JOURNAL OF BUSINESS MANAGEMENT AND ACCOUNTING
http://e-journal.uum.edu.my/index.php/jbma

How to cite this article:
Jimoh, A. T., Ijaiya, M. A., Attah, J. A, Abdulmumin, B. A. & Etudaiye-Muhtar, O. F. (2022). Comparative analysis of technical efficiency of Islamic banks in selected low-income countries of Africa and Asia. *Journal of Business Management and Accounting*, *12*(2) July, 81-102. https://doi.org/10.32890/ jbma2022.12.2.5

COMPARATIVE ANALYSIS OF TECHNICAL EFFICIENCY OF ISLAMIC BANKS IN SELECTED LOW-INCOME COUNTRIES OF AFRICA AND ASIA

[1]Abdulrazaq Taiye Jimoh, [2]Muftau Adeniyi Ijaiya,
[3]John Adeyi Attah,
[4]Biliqees Ayoola Abdulmumin &
[5]Oyebola Fatima Etudaiye-Muhtar
[1,2,4&5] Department of Finance, University of Ilorin, Nigeria
[3]Department of Accounting, Nasarawa State University, Keffi, Nigeria

Corresponding author: jimoh.at1@unilorin.edu.ng

Received: 28/7/2021 Revised: 12/11/2021 Accepted: 30/11/2021 Published: 31/7/2022

ABSTRACT

Islamic banks in Africa and Asia have been characterised by some technical inefficiencies. The sources (managerial issues or scale of operation) of these inefficiencies still remain a problem of empirical investigation since mixed reports have been given in that regard. This study therefore investigated the sources of inefficiencies by decomposing technical efficiencies of the banks and comparing the components of Islamic banks in the low-income countries of Africa and Asia. Data were collected from annual reports of the selected banks and analysed using both descriptive and inferential statistical

tools. Data Envelopment Analysis (DEA) was conducted to estimate the pure technical and scale efficiencies of the banks. The study found that the inefficiency attributable to all the selected banks were due to pure technical efficiency (0.876), which was lower than the mean value of scale efficiency (0.917). That is, the inefficiencies were caused largely by managerial problems rather than operating scale. It was also found that Islamic banks in Asia were more technically efficient than those from Africa in terms of pure technical (0.920>0.827) and scale efficiencies (0.934>0.902). The study concludes that managerial issues such as insufficient competent staff, poor monitoring and so on were the causes of low efficiency attributed to Islamic Banks in Africa. It was thus recommended that Islamic banks in Africa should employ staff members who are competent with requisite knowledge of Islamic finance to improve the pure technical and overall efficiency of the banks.

Keywords: Africa, Asia, Islamic Banks, low-income, technical efficiency.
JEL Code: G21

INTRODUCTION

Islamic banking system was introduced to boost intermediation and promote financial inclusion of many countries particularly those with high percentage of Muslim population in Africa and Asia. This model of banking has made it possible for the individuals who were unbanked due to their religious believes, among other factors, to be brought into formal financial systems. Many countries across Africa, Asia, and some parts of Europe and America have therefore adopted the Islamic banking system as alternative to conventional banking and foster the depth of financial system of respective countries.

Currently, Islamic finance market is dominated by the banking system in Asia, as the share of the banking market represents about 22.4% of the global Islamic financial assets implying that Islamic banking in Asia has been a success (Komijani & Taghizadeh-Hesary, 2018). Comparatively, Islamic banking in Asia has been more successful than other continents including Europe and America. This is particularly so with Iran, Saudi Arabia, Malaysia, UAE and Kuwait accounting for about 80% of the global Islamic banking assets (IFSB, 2020).

The implication is that the system of banking has become a major component of financial system in Asia.

Following the initiative of Egypt in the 1960s, the system of banking was adopted in Africa, following the Asian model, as a substitute for conventional banks which could not satisfy peoples' demand for banking services due to cumbersome procedures, stringent conditions and more importantly, their perceptions about interest *(riba)* (Abdu, Jibri, Abdullah & Rabiu, 2018). The model of banking has now spread across eastern, western, northern and southern regions of Africa.

The performance of Islamic banks across world regions is measured by the Islamic Financial Service Board (IFSB) in terms of assets and share of each region in Islamic banking market. The market is grouped into Asia, Gulf Cooperation Council (GCC) countries, Middle-East and North Africa (MENA, excluding GCC), Africa (excluding North Africa), and others. Asian market for Islamic banking had $232 billion as assets in 2017 representing about 14.90% of Islamic banking market across the globe. This increased to $266.1 billion in 2018 giving the region a market share of 16.93% (IFSB, 2017, 2018). The African market for Islamic banking depicts the under–developed nature of the region as the market share was just about 1.74% in 2017 and 0.85% in 2018. The value of Islamic bank assets in the region was $27.1 billion in 2017 but fell to $13.2 Billion in 2018 (IFSB, 2018, 2019).

In relation to conventional banks, the size of Islamic banking is comparatively small. The sector's asset as a percentage of the entire banking sector of any country is quite negligible. In Asia for example, the ratio of Islamic banking asset to domestic banking system has never been up to 30% (Goh, 2018). In Africa, even though the sector dominates the African Islamic finance market, providers of banking services occupy less than 10% of conventional commercial banks in the region (Ali, 2016, Goh, 2018). The small market share of the banks in Africa put them in position of perpetual competition with conventional banks, which may somehow be difficult except the banks are highly efficient. That is, the banks (Islamic) will have to continually engage in competition with conventional banks in a bid to meet customers' demand for banking services. It is therefore important for Islamic banks to be efficient in terms of improved performance so as to compete favourably in the market.

A number of efficiency studies have been carried out on Islamic banking across Africa and Asia. Many of these studies reported inefficiencies or low efficiency levels (Naeem-Ullah, 2013, Siwar & Jawada, 2017). There are few studies on Islamic banking efficiency in Africa; nearly all of the available studies confirmed the inefficiency of the system (A-Khasawneh, Bassedat, Aktan & Thapa, 2012). Effendi (2016) stated that inefficiency in banks may be traced to either managerial underperformance due to lack of expertise, skills or willingness on the part of the management or a mismatch in the scale of operation. A bank that is technically inefficient due to management underperformance in certain areas will be negatively affected in terms of investment, performance and growth. This is because it will not be able to allocate the available capital resources to the most profitable investment opportunities. Such inefficiencies put the bank in a less competitive position in the market (Effendi, 2016).

It has also been observed that wrong selection of operating scale tends to affect bank performance. The bank might not have been operating at optimal size, which would make increase in size of such bank results in higher cost than necessary for its operations (Repkove, 2015). In other words, it is not every expansion that leads to efficiency. Some banks might be expanding too quickly and have higher cost without corresponding increase in the value of assets. At both ends, the performance, growth and competitive positions as well as the long run survival of the banks will be affected.

Although the available studies on Islamic bank efficiency in Africa and Asia confirmed the inefficiency of the system, their reports were inconclusive as the sources of inefficiencies were not adequately considered. It is therefore necessary to analyse the technical efficiency of Islamic banks in Africa and Asia by decomposing it into pure technical and scale efficiencies. This provides the opportunity of identifying the source(s) or causes of inefficiencies in the banks and how to improve on the levels of efficiencies. Also, dearth of research exists on comparative efficiency study of Islamic banks in the low-income countries of Africa and Asia. Thus, this study focused on the low-income countries of the two regions for fair comparison of efficiency scores. The specific objectives were to assess the level of efficiency of the banks as well as establish whether a significant difference exists in the level of efficiencies of the banks from the two regions.

LITERATURE REVIEW

Efficiency of Islamic banks has been the subject of many empirical investigations even though the results are still inconclusive. Saaid, Rosly, Ibrahim and Abdullah (2003) studied efficiency of Islamic banks in Sudan. Low levels of efficiency were reported implying that Sudanese Islamic banks failed to achieve optimization in the use of their inputs. This means there is technical inefficiency which manifested in the input wastage. Yudistira (2004) studied efficiency of Islamic banks in twelve countries including some African countries of Algeria, Gambia, Sudan and Egypt. The selected banks were grouped into Middle East and non-Middle East banks. The Middle East banks were found to exhibit higher level of efficiency (scale) than the banks from non-Middle-East countries. Classifying efficiency measures as cost and profit, Tahir and Haron (2010) examined efficiency of 193 Islamic banks across Europe, Africa, Far East, Central Asia and the Middle East. Data were collected from Bankscope and analysed with stochastic frontier approach (SFA). It was found that Islamic banks in Europe were more efficient (cost and profit) than those of other regions. The study also revealed that Islamic banks in Africa were more efficient than those at the Middle East, Far East and Central Asia.

Following the World Bank grouping of national economies, Ahmad, Noor and Sufian (2010) investigated efficiency of Islamic banks in twenty-five (25) countries. Data were collected from annual reports of seventy-eight selected banks and the bankscope database. DEA and regression analysis were conducted and the study found that high-income countries Islamic banks were more efficient than those from low-income countries. In another study, Said (2013) used Data Envelopment Analysis (DEA) approach to estimate efficiency of thirty two Islamic banks selected from GCC, other MENA and Africa countries. The study found that Islamic banks of other MENA (excluding GCC and North Africa) countries were technically inefficient.

Ab-Rahim, Kadri and Ismail (2013) examined efficiency of full-fledged Islamic banks in Malaysia for the period between 2006 and 2011. Data Envelopment Analysis (DEA) was conducted to estimate efficiency from the data collected from BankScope and Annual reports of the banks. The study found that the banks were technically

inefficient. In a study of Bangladeshi Islamic banks, Abdulsamad (2015) found scale efficiency to be higher than pure technical. This means that inefficiency is largely due to lower pure technical efficiency.

Bahrini (2017) evaluated the pure technical and scale efficiency of Islamic banks in MENA and GCC regions from 2007 to 2012. Bootstrap DEA method was used to analyse the data collected from financial statements of the selected banks. MENA Islamic banks were found to be more scale efficient. This means that inefficiency resulted majorly from pure technical inefficiency. In another study, Yildrim (2017) found that Islamic banks in Qatar, Indonesia, Saudi Arabia, Malaysia, UAE and Turkey (QISMUT countries) failed in the area of managerial efficiency as they were also not able to produce on sufficient scale. Effendi (2016) reported high technical efficiency for Islamic rural banks in Indonesia.

It is clear from the empirical review that though past studies have analysed the different levels of efficiency in Islamic banks, no comparative analysis have been made for African and Asian countries. Also, none of the studies made comparative analysis of the decomposed (pure technical and scale) efficiency measures in the low-income countries of the two regions. In addition, previous studies on efficiency of Islamic Banks have not examined the significance of differences found in efficiency levels. This study filled these gaps by estimating and comparing pure technical and scale efficiencies of selected Islamic banks from low-income countries of Africa and Asia. The study also tested for the statistical significance of differences in efficiency between the two groups.

Theoretical Discussion

The efficient structure hypothesis developed by Demsetz (1973) states that in any competitive condition in the market, only efficient firms will survive and achieve some growths. The firms then become larger and stronger in the market with greater market share and opportunity for higher profits (Homma, Tsutsui & Uchida, 2014). According to the theory, efficiency will make the firms to be strong enough to face any competition, and surviving such competitive environment will increase market share leading to higher profitability. The efficient structure hypothesis makes some theoretical clarifications on how

efficient firms have their cost reduced in a manner that brings about higher profits to the firms (Chortareas, Garza-Garcia & Giradone, 2011). This theory, in a nutshell, assumes that competitive power and market share as well as the resultant improved profitability, which are paramount to the survival and growth of any firm, depend on the firm's level of efficiency.

Past research works have confirmed the relationship between efficiency, competition and profitability established by the efficient-structure theory and its variants (Seelanatha, 2010, Kasman, *et al*., 2011; Ferrouhi, 2018). Mensi and Zouari (2010) averred that positive signs have been reported in favour of the theory of efficient structure. Other recent empirical evidences have validated the theory.
This study is based on efficient structure hypothesis because, according to the theory, banks will be able to compete favourably in the market in order to achieve their growth potential in the long run if they are efficient. This is because, efficiency will enhance their market power to increase their market share and profitability. In other words, efficiency of Islamic banks in Africa and Asia will enable them compete favourably with conventional banks in their respective markets.

METHODOLOGY

This study used the ex-post facto design which allows for analysis of past observations and report on the findings. World Bank classification of economies (countries) was followed to select the population and samples for the study. The study covered the low-income countries from Africa and Asia as classified by the World Bank. According to the World Bank 2019 classification, low-income country is any country whose Gross Net Income (GNI) per capital is less than or equal to $1025 USD in 2018 while the lower-middle-income country is that one with GNI per capital between $1026 and $ 3995 in 2018. Both the low-income and lower-middle-income countries of Africa and Asia are regarded as low-income for the purpose of this study to allow for a larger sample. Based on this, twenty (20) Islamic banks whose annual reports were publicly available were selected from low-income countries of Africa and Asia for a period of eight (8) years from 2012 to 2019 (See Appendix 1). Sample banks were drawn based on the availability of data which were collected from annual reports

of the banks. The data were converted to US dollar using the end of the year exchange rate and deflated using respective country's rate of inflation, for uniformity purpose as suggested by Sufian and Noor (2009). The data were analysed via both descriptive and inferential statistical analysis.

Data Envelopment Analysis was conducted to estimate overall technical efficiency, pure technical efficiency, and scale efficiency of individual banks following Charnes, Cooper and Rhodes (1978) popularly known as CCR model, which is stated as follows:

$$Max\ a_r = \frac{\sum_{j=1}^{l} u_j\ y_{jr}}{\sum_{j=1}^{k} v_i\, x_{ir}} \quad \text{.........}(1)$$

Subject to the following constraints:

$$\sum_{i=1}^{k} v_i\ \ x_{ir} = 1, \quad \text{.........}(2)$$

$$\sum_{j=1}^{l} u_j\ \ y_{jr} - \sum_{i=1}^{k} v_i\ \ x_{ir} \leq 0, \quad \text{.........}(3)$$

$$u_j,\ v_i \geq 0, \quad \text{.........}(4)$$

$j = 1, 2, \ldots\ldots l,\ i = 1,2,\ldots\ldots\ldots k$ *and* $r = 1,2,\ldots\ldots s.$

Where i is the input that ranges from 1 to k; j is the output which also ranges from 1 to l; r is a bank whose efficiency is to be analysed and ranges from 1 to s. y_{jr} is the value of output (j) from bank (r); u_j is the weight (u) attached to output j. x_{ir} is the value of input i to bank r; v_i is the weight attached to input i.

l= number of output, k= number of output, s= number of banks. Efficiency score (a_r) for bank r was obtained by providing a linear programing solution to the CRR model, where $0 \leq a_r \leq 1$.

It should however be noted that efficiency score obtained from CCR model is the overall technical efficiency (OTE) on the assumption of constant return to scale. Decomposition of efficiency to pure technical efficiency (PTE) and scale efficiency (SE), calls for estimation of Banker, Charnes and Cooper (1984), BCC model under the variable return to scale (VRS) assumption. The only difference between the two models lies in the addition of another constraint for the BCC model as:

$$u_j,\ v_i = 1 \quad \text{.........}(5)$$

In other words, overall technical efficiency (OTE) is estimated with CCR model while the pure technical efficiency (PTE) is determined

with BCC model. The next is the determination of scale efficiency (SE). Scale efficiency is the ratio of overall technical efficiency to pure technical efficiency scores which is computed as SE = a_r^{CCR}/a_r^{BCC}.

Mann-Whitney U test was used to test the significance of observed differences statistically. The test was conducted after conducting tests for normality and homogeneity of variance as assumed by parametric tests. The results of these preliminary tests show that the assumptions of parametric test of independent sample t-test were not fulfilled. Thus, non-parametric test of Mann-Whitney was used in testing the hypothesis that no significance difference exists in the level of efficiencies of Islamic banks in the two selected regions.

RESULTS AND DISCUSSION OF FINDINGS

The descriptive analysis of efficiency results obtained from Data Envelopment Analysis (DEA) is presented in this section. The mean value explains the average behaviour of the variables over the period under investigation while the standard deviation shows the degree of disparity of these variables from their average values. The minimum and maximum values show the lowest and highest figures of each variable obtainable over the period under investigation.

Efficiency Estimation

Table 1 provides a description of estimator of overall technical efficiency (OTE), pure technical efficiency (PTE), and scale efficiency (SE) for the selected Islamic Banks in the low-income countries of Africa and Asia over a period of eight years from 2012 to 2019.

From Table 1, it could be observed that Islamic banks of low-income Asian countries recorded higher efficiency average measures during the period under review. The banks scored 0.860, 0.920 and 0.934 as means of OTE, PTE and SE, respectively. These figures are higher than those of low-income countries of Africa with the values of 0.748, 0.827, and 0.902 for OTE, PTE and SE, respectively. This implies that Islamic Banks in the low-income countries of Asia are more efficient than Islamic Banks in the low-income African countries as depicted in Table 1. Thus, the banks were able to produce more output from the available resources (input). In other words, low-income Asian

countries Islamic banks were able to create more financing at lower cost than their African counterparts.

Table 1

Descriptive Analysis of Efficiency Estimates

Bank	Estimator	Obs	Mean	Std. Dev.	Min.	Max.
Islamic Banks (Africa)	OTE	80	0.748	0.184	0.260	1
	PTE	80	0.827	0.172	0.330	1
	SE	80	0.902	0.110	0.580	1
Islamic Banks (Asia)	OTE	80	0.860	0.147	0.490	1
	PTE	80	0.920	0.110	0.560	1
	SE	80	0.934	0.108	0.570	1
All Banks	OTE	160	0.805	0.174	0.260	1
	PTE	160	0.876	0.150	0.330	1
	SE	160	0.917	0.110	0.570	1

Source: Author's computation (2021)

The standard deviations of OTE (0.174), PTE (0.150) and SE (0.110) estimators for all the selected Islamic banks under consideration, according to Table 1, are quite low. This means that the efficiency measures are relatively consistent. Also, the difference of standard deviation in the measures between the two regions is negligible. This testifies to internal validity of the measurement.

In Table 2, average efficiencies of selected Islamic banks in low income countries of Africa and Asia for periods from 2012 to 2019 are reported. The mean overall efficiency score for Islamic Banks in Africa is 0.748. This implies that, on the average, the banks are not technically efficient for the periods of the study. The source of this inefficiency could be traced to both pure technical and scale efficiencies which have 0.827 and 0.902 respectively as their mean scores. The highest efficiency scores for overall technical (OTE) and scale efficiencies (SE) were in 2019. From Table 2, the highest score for OTE is 0.751 implying that, in 2019, the most efficient bank on

average still needs to increase its output by (1-0.751) about 25 % to reach efficiency frontier. There is however higher score each for PTE and SE. In 2019, Pure technical efficiency score was 0.833 while scale efficiency has its highest score (0.905) in 2014, leaving both with just about 10% inefficiencies. For Asian banks, the average efficiency scores of 0.860, 0.920 and 0.930 OTE, PTE and SE indicate higher level of technical efficiencies in comparison with the African banks.

Table 2

Averages of OTE, PTE and SE for African and Asian Islamic Banks

Region	Average Efficiencies								
	IBs, Africa			IBs, Asia			Mean of all Islamic Banks		
YEAR	OTE	PTE	SE	OTE	PTE	SE	OTE	PTE	SE
2012	0.748	0.826	0.903	0.861	0.922	0.933	0.804	0.876	0.916
2013	0.749	0.825	0.904	0.860	0.922	0.932	0.804	0.875	0.916
2014	0.750	0.826	0.905	0.859	0.921	0.931	0.805	0.876	0.917
2015	0.746	0.825	0.902	0.859	0.921	0.931	0.806	0.877	0.917
2016	0.744	0.825	0.900	0.859	0.917	0.936	0.805	0.875	0.918
2017	0.746	0.826	0.900	0.863	0.920	0.938	0.805	0.875	0.918
2018	0.749	0.829	0.901	0.861	0.918	0.937	0.806	0.876	0.918
2019	0.751	0.833	0.899	0.860	0.918	0.936	0.808	0.878	0.918
Mean	**0.748**	**0.827**	**0.902**	**0.860**	**0.920**	**0.934**	**0.805**	**0.876**	**0.917**

Author's computation (2021)

This implies that the low-income Asian Islamic banks provide their services at lower costs than their African counterparts. This reduced cost of intermediation could be traced to improved managerial performance (pure technical efficiency) in terms skills and knowledge of Islamic banking and finance, as compared to the banks from Africa. In the same vein, the scale efficiency (SE) was also found to be higher for the selected Islamic banks in Asia. This means that the banks have reduced cost due to larger operating scale compared to their African counterparts.

From Table 2, efficiency measures for all banks indicates that SE (0.917) is averagely higher than pure technical efficiency, PTE (0.876). This implies that observed inefficiencies across the selected banks are largely from managerial underperformance. The analysis

of average efficiencies indicate that African (low-income countries) Islamic banks are less efficient than Asian banks for nearly all the years under consideration.

Table 3

Target Increase (Amount) of Output to be Fully Efficient

Region	Target Increase (amount) of output to be fully efficient IBs, Africa			IBs, Asia			Mean of all Islamic Banks		
YEAR	OTE	PTE	SE	OTE	PTE	SE	OTE	PTE	SE
2012	0.252	0.174	0.097	0.139	0.078	0.067	0.196	0.124	0.084
2013	0.251	0.175	0.096	0.140	0.078	0.068	0.196	0.125	0.084
2014	0.250	0.174	0.095	0.141	0.079	0.069	0.195	0.124	0.083
2015	0.254	0.175	0.098	0.141	0.079	0.069	0.194	0.123	0.083
2016	0.256	0.175	0.100	0.141	0.083	0.064	0.195	0.125	0.082
2017	0.254	0.174	0.100	0.137	0.080	0.062	0.195	0.125	0.082
2018	0.251	0.171	0.099	0.139	0.082	0.063	0.194	0.124	0.082
2019	0.249	0.167	0.101	0.140	0.082	0.064	0.192	0.122	0.082
Mean	0.252	0.173	0.098	0.140	0.080	0.066	0.195	0.124	0.083

Author's computation (2021)

Islamic banks of low-income Asian countries, going by the mean scores, can move to efficiency frontier by increasing their financing (intermediation outputs) by 14%, 8% and 6.6% for OTE, PTE and SE, respectively. Summarily, on average, Islamic banks in the low-income countries of Asia are not (fully) technically efficient and the inefficiencies are attributed to PTE (8%) and SE (6.6%). This means that the banks will have to improve on their managerial and operating skills targeting at their output by 8% for PTE and 6.6% for SE for them to appear on efficiency frontier.

The inefficiency attributed to African Islamic banks is however higher than that of the Asian banks. From Table 3, the mean inefficiency scores of African Islamic banks are 25.2%, 17.3% and 9.8% for OTE, PTE, and SE, respectively. This means that an average Islamic bank from any low-income country in Africa requires an increase of about 25.2% in its output capacity in the area of intermediation for it to achieve full efficiency and locate itself on the efficiency frontier. The overall efficiency can be achieved by improving its pure technical and scale efficiencies by 17.3% and 9.8%, respectively.

Test of Significance

Here, Mann-Whitney U, a non-parametric counterpart of the Independent sample t-test was conducted to confirm the significance or otherwise of the observed differences between efficiencies scores of Islamic banks in the low-income countries of Africa and Asia. The test was conducted after conducting tests for normality and homogeneity of variance as assumed by parametric tests. The results of these preliminary tests show that the assumptions of parametric test of independent sample t-test were not fulfilled.

Table 4

Tests of Normality

	Africa_Asia	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	Df	Sig.	Statistic	df	Sig.
Pure Tech Effic.	Africa	.178	80	.000	.868	80	.000
	Asia	.307	80	.000	.734	80	.000
Scale Effic.	Africa	.195	80	.000	.839	80	.000
	Asia	.258	80	.000	.698	80	.000
Overall Tech Effic.	Africa	.092	80	.092	.944	80	.002
	Asia	.196	80	.000	.854	80	.000

Source: Author's computation (2021)

Table 4 depicts the results of Kolmogorov-Smirnov and Shapiro-Wilk tests of normality. The null hypothesis underlying the two tests is that the population from which the sampled observations were drawn follows the normal distribution curve. This implies that the observations were normally distributed. In other words, normality assumption is that, the population distribution from which the sample was drawn is not significantly different from normal distribution. It follows therefore, that the null hypothesis would be rejected if the calculated p-value is less than 0.05 alpha level.

The result of Kolmogorov-Smirnov test for overall technical, pure technical and scale efficiencies indicates the absence of normality as the p-value calculated (0.000) in each case was less than 0.05. This means that the population distribution from which the sample was drawn for the observations was significantly different from normal distribution. Therefore, the null hypothesis was rejected. To further confirm this position, Shapiro-Wilk test, a more powerful test of normality was conducted and the result was not different from what

was found using Kolmogorove-Smirnov test. Shapiro-Wilk test result was also presented in Table 4 above. This result shows that a major assumption of parametric techniques has been violated.

Table 5

Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
Pure Tech Effic.	Based on Mean	16.507	1	158	.000
	Based on Median	14.078	1	158	.000
	Based on Median and with adjusted df	14.078	1	157.336	.000
	Based on trimmed mean	15.930	1	158	.000
Scale Effic.	Based on Mean	7.735	1	158	.000
	Based on Median	2.451	1	158	.021
	Based on Median and with adjusted df	2.559	1	155.297	.003
	Based on trimmed mean	5.157	1	158	.000
Overall Tech Effic.	Based on Mean	3.045	1	158	.010
	Based on Median	7.311	1	158	.000
	Based on Median and with adjusted df	2.210	1	149.634	.013
	Based on trimmed mean	4.067	1	158	0.03

Source: Author's computation (2021)

Homogeneity of variance (variances are of the same characteristics) is another assumption of parametric test which holds that the variances of any two different samples that are drawn from the same population are approximately the same (equal). In hypothesis testing, homogeneity of variance is assumed when p-value is greater than 0.05, otherwise the null hypothesis is rejected.

The result of Levene test of equal variance is shown in Table 5. In the case of overall technical efficiency (OTE), the p-value calculated of 0.010 was less than the significant level of 0.05. So, equal variance assumption was violated between the two samples in relation to overall technical efficiency. Also, the variance was not equal both in the case pure technical and scale efficiencies because the p-value based on the mean for both efficiency measures was 0.000 which was less than 0.05. This means that for pure technical and scale efficiencies, the assumption of homogeneity of variance was violated.

Based on the results of homogeneity of variance and the non-normality nature of the observations, the parametric statistical test of significance could not be conducted. Hence, the study resorted to Mann-Whitney, a non-parametric test.

Table 6

Mann-Whitney Test (Ranks)

	Africa_Asia	N	Mean Rank	Sum of Ranks
Overall Tech Effic.	Africa	80	67.54	5403.50
	Asia	80	93.46	7476.50
	Total	160		
Pure Tech Effic.	Africa	80	68.03	5442.00
	Asia	80	92.98	7438.00
	Total	160		
Scale Effic.	Africa	80	72.35	5788.00
	Asia	80	88.65	7092.00
	Total	160		

Source: Author's computation (2021)

Table 6 shows result of Mann-Whitney U test of the difference in the two independent samples (selected low-income countries of Africa and Asia Islamic banks). Mann-Whitney U result is always presented in two tables. The first table (Table 6) ranked the differences in the efficiencies scores between the two groups while the second table (Table 7) detailed the result of test of significance of the observable differences from the first table. From Table 6, the mean rank of African banks, on overall technical efficiency was 67.54 while that of Asia was 93.46. The difference in the mean rank between the two groups indicates that Islamic banks in Asian countries exhibited comparatively higher technical efficiency than those from Africa.

On pure technical efficiency, Asian Banks were also found with higher ranks with mean rank of 92.98 as against 68.03 recorded for Africa. This implies that Asian Islamic banks are superior to their African counterparts in terms of ranking of efficient banks. Similar result was obtained for scale efficient bank ranking. The table shows that Asian banks have mean rank of 88.65 which is also higher than 72.35 reported for African banks.

Table 7

Mann-Whitney Test Statistics[a]

	Overall Tech Effic.	Pure Tech Effic.	Scale Effic.
Mann-Whitney U	2163.500	2202.000	2548.000
Wilcoxon W	5403.500	5442.000	5788.000
Z	-3.562	-3.551	-2.273
Asymp. Sig. (2-tailed)	.000	.000	.023

Source: Author's computation (2021)

Table 7 presents information (test statistics) regarding the significance of the differences in ranking of efficiencies as reported in Table 6. According to Table 7, Mann-Whitney test shows that the difference observed in the mean rank of banks for overall technical efficiency is significant statistically because the p-value calculated was less than 5% level of significance (0.00<0.05). The Z-value of -3.562 also testifies to the significance of this difference.

In the case of pure technical efficiency, a higher mean rank was found in favour of banks from Asia. The Table shows that the result was also significant at 5% level of significance. This is indicated by the p-value of 0.000 which is less than 0.05. The position was also strengthened by the Z-value (-3.551). Lastly, on ranking of banks in the order of scale efficiency, the difference was found to be significant at 5% since the p-value of 0.023 was far less than the alpha value with a complimentary stand of -2.273 reported as Z-value. The above results indicate that significant difference exists between technical efficiency of Islamic banks in the low-income countries of Africa and Asia.

CONCLUSION AND RECOMMENDATIONS

The technical efficiencies of Islamic banks in Africa and Asia were estimated and compared in this study. Based on the results, it was found that averagely, Islamic banks in the two regions were not fully efficient, but the banks from Asian countries were more technically efficient that their counterparts from Africa. The differences in efficiency levels were found to be statistically significant. Decomposing the estimates allows for ranking of banks in terms of the sources of inefficiency. It

thus found that the banks in the two regions were in most cases scale efficient as higher scores were found for scale efficiency than pure technical efficiency. The study concluded, based on these findings, that the low efficiency attributed to Islamic banks in Africa and Asia is largely due to managerial underperformance (due to lack of sufficient competent staff with needed skills to discharge Islamic banking services).

It was therefore, recommended that Islamic banks in Africa should employ staff members who are competent with requisite knowledge of Islamic finance to improve the pure technical and overall efficiency of the banks. Also, management of the banks should be tasked on improving their monitoring capabilities as this will go a long way in enhancing performance and technical efficiency of the banks. Finally, future studies should include more data points and samples for more robust analysis.

ACKNOWLEDGMENT

This research work received no specific grant from any funding agency in the public, commercial, or not-for-profit organisations.

REFERENCES

Abdu, M., Jibir, A., Abdullahi, S., & Rabiu, A. A. (2018). Can Islamic banking and finance spur financial inclusion? Evidence from sub-saharah Africa. *CBN Journal of Applied Statistics 9*(1), 77-104.

Abdul-Khaliq, S. (2014). Comparison study of murabaha and istisnaa in Islamic banking in Jordan. *Interdisciplinary Journal of Contemporary Research in Business, 5*(9), 603-612.

Abel, S. & Bara, A. (2017). *Decomposition of the Technical Efficiency: Pure Technical and Scale Efficiency of the Financial System.* Economic Research Southern Africa (ERSA) working paper 683. Retrieved 10th December, 2019 from https://econrsa.org/system/files/publications/working_papers/working_paper_683.pdf

Ab-Rahim, R. Kadri, N. & Ismail, F. (2013). *Efficiency performance of Malaysian Islamic banks*. MPRA Working Paper No 46238. Retrieved on 23rd January, 2020 from https://mpra.ub.uni-muenchen.de/46238/

ADB-IFSB. (2015). *Islamic Finance for Asia: Development, Prospects, and Inclusive Growth*. Manila: Asian Development Bank.

Ahmad, S. & Abdulrahman, A. (2012). The efficiency of Islamic and conventional commercial banks in Malaysia. *International Journal of Islamic and Middle Eastern Finance and Management, 5*(3), 241-263.

Ahmed, H. (2014). Islamic banking and shari'ah compliance: A product development perspective. *Journal of Islamic Finance, 3*(2), 15 – 29.

Ajagbe, T. S. & Brimah, A. N. (2013). Islamic banking development and evolution: Current issues and future prospects. *Journal of Research in International Business and Management, 3*(2), 73-79.

Ali, A. S. (2016). *Islamic banking and finance in Sub-Saharah Africa: Recent developments and existing challenge*s. International Congress on Islamic Economics and Finance, at Instanbul, Turkey.

Al-Khasawneh, J. A., Bassedat, K., Aktan, K., & Thapa, P. (2012). Efficiency of Islamic banks: Check box of North African Arab countries. *Qualitative Research in Financial Markets, 4*(2/3), 228-239.

Altun-Ada, A. & Dalkilic, N. (2014). Efficiency analysis in Islamic banks: A study for Malaysia and Turkey. *BRSA Banking and Financial Markets, 8*(1), 9-33.

Ariss, R. T. (2010). Competitive conditions of Islamic and conventional banking: A global perspective. *Review of Financial Economics, 19*, 101-108.

Awan, A. G. & Azhar, M. (2014). Consumer behaviour towards Islamic banking in Pakistan. *European Journal of Accounting Auditing and Finance Research, 2*(9), 42-65.

Bahrini, R. (2017). Efficiency analysis of Islamic banks in the middle east and north Africa region: A bootstrap DEA approach. *International Journal of Financial Studies, 5(*7), 1-13.

Banna, H. Ahmad, R. & Koh, E. H. Y. (2017). Determinants of commercial banks' efficiency in Bangladesh: Does crisis matter? *Journal of Asian Finance, Economics and Business, 4(*3), 19-26.

Bhattacharyya, A., Lovell, C., & Sahay, P. (1997). The impact of liberalization on the productive efficiency of Indian commercial banks. *European Journal of Operational Research, 98*(2), 332-345.

Chortareas, G. E., Garza-Garcia, J. G. & Giradone, C. (2011). Banking sector performance in Latin America: Market power versus efficiency. *Review of Development Economics, 15*(2), 307-325.

Demsetz, H. (1973). Industry structure, market rivalry, and public policy. *Journal of Law and Economics 16*, 1–9.

Effendi, Y. (2016). Measuring efficiency of the Indonesian Islamic banks. *Financial Economics Study, 20*(2), 133-148.

Faye, I., Triki, T. & Kangoye, T. (2013). The Islamic finance promises: Evidence from Africa. *Review of Development Finance, 3*, 136-151.

Ferrouhi, E. M (2018). *Determinants of banks' profitability and performance: An overview*. *MPRA Paper No. 89470*. Retrieved on 26th October 2019 from https://mpra.ub.uni-muenchen.de/89470/

Goh, S. K. (2018). *Reporting Practices of Islamic Financial institutions in the BIS localized banking statistics.* Ninth IFC conference. Bank for International Settlement. Retrieved 11th January 2020 from www.bis.org/ifc/publ/ifcb49_49.pdf

Hanif, M. (2011). Differences and Similarities in Islamic and Conventional Banking. *International Journal of Business and Social Science, 2*(2), 166-175.

Hassan, M. K., Kayed, R. N. & Oseni, U. A. (2013). *Introduction to Islamic Banking and Finance*. Edinburgh, England: Pearson Education Limited.

Hisham, A. F. B. & Jaffar, M. M. (2017). Modeling Commodity Salam Contract between Two Parties for Discrete and Continuous Time Series. *AIP Conference Proceedings 1870.* Retrieved 12th January 2020 from http://dx.doi.org/10.1063/1.4995854

Homma, T., Tsutsui, Y. & Uchida, H. (2014). Firm growth and efficiency in the banking industry: A new test of the efficient structure hypothesis. *Journal of Banking & Finance*, *40*, 143–153.

IFSB (2018). Islamic financial service industry stability report. Retrieved 10th October 2019 from www.ifsb.org.

IFSB (2019). Islamic Financial Service Industry Stability Report. Retrieved 10th October 2019 from www.ifsb.org

IFSB (2020). Islamic Financial Service Industry Stability Report. Retrieved 10th October 2019 from www.ifsb.org

Imam, P. & Kpodar, K. (2010). Islamic banking: How has it diffused? *IMF Working Paper WP/10/195*

Iqbal Q. & Awan, H. M., (2015). Technical, pure technical and scale efficiency analysis of insurance companies of Pakistan. *International Journal of Business and Management Review*, *3*(4), 82-92.

Kasman, A., Kasman, S. & Turgutlu, E. (2011). Testing profit and structure relationship in the European banking markets using efficiency measures. *The Developing Economies, 49*(4), 404–428.

Komijani, A. & F. Taghizadeh-Hesary. (2018). An overview of Islamic banking and finance in Asia. ADBI Working Paper 853. Tokyo: Asian Development Bank Institute. Available: https://www.adb.org/publications/overview-islamic-banking-and-finance-asia

Kumar, S. & Gulati, R. (2008). An examination of technical, pure technical, and scale efficiencies in Indian public sector banks using data envelopment analysis. *Eurasian Journal of Business and Economics, 1*(2), 33-69.

Kumar, S. & Gulati, R. (2010). Measuring efficiency, effectiveness and performance of Indian public sector banks. *International Journal of Productivity and Performance Management*, *59*(1), 51 – 74.

Mensi, S. & Zouari, A. (2010). Efficient structure versus market power: Theories and empirical evidence. *International Journal of Economics and Finance, 2*(4), 151-166.

Milenkovic, I. & Milenkovic, D. (2016). Interest and *gharar* in Islamic banking. *Bankarstvo*, *45*(1), 56-69.

Naeem-Ullah, M. A. G. (2013). Technical efficiency of Islamic and commercial banks: Evidence from Pakistan using DEA model (2007-2011). *IOSR Journal of Business and Management, 7*(4), 68-76.

Saaid, A. E., Rosly, S. A., Ibrahim, M. H. & Abdullah, N. (2003). The x-efficiency of the Sudanese Islamic banks. *IIUM Journal of Economics and Management,* 11(2), 123-141.

Said, A. (2013). Evaluating the overall technical efficiency of Islamic banks operating in the MENA region during the financial crisis. *International Journal of Economics and Financial Issues, 3(2), 426-434.*

Said, A. (2013). Risks and efficiency in the Islamic banking systems: The case of selected Islamic banks in MENA region. *International Journal of Economics and Financial Issues, 3*(1), 66-73.

Seelanatha, L. (2010). Market structure, efficiency and performance of banking industry in Sri Lanka. *Banks and Bank Systems, 5*(1), 20-31.

Siwar, E. & Jawada, M. (2017). The determinants of technical efficiency: Case of Islamic banks. *Australian Journal of Basic and Applied Sciences, 11*(6), 12-24.

Sufian, F. & Noor, M. A. N. M. (2009). The determinants of Islamic bank's efficiency changes: Empirical evidence from the MENA and Asian countries Islamic banking sectors. *International Journal of Islamic and Middle Eastern Finance and Management, 2*(2), 120-138.

Tahir, I. M & Haron, S. (2010). Cost and profit efficiency of Islamic banks: International evidence using the stochastic frontier approach. *Banks and Bank Systems, 5(4),* 78-83.

Watkins, K. B., Hristovska, T., Mazzanti, R., Wilson, C. E., & Schmidt, L. (2014). Measurement of technical, allocative, economic, and scale efficiency of rice production in Arkansas using data envelopment analysis. *Journal of Agricultural and Applied Economics, 46(1),* 89–106.

Yildrim, I. (2017). Financial efficiency analysis of Islamic banks in the QISMUT countries. *Journal of Islamic Economics and Finance, 3*(2), 187-216.

Yudistira, D. (2004). Efficiency in Islamic banking: An empirical analysis of eighteen banks. *Islamic Economics Studies, 2*(1), 1-19.

Zandi, G., Ariffin, N. M. & Shahabi, A. (2012). Some issues on murabahah practices in Iran and Malaysian Islamic banks. *African Journal of Business Management, 6*(24), 7066-7073.

Ziauddin, A. (2016). Islamic banking: State of the art. Retrieved 28th of September, 2019 from http://www.isdb.org/irj/go/km/docs/documents/IDBDevelopments/Internet/English/IRTI/C M/downloads/IES_Articles/Vol%202-1..Ziauddin..ISLAMIC%20BANKING.pdf

Zieba, M. (2011). An analysis of technical efficiency and efficiency factors for Austrian and Swiss non-profit theatres. *Swiss Society of Economics and Statistics, 147(2), 233-274.*

APPENDIX 1

S/N	Bank	Country	Region
1	JAIZ Bank PLC	Nigeria	Africa
2	Gulf African Bank	Kenya	Africa
3	Zitouna Bank	Tunisia	Africa
4	AlSalam Bank	Sudan	Africa
5	Amana Bank	Tanzania	Africa
6	Faisal Islamic Bank	Egypt	Africa
7	Agib Bank	Gambia	Africa
8	Salaam African Bank	Djibouti	Africa
9	Al Muamelat Assahiha Bank	Mauritania	Africa
10	Islamic Bank of Senegal	Senegal	Africa
11	Al-Arafah Islamic Bank	Bangladesh	Asia
12	Bank Muamalat	Indonesia	Asia
13	CIMB Islamic Bank	Bangladesh	Asia
14	Islamic Bank of Bangladesh	Bangladesh	Asia
15	Bank Syariah Mandir (BSM)	Indonesia	Asia
16	Islamic International Arab Bank	Jordan	Asia
17	Meezan Bank	Pakistan	Asia
18	Bank Islami	Pakistan	Asia
19	Saba Islamic Bank	Yemen	Asia
20	Tadhamon International Islamic Bank	Yemen	Asia