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# Determinants of Capital Adequacy Ratio (CAR) in MENA Region: Islamic vs. Conventional Banks

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## Abstract

**Purpose:** The purpose of this research is to conduct a comparative analysis of CAR determinants between Islamic and conventional banks.

**Design/methodology/approach:** The analysis is conducted using GMM on annual data for 38 Islamic banks (IBs) and 75 conventional banks (CBs) in 10 MENA countries during 2009-2013. CAR is used as a dependent variable and is measured by the Basel framework. The independent variables are: profitability; liquidity risk; credit risk; bank size; deposits to assets; operational efficiency; portfolio risk; and two macro-economic variables (GDP growth rate and average world governance indicators for each country).

**Findings:** The results show that both IBs and CBs have a significant association between CAR and (bank size, operational efficiency, and GDP growth rate) and CAR is affected retroactively on the long-run. In IBs the results show a significant association between CAR

and deposits to assets ratio. However, CBs results show an association between CAR and (profitability, credit risk, and portfolio risk).

**Practical implications:** The empirical evidence accentuates the difference between both banking systems and the importance to enforce the application of the Islamic Financial Services Board (IFSB) proposal on IBs based in different jurisdictions. This will enhance the IBs stability and efficiency; and achieve standardization of CAR calculation between IBs.

**Originality/value:** Filling the gap in the Islamic finance literature by trying to examine whether factors influencing CAR are similar between both banking systems or to confirm on the view that they are completely different and should not adhere to the same regulatory bodies.

**Keywords:** Capital adequacy ratio, Islamic vs. conventional banks, Basel accord, MENA region

## 1. Introduction

The rapid growth of Islamic finance and banking grabbed the attention of the international financial community. The estimation of Islamic finance sector size is \$1.8 trillion globally, and the global assets of Islamic banks (IBs) is approximately \$1.4 trillion and expected to double by 2020 (Reuters 2015 and Islamic Finance Bulletin 2016) . The Islamic commercial banking size solely is expected to reach \$ 2.4 billion (Reuters, 2017).

Although it is expected for Islamic finance to spread in Muslim communities, however, there are around 350 institutions offering Islamic financial services trying to cater for the needs of Muslim and Non-Muslim communities as well (El-Masry, de Mingo-López, Matallón-Sáez, & Tortosa-Ausina, 2016). This rapid growth increased the systematic effect of IBs especially in economies that have more than 10% of its banking assets in Islamic accounts (Ashraf, Rizwan, & L'Huillier, 2016). These growth indicators call for special regulations for IBs that cater for their specificities.

A major regulatory standard presented by Basel committee is capital adequacy ratio. It presents a framework for banks to stabilize their financial position through enhancing their capital buffers because stringent capital buffers reduce risk and promote financial stability (Rahman, Zheng, Ashraf, & Rahman, 2018). However, Basel framework did not consider IBs unique characteristics and this resulted in challenges faced by IBs in application of its standards. In countries with dual banking systems IBs and CBs adhere to the same regulatory authorities (Islamic Financial Services Board, 2015). Therefore, Islamic Financial Services Board (IFSB) tried to compromise between Basel guidelines and IBs' specificities. However, its standards are not completely adopted by all IBs which still follow Basel guidelines in many jurisdictions and as reported by accredited databases.

Many researches separately examined CAR determinants in conventional and Islamic banking contexts. However, the main aim of this research is to conduct a comparative analysis between both banking systems internal and macroeconomic determinants of CAR. The focus of the analysis is on the MENA region due to the concentration of IBs (Reuters,

2017).

This research falls in the category of examining bank performance as established by Narayan & Phan (2019) and helps in filling an Islamic finance literature gap by trying to examine whether the factors that have an influence on CAR measured by Basel guidelines are similar between both banking systems or to confirm on the view that both banking systems are completely different and should not adhere to the same regulatory bodies.

We applied the research on ten MENA countries because according to IFSB (2015) annual report the MENA region possesses \$ 633.7 billion in banking assets which represents 42.9% from the global IBs. This paper is divided into five sections. The introduction is followed by the literature review. Section three presents the methodology, research variables, and hypotheses development. Data analysis and hypotheses testing are in section four followed by the conclusion.

## **2. Literature Review**

Previous literature on banks' capital adequacy can be divided into three main streams. The first stream presents briefly scholars' attempts to find a final solution for capital adequacy calculation and the issuance of Basel framework. The second stream introduces a discussion on challenges of Basel application and suggested solutions for IBs. The third stream focuses on the core of this research. A review of the studies that examined the factors that have an influence on capital adequacy of the bank is presented. Different studies tried to examine whether the internal factors of a bank have an influence on the capital adequacy ratio or there is no correlation.

### *2.1 Different Attempts for Capital Adequacy Measurement*

Adequate capital for banks is considered the main shock absorber in economic turmoils. The core rationale of having a capital adequacy standard is to enhance the financial system and economic stability as a bank failure may trigger a systematic crisis (Kupiec & Ramirez 2013 and Marques Pereira & Saito 2015) as the great recession of 2007-2009 showed us. This ratio can be simply calculated as total capital to total assets; however, Basel Committee for Banking Supervision (BCBS) presented a more sophisticated calculation.

The proposal presented by BCBS specified a certain level of minimum capital requirement should be maintained by banks all over the world. This level will be determined in accordance to the type of bank assets (loans) and their risk weights as proposed by the standard. This process can ensure a safer return from investments for the both shareholders and depositors due to risk sharing and limiting moral hazards (Abdul Karim, et al. 2014, Pessarossi & Weill 2015, and Ayadi et al. 2016).

There are many attempts by early scholars, and even after the presentation of Basel guidelines, to measure the capital adequacy ratio. However, different banks worldwide started to implement the standards of Basel I which are continued to improve through Basel II and Basel III in order to remain their worldwide competitiveness and adherence to international regulatory bodies.

In spite of Basel spread as an authorized model, Demirgüç-Kunt & Detragiache (2011), Chernykh & Cole (2015), Montes et al. (2016), and Bitar, Pukthuanthong, & Walker (2018) criticized its guidelines in calculating capital adequacy ratio (CAR) due to its complexity and failure to avoid 2008 financial crisis. Also a comparison was presented by Mayes & Stremmel (2012) between simple measures of capital adequacy based upon the leverage ratio and the risk weighted ratio used under Basel. They found the former to be more accurate than the latter as a predictor. Their results were consistent with the Estrella et al. (2000).

On the other hand, Alexander et al. (2014) based their research on the fact that Basel framework failed in promoting international financial stability. They suggested frameworks that can improve Basel calculation of CAR based on VaR at 99% confidence level. Their alternative framework is based on either CVaR, VaRs at multiple confidence levels, or VaR at a confidence level higher than 99%.

## *2.2 Challenges of Basel Application and Suggested Solutions for Islamic Banks*

The main aim of this part is to highlight the unique characteristics of IBs that may impede the implementation of Basel guidelines in its basic form. The discussion of IBs will be in terms of their conceptual background, unique financing characteristics, and risks. Finally, efforts made to overcome these challenges are addressed.

### *2.2.1 Challenges of Basel Application in Islamic Banks*

The philosophy of IBs is different from their conventional counterparties from several dimensions. First, IBs are based on the concept of risk sharing not risk transfer, so they are equity based institutions in contrast to CBs that are considered debt based institutions (Mejia, et al. 2014, and IFSB, 2018). Second, they avoid dealing with interest in their transactions. Third, they avoid investing in any product (good or service) prohibited under the Islamic regulations (Beck, Demirgüç-kunt, & Merrouche, 2013).

In spite of these specificities IBs are obliged to follow the same regulatory bodies of CBs (Ariss & Saredine, 2007). Apparently this will affect their performance as the regulations are more tailored to the conventional banking system. Someone may argue the necessity for such guidelines for IBs. It may appear that there is no need for adequate capital because IBs are following the profit and loss sharing concept so it will not require a backup for its operations, however, due to risk-averse investors and information asymmetry it will be an essential issue in order to insure cautious investors about the bank's solvency (Muljawan, Dar, and Hall 2004; and Louati, Abida, and Boujelbene 2015).

The enhancement of the risk management and the capital adequacy guidelines is a critical issue for IBs in order to strengthen their soundness (Daher, Masih, & Ibrahim, 2015). There are two main obstacles hinder Basel application in IBs. The first is the nature of profit sharing investment accounts (PSIAs) and the second is the risk weights for IBs' risks that are different from CBs.

#### *2.2.1.1 Profit Sharing Investment Accounts (PSIAs) and Islamic Banks' Risks*

In its basic form PSIAs are a type of Mudaraba contract where the bank is authorized to

invest the funds on behalf of another party. The bank will provide its entrepreneurial skills in return for a pre-specified percentage of profits referred to as management fees (Abdel Karim, 1996). However, these contracts are based on profit sharing and loss bearing (Archer & Abdel Karim 2009).

This means that the bank is not a guarantor and any losses incurred will be solely borne by the account holder. The rationale behind this is banks or entrepreneurs in general cannot be fully certain about the potential profits or losses of a project, because losses may occur as a result of uncontrollable circumstances. However, in case of fraud or misconduct the bank should bear the whole loss, and this will expose the bank to *fiduciary risk* (Hawary et al. 2004 and Mejia, A.L. et al. 2014).

PSIAs constitute the largest portion of financial resources for IBs and cannot be ignored. However, in practice, these accounts are an alternative of time deposit service offered in CBs and hence the IB should offer a competitive return in order not to lose market share. This problem resulted in a unique risk exposure for IBs referred to as *displaced commercial risk* (DCR). This risk was firstly addressed by Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI) in 1999 (Hawary et al., 2004). DCR occurs due to the volatility in returns, or what is known as *rate of return risk*, especially in times of recession which will cause a reduction of the profits. This reduction will affect the investment account holders' share of profit and may expose the bank to *withdrawal risk*.

The IBs started to use return smoothing techniques in order to mitigate such risk and offer competitive returns in comparison to their conventional counterparties. These smoothing techniques are done through two types of reserves; profit equalization reserve (PER) which is deducted from the entire profits before the allocation between shareholders and investment account holders, and the other is investment return reserve (IRR) which is deducted after the shareholders' share is excluded. The PER constitutes the amount of risk borne by shareholders in order to stabilize the PSIAs returns. DCR, smoothing returns, and mitigation techniques are comprehensively examined by Ahmed & Karim (2006), (2009); and Archer et al. (2010), amongst others.

However, IFSB (2015) annual report shows that IBs is mainly funded through deposits as the PSIAs is decreased by 50% starting from 2013. This decrease reflects higher demand on *Shariah-compliant capital* and *profit guaranteed term deposit*. The consequence of these products and the smoothing techniques practiced on the remaining PSIAs expose IBs to same risks resulted from maturity mismatches as CBs (IFSB 2015).

Other types of risks unique in the Islamic banking system are *Shariah-compliance risk* and *equity investment risk* (Mejia, A.L. et al. 2014). If customers discovered Shariah non-compliant practices will lose confidence in the IB and withdraw their funds. On the other hand due to the use of Musharaka contract on the basis of profit and loss sharing the shareholders are exposed to equity investment risk. IBs also face similar risks like CBs such as credit risk, market risk; operational risk; liquidity risk; etc. Table (1) summarizes differences and similarities between IBs' and CBs' risk exposures.

Table 1. Risk exposures IBs vs. CBs

Islamic Banks	Conventional Banks
	Credit Risk
	Market Risk
	Operational Risk
Displaced Commercial Risk	
Equity Investment Risk	
Shariah-compliance Risk	
Fiduciary Risk	

Note: The risk weight for common risks differ between both banking systems.

Sources: (Hawary et al., 2004); (Ariss & Sarieedine, 2007); and (Mejia, A.L. et al. 2014).

The main challenge of Basel application in IBs is the absence of suitable risk weights for their unique risk exposures. On the other hand, the level of exposure of common risks is different between both banking systems so the risk weights should not be applied as it is.

### 2.2.2 Proposed Solutions for Capital Adequacy Calculation in Islamic Banks

Many proposals are presented to make Basel guidelines applicable on Islamic banks. The main focus of these proposals is to deal with restricted and unrestricted profit sharing investment accounts (PSIAs). An early attempt by Abdel Karim (1996) suggested four scenarios; whether to ignore these accounts and follow Basel guidelines as it is, add them to core capital, consider them as a supplementary capital, or to be deducted from risk-weighted assets.

Later on serious efforts were exerted by AAOIFI in 1999 and the IFSB in 2005 to develop a suitable capital adequacy framework that addresses the risk profile in IBs (IFSB 2005). The IFSB initiates several events to facilitate the adoption of its standards by worldwide IBs. These initiatives include seminars, workshops, and conferences with the industry stakeholders (IFSB 2015). Recently in 2019, Baldwin, Alhalboni, & Helmi developed a new theoretical model for the adjustment factor in the CAR “alpha” to add for the methodology proposed by IFSB.

This research used data presented in accordance to Basel accord to standardize the comparison between both banking systems and be able to confirm or reject the need for tailored standards for Islamic banks.

### 2.3 Literature Review That Contributed in Developing Explanatory Model for Variables Determine the Capital Adequacy Ratio

The focus of this section is on previous studies examined the relationship between capital adequacy and bank variables. Many studies tried to explore whether there are factors that influence the banks' capital or not. There are a lot of determinants used by different research

papers to explain changes occur in the capital adequacy ratio (CAR).

Some researchers focused on the relation between risk and capital. Kleff & Weber (2004) stated that Basel regulatory framework linked the banks' capital with the level of portfolio risk in order to prevent the default probability. As a result they examined the main factors that may have an influence on the determination of capital in German banks such as; portfolio risk, profitability, bank size, deposits, provisions for loan losses, regulatory pressure, merger, and regulatory and macroeconomic shocks. Their results showed a positive significant relation between portfolio risks, profitability, and regulatory pressure as independent variables on capital adequacy ratio. However, bank size had a significant negative correlation.

Another study was conducted by Al-Sabbagh (2004) to examine the determinants of CAR in 17 Jordanian banks during the period 1985 to 1994 before the application of Basel standards and 1995 to 2001 after the application of Basel standards. Independent variables included in the model of the study were bank size, ratio of risky weighted assets, loan to asset ratio, return on equity, return on assets, deposit to asset ratio, equity ratio, dividends payout ratio, and loan provision ratio. The results showed positive relationship between CAR and loan to asset ratio, return on equity, return on assets, deposit to asset ratio, equity ratio, and dividends payout ratio; and negative relationship with loan provision ratio, bank size, and ratio of risky weighted assets.

In Jordanian listed banks Al-Tamimi & Obeidat (2013) examined the same question. Their study reported significant positive correlation between CAR and both return on assets and liquidity risk; and not significant negative correlation between CAR and credit risk.

Altunbas et al. (2007) also examined the relationship between three variables; capital, risk, and bank's efficiency. Their literature review showed conflicting results between level of capital and risk. However, their empirical results accentuated that there is a positive relation between the level of risk-taking, level of capital, and banks' liquidity. This result proved the concern of regulatory bodies to control the level of risk with an adequate amount of capital. Also they found that the higher financial stability of corporations, which constitutes the main borrowers, the lower the level of risk and capital the banks had. They developed three models for each; risk, capital, and efficiency, to be considered as dependent variable. The variables used to constitute these three statistical models were; loan loss reserves, equity multiplier ratio, net loans to total assets ratio, bank size, return on assets ratio, and liquidity ratio.

In the Portuguese context, Boucinha & Ribeiro (2007) examined similar determinants of capital and the results accentuated previous findings. They approved the "too big to fail" hypothesis as banks' size was negatively correlated with the required capital buffer. Also they found that portfolio risk is positively correlated with bank capital.

Regarding the determinants of capital adequacy ratio in developing countries, Ahmad, Ariff, and skully (2008) measured the effect of bank risk taking behavior, management quality, regulatory pressure, size, liquidity, and leverage on CAR. The study covered a crisis period which will incentivize the risk-taking behavior. The bank risk taking behavior was measured through non-performing loans as an indication of banks' credit risk and risk index measured



by return on assets plus equity multiplier divided by the standard deviation of return on assets. They used net interest margin as an indication of management quality. Their results were similar to that of developed countries, however, profitability showed contradictory results as it was negatively correlated.

In Turkey Büyükşalvarcı & Abdioğlu (2011) found that loans, return on equity, and leverage have a negative effect on CAR, while loan loss reserve and return on assets positively influence CAR. However, size, deposits, liquidity, and net interest margin have no significant effect on CAR.

In the banking sector of Pakistan, Bokhari et al. (2012) analyzed the determinants of capital adequacy ratio. Their analyses were based on studying the financial statements of a sample of 12 banks in Pakistan during the period 2005-2009. The used variables were CAR, GDP growth rate, share of deposits, average CAR for sector, Portfolio risk, and ROE. Abusharba, Triuwono, Ismail, and Rahman (2013) examined the determinants of CAR, measured in accordance to Basel II, in Indonesian IBs. They found that return on assets, and liquidity have positive effect on CAR; while non-performing finance, which they used as an indicator for asset quality, has a negative effect; and there was no effect for deposit structure and operating efficiency.

In Kingdom of Saudi Arabia Polat & Al-khalaf (2014) found that leverage, size, and return on assets have positive effect on CAR; while loan to asset ratio and loan to deposit ratio have negative effect; and non-performing loans has no significant effect on CAR. On the other hand Bateni, Vakilifard, and Asghari (2014) analyzed the influential factors on CAR in Iranian banks. They depended on seven explanatory factors that have an influence over CAR in Iranian private banks for the period 2006 to 2012. Their results showed a positive relationship between CAR and loan asset ratio, return on assets, return on equity, equity ratio; while bank size had a negative effect on CAR. The remaining variables risk asset ratio and deposit asset ratio had no effect on CAR.

In India Aspal & Nazneen (2014) examined the same research question in Indian private sector banks. They used loans, asset quality, management efficiency, liquidity, and sensitivity (risk-sensitive assets - risk-sensitive liabilities) as independent variables. Their results showed negative correlation between CAR and loans, asset quality, and management efficiency; and positive correlation between CAR and both liquidity and sensitivity.

A recent study by El-Ansary & Hafez (2015) studied the determinants of CAR on 33 Egyptian commercial banks covering the period from 2003 to 2013. The independent variables were assets management quality, liquidity, credit risk, profitability, size, net interest income, and management quality. They compared between the results before and after the crisis period of 2007-2008. The study reported that liquidity, size, and management quality had the highest significant effect in explaining the variance in CAR during the whole period under analysis. While asset quality, size, and profitability were the most significant before 2008. After the crisis asset quality, management quality, size, credit risk, and liquidity were the most significant variables.

Bitar & Tarazi (2019) conduct a comparative analysis between IBs and CBs in 24 countries to examine the ability of creditors rights, measured by an index composed of a sum of four legal measures (no automatic stay, secured creditor paid first, restrictions on reorganization, and no management stay), in explaining CAR variance. They found robust evidence that the stronger the creditors' rights the higher the CAR only for CBs. They explained their findings as a consequence of different philosophies of both banking systems. CBs managers increase their capital buffers under strong creditors' rights in order to signal enhanced efforts for monitoring and to overcome the probability of losing control. On the other hand, IBs profit and loss sharing principle made creditors' rights irrelevant in their context. However, they found similar behavior of both banking systems in non-Muslim markets where the competition is low.

There is a lack in literature concerning the determinants that affect CAR in Islamic banks solely (Abusharba et al., 2013, and Bitar, Hassan, & Hippler, 2018). This research provides a comparative analysis of factors that can explain the variance in CAR between IBs and CBs in the MENA region.

### 3. Methodology and Hypotheses Development

Based on the literature review, the analysis will depend on bank specific factors that are proved by literature to have an effect on CAR and two macroeconomic factors to explore country specific factors that may influence CAR variance. These factors will be examined on a sample of IBs and CBs in MENA region. This research attempts to determine the relative importance of each factor in CAR variance in both banking systems.

Table 2. Variables definitions and measures

DEPENDENT VARIABLE		Exp. Sign
Capital Adequacy Ratio (CAR)	$CAR = \frac{\text{Tier 1 capital} + \text{Tier 2 capital}}{\text{Risk weighted assets}} \geq 8\%$ <i>(Credit risk + Market risk + Operational risk)</i>	
INDEPENDENT VARIABLES		
Bank Specific Variables		
1. Profitability	$ROA = \frac{\text{Net Income}}{\text{Average Total Assets}}$	+
2. Liquidity Risk	$LDR (FDR) = \frac{\text{Total Loans (Financing)}}{\text{Total Deposits}}$	+
3. Credit Risk	$NPL (NPF) = \frac{\text{Nonperforming Loans (Financing)}}{\text{Total Loans (Financing)}}$	+
4. Bank Size	Natural Logarithm of Total Assets	-

5. Deposits to Assets	$DAR = \frac{\text{Total Deposits}}{\text{Total Assets}}$	+/-
6. Operational Efficiency	$OEOI = \frac{\text{Total Interest Expenses} + \text{Total Noninterest Expenses}}{\text{Total Interest Income} + \text{Total Noninterest Income}}$	?
7. Portfolio Risk	$RAR = \frac{\text{Risk weighted Assets}}{\text{Total Assets}}$	+
<b>Macroeconomic Variables</b>		
8. GDP	GDP growth rate	-
9. Average World Governance indicators	$WGI\ Index = \frac{\sum \text{of all the six indicators of each country}}{6}$	-

Source: Developed by the authors.

The study uses financial statements gathered from annual financial statements through Bank-Scope database. As for the macroeconomic variables they are collected from the World Bank database. The research sample is composed of 38 IBs unbalanced panel and 75 CBs balanced panel covering the period from 2009 to 2013 in order to test the study hypotheses.

The research depends on completely Islamic banks and not CBs with Islamic windows to facilitate the comparison. In addition, the study focused on 10 countries in the MENA region who have both IBs and CBs. The main advantage of depending on Bank-Scope is data standardization based on Basel requirements for both banking systems.

Variable definitions are listed in Table 2. An explanation for the model variables and the hypotheses are listed in this part in details.

### 3.1 The Study Variables and Hypotheses Development

#### 3.1.1 Dependent Variable (CAR)

Capital adequacy ratio is an indicator that reflects bank soundness and its capability to overcome unexpected losses. Similar to CBs; IBs follow the guidelines of Basel. During the period under the research from 2009 to 2013; Islamic financial institutions are required to have CAR not less than 8% and Tier2 capital is limited to 100% of Tier1 (IFSB 2005).

#### 3.1.2 Independent Variables

##### 3.1.2.1 Profitability (ROA)

Kleff & Weber (2004) and Bitar, Hassan, & Hippler (2018) hypothesized that there is a positive relation between profitability and capital. They rationalized this relation by approving the fact that different organizations prefer to finance their operations depending on retained earnings rather than external and more expensive financing methods. This finding was accentuated by El-Ansary & Hafez (2015) in their research on Egyptian commercial

banks because the increase in bank efficiency in managing risk through holding adequate amount of capital will lead to risk reduction and increased profitability. Büyükşalvarcı & Abdioğlu (2011) research in Turkish banking sector and Abusharba et al. (2013) research on Indonesian Islamic banks found that ROA has a positive significant effect on CAR. Return on assets (net income to total assets) is used in this research as a proxy for profitability (Yanikkaya, Gumus, & Pabuccu, 2018). Thus hypothesis one can be stated as:

H1: “There is a significant association between the capital adequacy ratio (CAR) and profitability in both Islamic and conventional banks”.

#### 3.1.2.2 Liquidity Risk (LDR-FDR)

Total loans with respect to CBs and total financing with respect to IBs to total deposits ratio is a measurement of bank's liquidity that assesses the bank's ability to meet short-term obligations and additional financial requirements. Total financing refers to Musharakah, Mudarabah, and Murabaha accounts in IBs. Generally, high liquid banks face low bankruptcy costs and can raise more debt, and this will have negative consequences on their capital positions (Bitar, Hassan, et al., 2018). The higher this ratio is an indication of low liquidity and, of course, the higher the risk. As a result if liquidity risk increased the CAR should be increased too due to the increase in the banks' expected default risk. Abusharba et al. (2013) research on Indonesian Islamic banks proved this as they found that there is a positive significant relationship between FDR ratio and CAR. Thus hypothesis two can be stated as:

H2: “There is a significant association between the capital adequacy ratio (CAR) and liquidity risk in both Islamic and conventional banks”.

#### 3.1.2.3 Credit Risk (NPL-NPF)

Non-performing loans or finance (NPL or NPF) are those loans (financing services) and leases banks can't retrieve from some customers for 90 days or more (A. Ghosh, 2015). They are written in the balance sheet under the item nonperforming loans (finance). Generally, credit risk can raise a financial loss if the borrower fails to honor his/her contractual obligations (Elsiefy, 2013). NPL was used by Abusharba et al. (2013) to measure asset quality and they found that NPF has a negative significant effect on CAR. It describes also the bank's capacity in spreading risk and default loan recovery. NPL is used by Polat & Al-khalaf (2014) as an indicator of loan quality. However, their results showed that NPL has no significant effect on CAR in Kingdom of Saudi Arabia banking sector. This ratio is used as an indicator of credit risk faced by banks by Srairi (2013). Thus hypothesis three can be stated as:

H3: “There is a significant association between the capital adequacy ratio (CAR) and credit risk in both Islamic and conventional banks”.

#### 3.1.2.4 Bank Size (SIZE)

Bank size is considered one of the most important factors that affect CAR. Bank size can be reflected through the number of branches and the total size of the balance sheet. The larger the bank size the larger the ability to diversify risk. The increase in bank size will mean the

increased bank's ability to increase external financing at lower costs through the large number of branches which will result in a decrease CAR. It is also an indicator of more effective diversification, which will result in a reduction of risk exposure (Büyüksalvarcı & Abdioğlu, 2011).

Many studies have proved a negative relationship between bank size and CAR (Bitar, Hassan, et al., 2018). Al-Sabbagh (2004) hypothesized a positive correlation between size and CAR as the larger size will lead to greater operations and activities that may expose banks to more risks. As a result depositors will require a guarantee by increasing the CAR of the bank. However, the final and more recent literature results accentuated finding a negative relationship. Bank size is measured by the natural logarithm of total assets. Thus hypothesis four can be stated as:

H4: "There is a significant association between the capital adequacy ratio (CAR) and bank size in both Islamic and conventional banks".

#### 3.1.2.5 Deposits to Assets (DAR)

Increased deposits will require an increase in regulations in order to guarantee depositors right and prevent banks insolvency risk. It was found that there is a positive relationship between DAR ratio and CAR; however, the relationship wasn't significant (Al-Sabbagh 2004). In addition, Abusharba et al. (2013) hypothesized a positive relationship between DAR and CAR, however their results showed that deposits has no effect on CAR. On the other hand, Mili, Sahut, Trimeche, & Teulon (2017) hypothesized negative association since deposits are cheaper as a source of financing. Deposit asset ratio is calculated by dividing total deposits over total assets. Thus hypothesis five can be stated as:

H5: "There is a significant association between the capital adequacy ratio (CAR) and deposits to assets ratio in both Islamic and conventional banks".

#### 3.1.2.6 Operational Efficiency (OEOI)

Operational efficiency is used by Abusharba et al. (2013) as one of the variables that affect CAR in Indonesian Islamic banks. It is calculated by dividing operating expenses over operating income (OEOI). Their results showed that OEOI has no effect on CAR. It was also used by different studies as an indicator for management soundness. It is supposed that operationally efficient banks are holding adequate capital buffers. Thus hypothesis six can be stated as:

H6: "There is a significant association between the capital adequacy ratio (CAR) and operational efficiency in both Islamic and conventional banks".

#### 3.1.2.7 Portfolio Risk (RAR)

Any increase in a bank's portfolio risk will require an increase in the CAR in order to maintain the adequate capital buffer. It is proved by Kleff & Weber (2004) and Al-Sabbagh (2004) the existence of positive correlation which means that banks hold portfolios with excessive risk increased their CAR.

It is obvious that any increase in this ratio will result in a negative reflection on CAR, holding eligible capital constant, because RWAs are the denominator of the equation. The ratio of risk weighted assets (RWA) to total assets is used as a proxy for bank's portfolio risk. Thus hypothesis seven can be stated as:

H7: "There is a significant association between the capital adequacy ratio (CAR) and portfolio risk in both Islamic and conventional banks".

#### 3.1.2.8 Macro-Economic Variables

Since this research examines the determinants of CAR across 10 countries in MENA region, it is important to control for differences across MENA countries. GDP and the world governance indicators are used as a proxy for macroeconomic determinants on bank's CAR.

##### 3.1.2.8.1 Gross Domestic Product (GDP)

Gross Domestic Product is the total amount of produced goods and services in an economy measured in a monetary value. It consists of private and public spending, business investments, and net exports. The rationale of considering GDP as a determinant of CAR is the relationship between bank lending policies and its required capital buffer with the economic welfare.

The higher the economic growth the lower capital buffer is needed by banks. In contrast if the economy is in a recession it will be required by banks to protect their capital position by lowering private lending and depend more on sovereign debt which is more secured (Barrell & Gottschalk 2006 and Babihuga 2007). In addition, GDP may have no effect on CAR even in recession periods because when banks avoid private lending and increase sovereign debt this will stabilize the GDP due to increased government expenditure. Thus hypothesis eight can be stated as:

H8: "There is a significant association between the capital adequacy ratio (CAR) and gross domestic product in both Islamic and conventional banks".

##### 3.1.2.8.2 World Governance Indicators (WGI)

Capital buffers can protect from systematic risk especially in the case of weak institutional environment (Anginer, Demirgüç, & Mare, 2018). Thus, world governance indicators are used in this research as a comprehensive macroeconomic variable that may reflect the degree of adherence to international regulatory bodies. It ranks countries based on their governance quality. It is based on hundreds of variables gathered from 31 data sources such as; public and private organizations, think tanks, surveys of experts and households, commercial information providers, etc. It consists of six indicators and ranks 212 countries and territories in each one (Thomas, 2010).

The six indicators are; voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption. This variable is included in the model as an index of the average rank of the six indicators in each country. It is supposed that countries with highly qualified governance will need to maintain

lower CAR due to higher economic stability (Bitar, Hassan, et al., 2018). Thus hypothesis none can be stated as:

H9: “There is a significant association between the capital adequacy ratio (CAR) and world governance indicators in both Islamic and conventional banks”.

All these explanatory variables jointly may have an impact on CAR. As a result, the tenth hypothesis can be:

H10: “All the research independent variables jointly have a significant impact on Islamic and conventional banks’ CAR”.

#### **4. Data Analysis and Testing Hypotheses**

##### *4.1 Descriptive Statistics*

The following table (3) presents mean values; standard deviation, and Jarque-Bera probability in each variable for both IBs and CBs. In addition, the t-test is employed to test for significance of mean differences in research variables between IBs and CBs. It reports a significant difference of mean values for almost all the variables between IBs and CBs.

Based on the Jarque-Bera test the assumption of normality is rejected at 5% significance level. As shown in the table all the variables are not normally distributed in both samples except for loans to deposits ratio in the CBs’ sample. The data was transformed by using the natural logarithm in order to achieve normality but it is still not normally distributed. However, this will not cause major problems due to the large number of observations (more than 30) (Field 2009, p.134).

Similar to what was found by Sun, Mohamad, and Ariff (2016) IBs in general are holding more than the minimum requirement, in comparison to CBs, as a result of being equity-based institutions. In addition, the overcapitalization of IBs is accentuated by IFSB (2015) sample. The reason is the need of IBs to compensate with higher capital buffers than their conventional counterparties for the scarcity of Shariah-compliant lender-of-last-resort facilities or effective interbank markets.

The higher capital ratios for IBs may be the reason that hindered their profitability as the results showed that CBs became more profitable on average. On the other hand, the t-test shows that there is no significant difference in operational efficiency (OEOI) between IBs and CBs. This result contradicts with Olson & Zoubi (2008) who found that IBs are more profitable than CBs, however, less efficient. On the other hand; CBs are more liquid than IBs. This result contradicts with Massah & Al-sayed (2015) as they accentuated the higher liquidity level in IBs.

In addition, IBs surpass CBs in credit risk management as the ratio of nonperforming loans to total loans is 7.4% for CBs and 6% for IBs. Based on Kabir, Worthington, & Gupta (2015) work the comparison between IBs and CBs credit risk depends significantly on the chosen measure; as different measures show contradicting results. Deposits to assets ratio mean values show that deposits finance the total assets by an average of 71% in IBs and 80% in

CBs. This indicates that depositors in IBs are more guaranteed than CBs' depositors.

Table 3. Descriptive statistics

Variables	Islamic Banks			Conventional Banks			T-test	Sig.
	Mean	SD	Jarque-Bera Prob.	Mean	SD	Jarque-Bera Prob.		
Dependent Variables								
CAR	0.242	0.1236	0.000	0.2033	0.091	0.000	2.292	.023**
Independent Variables								
ROA	0.001	0.0488	0.000	0.0137	0.012	0.000	-2.644	.008***
LDR	0.758	0.3905	0.000	0.658	0.212	0.577	3.041	.003***
NPL	0.06	0.0979	0.000	0.074	0.086	0.000	-3.667	.000***
SIZE	3.499	0.7	0.0265	3.799	0.658	0.004	-1.663	.098*
DAR	0.71	0.2295	0.000	0.801	0.662	0.000	-3.156	.002***
OEOI	0.759	0.7498	0.000	0.609	0.171	0.000	0.320	.749
RAR	0.766	0.4775	0.000	0.7043	0.316	0.000	-1.974	.049**

CAR: Capital Adequacy Ratio; ROA: Return on Assets; LDR: Loan to Deposit Ratio; NPL: Non-performing Loans to Total Loans; SIZE: Natural Logarithm of Total Assets; DAR: Deposits to Total Assets Ratio; OEOI: Operating Expenses to Operating Income; RAR: Risk-weighted Assets to Total Assets.

\*\*\* Significant at 0.01 level, \*\*Significant at 0.05 level, \*Significant at 0.1 level

Regarding the portfolio risk, IBs hold less secure portfolios than their conventional counterparties. This is the result of different risk exposures of IBs, however, Kabir, Khan, & Paltrinieri (2019) found that IBs are better in managing their risks than CBs.

Finally, Independent t-test shows that there is a significant difference between CAR means in IBs and CBs. This result contradicts the finding of Sun et al. (2016) that shows that IBs and CBs in dual banking environments are not significantly different. In addition, it is inconsistent with the results of Louati et al. (2015) who found that although IBs are highly capitalized than CBs on average there is no significant difference in capitalization.

However, a research done by Olson & Zoubi (2008) in the Gulf Cooperation Council (GCC) region accentuated the ability to discriminate between both banking systems through financial indicators even if they follow the same regulations of Basel imposed by the central bank. This result is consistent with Ariss & Saredidine (2007) that each banking system should adhere to different regulatory standards that are tailored to its conceptual background. The results from the comparison in general is consistent with Beck et al., (2013) and shows that IBs are lower in cost efficiency but have higher asset quality and capitalization when



compared with CBs.

#### *4.2 Testing Association Between Dependent and Independent Variables*

Pearson correlation matrix is employed to explore direction and significance of relationship between CAR and the independent variables in both IBs and CBs. We can simply explore from it that there is no multi-collinearity between independent variables as there is no correlation greater than 0.8 (Field 2009, p.224).

##### 4.2.1 Islamic Banks

Islamic banks results are reported in table (4). Apparently, there is a statistical significant correlation between CAR and ROA, FDR, NPF, SIZE, DAR, and GDP. Profitability (ROA) results accentuated previous researches by having a significant positive correlation with CAR. The positive association indicates that IBs became more profitable due to the efficient management of their capital buffers. Liquidity risk (FDR) has a significant positive correlation with CAR. This result is consistent with previous researches as the increase in FDR means lowering the liquidity level and higher risks. This shows that IBs enhance their capital buffers when they face an increase in liquidity risk.

Credit risk (NPF) is significantly negatively correlated with CAR. The indication of this relation shows that IBs enhance neither their assets quality nor their capital buffers with the increase in credit risk. Bank size (SIZE) as expected has a significant positive relationship with CAR. Surprisingly CAR is negatively correlated with deposits to assets ratio (DAR). This result shows that IBs in MENA region are not increasing their capital buffers when increasing deposits. This may cause banks' failure to satisfy depositors' withdrawals which may expose shareholders to potential losses.

Gross domestic product growth rate (GDP) is positively associated with CAR and this result indicates that banks in countries with high GDP growth rates are more capable to efficiently manage their capital buffers. Finally, the matrix shows that there is no significant relationship between CAR and operational efficiency (OEOI), portfolio risk (RAR) and world governance indicators (WGI).

##### 4.2.2 Conventional Banks

Table (5) shows the correlation between CAR and the independent variables in the CBs' sample. Almost all the correlations are statistically significant except for OEOI. CAR has significant positive correlation with profitability (ROA). This result is consistent with previous literature. The rationale is that high profits expose the bank to high risks that should be reflected by an increase in CAR.

Table 4. Pearson's correlations matrix IBs

	CAR	ROA	LDR	NPL	SIZE	DAR	OEOI	RAR	GDP	WGI
CAR	1									
ROA	.198***	1								
FDR	.429***	.276***	1							
NPF	-.203***	-.568***	-.375***	1						
SIZE	-.236***	.233***	.276***	-.179**	1					
DAR	-.511***	.041	-.593***	.014	.208***	1				
OEOI	-.028	-.470***	-.300***	.599***	-.260***	-.01	1			
RAR	.088	-.279***	.345***	.270***	.159*	-.395***	.113	1		
GDP	.193**	.120	.202***	-.137*	.052	-.212***	-.075	.102	1	
WGI	.106	.047	.529***	-.223***	.561***	-.157*	-.152*	.414***	.241***	1

Significance Levels: \*\*\* Correlation is significant at the 0.01 level; \*\* Correlation is significant at the 0.05 level; and \* Correlation is significant at the 0.1 level.

Liquidity risk (LDR) is significantly negatively correlated and credit risk (NPL) is significantly positively correlated with CAR. This shows that CBs do not increase their capital buffer with respect to the increase in loans. However, they increase CAR when the credit risk rise as there is a significant positive relationship between CAR and NPL. The negative correlation of LDR with CAR contradicts with the expected correlation. This result is consistent with the findings of Shimizu (2015) in Japanese banks where banks with low capital surplus decompose their portfolios with assets having lower risk-weights without reducing total assets.

Table 5. Pearson's correlations matrix CBs

	CAR	ROA	LDR	NPL	SIZE	DAR	OEOI	RAR	GDP	WGI
CAR	1									
ROA	.164***	1								
LDR	-.282***	.118**	1							
NPL	.260***	-.393***	-.359***	1						
SIZE	-.369***	.210***	.472***	-.362***	1					
DAR	-.181***	-.097*	-.504***	.175***	-.063	1				
OEOI	-.084	-.605***	-.345***	.409***	-.492***	.195***	1			
RAR	-.306***	.058	.379***	-.345***	.200***	-.303***	-.158***	1		
GDP	-.115**	.157***	.007	-.212***	.055	-.033	-.083	.034	1	
WGI	-.121**	.225***	.709***	-.483***	.395***	-.510***	-.453**	.297***	.184***	1

Significance Levels:

\*\*\* Correlation is significant at the 0.01 level; \*\* Correlation is significant at the 0.05 level; and \* Correlation is significant at the 0.1 level.

Similar to IBs and consistent with literature CAR is negatively correlated with bank size (SIZE). CBs' CAR is significantly negatively correlated with deposits to assets ratio (DAR) like their Islamic counterparts. This shows that banks' in MENA region are not protecting their depositors with adequate capital buffers. However, the sample shows that both banking systems are adequately capitalized in general. Portfolio risk (RAR) has significant negative correlation with CAR. However, it is supposed to show a positive association as IBs and CBs should have to increase their capital due to any increase in the portfolio risk.

Finally, the two macroeconomic variables gross domestic product growth rate (GDP) and world governance indicators (WGI) are significantly negatively correlated with CAR. These are the expected correlations based on the previous literature and the research assumptions. In accordance to the Correlation Analysis *we can partially accept* the nine hypotheses as there are three independent variables (OEOI, RAR, and WGI) not significantly correlated with CAR in IBs, and in CBs most the independent variables are significantly correlated with CAR except OEOI.

#### 4.3 Study Results "Testing Hypotheses 10"

H10: All the research independent variables jointly have a significant impact on Islamic and conventional banks' CAR.

The researchers used regression analysis to test the significance of the independent variables in explaining the variance in CAR. Before running the regression model five diagnostic tests are conducted on the data: normality test, multicollinearity, heteroscedasticity, autocorrelation and heterogeneity (cross sectional correlation). These tests are conducted to make sure that the assumptions of the Ordinary Least Square have been met by the research data or not. The variance inflation factor (VIF) indicates whether there is a strong linear relationship between model's independent variables. If VIF is greater than or equal 10 this may be an indicator for biasness in the regression model (Sekaran & Bougie 2009, p.353). The VIF results for all variables are less than 5.

The tests reports that there is no homoscedasticity and the residuals do not have the same variance. Also there is autocorrelation in lag 1 and lag 2. The opportunity to use whether fixed or random effect is tests through Hausman test. The test suggested the use of fixed effect, however, based on (Bell et al., 2015), and due to heterogeneity, random effect is more suitable for its ability to solve the problem of heterogeneity bias and reducing the standard error.

Generalized Method of Moments (GMM) using random effect is employed to test for the 10<sup>th</sup> hypothesis. The GMM is used to overcome the endogeneity issue (Sun et al., 2016 and Ben, Mahdi, & Abbes, 2018) due to the potential autocorrelation problems and heterogeneity as a result of the dynamic nature of the panel data (Bitar & Tarazi, 2019) using the following equation:

$$Y_{it} = \beta_0 + Y_{(t-1)} + Y_{(t-2)} + \beta_1 X_{it} + \beta_2 X_{it} + \beta_3 X_{it} + \beta_4 X_{it} + \beta_5 X_{it} + \beta_6 X_{it} + \beta_7 X_{it} + \beta_8 X_{kt} + \beta_9 X_{kt} + e_{it}$$

$$\begin{aligned} \text{CAR} = & \text{CAR} (-1) + \text{CAR} (-2) + \text{ROA} + \text{LDR} + \text{NPL} + \text{SIZE} + \text{DAR} \\ & + \text{OEOI} + \text{RAR} + \text{GDP} + \text{WGI} + \text{C} \end{aligned}$$

Where:

- $Y_{it}$ : Denotes capital adequacy ratio as measured by Basel II guidelines for bank  $i$  at time  $t$ ,
- $\beta_0$ : Constant,
- $Y_{(t-1)}$ : lagged one year dependent variable (CAR),
- $Y_{(t-2)}$ : lagged two years dependent variable (CAR),
- $X1_{it}$ : Denotes return on assets for bank  $i$  at time  $t$ ,
- $X2_{it}$ : Denotes loans to deposits ratio for bank  $i$  at time  $t$ ,
- $X3_{it}$ : Denotes non-performing loans to total loans ratio for bank  $i$  at time  $t$ ,
- $X4_{it}$ : Denotes the natural logarithm of total assets for bank  $i$  at time  $t$ ,
- $X5_{it}$ : Denotes total deposits to total assets ratio for bank  $i$  at time  $t$ ,
- $X6_{it}$ : Denotes for operating expenses to operating income ratio for bank  $i$  at time  $t$ ,
- $X7_{it}$ : Denotes risk-weighted assets to total assets ratio for bank  $i$  at time  $t$ ,
- $X8_{kt}$ : Denotes the gross domestic product growth rate for country  $k$  at time  $t$ ,
- $X9_{kt}$ : Denotes an index of the six world governance indicators to assess governance quality for country  $k$  at time  $t$ ,
- $i$ : 38 Islamic banks and 75 conventional banks in ten MENA region countries,
- $t$ : From 2009 to 2013,
- $k$ : Denotes 10 countries in the MENA region, and
- $e_{it}$ : Denotes error term.

It is noticed that 2 years lagged capital adequacy ratios are endogenous variables. This problem is considered by using 2SLS estimator to take the endogeneity into account and producing consistent estimates (S. Ghosh, 2014). Table (9) shows that  $R^2$  and adjusted  $R^2$  values are higher for CBs than their Islamic counterparties. This means that the conventional regression model has a higher ability to explain variance in the dependent variable CAR. The Durbin Watson tests the serial correlation between errors in the model and it is close to 2 in both banking systems. Values less than 1 and greater than three are cause of concern (Field, 2009). Finally, the table shows that J-statistics, used for testing the overall fit of the model, are significant in both models.

#### 4.3.1 Regression Model Results for Islamic Banks

The following table (6) illustrates the GMM model analysis results. There are significant relationships between CAR and bank size, deposits to assets ratio, operational efficiency, and GDP. However, all other variables have no significant impact on CAR. CAR lag (1) and lag (2) have a significant positive relationship and this indicates that banks holding strong capital buffers previously will continue to be strong today and vice versa; so CAR is affected retroactively on the long-run. The lags are used to overcome the autocorrelation problems. Bank size (SIZE) measured by the natural logarithm of total assets shows a consistent result with almost all the previous literature.

Table 6. Multiple regression analysis results for IBs versus CBs

Independent Variables	Islamic Banks			Conventional Banks		
	Beta	t-value	Sig.	Beta	t-value	Sig.
(Constant)	0.151	1.210	0.198	-0.040	-0.547	0.584
CAR (-1)	0.452	5.960	0.000***	0.705	13.949	0.000***
CAR (-2)	0.116	2.322	0.023**	0.112	2.236	0.027**
ROA	0.036	0.105	0.917	0.716	3.782	0.000***
LDR-FDR	0.030	1.080	0.284	-0.024	-1.470	0.143
NPL-NPF	0.076	1.570	0.121	0.075	2.912	0.004***
Size	-0.004	-2.889	0.005***	-0.001	-1.898	0.059*
DAR	-0.099	-2.238	0.028**	-0.058	-1.295	0.197
OEOI	-0.047	-1.807	0.075*	-0.082	-4.307	0.000***
RAR	-0.016	-0.766	0.447	-0.019	-2.392	0.018**
GDP	0.115	2.576	0.012**	-0.181	-3.503	0.001***
IndexWGI	2.150	0.040	0.968	1.010	0.287	0.774
<b>Model Indicators</b>						
$R^2$	0.766			0.868		
Adjusted $R^2$	0.730			0.860		
Durbin Watson	2.206			2.276		
Probability of (J-statistics)	0.000***			0.000***		

\*\*\* Correlation is significant at the 0.01 level; Significance Levels: \*\* Correlation is significant at the 0.05 level; and \* Correlation is significant at the 0.1 level.

A deposit to assets ratio (DAR) has a significant negative impact on CAR. This result is an

indication of holding inadequate buffers to protect the depositors' rights. The b-coefficient indicates that an increase in DAR by 1 unit will result in a decrease in CAR by 0.099. Abusharba et al. (2013) found that there is no significant impact of deposits on CAR in Indonesian Islamic banks.

Operational efficiency (OEOI) is negatively correlated with CAR. This result accentuated the assumption that the higher operational efficiency and management soundness should be reflected by strong capital buffers. Gross domestic product (GDP) shows a positive significant effect on CAR. This result is not consistent with the previous studies. The interpretation may be that Islamic banks in low GDP countries adopt aggressive investment strategies that are risky in order to compete with their conventional counterparts. The risky investments apparently will decrease their capital buffers.

#### 4.3.2 Regression Model Results for Conventional Banks

The results showed a significant relationship between CAR and CAR lag (1), CAR lag (2), profitability, credit risk, bank size, operational efficiency, portfolio risk and GDP. CAR lag (1), CAR lag (2), SIZE, and OEOI show similar results to Islamic banks sample. Profitability measured by return on assets (ROA) has a significant positive impact on CAR accentuating that high returns results in high risks. The higher risks are reflected by adjusting CAR. This result is consistent with Büyükşalvarcı & Abdioğlu (2011) and Abusharba et al. (2013).

Credit risk (NPL) as expected has a significant positive impact on CAR. Portfolio risk measured by risk-weighted assets to total assets (RAR) has a significant negative impact on CAR. This indicates that conventional banks do not adjust their capital to increases in portfolio risk. GDP has significant negative impact on CAR. This correlation is consistent with literature as the higher economic stability the lower capital buffer needed due to higher security (Barrell & Gottschalk 2006 and Babihuga 2007).

Based on the regression results we can partially accept the tenth hypothesis because not all the variables have significant impact on CAR. In IBs profitability, liquidity risk, credit risk, portfolio risk, and world governance indicators are not statistically significant. On the other hand, in CBs liquidity risk, deposits to assets ratio, and world governance indicators are not statistically significant.

## 5. Conclusion

The main purpose of this paper is to explore whether the determinants of CAR are the same between IBs and CBs. The findings report different results for each banking system. The hypotheses from one to nine are partially accepted. Based on the regression results the 10<sup>th</sup> hypothesis is partially accepted because not all the variables significant impact on CAR. The results of the regression analysis are different between IBs and CBs. It showed that both IBs and CBs have a significant association between CAR and (size, OEOI, and GDP) and CAR is affected retroactively on the long-run. However, the results of IB only showed a significant negative association between CAR and deposits to assets ratio. The results show that IBs are not increasing their capital ratios when deposits increase. This result is consistent with the theoretical model of profit and loss sharing principle.

The results of CBs show an association between CAR and (profitability, credit risk, and portfolio risk). In IBs profitability, liquidity risk, credit risk, portfolio risk, and world governance indicators are not statistically significant. On the other hand, CBs liquidity risk, deposits to assets ratio, and world governance indicators are not statistically significant. These findings indicate that determinants of CAR are different between both banking systems. This calls for considering each system characteristics in measuring capital adequacy ratio. In addition, managements of IBs and CBs should consider the main determinants of CAR based on each banking characteristics.

The research presents a conclusion from the regression results in addition to the t-test result the view that both banking systems are based on different conceptual philosophies. The obligation to IBs to follow the regulatory standards CBs will hinder their stability and resilience. This result is consistent with Olson & Zoubi (2008) who accentuated the ability to discriminate between both banking systems through financial indicators even if they follow the same regulations of Basel imposed by the central bank. In addition, the results are consistent with Ariss & Sarieedine (2007) and (Abul Basher, Kessler, & Munkin, 2017) that each banking system should adhere to different regulatory standards that are tailored to its conceptual background. Alam, Zainuddin, & Rizvi (2019) confirm on the negative consequences on non-standardized regulations for IBs on their performance and that the factors differ significantly from one region to another.

Based on the study findings, it is suggested for Bank of International Settlement (BIS) to officially cooperate with Islamic Financial Services Board (IFSB) through Basel committee for Banking Supervision (BCBS) to enforce IFSB proposals. This could encourage central banks in different jurisdictions with dual banking systems to recognize IFSB adjustments and could be adopted for IBs. In addition, it will enhance IBs performance by not following the same regulatory standards of their conventional counterparties; however, they should adhere to the same regulatory bodies in order to stabilize the international financial system. These rules will enhance the soundness of IBs and remove the obstacles for fair competition between both banking systems.

## References

- Abdel Karim, R. A. (1996). The impact of the Basle capital adequacy ratio regulation on the financial and marketing strategies of Islamic banks. *International Journal of Bank Marketing*, 14(7), 32-44. <https://doi.org/10.1108/02652329610151368>
- Abdul Karim, M., Hassan, M. K., Hassan, T., & Mohamad, S. (2014). Capital adequacy and lending and deposit behaviors of conventional and Islamic banks. *Pacific Basin Finance Journal*, 28, 58-75. <https://doi.org/10.1016/j.pacfin.2013.11.002>
- Abul Basher, S., Kessler, L. M., & Munkin, M. K. (2017). Bank capital and portfolio risk among Islamic banks. *Review of Financial Economics*, 34, 1-9. <https://doi.org/10.1016/j.rfe.2017.03.004>
- Abusharba, M. T., Triyuwono, I., Ismail, M., & Rahman, A. F. (2013). Determinants of Capital Adequacy Ratio (CAR) in Indonesian Islamic Commercial Banks. *Global Review of Accounting and Finance*, 4(1), 159-170.

- Ahmad, R., Ariff, M., Skully, M. J., & Ahmad, R. (2008). Determinants of Bank Capital Ratios in a Developing Economy. *Asia-Pacific Financial Markets*, 15(3-4), 255-272.
- Ahmed, R., & Karim, A. (2006). Capital Adequacy in Islamic Banks. *International Journal of Theoretical and Applied Finance*, 9(3), 269-280.
- Alam, N., Binti Zainuddin, S. S., & Rizvi, S. A. R. (2019). Ramifications of varying banking regulations on performance of Islamic Banks. *Borsa Istanbul Review*, 19(1), 49-64. <https://doi.org/10.1016/j.bir.2018.05.005>
- Alexander, G. J., Baptista, A. M., & Yan, S. (2014). Bank regulation and international financial stability: A case against the 2006 Basel framework for controlling tail risk in trading books. *Journal of International Money and Finance*, 43, 107-130. <https://doi.org/10.1016/j.jimonfin.2014.01.001>
- Al-Sabbagh, N. M. (2004). Determinants of Capital Adequacy Ratio in Jordanian Banks. *Master Thesis*, Yarmouk University. Irbid, Jordan: Master Thesis in Yarmouk University.
- Al-Tamimi, K. A. M., & Obeidat, S. F. (2013). Determinants of Capital Adequacy in Commercial Banks of Jordan an Empirical Study. *International Journal of Academic Research in Economics and Management Sciences*, 2(4), 44-58. <https://doi.org/10.6007/IJAREMS/v2-i4/53>
- Altunbas, Y., Carbo, S., Gardener, E. P. M., & Molyneux, P. (2007). Examining the relationships between capital, risk and efficiency in European banking. *European Financial Management*, 13(1), 49-70. <https://doi.org/10.1111/j.1468-036X.2006.00285.x>
- Anginer, D., Demirgüç, A., & Mare, D. S. (2018). Bank capital, institutional environment and systemic stability. *Journal of Financial Stability*, 37, 97-106. <https://doi.org/10.1016/j.jfs.2018.06.001>
- Archer, S., & Karim, R. A. A. (2009). Profit-sharing investment accounts in Islamic banks: Regulatory problems and possible solutions. *Journal of Banking Regulation*, 10(4), 300-306. <https://doi.org/10.1057/jbr.2009.9>
- Archer, S., Karim, R. A. A., & Sundararajan, V. (2010). Supervisory, regulatory, and capital adequacy implications of profit-sharing investment accounts in Islamic finance. *Journal of Islamic Accounting and Business Research*, 1(1), 10-31. <https://doi.org/10.1108/17590811011033389>
- Ariss, R. T., & Sariaeddine, Y. (2007). Challenges in implementing capital adequacy guidelines to Islamic banks. *Journal of Banking Regulation*, 9(1), 46-59. <https://doi.org/10.1057/palgrave.jbr.2350059>
- Ashraf, D., Rizwan, M. S., & L'Huillier, B. (2016). A net stable funding ratio for Islamic banks and its impact on financial stability: An international investigation. *Journal of Financial Stability*, 25, 47-57. <https://doi.org/10.1016/j.jfs.2016.06.010>
- Aspal, P. K., & Nazneen, A. (2014). An Empirical Analysis of Capital Adequacy in the Indian Private Sector Banks. *American Journal of Research Communication*, 2(11), 28-42. Retrieved from [www.usa-journals.com](http://www.usa-journals.com)



- Ayadi, R., Naceur, S. Ben, Casu, B., & Quinn, B. (2016). Does Basel compliance matter for bank performance?. *Journal of Financial Stability*, 23, 15-32. <https://doi.org/10.1016/j.jfs.2015.12.007>
- Babihuga, R. (2007). Macroeconomic and financial soundness indicators: an empirical investigation. *IMF Working Paper* (pp. 7-115).
- Baldwin, K., Alhalboni, M., & Helmi, M. H. (2019). A structural model of “alpha” for the capital adequacy ratios of Islamic banks. *Journal of International Financial Markets, Institutions and Money*. <https://doi.org/10.1016/j.intfin.2018.12.015>
- Barrell, R., & Gottschalk, S. (2006). the Impacts of Capital Adequacy Requirements on Emerging Markets. *National Institute of Economic and Social Research*.
- Bateni, L., Vakilifard, H., & Asghari, F. (2014). The Influential Factors on Capital Adequacy Ratio in Iranian Banks. *International Journal of Economics and Finance*, 6(11), 108-116. <https://doi.org/10.5539/ijef.v6n11p108>
- Beck, T., Demirgüç-kunt, A., & Merrouche, O. (2013). Islamic vs . conventional banking : Business model , efficiency and stability. *Journal of Banking and Finance*, 37(2), 433-447. <https://doi.org/10.1016/j.jbankfin.2012.09.016>
- Bell, A., Jones, K., Steele, F., Clarke, P., Fairbrother, M., Leyland, A., ... Pluper, T. (2015). Explaining Fixed Effects: Random Effects Modeling of Time-Series Cross-Sectional and Panel Data. *Political Science Research and Methods*, 3(1), 133-153. <https://doi.org/10.1017/psrm.2014.7>
- Ben, I., Mahdi, S., & Abbes, M. B. (2018). Relationship between capital , risk and liquidity : a comparative study between Islamic and conventional banks in MENA region. *Research in International Business and Finance*, 45, 588-596. <https://doi.org/10.1016/j.ribaf.2017.07.113>
- Bitar, M., & Tarazi, A. (2019). Creditor rights and bank capital decisions: Conventional vs. Islamic banking. *Journal of Corporate Finance*, 55, 69-104. <https://doi.org/10.1016/j.jcorpfin.2018.11.007>
- Bitar, M., Hassan, M. K., & Hippler, W. J. (2018). The determinants of Islamic bank capital decisions. *Emerging Markets Review*, 35, 48-68. <https://doi.org/10.1016/j.ememar.2017.12.002>
- Bitar, M., Pukthuanthong, K., & Walker, T. (2018). The effect of capital ratios on the risk , efficiency and profitability of banks : Evidence from OECD countries. *Journal of International Financial Markets, Institutions & Money*, 53, 227-262. <https://doi.org/10.1016/j.intfin.2017.12.002>
- Bokhari, I. H., Ali, S. M., & Sultan, K. (2012). Determinants of Capital Adequacy Ratio in Banking Sector: An Empirical Analysis from Pakistan Ijaz Hussain Bokhari. *Academy of Contemporary Research Journal*, 2(1), 1-9.
- Boucinha, M., & Ribeiro, N. (2007). The Determinants of Portuguese Banks’ Capital Buffers. *Financial Stability Report*, 153-165.

Bulletin, I. F. (2016, March). Islamic Finance Bulletin March 2016. *Center of Research Excellence for Islamic Banking and Finance*.

Büyükşalvarcı, A., & Abdioğlu, H. (2011). Determinants of capital adequacy ratio in Turkish Banks : A panel data analysis. *African Journal of Business Management*, 5(27), 11199-11209. <https://doi.org/10.5897/AJBM11.1957>

Chernykh, L., & Cole, R. A. (2015). How should we measure bank capital adequacy for triggering Prompt Corrective Action? A (simple) proposal. *Journal of Financial Stability*, 20, 131-143. <https://doi.org/10.1016/j.jfs.2015.08.003>

Daher, H., Masih, M., & Ibrahim, M. (2015). The unique risk exposures of Islamic banks' capital buffers: A dynamic panel data analysis. *Journal of International Financial Markets, Institutions and Money*, 36, 36-52. <https://doi.org/10.1016/j.intfin.2015.02.012>

Demirgüç-Kunt, A., & Detragiache, E. (2011). Basel Core Principles and bank soundness: Does compliance matter?. *Journal of Financial Stability*, 7(4), 179-190.

El-Ansary, O. A., & Hafez, H. M. (2015). *Determinants of Capital Adequacy Ratio : an Empirical Study on Egyptian Banks*, 13(1), 806-816.

El-Masry, A., de Mingo-López, D. V., Matallín-Sáez, J. C., & Tortosa-Ausina, E. (2016). Environmental Conditions, Fund Characteristics, and Islamic Orientation: An Analysis of Mutual Fund Performance for the MENA Region. *Journal of Economic Behavior & Organization*, 132, 174-197. <https://doi.org/10.1016/j.jebo.2016.10.015>

Elsiefy, E. (2013). Determinants of profitability of commercial banks in Qatar. *International Journal of Economic and Management Sciences*, 2(11), 108-142.

Estrella, A., Park, S., & Peristiani, S. (2000, July). Capital Ratios as Predictors of Bank Failure. *Economic Policy*, 33-52.

Field, A. (2009). *Discovering Statistics Using SPSS* (3rd ed.). Sage.

Ghosh, A. (2015). Banking-industry specific and regional economic determinants of non-performing loans: Evidence from US states. *Journal of Financial Stability*, 20, 93-104. <https://doi.org/10.1016/j.jfs.2015.08.004>

Ghosh, S. (2014). Risk, capital and financial crisis: Evidence for GCC banks. *Borsa Istanbul Review*, 14(3), 145-157. <https://doi.org/10.1016/j.bir.2014.06.003>

Hassan, M. K., Khan, A., & Paltrinieri, A. (2019). Liquidity risk, credit risk and stability in Islamic and conventional banks. *Research in International Business and Finance*, 48, 17-31.

Hawary, D. El., Grais, W., & Iqbal, Z. (2004). Regulating Islamic Financial Institutions : The Nature of the Regulated By World Bank Zamir Iqbal Abstract World Bank Policy Research Working Paper 3227 , March 2004 institutions have been established to become focal points on major issues, in particular. *World Bank Policy Research Working Paper*, 3227, 1-49.

Islamic Financial Services Board (IFSB). (2018, December). *Revised Standard on Disclosures to Promote Transparency and Market Discipline for Institutions Offering Islamic Financial Services*.

- Islamic Financial Services Board. (2005, December). *Capital Adequacy Standard for Institutions (other than Insurance Institutions) offering only Islamic Financial Services*, p.71.
- Islamic Financial Services Board. (2015). Islamic Financial Services Industry Stability Report 2015. In *Annual Report*. <https://doi.org/10.1017/CBO9781107415324.004>
- Kabir, M. N., Worthington, A., & Gupta, R. (2015). Comparative credit risk in Islamic and conventional bank. *Pacific Basin Finance Journal*, 34, 327-353.
- Kleff, V., & Weber, M. (2004). How Do Banks Determine Capital ? - Empirical Evidence for Germany How Do Banks Determine Capital ? - Empirical Evidence for Germany. *Center for European Economic Research in Its Series ZEW Discussion Papers, No 03-66*.
- Kupiec, P. H., & Ramirez, C. D. (2013). Bank failures and the cost of systemic risk: Evidence from 1900 to 1930. *Journal of Financial Intermediation*, 22(3), 285-307. <https://doi.org/10.1016/j.jfi.2012.09.005>
- Louati, S., Gargouri Abida, I., & Boujelbene, Y. (2015). Capital adequacy implications on Islamic and non-Islamic bank's behavior: Does market power matter?. *Borsa Istanbul Review*, 15(3), 192-204. <https://doi.org/10.1016/j.bir.2015.04.001>
- Marques Pereira, J. A. C., & Saito, R. (2015). How banks respond to Central Bank supervision: Evidence from Brazil. *Journal of Financial Stability*, 19, 22-30. <https://doi.org/10.1016/j.jfs.2015.05.001>
- Massah, S. El, & Al-sayed, O. (2015). *Banking Sector Performance: Islamic and Conventional Banks in the UAE*. 36(1), 69-81.
- Mayes, D. G., & Stremmel, H. (2012, December). The Effectiveness of Capital Adequacy Measures in Predicting Bank Distress. *SUERF Working Paper*, 1-46. <https://doi.org/10.2139/ssrn.2191861>
- Mejia, A. L., Aljabrin, S., Awad, R., Norat, M. M., & Song, M. I. (2014). Regulation and Supervision of Islamic Banks. *IMF Working Paper, WP/14/219*, 33.
- Mili, M., Sahut, J. M., Trimeche, H., & Teulon, F. (2017). Determinants of the capital adequacy ratio of foreign banks' subsidiaries: The role of interbank market and regulation. *Research in International Business and Finance*, 42, 442-453. <https://doi.org/10.1016/j.ribaf.2016.02.002>
- Montes, C. P., Artigas, C. T., Cristófoli, M. E., & Segundo, N. L. S. (2016). The impact of the IRB approach on the risk weights of European banks. *Journal of Financial Stability*. <https://doi.org/10.1016/j.jfs.2016.11.004>
- Muljawan, D., Dar, H. A., & Hall, M. J. B. (2004). A capital adequacy framework for Islamic banks: the need to reconcile depositors' risk aversion with managers' risk taking. *Applied Financial Economics*, 14(6), 429-441. <https://doi.org/10.1080/09603100410001673667>
- Narayan, P. K., & Phan, D. H. B. (2019). A survey of Islamic banking and finance literature: Issues, challenges and future directions. *Pacific Basin Finance Journal*, 53, 484-496. <https://doi.org/10.1016/j.pacfin.2017.06.006>

- Olson, D., & Zoubi, T. A. (2008). Using accounting ratios to distinguish between Islamic and conventional banks in the GCC region. *International Journal of Accounting*, 43(1), 45-65.
- Pessarossi, P., & Weill, L. (2015). Do capital requirements affect cost efficiency? Evidence from China. *Journal of Financial Stability*, 19, 119-127. <https://doi.org/10.1016/j.jfs.2014.11.002>
- Polat, A., & Al-khalaf, H. (2014). What Determines Capital Adequacy in the Banking System of Kingdom of Saudi Arabia? A Panel Data Analysis on Tadawul Banks. *Journal of Applied Finance & Banking*, 4(5), 27-43.
- Rahman, M. M., Zheng, C., Ashraf, B. N., & Rahman, M. M. (2018). Capital requirements , the cost of financial intermediation and bank risk-taking: Empirical evidence from Bangladesh. *Research in International Business and Finance*, 44, 488-503.
- Reuters, T. (2015). State of the Global Islamic Economy Report 2015/16. In *Thomson Reuters*. Retrieved from <http://halalfocus.net/uae-state-of-the-global-islamic-economy-report-2015-2016/>
- Reuters, T. (2017). The State of the Global Islamic Economy Report 2017/18. *Outpacing the Main Stream*. Retrieved from <https://www.zawya.com/mena/en/ifg-publications/ifgRegister/231017085726C/>
- Sekaran, U., & Bougie, R. (2009). *Research Methods for Business: A Skill-Building Approach* (5th ed.). New York: John Willey and Sons.
- Shimizu, K. (2015). Adjusting denominators of capital ratios: Evidence from Japanese banks. *Journal of Financial Stability*, 19, 60-68. <https://doi.org/10.1016/j.jfs.2015.05.005>
- Srairi, S. (2013). Ownership structure and risk-taking behaviour in conventional and Islamic banks: Evidence for MENA countries. *Borsa Istanbul Review*, 13(4), 115-127.
- Sun, P. H., Mohamad, S., & Ariff, M. (2016). Determinants driving bank performance: A comparison of two types of banks in the OIC. *Pacific-Basin Finance Journal*.
- Thomas, M. A. (2010). What Do the Worldwide Governance Indicators Measure?. *European Journal of Development Research*, 22(1), 31-54. <https://doi.org/10.1057/ejdr.2009.32>
- Yanikkaya, H., Gumus, N., & Pabuccu, Y. U. (2018, January). How profitability differs between conventional and Islamic banks: A dynamic panel data approach. *Pacific-Basin Finance Journal*, 48, 99-111. <https://doi.org/10.1016/j.pacfin.2018.01.006>

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