.6102                                        avg =       5.1
       overall = 0.5319                                        max =         7

                                                Wald chi2(6)       =    431.67
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

| ROE | Coef. | Std. Err. | z | P>\|z\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Capital | -.1771094 | .1508986 | -1.17 | 0.241 | -.4728652 | .1186463 |
| Assets | -.0148782 | .0123995 | -1.20 | 0.230 | -.0391808 | .0094244 |
| Management | .0001472 | .0001698 | 0.87 | 0.386 | -.0001856 | .00048 |
| Equity | -.7011341 | .0353926 | -19.81 | 0.000 | -.7705023 | -.6317658 |
| Liquidity | .0260212 | .031135 | 0.84 | 0.403 | -.0350024 | .0870447 |
| Type | -.0317532 | .0320481 | -0.99 | 0.322 | -.0945664 | .0310599 |
| _cons | .6430256 | .0531363 | 12.10 | 0.000 | .5388803 | .7471708 |
| sigma_u | .10645784 | | | | | |
| sigma_e | .07883141 | | | | | |
| rho | .64585645 | (fraction of variance due to u_i) | | | | |

**Appendix 8: Stata output for 'Table 16: Impact of CAMELS on ROA of both conventional and Islamic banks in the MENA region using the random-effects model.'**

```
. xtreg ROA Capital Assets Management Equity Liquidity Type, re

Random-effects GLS regression                   Number of obs      =       368
Group variable: Bank                            Number of groups   =        72

R-sq:  within  = 0.7891                         Obs per group: min =         1
       between = 0.9199                                        avg =       5.1
       overall = 0.8543                                        max =         7

                                                Wald chi2(6)       =   1812.91
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

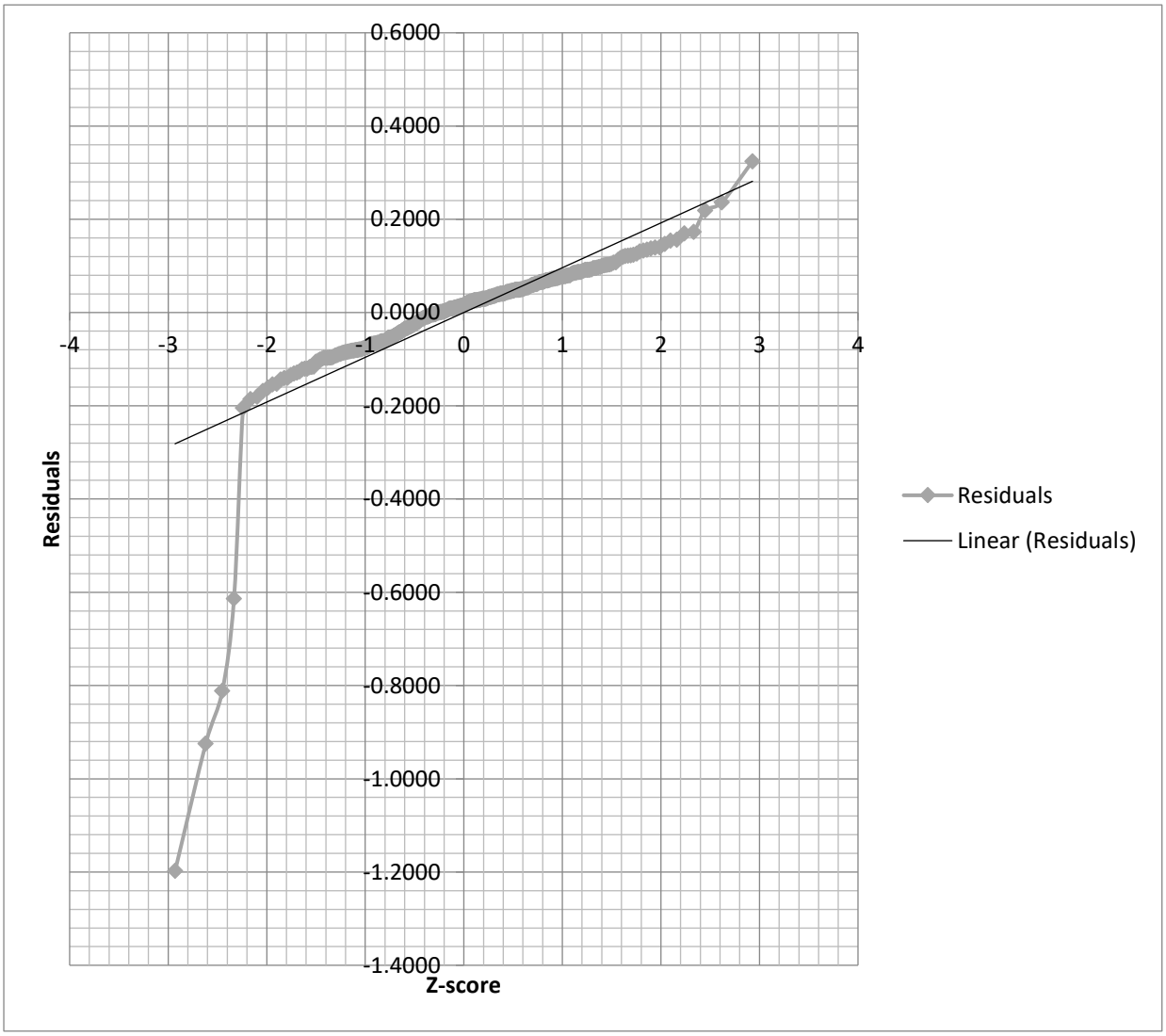
| ROA | Coef. | Std. Err. | z | P>\|z\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Capital | .002479 | .0057411 | 0.43 | 0.666 | -.0087734 | .0137314 |
| Assets | -.0009089 | .0004877 | -1.86 | 0.062 | -.0018647 | .0000469 |
| Management | -7.17e-07 | 6.69e-06 | -0.11 | 0.915 | -.0000138 | .0000124 |
| Equity | -.0519673 | .0013256 | -39.20 | 0.000 | -.0545655 | -.0493691 |
| Liquidity | .0052562 | .0011791 | 4.46 | 0.000 | .0029452 | .0075673 |
| Type | -.0016146 | .0010668 | -1.51 | 0.130 | -.0037055 | .0004763 |
| _cons | .0474817 | .0019965 | 23.78 | 0.000 | .0435686 | .0513949 |
| sigma_u | .00338995 | | | | | |
| sigma_e | .00310564 | | | | | |
| rho | .54368562 | (fraction of variance due to u_i) | | | | |

**Appendix 9: Stata output for 'Table 17: Impact of CAMELS on ROIC of both conventional and Islamic banks in the MENA region using the random-effects model.'**

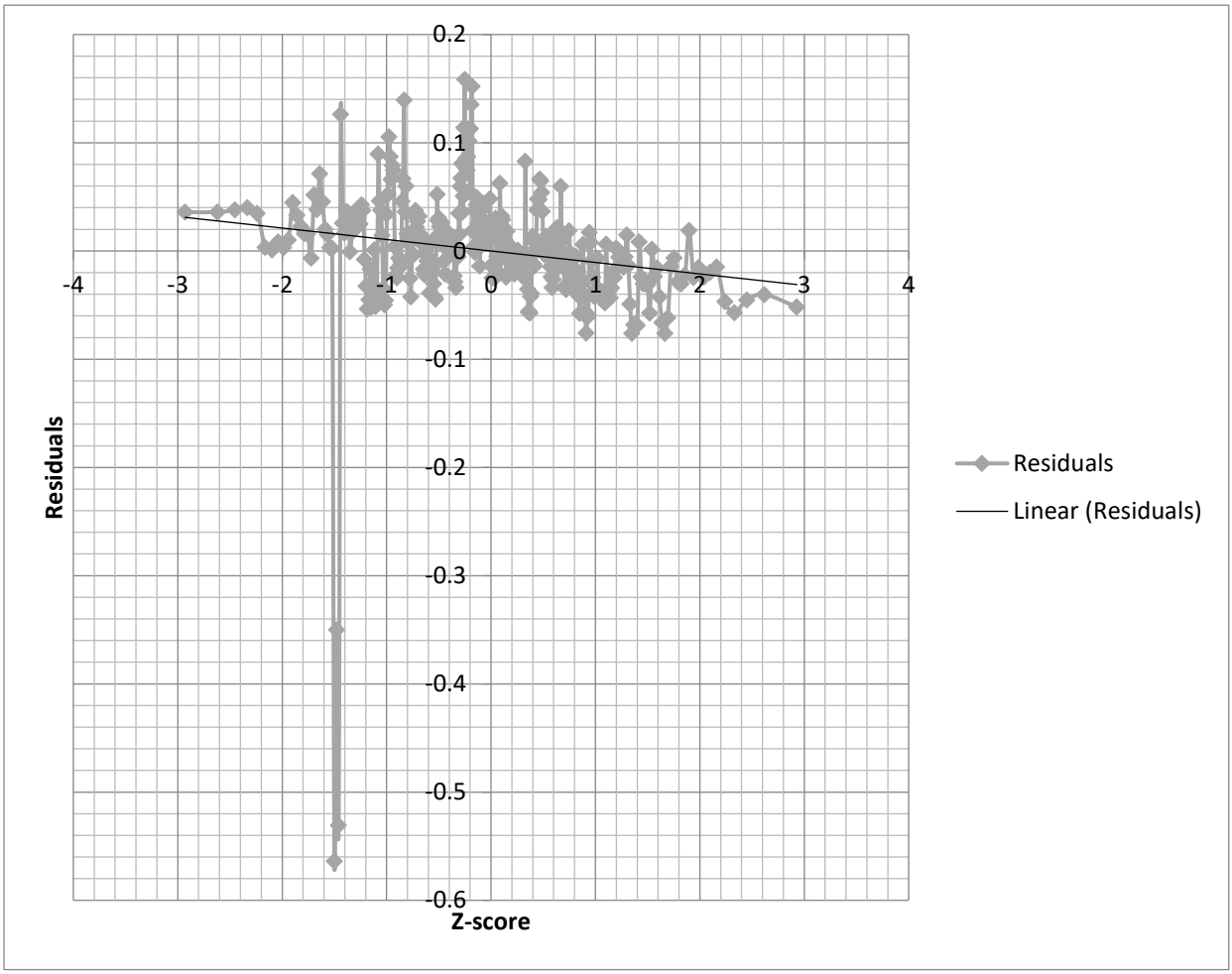
```
. xtreg ROIC Capital Assets Management Equity Liquidity Type, re

Random-effects GLS regression                   Number of obs      =       368
Group variable: Bank                            Number of groups   =        72

R-sq:  within  = 0.4870                         Obs per group: min =         1
       between = 0.5458                                        avg =       5.1
       overall = 0.4831                                        max =         7

                                                Wald chi2(6)       =    347.48
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

| ROIC | Coef. | Std. Err. | z | P>\|z\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Capital | -.0898487 | .0705187 | -1.27 | 0.203 | -.2280627 | .0483654 |
| Assets | -.005155 | .0057381 | -0.90 | 0.369 | -.0164014 | .0060914 |
| Management | .0000619 | .0000785 | 0.79 | 0.431 | -.000092 | .0002158 |
| Equity | -.2977254 | .016631 | -17.90 | 0.000 | -.3303216 | -.2651291 |
| Liquidity | -.0076042 | .0145732 | -0.52 | 0.602 | -.0361672 | .0209587 |
| Type | -.0147531 | .0157351 | -0.94 | 0.348 | -.0455934 | .0160871 |
| _cons | .3151521 | .0249619 | 12.63 | 0.000 | .2662276 | .3640766 |
| sigma_u | .05329554 | | | | | |
| sigma_e | .03672492 | | | | | |
| rho | .67804337 | (fraction of variance due to u_i) | | | | |

**Appendix 10: Residuals Normal Probability Plot 'Impact of CAMELS on ROE of both banks'**



**Appendix 11: Residuals Normal Probability Plot 'Impact of CAMELS on ROIC of both banks'**



**Appendix 12: Residuals Normal Probability Plot 'Impact of CAMELS on ROA of both banks'**