



The Efficiency of Islamic Banks in the Middle East and Southeast Asia: Stochastic Frontier Approach

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Abstract

This research aims to compare and analyze the efficiency of Islamic banking in Southeast Asia and the Middle East by examining particular inputs such as third-party funds, operational expenses, labor costs, and return on assets, focusing on financing as the output. This quantitative study uses a purposive sampling technique to sample 30 sharia banks from Southeast Asia and 30 sharia banks from the Middle East from 2015 to 2022. The data used is secondary data from BankFocus and the annual financial reports of each bank. Data was processed using the Frontier 4.1 application with the Stochastic Frontier Analysis method. The results of this research show that the efficiency of sharia banking in the Middle East is higher than sharia banking in Southeast Asia. On the other hand, the return on assets has no impact on financing, but the input of third-party funds, operational expenses, and labor costs all have an impact. These findings show the importance of efficiently supervising the management of third-party funds and costs incurred by banks in order to improve banking performance. Hence, this will ultimately lead to an increase in the efficiency of sharia banking and a growth of banking profits.

Keywords : Efficiency; Islamic Banks; Stochastic Frontier Analysis

INTRODUCTION

The Islamic banking sector continues to grow quite rapidly every year. According to the 2022 Islamic Finance Development Report, Islamic banking grew 17% from 2021, dominating 70% of sharia financial assets. The Gulf Cooperation Council (GCC), the Middle East and North Africa (MENA), and Southeast Asia occupy the top three positions in Islamic banking assets, which are recorded in the

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Islamic Finance Development Report respectively at \$1,188 billion for the GCC, \$1,100 billion for MENA and \$320 billion for Southeast Asia in 2021 (Refinitiv, 2022).

Despite having fast growth and large assets, according to the Islamic Financial Services Industry Report 2019, the performance of Islamic banking experienced a slowdown due to operational inefficiencies. Low efficiency will make banks lower their operating standards to increase their profits, such as by reducing credit supervision and causing increased bank risk, which will have implications for their financial stability (Isnurhadi et al., 2021). Efficiency is one of the banking performance parameters where the bank can manage its inputs to obtain maximum output. The more efficient a bank is, the more profits will increase, and this shows that the bank has good management so that bank risk will decrease and maintain its stability, considering the increasing competition between banks and unpredictable economic conditions (Rabbaniyah & Afandi, 2019).

There are indicators to see whether a bank is efficient or not, one of which is looking at the bank's savings or funds, financing, and costs. If the value of deposits and financing increases and expenses do not increase, the bank will be more productive and efficient in its performance (Kautsar & Sadalia, 2018).

Table 1
Data on Third-party Funds, Operational Costs, Labor Costs, ROA, and Financing in Southeast Asia Sharia Banking
Year 2015 - 2022 (in USD)

Year	Third-Party Fund	Labor Cost	Operating Cost	Return on Assets	Financing
2015	125.018.015	669.547	976.381	0.29	116.725.429
2016	130.666.583	688.821	982.930	0.07	122.186.386
2017	160.842.670	784.145	1.071.214	-0.32	144.743.395
2018	176.557.138	842.921	1.115.194	0.37	161.733.667
2019	191.472.840	931.490	1.140.401	0.32	176.178.261
2020	217.306.805	1.223.947	1.615.594	-0.04	200.162.212
2021	229.967.821	1.236.828	1.394.810	0.01	200.533.852
2022	241.092.559	1.325.156	1.449.457	0.47	212.324.302

Source: Secondary data, processed (2023)



Table 1 shows that the largest increase in financing, labor costs and operational costs is in 2020, which is 13.6%, 31.4% and 41.7%, while the largest increase in third-party funds (DPK, *Dana Pihak Ketiga*) occurred in 2017, which amounted to 23.1%. Then, the ROA input shows a fluctuating number and touched minus (-) in 2017 and 2020. Nevertheless, the bank demonstrated effective management of its operating costs by achieving a 15.8% decrease in 2021. This reduction is indicative of the bank's efficient cost management practices, which are expected to lead to improved profitability (Amalia & Diana, 2022). This corresponds to the data presented in Table 1, which indicates an increase in the Return On Assets (ROA) for Islamic banks in Southeast Asia in 2021.

However, for the entire research year, third-party funding in 2020 increased by 92.8% from 2015, as did labor costs which increased 97.9%, operating costs increased 48.5%, and financing increased 81.9% from 2015. This shows that sharia banks in Southeast Asia have been unable to reduce their operational costs to maintain efficiency. There has only been one year where sharia banks in Southeast Asia have been able to reduce their operating costs.

The table below is data on third-party funds (DPK), operating costs, labor costs, ROA, and financing in Islamic banking in the Middle East for 2015-2022.

Table 2
Data on Third-party Funds, Operational Costs, Labor Costs, ROA, and Financing in Middle East Sharia Banking Year 2015–2022 (in USD)

Year	Third-party Fund	Labor Cost	Operating Cost	Return on Assets	Financing
2015	350.727.069	4.736.421	2.814.695	1.40	303.589.301
2016	365.675.437	4.810.650	3.469.385	1.60	325.095.346
2017	390.735.768	4.981.430	4.077.945	1.12	347.673.382
2018	412.854.707	5.033.754	2.772.644	1.37	371.040.678
2019	465.481.456	5.472.997	3.596.220	1.31	418.042.150
2020	563.105.666	6.419.733	5.192.156	1.38	522.154.280
2021	677.475.417	6.751.885	11.550.610	1.53	636.483.237
2022	791.741.153	8.970.193	14.438.996	1.45	770.613.602

Source: Secondary data, processed (2023)

According to Table 2, the most significant increases in financing, DPK, and labor expenses occurred in 2022 at an annual rate of 21%, 16.8%, and 32.8%, respectively. Additionally, the highest increase in operational expenses appeared in 2021, with a substantial rise of 122.5%. The ROA input value exhibits a variable figure and never falls below 0; the most significant increase occurred in 2016, amounting to 14.3%.

Apart from that, there was a decrease in operating costs by 32% in 2017, and in the same year, the ROA increased, which is the same as conditions in sharia banking in Southeast Asia in 2021. However, table 2 also shows that a large increase in operating costs in 2021 does not reduce ROA but increases ROA value. According to the Islamic Finance Development Report (IFDR) 2021, this is because Islamic banks in Saudi Arabia have good asset quality and partner with FinTech, where the transaction volume from FinTech in Saudi Arabia reached \$17.9 billion, making it the largest market (Refinitiv, 2021).

However, overall DPK in 2020 increased 125.7% from 2015, as did labor costs, which increased 89.4%, operating costs increased 412.9%, and financing increased 153.8%. The escalation in operational expenses over existing funds and financing indicates that Islamic banks in the Middle East remain unsuccessful in reducing their operational expenses in order to maintain their efficiency (Kautsar & Sadalia, 2018).

Even though the efficiency of Islamic banks in Southeast Asia experienced fluctuations, the average efficiency score during 2007 - 2010 using the Data Envelopment Analysis (DEA) method was 66.75%, higher than the efficiency of Islamic banking in the Middle East, which is only 45.25%. This is because most Islamic banks in the Middle East operate on decreasing returns to scale, reducing input to achieve optimal scale so that their assets can increase (Rosman et al., 2014).

In Chowdury's research, the efficiency of Islamic banking in Southeast Asia, as measured by the DEA method from 2014-2019, experienced fluctuations. The efficiency of Islamic banking in the Philippines experienced a very significant decline, which, according to Chowdury, was caused by lower economic growth driven by slow global economic growth and public spending. Meanwhile, in Brunei, efficiency continues to increase consistently, even though it fell in 2015 due to technological advances and proper management. In 2015 and 2019, sharia



banking in several countries simultaneously experienced a decline due to the global economic recession (Chowdhury & Haron, 2021).

Then, Bahrini examined the efficiency of Islamic banks in the MENA region, specifically focusing on the GCC and non-GCC regions over the period of 2007-2012. The results showed that Islamic banks in the MENA region, especially GCC countries, performed well. Even during the global financial crisis in 2008, their efficiency remained untouched. On the other hand, Islamic banks in non-GCC regions experienced a decrease. Overall, bank performance in the MENA region was excellent, although it had decreased significantly in 2011 and 2012 due to inefficient allocation of bank input, and they just focused on increasing bank assets or size (Bahrini, 2017).

Several approaches could potentially be used as measurements of efficiency. The DEA approach has been used in several prior research. In addition to the DEA approach, another technique is referred to the parametric Stochastic Frontier Analysis (SFA) method. The SFA method offers several advantages. Firstly, it incorporates a disturbance term that represents problems, measurement errors, and uncontrolled surprises. Secondly, this allows for the testing of hypotheses using statistical methods. Thirdly, the SFA method facilitates the identification of outliers. It enables the calculation of efficiency values by utilizing the cost frontier and distance function, making it easier to detect unusual observations. Lastly, the cost frontier and distance function can be utilized to calculate efficiency values for companies with high output levels (Afandi et al., 2023).

Several studies have been conducted to assess the efficacy of Islamic banking. However, there is limited research on the differences in the efficiency of Islamic banking between Southeast Asia and the Middle East, specifically using the Stochastic Frontier method. Furthermore, each study varies in terms of the input and output variables used and the years in which the research was conducted.

Based on the background description, this research aims to find the level of sharia banking efficiency in Southeast Asia and the Middle East from 2015-2022. In addition, it aims to contribute to the existing literature on sharia banking efficiency. This study is expected to serve as evaluative material in bank management and enhance the sharia banking industry.



LITERATUR REVIEW

Efficiency Theory

Efficiency is an effort to maximize results in doing something by managing limited resources optimally. The concept of efficiency was first proposed by Farrell (1957), which was a follow-up to the model proposed by Debreu (1951) and Koopmans (1951). Farrell's efficiency measurement concept can take into account compound inputs (more than 1 input). Farrell stated that the efficiency of a company consists of two components, namely technical efficiency and allocative efficiency.

According to Koopmans (1951), technical efficiency occurs if a company produces more output without reducing other outputs using its inputs. On the other hand, allocative efficiency relates to the combination of inputs to produce optimal output at a certain price. Companies may be able to reduce costs in an effort to optimize the profits they want to achieve. According to Farrell (1957), efficiency is divided into two, namely technical efficiency and allocative efficiency, and then there is total economic efficiency, which is a combination of the two efficiencies that have been mentioned.

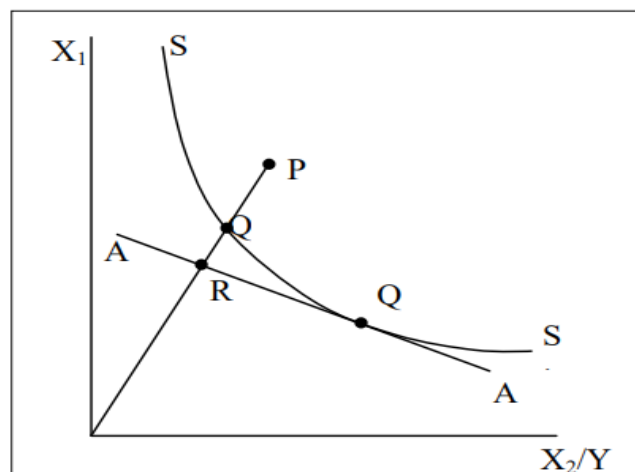


Figure 1 : Efficiency Concept

In Figure 1, the SS' curve represents the frontier isoquant, which shows the minimum combination of inputs to produce the most efficient output. Points P and Q represent two production conditions using inputs with the same



combinations $X1/Y$ and $X2/Y$. In Technical Efficiency, the combination of inputs to create one unit of output at point P is inefficient, while point Q is said to be efficient because the point is right on the isoquant frontier. This is because the QP/OP point is the amount of input that can be reduced proportionally without reducing output. Subsequently, Allocative Efficiency can be calculated if line AA' touches the SS' isoquant curve. The RQ distance indicates the level of inefficiency and costs that can be reduced to achieve allocative efficiency. Then, in Economic Efficiency, the efficiency point is located at point Q', and inefficiency is expressed other than at point Q' (Dewi & Fianto, 2020).

Bank Efficiency

Efficiency is an essential indicator in measuring banking performance. Komaryatin (2006) said that banking efficiency can be analyzed using scale, scope, technical, and location efficiency. Banks are said to achieve efficiency in scale when the banking concerned can operate with constant returns to scale, while coverage efficiency is achieved when banks can operate in diversified locations. Allocative efficiency is achieved when the bank can determine various outputs that can maximize profits, while technical efficiency is the relationship between input and output in a production process. A production process is considered efficient if a certain amount of input can produce maximum output or if minimum input is used to produce a certain amount of output (Novandra, 2014).

In Famera's research (2018), Silkman and Richard H. stated that three approach methods are often used to measure banking efficiency (Famera & Indriani, 2018):

- 1) Ratio Approach. We need to compare the amount of input and output used to calculate efficiency using the ratio approach. This approach shows that an organization is considered efficient if it is able to produce maximum output. However, this approach cannot calculate many inputs and outputs because it creates ambiguous assumptions.
- 2) Regression Approach. This approach calculates efficiency using a model that considers a given output level as a function of various input levels. This regression approach provides estimates of the relation that can be used to produce output at certain input levels. In this approach, an



organization is considered efficient if it is able to produce output greater than estimated. However, the weakness of this approach is that it can only take into account one output indicator. If many outputs are combined in one indicator, the information produced will be less detailed.

- 3) Frontier Approach. This approach is divided into two, namely, parametric and non-parametric approaches. The parametric approach is a method that determines the requirements for the population parameters. Meanwhile, a non-parametric approach is an approach that does not set specific requirements regarding population parameters. This parametric approach is categorized into three methods: Stochastic Frontier Analysis (SFA), Distribution Free Approach (DFA), and Thick Frontier Approach (TFA). Meanwhile, non-parametric approaches may be categorized into two methods: Data Envelopment Analysis (DEA) and Free Disposal Hull (FDH).

According to Hadad in Famera's research (2018), three approaches can be used in parametric and non-parametric methods in financial institutions (Famera & Indriani, 2018) :

- 1) Asset Approach. This approach has a character that describes the main function of financial institutions as lenders (loans).
- 2) Production Approach. This approach views financial institutions as producers of deposit accounts and loans and considers output as capital investment, number of workers, and others.
- 3) Intermediation Approach. This approach sees financial institutions as mediators managing assets from surplus to deficit units.

Hypothesis Development

The efficiency of Islamic Banking between Southeast Asia and the Middle East

Regarding the efficiency of Islamic banking, there are quite large differences between Islamic banks in Southeast Asia and the Middle East in terms of efficiency. In research by (Rosman et al., 2014) the average efficiency of Islamic banks during 2007 - 2010 in Southeast Asia using the Data Envelopment Analysis



(DEA) method was 66.75%, higher than the efficiency of Islamic banking in the Middle East, which was only 45.25%.

Then, in Fakhrunnas's reserach (2017), the average efficiency of Islamic banking in Southeast Asia during 2009 - 2012 using the Stochastic Frontier Analysis (SFA) method had a value of 90%. Meanwhile, in Bahrini's (2017), the average efficiency of Islamic banking during 2007 - 2012 in the GCC was 82.67% and in MENA was 76.5%, and in Abu-Alkheil et al., (2018) research, the efficiency of Islamic banking in Southeast Asia during in 2004–2014 it was 98%. However, the efficiency of the financial sector in the Middle East is slightly lower than that of Southeast Asia, where it stands at 85%, according to a study by Abu-Alkheil et al., (2018). Efficiency in the Middle East turns out to be smaller than the efficiency of Islamic banks in Southeast Asia, even though their assets and growth are greater than in Southeast Asia. Therefore the main hypothesis posited in this research is :

H_1 : The efficiency of Islamic banks in Southeast Asia is higher than Islamic banks in the Middle East

Determinants of Islamic Banking Efficiency

Efficiency in banking refers to the combination of inputs to produce optimal output at a certain level. A company is considered efficient if it produces maximum output with input. The inputs in this research are DPK, labor costs, operational expenses, and ROA, while the output is financing.

Regarding DPK, prior research has had a substantial impact on them Afandi et al. (2023); Dewi & Fianto (2020); Kautsar & Sadalia (2018); Ali et al. (2016). In order to implement financing, capital or funds are required; thus, DPK serves as a form of financing capital; an increased value of DPK enhances the bank's capacity to distribute financing.

Additionally, the financing management will incur operational expenses. Effective cost management is crucial for minimizing administrative costs and saving funds for essential purposes such as financing (Le, 2020). Previous studies have established that operational expenses have a substantial impact on financing Afandi et al. (2023); and Nguyen & Pham (2020). The higher the operational expenses, the lower financing would be.



Financing is also affected by labor costs Afandi et al. (2023); Nguyen & Pham (2020); and Rabbaniyah & Afandi (2019). An increase in the number of workers will directly affect the expenditure on labor costs. If there is no corresponding rise in the bank's profit, this will place pressure on administrative costs and divert funds that should be allocated for financing or other essential purposes toward labor costs.

Furthermore, the financing was also influenced by the ROA. The higher the bank's ROA, the more the management will allocate these earnings, particularly via financing distribution, resulting in increased bank efficiency as an intermediary institution (Muttaqin et al., 2020). This evidence can be found in previous studies like Pradika & Rohman (2022); and Rahmani & Wirman (2021).

Based on the explanation above, this research concludes the sub-hypothesis, namely as follows:

$H_{2,1}$: DPK influence financing in Southeast Asian sharia banking

$H_{2,2}$: Operational expenses influence financing in Southeast Asian sharia banking

$H_{2,3}$: Labor costs influence financing in Southeast Asian sharia banking

$H_{2,4}$: ROA influences financing in Southeast Asian sharia banking

RESEARCH METHOD

This research is quantitative research using secondary data and a purposive sampling technique with the criteria of Islamic banks, which have the variables studied in their annual financial reports, which are available on BankFocus and can be accessed on the websites of each bank in the 2015-2022 period. There are 60 Islamic banks with 30 banks each in Southeast Asia with 10 banks in Indonesia, 17 Banks in Malaysia, 1 Bank in the Philippines, Thailand, and Brunei Darussalam, and 30 banks in the Middle East, of which 5 Banks in the UAE, 3 banks in Saudi Arabia, Bahrain, Kuwait and Qatar, 2 banks in Iran, Jordan, Oman, Palestine and Syria, and 1 bank in Iraq, Egypt and Tunisia, so the sample for this research is 480 samples.



To see the efficiency of output and input, we use a technical efficiency approach, which focuses on the bank's operational pattern in channeling input to output, which will be directly calculated in the Frontier 4.1 application. According to Parasari (2020), using this technique can be interpreted as a bank only needing control in allocating its resources optimally if it wants to increase its technical efficiency.

This research uses the Stochastic Frontier Analysis (SFA) method using the Frontier 4.1 application, providing an efficiency value ranging between 0 and 1. The outcomes of this assessment provide a numerical value ranging from 0 to 1. A bank's efficiency is directly proportional to its proximity to 1, indicating more efficiency. Conversely, a bank's inefficiency is directly proportional to its proximity to 0, indicating lower efficiency. This SFA method has several advantages, such as involving a disturbance term that represents disturbances, measurement errors, and uncontrolled surprises. It makes it possible to test hypotheses using statistics, it is easier to identify outliers, and the cost frontier and distance function can be used to calculate efficiency values for companies with much output (Afandi et al., 2023).

This research also uses the Mann-Whitney difference test, which is a non-parametric test, to measure two samples that are independent of each other. The Mann-Whitney test is used to test differences in efficiency scores between Islamic banking in Southeast Asia and the Middle East. If the significance is < 0.05 , there is a difference in Islamic Bank efficiency between Southeast Asia and the Middle East (Jannah & Oktaviana, 2022).

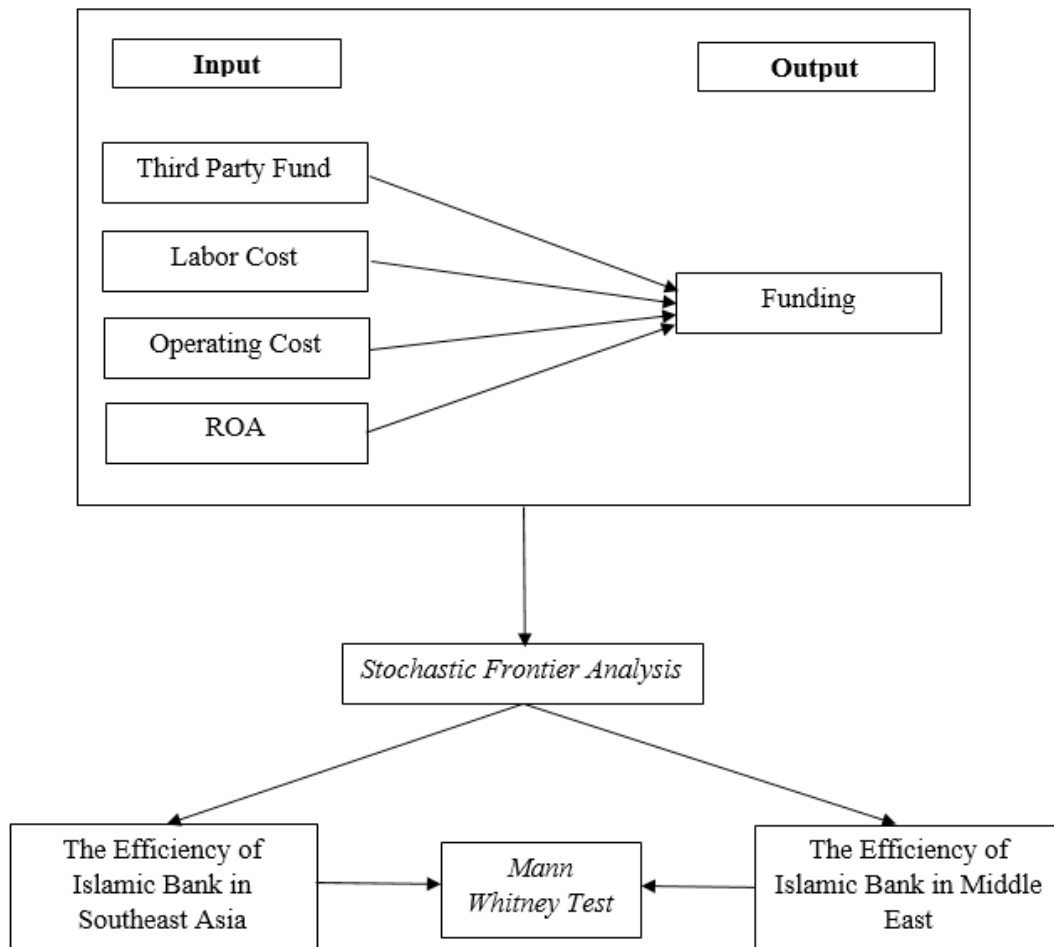


Figure 2 : Schematic Diagram of the Study

RESULTS AND DISCUSSION

The results of the empirical model estimation using the stochastic frontier approach or SFA method using the Frontier 4.1 application are in Table 3.

Table 3
Estimation Results of Islamic Bank in Southeast Asia and the Middle East

Information	Coefficient	Standard-Error	T-Ratio
Constanta	3,78423030	0,37915223	9,9807676
Third-party Fund	0,54913863	0,03474158	15,806378



Labor Cost	0,35715076	0,04731966	7,5476179
Operating Cost	0,05963175	0,01679019	3,5515978
ROA	-0,01686936	0,01162659	-1,4509289
Sigma-square	0,02582069	0,71456269	3,6134947
Gamma	0,98531281	0,00454138	216,696342

Source: Frontier 4.1, 2023

The equation model for the level of efficiency of Islamic banks during the 2015 – 2022 period can be written as follows :

$$\ln EF = 3,7842303 + 0,54913863 \ln DPK + 0,35715076 \ln BTK + 0,059631752 \ln BOP - 0,01686936 \ln ROA + 0,02582069 + 0,98531281$$

In order to assess the impact of the independent variable on the dependent variable separately, a statistical t test is used by comparing the estimated t value with the corresponding value in the t table. The value of the t table in this research is 1.64806, which is derived from a significance level (α) of 5% and degrees of freedom (df) of 476.

The input variable third-party funds (DPK) has a calculated t-value that exceeds the critical t-value from the t-table. Specifically, the calculated t-value is 15.806378, whereas the critical t-value is 1.64806. Therefore, it can be concluded that DPK has a considerable impact on financing. The DPK coefficient value of 0.5491 indicates that a 1% increase in DPK will result in a 0.5491% increase in funding. Thus, $H_{2,1}$ is accepted.

This result is the same as research by Afandi et al. (2023), Dewi & Fianto (2020), Kautsar & Sadalia (2018) and Ali et al. (2016) which states that DPK has an effect on financing, where if the DPK value is greater, the bank's ability to channel financing will be higher so that operational income will be higher. The bank's income from financing will be greater, and its performance will increase. On the other hand, if the DPK value becomes smaller, it will reduce the bank's ability to channel financing, which will have an impact on reducing bank profits, while labor costs and operational costs will still have to be paid so that the bank's performance will decrease and the bank will be considered inefficient (Parasari, 2020).

Furthermore, the input variable, labor costs, has a calculated t-value that exceeds the critical t-value from the t-table. Specifically, the calculated t-value is 7.5476179, while the critical t-value is 1.64806. This indicates that labor costs have a statistically significant impact on financing. Moreover, the coefficient value associated with labor costs is 0.35715, indicating that a 1% rise in labor costs would result in a 0.35715% increase in financing. The $H_{2,2}$ hypothesis has been confirmed, aligning with the findings of previous studies conducted by Afandi et al. (2023), Nguyen & Pham (2020), and Rabbaniyah & Afandi (2019). These studies have shown that labor costs positively impact financing.

Banks must be able to select better workers and understand what they are doing to make bank operations more effective. Every year sharia banking continues to experience development. It opens branch offices to expand and make it easier to carry out its intermediation function. In this case, there is an increase in competent workforce so that it can carry out more effective operational activities and attract public interest in entrusting their funds and carrying out financing in Islamic banks (Le, 2020).

Then the input variable operational costs have a calculated t that is greater than the t table, namely $3.55159781 > 1.64806$, so that operational costs have a significant effect on financing, with a coefficient value of 0.0596, which means that if operational costs increase by 1% then will increase financing by 0.0596%. The $H_{2,3}$ is approved and accepted, and these results align with research by Afandi et al. (2023) and Nguyen & Pham (2020) which states that operational costs positively affect financing.

Operational costs are incurred to operate bank business activities, such as promotional costs, rental costs, profit sharing costs, depreciation, investment, and others. According to research by Damayanti & Sulindawati (2022), operational costs, which have a positive effect, indicate that banks are able to control and manage operational costs well and can increase the potential income they will receive. In the IFDR 2021, sharia banking is implementing a branchless banking initiative and endeavoring to innovate banking products. This endeavor, as indicated by the research conducted by Tanjung & Novitasari (2022), requires expenses for promotion and investment costs in the technology sector for branchless banking and the development of these banking products. The ultimate



goal is to successfully attract public interest in utilizing sharia bank products, specifically fund custody and financing products.

Furthermore, the last input variable, namely return on assets (ROA), has a calculated t that is smaller than the t table, namely $-0.14509289 > 1.64806$, so that ROA does not have a significant effect on financing, so the $H_{2,4}$ rejected. This result is in line with research by Swaskarina & Pengestuti (2019) which states that ROA has no effect on financing.

ROA has no effect because Islamic banks have not generated good income from the distribution of financing, or if financing increases, but the ROA value decreases, this could be because the financing provided by the bank comes from DPK.

The efficiency level of Islamic banks in Southeast Asia during 2015–2022 can be seen in Table 4 below.

Table 4
Efficiency of Southeast Asian Sharia Banks 2015 – 2022

Bank	2015	2016	2017	2018	2019	2020	2021	2022	Mean
BSI	0,6836	0,6199	0,7646	0,3305	0,1081	0,6166	0,6948	0,7204	0,5673
Mega	0,5236	0,6222	0,7422	0,2012	0,5779	0,7712	0,7763	0,7235	0,6173
Muamalat	0,2981	0,3030	0,6765	0,3847	0,2330	0,6002	0,6526	0,7009	0,4811
Victoria	0,7566	0,6273	0,7002	0,1298	0,2593	0,6775	0,7379	0,7529	0,5802
BCA	0,6838	0,7155	0,7656	0,4735	0,5631	0,7064	0,7311	0,7486	0,6674
Maybank	0,9294	0,8885	0,7736	0,1139	0,5801	0,7917	0,7602	0,7511	0,6986
Panin	0,8536	0,9448	0,7111	0,2496	0,6255	0,8022	0,6469	0,7667	0,7001
Bukopin	0,8479	0,8492	0,7842	0,2418	0,2626	0,5698	0,6809	0,7416	0,6223
BJB	0,7869	0,7769	0,9116	0,3486	0,1496	0,7379	0,7776	0,7152	0,6505
BPD Riau	0,7139	0,6909	0,7910	0,2615	0,1191	0,7826	0,8318	0,7959	0,6233
Affin	0,7890	0,8973	0,7962	0,4053	0,3073	0,7888	0,7965	0,7677	0,6935
CIMB	0,6865	0,6106	0,7976	0,4923	0,4891	0,7641	0,7809	0,7969	0,6773
HSBC	0,8464	0,8665	0,8097	0,3526	0,3245	0,8339	0,8123	0,8293	0,7094
SCS	0,9586	0,9596	0,8296	0,2626	0,2409	0,8940	0,8901	0,8848	0,7400
KFH	0,8997	0,8905	0,7623	0,2718	0,1869	0,7612	0,8112	0,8634	0,6809

Al Rajhi	0,8381	0,8578	0,7908	0,2933	0,2607	0,6561	0,6482	0,7463	0,6364
Maybank	0,6643	0,6865	0,8324	0,5409	0,6591	0,8019	0,8165	0,8291	0,7288
RHB	0,6772	0,6974	0,8164	0,4509	0,5558	0,7719	0,8178	0,8186	0,6832
BIM	0,7467	0,7414	0,7788	0,4475	0,5342	0,7409	0,7365	0,7396	0,6663
OCBC	0,8569	0,8273	0,8305	0,3189	0,1918	0,7639	0,7486	0,7921	0,6378
HLI	0,6522	0,6954	0,8377	0,3749	0,2976	0,7323	0,7363	0,7758	0,6408
Muamalat	0,8010	0,7891	0,7748	0,3715	0,2883	0,6905	0,6951	0,7159	0,7410
MBSB	0,9299	0,9694	0,8132	0,4210	0,5347	0,6862	0,7941	0,7792	0,6498
Alliance	0,7603	0,8127	0,7620	0,3273	0,3462	0,7363	0,7194	0,7339	0,6807
PIB	0,6532	0,6893	0,8054	0,4537	0,5352	0,7490	0,7763	0,7838	0,6965
KRM	0,8037	0,7741	0,7851	0,4679	0,4031	0,7625	0,7879	0,7873	0,6900
Ambank	0,7782	0,8009	0,7783	0,4221	0,3302	0,8013	0,7982	0,8109	0,6855
Amanah	0,3760	0,3367	0,6225	0,1603	0,3509	0,6041	0,6704	0,5745	0,4619
IBT	0,6617	0,6434	0,7624	0,2721	0,1936	0,5689	0,7431	0,7419	0,5734
BIB	0,4263	0,4511	0,7361	0,2977	0,3267	0,5204	0,5730	0,6930	0,5030
Mean	0,7294	0,7345	0,7781	0,33799	0,3612	0,7228	0,7481	0,7627	0,6461

Source: Frontier 4.1, 2023

The results seen in Table 4 show that the efficiency of sharia bank in Southeast Asia is quite efficient because the result of their efficiency is 0.7 - 0.8 and is spread across almost the entire sample with an average of 0.7 even though in 2018 and 2019, the efficiency decrease, and the average efficiency is 0.6461.

Banking efficiency decreased drastically in 2018 because almost every country worldwide experienced an economic recession caused by several factors, like the trade war between the United States and China. Apart from that, in 2019, the efficiency of sharia banking in several Southeast Asian countries continued to decrease due to the COVID-19 pandemic. Consequently, this has a direct impact on the bank's overall performance and diminishes its operational efficiency. However, Table 4 shows that several Islamic banks in Indonesia and Malaysia experienced an increase in efficiency in 2019, although only slightly. This is because the bank is ready to face unstable economic conditions supported by good risk management. Moreover, in 2020, the efficiency of sharia banking has increased quite significantly and continues to increase.



Then, the efficiency of sharia banking in the Middle East during 2015-2022 can be seen in Table 5.

Tabel 5
Middle East Sharia Bank Efficiency 2015 - 2022

Bank	2015	2016	2017	2018	2019	2020	2021	2022	Mean
Al Rajhi	0,8284	0,7133	0,7967	0,6766	0,5486	0,7706	0,7929	0,7693	0,7371
Alinma	0,8531	0,8816	0,8103	0,6432	0,4678	0,7718	0,7801	0,7744	0,7478
Al Jazira	0,7293	0,6898	0,6954	0,5628	0,4576	0,7354	0,7619	0,7671	0,6749
AlBaraka	0,6218	0,6110	0,752	0,6477	0,4636	0,7349	0,7508	0,7435	0,6657
Al Salam	0,6201	0,5779	0,7563	0,426	0,3126	0,7121	0,8786	0,8802	0,6455
BIB	0,8857	0,8505	0,8094	0,4373	0,2919	0,7178	0,7228	0,7516	0,6834
Mellat	0,9229	0,9288	0,7967	0,7123	0,5431	0,7684	0,7410	0,7344	0,7685
Tejarat	0,4985	0,8693	0,8855	0,1531	0,1459	0,8735	0,8204	0,6429	0,6111
IIB	0,3648	0,3093	0,6434	0,2599	0,1063	0,7267	0,7191	0,7512	0,4851
KFH	0,7134	0,6057	0,7609	0,6193	0,4984	0,7267	0,7322	0,7342	0,6739
Boubyan	0,8341	0,8404	0,8049	0,5015	0,4185	0,7442	0,7572	0,7743	0,7094
Al Ahli	0,8634	0,9119	0,8248	0,4153	0,4183	0,8102	0,8001	0,7929	0,7296
JIB	0,7348	0,7203	0,7853	0,3946	0,3405	0,6977	0,7189	0,7384	0,6413
IIAB	0,7184	0,6576	0,7478	0,3614	0,3039	0,7393	0,7054	0,6865	0,6150
Faisal IB	0,1088	0,1076	0,4831	0,2439	0,1055	0,2165	0,2624	0,2825	0,2263
Nizwa	0,9009	0,9005	0,7829	0,3819	0,3148	0,7996	0,6361	0,8371	0,6942
Alizz	0,8457	0,8704	0,8201	0,1502	0,3609	0,9292	0,9246	0,9227	0,7280
AIB	0,6977	0,6712	0,7596	0,1375	0,2274	0,6795	0,6613	0,6566	0,5614
PIB	0,6978	0,6597	0,7669	0,1326	0,2073	0,7331	0,7447	0,7461	0,5860
QIB	0,8115	0,814	0,8333	0,5978	0,4894	0,7967	0,8142	0,7972	0,7443
MARB	0,9126	0,9136	0,8609	0,5172	0,4557	0,8286	0,8403	0,8275	0,7696
Dukhan	0,8285	0,8046	0,8203	0,5149	0,3914	0,8303	0,7969	0,8137	0,7251
CIB	0,6644	0,6923	0,7756	0,4872	0,8717	0,6594	0,7302	0,7384	0,7024
SIIB	0,5155	0,5011	0,7780	0,1669	0,1299	0,3481	0,4423	0,6156	0,4372
Zitouna	0,8537	0,9193	0,8065	0,1718	0,2438	0,7478	0,7083	0,7203	0,6464
DIB	0,7904	0,7537	0,8189	0,5550	0,5036	0,7807	0,8114	0,7838	0,7247
ADB	0,6921	0,6972	0,7859	0,5433	0,4645	0,7282	0,7592	0,7602	0,6788
EIB	0,7592	0,7907	0,7775	0,6332	0,4088	0,7259	0,6748	0,7631	0,6917

SIB	0,6836	0,6664	0,8033	0,4589	0,3841	0,7844	0,7759	0,7822	0,6674
Ajman	0,6944	0,8935	0,8139	0,3609	0,3664	0,7885	0,7895	0,7852	0,6865
Mean	0,7215	0,7274	0,7785	0,4288	0,3747	0,7302	0,7351	0,7458	0,6553

Source : Frontier 4.1, 2023

For efficiency in the Middle East itself, it can be seen in table 3 that the annual average is 0.7 with an overall average of 0.6553, which is in the quite efficient category. In both 2018 and 2019, Southeast Asia had a comparable decline in efficiency due to the global economic situation. However, several nations such as Saudi Arabia, Bahrain, and a number of other banks were not affected by the US and China trade war in terms of their bank's efficiency.

Then, in 2019, almost all banks in the Middle East experienced a drastic decrease due to the impact of the COVID-19 pandemic; only a few banks experienced a slight increase in efficiency after the 2018 global economic recession. After the pandemic, in 2020, the condition of banks in the Middle East also improved, like in Southeast Asia, and increased drastically, even in Iran, Oman, and Qatar, which increased to 0.8 points and was included in the efficient category.

Then, after getting the efficiency value for each bank from Southeast Asia and the Middle East, we carry out the Mann-Whitney difference test. The Mann-Whitney difference test is a data process carried out to determine whether there are significant differences between Islamic banks in Southeast Asia and the Middle East. The Man-Whitney test is a non-parametric difference test used to determine the differences between two existing samples. The result can be seen in Table 7.

Table 7
Mann Whitney Test

Statistic Test	
	Efficiency
Mann-Whitney U	367.000
Wilcoxon W	832.000
Z	-1.227
Asymp. Sig. (2-tailed)	.022

Source: SPSS 23, 2023



The results show that the value of Asymp. sig. (2- tailed) = 0.022 < significant value ($\alpha = 0.05$), meaning there is a difference in efficiency between Islamic banks in Southeast Asia and the Middle East.

When compared between Islamic banks in Southeast Asia and The Middle East, the Middle East has better efficiency than sharia banking in Southeast Asia. In fact, in many Islamic banks in several countries in the Middle East, the efficiency reaches 0.8 to 0.9, which is very efficient and remains consistent. This is different from Southeast Asia, where sharia banking is more prevalent in Malaysia and Indonesia because the Muslim population in Southeast Asia is larger in those two countries. According to research by HT and Rama (2018), sharia banking in Southeast Asia does not have the same quality of development because each country has political will.

Differences in local financing demand, quantity and quality of sharia assets, resources, *fatwas*, and others also cause this difference. According to Andre Sayegh, Deputy CEO of First Abu Dhabi Bank (FAB), the bank's strong capital ratios and liquidity metrics, operating in a government-supported environment, a careful risk management approach combined with excellent asset quality make banks in the Middle East can generate sustainable profitability, so that Islamic banks continue to grow stronger and have better and more stable efficiency (First Abu Dhabi Bank website, 2018). This is also supported by a statement from the Islamic Finance Development Report (IFDR) 2021, which states that Islamic banks in the Middle East have lower funding costs, good asset quality, and partner with many FinTechs, where the transaction volume from FinTechs in Saudi Arabia reaches \$17.9 billion makes it the largest market. In the Middle East region, such as in Saudi Arabia, the UAE, and Qatar, the government invests most of its infrastructure projects from Islamic banking financing in their countries (Ritonga et al., 2022).

Based on the description and statistics provided in this chapter, it can be inferred that the efficiency of sharia banking in the Middle East surpasses that of sharia banking in Southeast Asia. Consequently, the primary hypothesis in this study is rejected, or H_1 is rejected.

CONCLUSION

The results of research comparing 30 Islamic banks in each country in Southeast Asia and the Middle East show that the average efficiency value of



Islamic banking in the Middle East from 2015-2022 is 0.6553, with each year the efficiency value is stable at 0.7 except in 2018 and 2019, where the efficiency value was higher than the efficiency value of Islamic bank in Southeast Asia, where the average value was 0.6461, each year also had a stable efficiency value of 0.7 except in 2018 and 2019. Thus, the efficiency of Islamic banks in the Middle East is higher than the efficiency of Islamic banks in Southeast Asia, and this research hypothesis is rejected or H_1 is rejected.

The limitation of this research is that several Islamic banks in the Middle East and Southeast Asia are not included in the research object because one of the variables, namely labor costs, is not included in their annual financial report, and the banks selected in this research are limited because we compare the object with the same certain amount, only 30 sharia banks in each region of the Middle East and Southeast Asia. Consequently, Islamic banks need to pay more attention to their management, especially fund and risk management, because this will greatly influence banking efficiency and performance.

Future researchers can complement the number of output variables, such as revenue or profits, or include more input variables, such as fixed assets, capital, and others. In addition, future researchers have the opportunity to incorporate various alternative methodologies, such as the Distribution Free Approach (DFA), Thick Frontier Approach (TFA), Data Envelopment Analysis (DEA), and Free Disposal Hull (FDH), in order to gain a different perspective on bank efficiency. Future researchers can also increase the sample size or concentrate their sampling resources on other countries for greater accuracy in their findings.

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