Nor Halida Haziaton MOHD NOOR, Mohammed Hariri BAKRI, Wan Yusrol Rizal WAN YUSOF, Nor Raihana Asmar MOHD NOOR, Nurazilah ZAINAL / Journal of Asian Finance, Economics and Business Vol 7 No 11 (2020) 747–757

747

The Impact of the Bank Regulation and Supervision on the Efficiency of Islamic Banks*

Nor Halida Haziaton MOHD NOOR[1], Mohammed Hariri BAKRI[2], Wan Yusrol Rizal WAN YUSOF[3],

Nor Raihana Asmar MOHD NOOR[4], Nurazilah ZAINAL[5]

Abstract

This study investigates the impact of bank regulation and supervision on the efficiency of banking sectors on 108 Islamic banks from 26 countries offering Islamic banking and finance products and services. The technical efficiencies of individual Islamic banks have been analyzed using the data envelopment analysis method (DEA). The ordinary least square estimation method is employed to examine the impact of country supervision and regulation on the technical efficiency of Islamic banks. The empirical findings suggest that supervisory power, activity restrictions and private monitoring positively influence the efficiency of Islamic banks. The study revealed that Islamic banks that are operating in Middle East and North Africa (MENA) and middle-income countries are more technically efficient given the less stringent rules on capital requirement and we found that there is statistically significant evidence that higher capital requirements are negatively associated with the efficiency of Islamic banks. The empirical findings of this study are expected to help policy-makers and government officials to better understand how their decisions affect the performance.

[1]First Author. Senior Lecturer, Faculty of Business and Management, UiTM Kelantan, Malaysia. Email: halley2302@yahoo.com
[2]Corresponding Author. Associate Professor, Faculty of Technology Management and Technopreneurship, Universiti Teknikal Malaysia, Melaka, Malaysia [Postal Address: Hang Tuah Jaya, Durian Tunggal, Melaka,76100, Malaysia]
Email: hariri@utem.edu.my
[3]Senior Lecturer, Faculty of Business and Management, UiTM Kelantan, Malaysia. Email: wanyusrol@uitm.edu.my
[4]Senior Lecturer, Faculty of Business and Management, UiTM Kelantan, Malaysia. Email: raihana6791@kelantan.uitm.edu.my
[5]Senior Lecturer, Faculty of Business Administration, UiTM Seremban, Malaysia Email: nuraz3169@uitm.edu.my

1. Introduction

Dual banking environment as pioneered by the Dubai Islamic Bank, was a move by private Islamic banks towards maximizing profitability by offering consumer products and banking services. The Dubai Islamic Bank positions itself as innovative and flexible by offering both an 'Islamic Window' and traditional banking, making available Shariah compliant products and services. Like other financial institutions, risk is among the main challenges and needs to be addressed properly by Islamic banks to make sure that they operate efficiently (Widarjono et al., 2020). This study sheds light on the efficiency of Islamic banks by examining the determinants of the efficiency of Islamic banks. We determine the technical efficiency scores of 108 Islamic banks operating in 26 countries, post which we regress the technical efficiency scores as the dependent variable against the bank-specific, country-specific variables and banking regulations and supervision variables in association with Basel II's tenet in order to determine the impact towards

the efficiency of Islamic banks during the period 2004-2010. To account for Basel II's pillars on bank regulations and supervision, the study uses the data from Barth et al., (2008, 2013) World Bank database. In this study, we perform two stages of analysis of which the first stage is technical efficiency (DEA) and univariate analysis and the second stage is multivariate regression analysis. For estimating efficiency, we perform the first stage analysis where we established non-parametric methods (DEA) to set up the efficiency examination, and these scores are used in static panel data models to discover the impact of regulations and supervision on the level of Islamic bank efficiency (Alam and Al-Amri, 2020).

2. Literature Review

Generally, efficiency in economics refers to the efficiency of a system to generate maximum output from the inputs. The efficiency of a system is reflected in the way it is able to increase output with the same input or in the way it is able to maintain the same output with reduced input. Chortareas et al., (2010) maintain that the efficiency of banks can be enhanced with the existence of stronger capital restrictions and official supervisory powers.

Iqbal and Molyneux (2005) provide three reasons for stressing the importance of investigating the efficiency of Islamic banking. First, enhancing cost efficiency leads to higher profits and enhances the possibility of survival, should there be deregulations and market competition.

The literature on Islamic banking offers research from emerging markets and less developed countries while conventional banking literature contains reports from both developed and less developed countries. The bulk of the research shows that in the evaluation of Islamic banking performance, the focus has been primarily on profitability helped by financial ratios (Idris et al., 2016). This method has been employed by numerous researchers in their comparisons of the performances of Islamic banks and conventional banks (Samad and Hassan, 1999; Iqbal, 2001; Haron, 2004; Hassan and Bashir, 2005). On the other hand, this approach is hampered by the time span as well as the existence of some Islamic banks (Samad and Hassan, 1999; Iqbal 2001).

In summary, the above literature reveals the following research gaps. First, the majority of these studies have mainly concentrated on the technical, cost, or profit efficiency of the Islamic and conventional banks (Isik and Hassan, 2002; Hassan and Hussein, 2003; Yudistira, 2004). Overall, only few studies have addressed the issues of cost, revenue and profit efficiency of Islamic banks (Yudistira, 2004; Hassan, 2005; Brown and Skully, 2005). This limitation is somewhat surprising given the fact that revenue inefficiency has been found to be the main problem resulting in lower profit efficiency levels (Kamarudin et al., 2014; Kamarudin et

al., 2017; Sufian et al., 2012). Second, empirical evidence on the impact of regulation and supervision on the banking sector is scarce and is completely missing within the context of the Islamic banking sector. Within the context of the banking sector, the earlier studies by Bitar et al., (2015) rely on ordinary least squares (OLS) which contains many assumptions that have to be fulfilled. This paper will proceed with panel data to do analysis which is more rigorous.

3. Data and Methodology

We gather data on 108 Islamic banks from 26 countries for the period 2004-2010. The primary source of financial data is the BankScope database, while the IMF Financial Statistics (IFS) and the World Bank World Development Indicator (WDI) databases are the main source for the macroeconomic and market indicators. We retrieve the account for Basel II's pillars on bank regulations and supervision from the study which follows the regulations and supervision variables (Barth et al., 2004). The data for regulations and supervision variables are provided by the World Bank through two set of surveys which are: The World Bank Regulations and Supervision Survey (2008) to cover the data from year 2004-2007 and the World Bank Regulations and Supervision Survey (2011) to cover the data from year 2008-2010.

The advantages of this database are its wide coverage (more than 100 countries) and the measurement of many aspects of the regulatory environment. The data will be pooled across the selected countries and utilized in the intermediation approach with assumption that all banks will have certain amount of regulated framework and all will have to utilize capital, assets and some form of liabilities to function (Ismail et al., 2014). The data covers the period from 2004 to 2010.

3.1. Data Envelopment Analysis

In this study, we will calculate DEA efficiency scores by using DEA method. Three types of scores are in estimates efficiency: (1) Technical efficiency (TE), (2) pure technical efficiency (PTE) and (3) scale efficiency (SE). The DEA method of evaluating efficiency has its basis in Farrell's (1957) work and continued by Charnes et al., (1978) and Banker et al., (1984). Charnes et al., (1978) were the first to use the term DEA whereby they introduced a model that had an input-oriented and assumed constant returns-to-scale (CRS). This method is named after the researchers Charnes-Cooper-Rhodes and is referred to as the CCR model. The DEA method permits an evaluation of the technical efficiency performance of an existing technology in relation to an ideal, best practice or frontier technology (Coelli et al., 1998) to frontier, which refers to technology or production frontier that shows the most technically efficient mix of inputs and

outputs. Each DMU is acquired as a maximum of a ratio of weighted outputs to weighted inputs, in which the greater the outputs derived from given inputs, the more efficient is the production. The weights for the ratio are determined by restricting the ratios for all DMUs to be less than or equal to unity. Banker, Charnes and Cooper in 1984 introduced a model with variable return to scale under input orientation as an extension of the CCR model by utilising the CRS assumption. The resulting BCC model was employed to evaluate the efficiency of DMUs typified by variable returns to scale (VRS). Banker et al., (1984) proposed that VRS breaks down total TE into two parts. The first is TE under VRS or pure technical efficiency (PTE) and it is related to how managers are able to use DMUs' given resources. The second is SE and it means investigating scale economies by operating at a point where the production frontier shows CRS. If the TE and PTE scores of a specific DMU are different, it indicates the presence of scale inefficiency.

3.2. The Choice of Approach, Inputs, and Outputs Variables

In the efficiency literature, there is no consensus on the input and output variable selection and there is no restriction that one must use particular inputs or outputs (Berger & Humphrey, 1997). There are a few approaches that define the input and output variable section in the banking efficiency analysis. These are production approach, intermediation approach, value-added approach and operating approach.

In the intermediation approach, banks are the intermediaries between savers (surplus of funds party) and borrowers (deficit of funds party). The inputs for this approach are all type of sources of funds and the outputs include all types of lending products. The production approach is used to the study the efficiency of the bank branches while the intermediation approach is used for empirical studies at the bank or industry level.

Our analysis uses a variant of the intermediation approach by following the commonly accepted intermediation proposed by Sealey and Lindley (1977). This approach assumes that banks act as an intermediary between the borrower and depositors which is more consistent with the function of banks. The approach views banks as financial intermediaries whose primary business is to borrow funds from depositors and lend those funds to others for profit. Berger and Humphrey (1997) state that 'this approach has been found to be more relevant for financial institutions…' (Duong et. al., (2020)

In this study, the banks' inputs are total deposits (X1) and includes deposits from customers and other banks, fixed assets (X2) which are measured by the book value of property and capital, general and administration expenses (X3) which

Table 1: Descriptive Statistics for the DEA Input and Output Variable

	Mean	**Median**	**SD**
Total Deposits	6384.73	682.98	6807.57
Fixed Assets	267.65	13.78	422.77
General and Administration Expenses	74.62	8.68	90.94
Total Loans	5123.83	494.99	5333.23
Investments	855.05	128.31	850.43

Note: All variables are reported in USD millions at 2011 prices. The number of observations in each year is 756 observations of 108 Islamic bank.

include total expenditures on employees such as salaries, employee benefits and reserves for retirement pay. Whilst the banks' outputs are loans (Y1) which includes financing to customers and other banks, investments (Y2) which includes income derived from investment of depositors' fund and other income from Islamic banking operations. Islamic banks do not offer loans as the conventional banks, however, the term total loans is a generic term used to encompass the equity financing products that the Islamic banks use. Descriptive statistics of the DEA variables are presented in Table 1.

3.3. Multivariate Panel Regression Analysis

In the second stage, an investigation of the possible determinants of technical efficiency scores of Islamic banks is undertaken. The modeling framework is built from the approaches suggested by Chortareas et al., (2011) and we follow the regulatory and supervision variables of Barth et al., (2008, 2013).We consider three broad categories, the characteristics of the individual banks (bank-specifics), the characteristics of macroeconomics (country-specifics) and the characteristics of banking regulations and supervision (Basel II pillars). We incorporate *Bank Specifics$_{j,t}$* vector for bank-specific variables, *Country Specifics$_t$* vector for country specific controls and *Bank Regulations and Supervision$_t$* vector to account for Basel II's pillars on bank regulations and supervision variables. The variables in the vectors are as follows:

$$Bank\ Specifics_{j,t} = \ln(SIZE_{j,t} + EQASS_{j,t} + LOANSTA_{j,t} + LNIETA_{j,t})$$

$$Country\ Specifics_t = \ln(GDP_t + INFL_t + CR3_t + Z\text{-}SCORE_t)$$

$$Bank\ Regulations\ and\ Supervision_t = \ln(SPOWER_t + CAPRQ_t + PRMONIT_t + ACTRS_t)$$

750

Nor Halida Haziaton MOHD NOOR, Mohammed Hariri BAKRI, Wan Yusrol Rizal WAN YUSOF, Nor Raihana Asmar MOHD NOOR,
Nurazilah ZAINAL / Journal of Asian Finance, Economics and Business Vol 7 No 11 (2020) 747–757

Where, *j* denotes *bank*, *t* denotes time period, *Bank Regulations and Supervision$_t$* denotes vector of bank regulatory, *Bank Specifics$_{j,t}$* denotes vector of bank-specific variables and *Country Specifics$_t$* denotes vector of country-specific control variables or macroeconomic and financial markets condition. We use log-linear form for the variables similar as De Bandt and Davis (2000) and Staikouras et al., (2008) among others. According to them, the log-linear form has advantages as it typically improves the regression's goodness of fit and may reduce simultaneity bias.

To investigate the determinants of Islamic bank's efficiency, we construct a model as follow:

$$TE_{j,t} = \beta_1 \sum_n^4 Bank\ Specifics_{j,t}$$
$$+ \beta_2 \sum_n^4 Country\ Specifics_t$$
$$+ \beta_3 \sum_n^4 Bank\ Regulation\ and\ Supervision_t + \varepsilon_{j,t}\ (1)$$

Where $TE_{j,t}$ is the technical efficiency, *Bank Specifics$_{j,t}$* is a vector of bank specific characteristics *Country Specifics$_t$*, is a vector of macroeconomic and financial market condition variables, *Bank Regulation and Supervision$_t$* is a vector to account for Basel II's pillars on bank regulations and supervision, *n* is number of observations, $\varepsilon_{j,t}$ is the error term, and the subscripts '*j*' and '*t*' represent individual financial institutions and time period, respectively.

Expanding the *Model 1*, we are going to estimate regression models which are:

$$(TE)_{j,t} = \alpha + \beta1\ ln(EQASS)_{j,t} + \beta2\ ln(LOANSTA)_{j,t}$$
$$+ \beta3\ ln(TA)_{j,t} + \beta4\ ln(NIETA)_{j,t} + \Upsilon1\ ln(GDP)_{j,t}$$
$$+ \Upsilon2\ ln(INFL)_{j,t} + \Upsilon3\ ln(CR3)_{j,t}$$
$$+ \Upsilon4\ ln(Z\text{-}SCORE)_{j,t} + \delta1\ ln(SPOWER)_{j,t}$$
$$+ \delta1\ ln(LCAPRQ)_{j,t + \delta1ln(LACTRS)\ j,t}$$
$$+ \delta1\ ln(LPRIMON)_{j,t} + \mathcal{E}_{j,t} \qquad (2)$$

3.4. Description of Variables Used in the Panel Regression Models

We include four bank specific and four macroeconomic condition variables in the panel regression analysis. To address the issue of whether country regulation and supervision matters for bank efficiency, we re-estimate equation (2) to include the four dimensions of a country's bank regulation and supervision indicators.

3.5. Bank Specific Characteristic Variables

We include the natural logarithm of The EQASS (Equity over Total Assets) variable in the regression models to examine the relationship between Islamic bank's efficiency and capitalization. The ratio measures the degree of risk taken by bank managers, as higher leverage increases the risk of insolvency which can result in greater borrowing cost (Berger and Mester, 1997). Moreover, higher level of capitalization may reflect higher incentives from the stockholders to monitor management, thus, resulting in alleviating the efficiency problem caused by conflict of interest (Eisenbeis et al., 1999). The LOANSTA (Loans to Total Assets) ratio is to account for the level of liquidity, which proxies for differences in bank assets. Liquid assets reduce banks' liquidity risk, however, banks have to incur an opportunity cost for holding liquid assets. This could hamper their cost efficiency and adversely affect their competitive viability. Therefore, positive relationship between liquidity and efficiency is expected. Berger and Mester (1997) reported that loan to asset ratio is significantly negatively related to cost efficiency and significantly positively related to profit efficiency. Pasiouras and Kosmidou (2007) and Kosmidou (2008) among others have found poor expenses management and non-interest expenses to total assets (NIETA) as among the main contributors to poor banks performance. Clearly, efficient cost management is a prerequisite for the improved efficiency of the Islamic banking sectors and Islamic banks have much to gain if they improve their managerial practices. Furthermore, most of the Islamic banking sectors have not reached the maturity level required to link quality effects from increased spending to higher efficiency. Molyneux and Thornton (1992) found a positive relationship between higher spending and productivity and suggested that high bank profits may be appropriated in the form of higher payroll expenditures paid to the more productive human capital.

3.6. Macroeconomic and Market Condition Variables

The gross domestic production (GDP) is a macroeconomic variable used to control for local economic condition. It is also expected to capture the implications for bank efficiency stemming from operating in different economic environment, as demand for financial products depend on the level of economic activity. Generally, higher economic growth encourages bank to lend more and permits them to charge higher margins, as well as improving the quality of their assets. Gross domestic product was used as one of macroeconomic-specific factor. The empirical finding by Maudos et al., (2002) who performed cost efficiency analysis, provide evidence to show that GDP can be negatively associated with bank efficiency. Another important external condition which may affect the efficiency of banks is the inflation rate. Staikouras and Wood (2003) suggest that inflation may have direct effect i.e., increase in the price of labour and indirect effect i.e., change in interest rate and asset price.

Perry (1992) states that the effects of inflation on bank performance depend on whether the inflation is anticipated or unanticipated. In the anticipated case, the interest rates are adjusted accordingly, resulting in revenue increase faster than costs and subsequently leading to a positive impact on performance. To control for macroeconomic risk, we include the consumer price index growth rate (lnINFL) as a control variable. The impact of inflation on bank performance may be positive if the rate of inflation is anticipated and banks are able to adjust interest rates accordingly, resulting in revenues to increase faster than costs. The CR3 variable measured as the concentration ratio of the three largest banks in terms of assets is introduced in the regression model. There are two competing theories exploring the relationship between the level of concentration in the banking industry and bank performance. According to the Structure Conduct Performance (SCP) theory, higher concentration boosts bank performance, since more concentration might imply greater market power and ability to generate higher profits. Insolvency risk indicates banks' distance from failure and the probability of risk of insolvency is proxied by the Z-score. Banks insolvency problem reveal the degree of exposure to losses or failure, which will reduce bank capital reserves, which could be used to offset adverse shock. Higher values of the Z-score are associated with lower probabilities of failure or more stable bank whereby lower values Z-score implies a riskier bank. Thus, the more volatile the asset returns, the lower the Z-score.

3.7. Regulation and Supervision Variables

We introduce the four country regulation and supervision indicators. To measure the impact of supervisory power, capital requirement, activity restrictions and private monitoring variable is included in regression model 2. Theoretical studies have emphasized the relative importance of supervisory power towards the banks' performance. Official supervision can reduce market failure by monitoring and disciplining banks, thus, weakening corruption in bank lending and improving the functioning of banks as intermediaries (Beck et al., 2006). Nevertheless, powerful supervisors may exert a negative influence on bank performance. There are many of the studies that give contradictory empirical results between the bank performance and the official supervisory power. The study by Barth et al., (2004) indicates that there is no strong association between bank performance and development and official supervisory power. However, the results of Barth et al., (2002) show that the more powerful government supervisors are associated with higher levels of non-performing loans while the results of Pasiouras et al., (2006) also indicate a negative relationship between supervisory power and overall bank soundness.

Theoretically, Barth, Caprio, and Levine (2006) mentioned that the capital adequacy requirements prompt bank to be more careful in lending, and it considers as a buffer against losses and consequently, protects banks form failure. On another hand, Barth, Caprio, and Levine (2008) argued that although many countries strengthen capital regulations based on Basel guidelines, the banking system stability and efficiency were not affected, but in some cases affected negatively as a result of banks shifting toward risky behavior. However, Barth et al., (2013) found a significant positive relationship between capital requirements and banks' efficiency, which suggest that the higher capital stringency the higher banks' efficiency. Moreover, Pasiouras et al., (2009) found a significant and negative relationship between capital requirement and cost inefficiency, and positive relationship between capital requirements and profit inefficiency. They argued for increasing cost efficiency of the bank due to the increasing cost of capital, and reducing profit efficiency resulting from replacement loans with another type of financial assets to meet capital requirements.

Activity restrictions is an indicator of the degree to which banks may engage in real estate investment, insurance underwriting and selling, underwriting, brokering and dealing in securities and all aspects of the mutual fund industry. In a recent finding by Barth et al., (2010) who conducted the non-parametric frontier analysis based on an international sample of 4050 bank observations operating in 72 countries during 1999-2007 indicate that tighter restrictions on bank activities also exert a negative impact on bank efficiency, while greater capital restrictions are marginally and positively associated with bank efficiency. The evidence broadly supports the role of market discipline. The findings by Chortareas et al., (2011) in their study of commercial banks efficiency for a sample of 22 EU countries over 2000-2008 by employing DEA technique also supports the above studies, as they also provide supporting evidence that restricting banks from engaging in security activities is also strongly associated with lower bank efficiency (Bakri et al., 2018). Private monitoring is measured as the degree of information that is released to officials and the public, relating to audit related requirements and credit ratings (Al-Lamy et al., 2018). According to Barth et al., (2006, 2004a), private monitoring by the government can significantly enhance the bank efficiency. This is supported by Pasiouras (2008) where his study has showed that encouraging and facilitating private monitoring of banks can increase efficiency. Demirguc-Kunt and Levine (1999) point out that underdeveloped financial system is much less likely to have high accounting standards. Barth et al., (2004) also find that regulations that encourage and facilitate private monitoring of banks are associated with greater bank development, lower net interest margins and small non-performing loans. Qian and Strahan (2005) posit that loan concentration is higher, loan maturity is longer and financial covenants are more common when the accounting framework results in better information for investors.

4. Empirical Results

4.1. Efficiency of Islamic Banks

It is also interesting to examine efficiency of Islamic banking sectors of the three continents, according to the countries' income levels. Therefore, in the subsequent section, we divide the sample into three major groups, namely high-income, middle-income, and low-income countries. The summary of technical efficiency, pure technical efficiency, and scale efficiency estimates are given in Table 2. The empirical findings presented in Table 2 seem to suggest that the Islamic banking sector of the high-income countries has consistently exhibited a higher level of technical efficiency compared to low and middle-income countries Islamic banking sectors. During the period under study, the empirical findings indicate that the inefficiency of the high-income country Islamic banking sector stems mainly from scale rather than pure technical. If anything could be delved, the empirical findings seem to suggest that the Islamic banking sector of the high-income countries has been relatively managerially efficient in controlling their operating costs, but have been operating at a relatively non-optimal scale of operations.

Table 2: Summary of Efficiency Scores- Analysis by Income Levels

The table presents the mean technical efficiency (TE) scores, along with its mutually exhaustive pure technical efficiency (PTE) and scale efficiency (SE) components of the world Islamic banking sectors during the period 2004-2010. Panel A to G shows the mean TE, PTE, and SE values for the years 2004 to 2010. Panel H presents the mean scores of TE, PTE, and SE during all years. The TE, PTE, and SE scores are bounded between 0 and 1.			
	No. Of Banks	**Technical Efficiency**	**Pure Technical Efficiency**	**Scale Efficiency**
Panel A: **2004**				
Low-income	2	0.501	0.925	0.538
Middle-income	25	0.707	0.964	0.734
High-income	12	0.929	0.960	0.966
Panel B: **2005**				
Low-income	3	0.525	0.781	0.710
Middle-income	36	0.618	0.781	0.786
High-income	19	0.564	0.891	0.624
Panel C: **2006**				
Low-income	3	0.290	0.871	0.340
Middle-income	46	0.537	0.858	0.622
High-income	21	0.592	0.845	0.688
Panel D: **2007**				
Low-income	3	0.280	0.814	0.346
Middle-income	55	0.501	0.811	0.601
High-income	24	0.575	0.782	0.744
Panel E: **2008**				
Low-income	3	0.222	0.784	0.284
Middle-income	63	0.369	0.759	0.504
High-income	30	0.486	0.688	0.741
Panel F: **2009**				
Low-income	3	0.288	0.734	0.393
Middle-income	61	0.415	0.762	0.566
High-income	31	0.465	0.673	0.714
Panel G: **2010**				
Low-income	3	0.196	0.668	0.305

Table 2: Continued

Middle-income	53	0.377	0.713	0.558
High-income	30	0.410	0.657	0.668
Panel H: **All Years**				
Low-income	20	0.329	0.797	0.417
Middle-income	339	0.503	0.807	0.624
High-income	167	0.574	0.785	0.735

Note: The low-income countries are Gambia, Palestinian Territory and Bangladesh, the middle-income countries are Egypt, Iran, Iraq, Jordan, Lebanon, Mauritania, Sudan, Syria, Tunisia, Yemen, Indonesia, Malaysia, Pakistan, Russian Federation and Turkey while Bahrain, Kuwait, Qatar, Saudi Arabia, UAE, Brunei Darussalam, Singapore and United Kingdom are the high-income countries.

Table 3: Panel Regression Analysis: Banking Regulations and Supervision

	Pooled OLS	Fixed Effect	Random Effect
Constant	-2.4458 (-1.52)	51.4163*** (4.16)	-2.43070 (-1.06)
Llonansta	0.1555*** (4.82)	0.0738 (1.51)	0.1434*** (3.77)
Leqass	-0.0003 (-0.01)	-0.1779 (-1.63)	-0.0620* (-0.91)
Lnieta	-0.2562*** (-4.85)	-0.1743** (-2.47)	-0.2500*** (-4.270)
Lnta	0.0600*** (3.40)	-0.1201 (-1.27)	-0.0325* (-1.15)
Linfl	-0.2241*** (-5.67)	-0.1027** (-2.21)	-0.2085*** (-5.23)
Lngdp	-0.752* (-1.92)	-2.1064*** (-4.30)	-0.0810 (-1.33)
Lcr3	-0.05563 (0.35)	-0.01544 (-0.05)	0.2589 (1.15)
Lzsore	0.1090 (1.64)	-0.2329* (-1.84)	-0.0488* (-0.56)
Lspower	1.0178*** (6.64)	-0.0302 (-0.11)	0.9184*** (4.98)
Lcaprq	-0.2236** (-3.16)	-0.0683 (0.75)	-0.2264** (-3.11)
Lactrs	0.3806* (1.96)	-0.0717 (4.55)	0.1743* (0.87)
Lprimon	0.936*** (4.31)	-0.0170 (-0.06)	0.6665** (2.66)
BP-LM	125.76***	-	-
Hausman	-	-	50.29***
R²	0.3701	0.0277	0.3468
Adjusted R²	0.3560	-	-
F-statistic	26.37***	7.77***	-
Wald Chi Square			100.07***
No of observation	414	414	414

* Note Value in parenthesis () are t statistic except for FE, it is z statistic.
***, ** and * indicates significant at 0.01, 0.05 and 0.10 level respectively

From Table 2, it can also be observed that the Islamic banking sectors of the middle-income countries have exhibited a mean technical efficiency of 50.3%. The findings seem to suggest that the Islamic banking sector of the middle-income countries could have produced the same level of outputs by using only 50.3% of the inputs it employs without having any detrimental impact on the output levels. Interestingly, like their counterparts from the high-income countries, the empirical findings indicate that scale inefficiency outweighs pure technical inefficiency in determining the total technical inefficiency of the middle-income countries' Islamic banking sectors.

During the period under studies, the empirical findings from this study seem to suggest that the Islamic banking sectors of low-income countries have been the least efficient. It is observed from Table 2 that the inefficiency of the Islamic banking sector in low-income countries arises mainly from scale inefficiency rather than pure technical inefficiency. If anything could be probed, the findings clearly suggest that the Islamic banking sectors of low-income countries have been managerially efficient in controlling their operating cost but have not been operating at optimal scale relatively.

4.2. Determinants of the Efficiency of Islamic Banking

The empirical findings presented in Table 5 clearly suggest that the impact of SPOWER variable is positive towards the efficiency of the Islamic banks (statistically significant at 1% level in the random effect regression model). The empirical findings corroborate the studies done by others like Demirguc-Kunt and Detragiache (2002), Beck et al., (2006), Pasiouras (2008) and Chortareas et al., (2012). Thus, we find evidence to support the argument of the official supervision approach that powerful official supervision fosters bank stability and efficiency. The empirical findings presented in Tables 5 also clearly suggest that the impact of LCAPRQ variable is negative towards the efficiency of the Islamic banks (statistically significant at 5% level in the random effect regression model).

The empirical findings corroborate the other studies like Bitar et al., (2015) which find a negative effect of capital on bank performance. Fonseca and González (2010) explain that raising capital ratio to meet capital standards may lead to a greater probability of default. The empirical findings clearly suggest that the impact of ACTRS variable is positive towards the efficiency of the Islamic banks (statistically significant at 10% level in the random effect regression model). The finding is in consonance with the findings by Kremmling (2011) providing support to the argument that banking institutions with fewer activity restrictions are not transparent in their dealings and sometimes do not aid bank performance.

It is interesting to note that the restrictions on banks' activities help prevent the creation of complex structures that are hard to monitor or banks that are too large to discipline. Restrictions like impelling banks to keep simple balance sheets should lead to an improved efficiency. It can be observed that during the period under study, the private monitoring (LPRIMON) exerts positive impact on Islamic banks (the variable is statistically significant at the 5% level in the random effect regression model).

5. Conclusion and Policy Implication

This study sheds light on the efficiency of Islamic banks by examining the determinants of efficiency of Islamic banks. We determine the technical efficiency scores of 108 Islamic banks operating in 26 countries across MENA region, Asia region and others and then we regressed the technical efficiency scores as the dependent variable against the bank-specific, country-specific variables and banking regulations and supervision variables in association with Basel II tenets in order to determine the impact towards the efficiency of Islamic banks during the years 2004-2010. The empirical findings clearly bring forth the high degree of inefficiency of the MENA, Asia and other region Islamic banking sectors during the period under study. The findings clearly demonstrate the existence of sizable scale inefficiency among Islamic banks operating in these countries. The findings of the study have very significant implications to regulators, supervisory bodies and policy-makers of the banking sector as well as taxpayers (Berger et al., 1993). The study covered challenges and issues pertaining to the regulations and the implications of Basel II framework towards the efficiency of Islamic banks.

BCBS acknowledges the fact that commercial real estate is a common source of major credit problem for banks around the world (Sharif et al., 2018). The Shariah principles mean that Islamic banks have stable deposit bases, no exposure to toxic assets and little leverage, thus, shielding the Islamic banks from the worst of the financial crisis (Bakri et al., 2015).

Our findings support the view expressed during both the recent global financial crisis and the Asian crisis regarding the moral hazard related to weak private sector monitoring of the financial markets by rating agencies and private investors that leads to the decrease in the efficiency levels of the banks (Bakri et al., 2016). Moreover, external rating agencies can play a key role in stimulating private monitoring by supplying information to depositors on the quality of the banks (Ali et al., 2015). In a nutshell, we conclude that the stricter the supervisory power, the less strict capital requirement. Statistically, tighter restrictions on non-banking activities and stricter private monitoring could significantly enhance the level of efficiency of Islamic banks.

References

Alam, N., & Al-Amri, H. A. (2020). Service quality perception and customer satisfaction in Islamic banks of Oman. *Journal of Asian Finance, Economics and Business, 7*(9), 499–504. https://doi.org/10.13106/jafeb.2020.vol7.no9.499

Ali, R., Ismail, S., & Bakri, M. (2015). Proposed Islamic educational loan-backed securities for quality life of university graduates in Malaysia. *Procedia-Social and Behavioral Sciences, 201*, 85-92. https://doi.org/10.1016/j.sbspro.2015.08.134

Al-Lamy, H. A., Bakry, M. H., Raad, W., Al-Shami, S. A., Alaraji, Z. J., Alsa-Lihi, M. W., & Al-Tameemi, H. M. (2018). Information technology infrastructure and small medium enterprises' in Iraq. *Opcion, 34*(86), 1711–1724.

Banker, R. D., Charnes, A., & Cooper, W. W. (1984). Some models for estimating technical and scale inefficiencies in data envelopment analysis. *Management Science, 30*, 78-92. https://doi.org/10.1287/mnsc.30.9.1078

Bakri, M. H., Ali, R., & Ismail, S. (2016). Developing primary market spread and measuring financial performance of staff housing government loans. *Proceedings of the 1st AAGBS International Conference on Business Management,* 501-511. https://doi.org/10.1007/978-981-287-426-9_44

Bakri, M. H., Ali, R., & Ismail, S. (2015). The study of residential mortgage backed securities during subprime mortgage: Malaysian experience. *Advanced Science Letters, 21*(5), 1468-1472. https://doi.org/10.1166/asl.2015.6073

Bakri, M. H., Sufian, F., Baharom, A. H., & Ismail, S. (2018). Determinant of securitization spread in Malaysia. *International Journal of Business and Society, 19*(3), 904-917.

Barth, J. R., Dopico, L. G., Nolle, D. E., & Wilcox, J. A. (2002). Bank safety and soundness and the structure of bank supervision: A cross-country analysis, *International Review of Finance, 3*(3/4), 163-188. https://doi.org/10.1111/j.1369-412X.2002.00037.x

Barth, J. R., Caprio, G., & Levine, R. (2004). Bank regulation and supervision: What works best?. *Journal of Financial Intermediation, 13*(2), 205-248. https://doi.org/13:205-248.10.3386/w9323

Barth, J. R., Caprio Jr, G., & Levine, R. (2006). *Rethinking Bank Regulation: Till Angels Govern*. Cambridge University Press.

Barth, J. R., Caprio, G., & Levine, R. (2008). Bank regulations are changing: For better or worse. *Comparative Economic Studies*, *50*(4), 537-563. https://doi.org/10.1057/ces.2008.33

Barth, J. R., Liy, A. T., & Luy D. W. (2010). Bank regulation in the United States, *CESifo Economic Studies, 56*(1), 112-140. https://doi.org/10.1093/CESIFO/IFP026

Barth, J. R., Caprio Jr., G., & Levine, R. (2013). Bank regulation and supervision in 180 countries from 1999 to 2011. *Journal of Financial Economic Policy*, *5*(2), 111-219. https://doi.org/10.1108/17576381311329661

Beck, T., Demirguc-Kunt, A., & Levine, R. (2006). Bank concentration, competition, and crises: First results. *Journal of Banking and Finance*, *30*(5), 1581-1603. https://doi.org/10.1016/j.jbankfin.2005.05.010

Beck, T., Demirguc-Kunt, A., & Merrouche, O. (2013). Islamic vs. conventional banking: Business model, efficiency and stability. *Journal of Banking and Finance, 37*, 433-447. https://doi.org/10.1016/j.jbankfin.2012.09.016

Berger, A. N., & Humphrey, D. B. (1997). Efficiency of financial institutions: International survey and directions for future research. *European Journal of Operational Research, 98*(2), 175-212. https://doi.org/10.1016/S0377-2217(96)00342-6

Berger, A. N., & Humphrey, D. B. (1991). The dominance of inefficiencies overscale and product mix economies in banking. *Journal of Monetary Economics, 28,* 117-148. https://doi.org/10.1016/0304-3932(91)90027-L

Berger, A. N., Hunter, W. C., & Timme, S. G. (1993). The efficiency of financial institutions: A review and preview of research past, present and future. *Journal of Banking & Finance*, *17*(2-3), 221-249. https://doi.org/10.1016/0378-4266(93)90030-H

Berger, A. N., & Mester, L. J. (1997). Inside the black box: What explains differences in the efficiencies of financial institutions?. *Journal of Banking and Finance, 21,* 895-947. https://doi.org/10.1016/S0378-4266(97)00010-1

Bitar, M., Walker, T. J., & Pukthuanthong, K. (2015). Basel III and bank efficiency: Does one solution fit all? Evidence from Islamic and conventional banks. *(May 4, 2015)*. https://doi.org/10.2139/ssrn.2602198.

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

Charnes, A., Cooper, W. W., & Rhodes, E. (1978). Measuring efficiency of decision making units. *European Journal of Operations Research, 6*, 429-444. https://doi.org/10.1016/0377-2217(78)90138-8

Chortareas, G. E., Garza-Garcia, J. G., & Girardone, C. (2010). Banking sector performance in some Latin American countries: Market power versus efficiency. *Working Papers (No. 2010-20).*

Chortareas, G., Girardone, C., & Ventouri, A. (2011). Financial frictions, bank efficiency and risk: Evidence from the Eurozone. *Journal of Business, Finance and Accounting*, *38*(1-2), 259-287. https://doi.org/10.1111/j.1468-5957.2010.02226.x

Chortareas, G. E., Girardone, C., & Ventouri, A. (2012). Bank supervision, regulation, and efficiency: Evidence from the European Union. *Journal of Financial Stability*, *8*(4), 292-302. https://doi.org/10.1016/j.jfs.2011.12.001

Coelli, T., Prasada, R., & Battese, G. (1998). *An Introduction to Efficiency and Productivity Analysis* (2nd ed.). New York, NY: Springer.

De Bandt, O., & Davis, E. P. (2000). Competition, contestability and market structure in European banking sectors on the eve of EMU. *Journal of Banking and Finance, 24*, 1045-66. https://doi.org/10.1016/S0378-4266(99)00117-X

Demirgüç-Kunt, A., & Levine, R. (1999). *Bank-based and market-based financial systems: Cross-country comparisons*. Washington, DC: The World Bank. https://doi.org/10.1006/jfin.2002.0341

Demirgüç-Kunt, A., & Detragiache, E. (2002). Does deposit insurance increase banking system stability? An empirical investigation. *Journal of Monetary Economics*, *49*(7), 1373-1406. https://doi.org/10.1016/S0304-3932(02)00171-X

Duong, T. T. N., Phan, H. T., Hoang, T. N., & Vo, T. T. T. (2020). The effect of financial restructuring on the overall financial performance of the commercial banks in Vietnam. *Journal of Asian Finance, Economics and Business, 7*(9), 75-84. https://doi.org/10.13106/jafeb.2020.vol7.no9.075

Eisenbeis, R. A., Ferrier, G. D., & Kwan, S. H. (1999). The informativeness of stochastic frontier and programming frontier efficiency scores: Cost efficiency and other measures of bank holding company performance. *Working Paper No. 99-23.* Federal Reserve Bank of Atlanta.

Farrell, M. J. (1957). The measurement of productive efficiency. *Journal of Royal Statistical Society Association, 120,* 253-281. https://doi.org/10.2307/2343100

Fonseca, A. R., & González, F. (2010). How bank capital buffers vary across countries: The influence of cost of deposits, market power and bank regulation. *Journal of Banking & Finance, 34*(4), 892-902. https://doi.org/10.1016/j.jbankfin.2009.09.020

Haron, S. (2004). Determinants of Islamic banking profitability. *Global journal of Finance and Economics*, *28*, 314-337.

Hassan, M. K. (2005). The cost, profit and x-efficiency of Islamic banks. In: *Economic Research Forum, 12th Annual Conference,* Cairo, Egypt.

Hassan, M. K., & Bashir, A. H. (2005). Determinants of Islamic banking profitability. In: M. Iqbal & R. Wilson (Eds.), *Islamic Perspectives on Wealth Creation*, Edinburgh: Edinburgh University Press.

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

Idris, N. H., Yazid, Z. A., Faique, F. A., Daud, S., Ismail, S., Bakri, M. H., & Taib, N. M. (2016). Financial literacy and debt burden among Malay youth workers in Malaysia. *Advanced Science Letters, 22*(12), 4288-4292. https://doi.org/10.1166/asl.2016.8130

Ismail, S., Bakri, M. H., Ali, R., & Noor, A. M. (2014). Developing a framework of Islamic student loan-backed securitization. *Procedia-Social and Behavioral Sciences, 129*, 380-387. https://doi.org/10.1016/j.sbspro.2014.03.691

Isik, I., & Hassan, M. K. (2002). Cost and profit efficiency of the Turkish banking industry: An empirical investigation. *The Financial Review, 37*(2), 257-280. https://doi.org/10.1111/1540-6288.00014

Iqbal, M. (2001). Islamic and conventional banking in the nineties: A comparative study. *Islamic Economic Studies, 8*, 1-27.

Iqbal, M., & Molyneux, P. (2005). Efficiency in Islamic banking. In: *Thirty years of Islamic banking* (pp. 88-104). London, UK: Palgrave Macmillan.

Kamarudin, F., Hue, C., Sufian, F., & Mohamad Anwar, N. (2017). Does productivity of Islamic banks endure progress or regress?. *Humanomics, 33*(1), 84-118. https://doi.org/10.1108/H-08-2016-0059

Kamarudin, F., Nordin, B. A. A., Muhammad, J., & Hamid, M. A. A. (2014). Cost, revenue and profit efficiency of Islamic and conventional banking sector: Empirical evidence from Gulf Cooperative Council countries. *Global Business Review, 15*, 1-24. https://doi.org/10.1177/0972150913515579

Kosmidou, K. (2008). The determinants of banks' profits in Greece during the period of EU financial integration. *Managerial Finance*, *34*(3), 146-159. https://doi.org/10.1108/03074350810848036

Kremmling, M. D. (2011). The influence of financial sector regulation on bank performance: a study of bank performance during the world financial crisis. *Aarhus School of Business and Social Sciences, Aarhus University. Retrieved March*, *27*, 2017.

Lozano-Vivas, A., & Pasiouras, F. (2010). The impact of non-traditional activities on the estimation of bank efficiency: International evidence. *Journal of Banking and Finance, 34*, 1436-1449. https://doi.org/10.1016/j.jbankfin.2010.01.006

Maudos, J., Pastor, J. M., Francisco, P., & Javier, Q. (2002). Cost and profit efficiency in European banks. *Journal of International Financial Markets, Institutions and Money, 12*, 33–58. https://doi.org/10.1016/S1042-4431(01)00051-8

Molyneux, P., & Thornton, J. (1992). Determinants of European bank profitability: A note. *Journal of Banking and Finance*, *16*(6), 1173-1178. https://doi.org/10.1016/0378-4266(92)90065-8

Pasiouras F., Gaganis C., & Zopounidis C. (2006). The impact of bank regulations, supervision, market structure and bank characteristics on individual bank ratings: A cross country analysis. *Review of Quantitative Finance and Accounting, 27*(4), 403-438. https://doi.org/10.1007/s11156-006-0045-0

Pasiouras, F., & Kosmidou, K. (2007). Factors influencing the profitability of domestic and foreign commercial banks in the European Union. *Research in International Business and Finance, 21,* 222-237. https://doi.org/10.1016/j.ribaf.2006.03.007

Pasiouras, F. (2008). International evidence on the impact of regulations and supervision on banks' technical efficiency: An application of two-stage data envelopment analysis. *Review of Quantitative Finance and Accounting*, *30*(2), 187-223. https://doi.org/10.1007/s11156-007-0046-7

Pasiouras F., Tanna S., & Zopounidis C., (2009). The impact of banking regulations on banks' cost and profit efficiency: Cross-country evidence. *International Review of Financial Analysis, 18*(5), 294-302. https://doi.org/10.1016/j.irfa.2009.07.003

Perry, P. (1992). Do banks gain or lose from inflation. *Journal of Retail Banking, 14*(2), 25-40.

Nor Halida Haziaton MOHD NOOR, Mohammed Hariri BAKRI, Wan Yusrol Rizal WAN YUSOF, Nor Raihana Asmar MOHD NOOR,
Nurazilah ZAINAL / Journal of Asian Finance, Economics and Business Vol 7 No 11 (2020) 747–757

757

Qian, J., & Strahan, P. E. (2005). How law and institutions shape financial contracts: The case of bank loans. *Working Paper 11052, National Bureau of Economic Research, Inc.* https://doi.org/10.1111/j.1540-6261.2007.01293.x

Samad, A., & M. K. Hassan (1999). The performance of malaysian Islamic bank during 1984-1997: An exploratory study. *International Journal of Islamic Financial Services*, *1*(3), 1-14. http://dx.doi.org/10.2139/ssrn.3263331

Sealey, C., & Lindley, J. T. (1977). Inputs, outputs and a theory of production and cost at depository financial institutions. *The Journal of Finance, 32,* 1251-1266*.* https://doi.org/10.1111/j.1540-6261.1977.tb03324.x

Sharif, S. M., Nizam, N. Z., Rashid, N. A., Masrom, N. R., & Bakri, M. H. (2018). Role of values and competencies in university intellectual property commercialization: A critical review. *The Turkish Online Journal of Design, Art and Communication,* 887-904. https://doi.org/10.7456/1080SSE/125

Staikouras, C., Mamatzakis, E., & Koutsomanoli-Filippaki, A. (2008). An empirical investigation of operating performance in the new European banking landscape. *Global Finance Journal, 19,* 32-45.

Sufian, F., Kamarudin, F., & Noor, N. H. H. M. (2012). Determinants of revenue efficiency in the Malaysian Islamic banking sector. *Journal of King Abdul Aziz University: Islamic Economics, 25*, 195-224. https://doi.org//10.4197 / Islec. 25-2.7

Staikouras, Ch., & Wood, G. (2003). The determinants of bank profitability in Europe. *Proceedings of the European Applied Business Research Conference.* Venice, Italy, June 9-13, 2003. https://doi.org/10.19030/iber.v3i6.3699

Widarjono, A., Hendrie Anto, M. B., & Fakhrunnas, F. (2020). Financing risk in indonesian islamic rural banks: Do financing products matter?. *Journal of Asian Finance, Economics and Business, 7*(9), 305-314. https://doi.org/10.13106/jafeb.2020.vol7.no9.305

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