

Assessing the Role of Zakat and Murabahah Financing in Improving Islamic Bank Performance

Dama Mustika^{1*}, Anis Mahmudah Dariati²

¹ STAI Hubbulwathan Duri, Indonesia, damamustika@staihwduri.ac.id

² STAI Arridho Bagansiapiapi, Indonesia, anismahmudahdariati07@gmail.com

Article Info	Abstract
Article history: Received May 26, 2026 Revised June 21, 2026 Accepted June 28, 2026 *Corresponding author email : damamustika@staihwduri.ac.id Keywords: Zakat, Murabahah, Return on Asset, Return on Equity, Islamic Commercial Banks, Legitimacy Theory	Introduction: Financial performance is a key indicator of the sustainability and competitiveness of Islamic Commercial Banks in Indonesia. Previous studies have reported inconsistent findings on the effects of zakat and murabahah financing on bank profitability, while limited research has simultaneously examined their impacts on Return on Assets (ROA) and Return on Equity (ROE) using legitimacy theory. This study investigates their influence on Islamic bank performance. Research Methods: A quantitative approach was employed using panel data regression analysis on eight Islamic Commercial Banks selected through purposive sampling during 2019–2023. Results: Zakat ($\beta = 0.000214$; $p = 0.0421$) and murabahah financing ($\beta = 0.000543$; $p = 0.0158$) positively and significantly affect ROA but have no significant effect on ROE. The ROA model explains 45.20% of the variation in profitability, whereas the ROE model explains only 6.50%. Conclusion: Zakat and murabahah financing improve asset utilization efficiency and strengthen organizational legitimacy, although their contribution to shareholder return efficiency remains limited.
DOI : 10.21154/etihad.v6i1.13904 Page: 30 - 50	Etihad with CC BY license. Copyright © 2026, the author(s)

INTRODUCTION

Financial performance is one of the main indicators to assess whether a bank functions as a financial institution. High financial performance is usually a top priority for a manager because it is very important for the organisation and the growth of a business (Dariati &

Mustika, 2025). Owners and potential investors pay close attention to the company's financial performance because this condition reflects the company's ability to provide welfare to its owners and positively contribute to improving the company's performance (Dariati et al., 2023). For Islamic financial institutions, financial performance is not only measured by profitability but also by the bank's ability to conduct its business in accordance with Islamic principles. Performance is not only assessed based on profitability but also on how well the company adheres to Sharia principles, including the management of zakat as a corporate social responsibility.

The performance of Islamic financial institutions is an important element that serves as a key aspect in the assessment of banking activities. The financial performance of a bank will describe the extent to which the bank can maximise its resources (Firdayati & Canggi, 2020). To face increasingly competitive competition, every bank is required to generate good financial performance. Islamic banks should identify the obstacles and challenges that may arise in carrying out their operational activities. The development of Islamic financial institutions in Indonesia has experienced a significant increase in line with the growing awareness of the community toward the Sharia-based financial system. This growth demands that Islamic financial institutions operate their activities professionally and accountably.

Financial performance is a reflection of the bank's financial condition from the past and serves as an indication of whether its condition will improve or worsen in the future (Tuan Ibrahim et al., 2020). The output of the bank's financial performance assessment is the presence of new strategies and policies for future business improvement. A good banking institution is a healthy financial institution, one that is sound in terms of credit or financing management. For that reason, banks must meet the health standards required by the Central Bank in each country. This is intended so that the economic growth of a country can grow positively. This research focuses on the Return on Assets (ROA) and Return on Equity (ROE) ratios because, for Islamic financial institutions, they demonstrate the bank's ability to manage assets efficiently, generate optimal profits, and remain compliant with Sharia principles. Financial performance is very good in terms of profitability (Dariati & Mustika, 2025).

Bank Syariah Indonesia (2024) recorded positive performance in 2023, with an increase in net profit and financing growth. This shows that BSI has successfully managed its assets and operations well. However, it is important to compare BSI's performance with other Islamic banks and observe performance trends over time to obtain a more comprehensive picture. The high preference of the public for using Islamic banks, coupled with modern banking services, has led to a rapid increase in the number of customers of Bank Syariah Indonesia. In the three years since the merger on February 1, 2021, until December 2023, the number of customers increased to 19.5 million and surpassed 20.5 million in the first half of 2024, making BSI the sharia bank with the largest number of customers in the world. According to the Financial Services Authority (OJK), Islamic banking assets in Indonesia continue to increase, with total assets reaching Rp703 trillion by the end of 2023, experiencing

growth of more than 10% compared to the previous year. Below are the banking performance data according to the OJK (2023) as follows:

Table 1. Banking Performance Data

Indikator	November 2023	Desember 2023
Return on asset	2,72%	2,74%
Net interest margin	4,83%	4,81%
Capital adequacy ratio	27,86%	27,65%
Credit growth (yoy)	9,74%	10,38%
Investment credit growth	-	12,26%
Working capital credit growth	-	10,05%
Contribution of state-owned banks to credit	-	45,64%
Third-party funds	-	Rp 8.458 triliun

Source: OJK, 2023

Table 1 above shows that the Financial Services Authority (OJK) assesses that the stability of the banking industry remains maintained, supported by strong capital, adequate liquidity, and a controlled risk profile. This condition allows the banking industry to face the potential slowdown in global economic growth.

The second phenomenon, Bank Muamalat Indonesia, recorded a profit decline of 83.68% year-on-year (YoY) to Rp 8.54 billion as of September 2024. The decline in performance is said to be an anomaly. There is suspicion that Bank Muamalat's performance in 2023 showed discrepancies. Therefore, the financial performance of Bank Muamalat Indonesia in 2023 needs to have its figures rechecked. Because there is a possibility that the financial statements do not comply with PSAK regulations (Kontan.co.id, 2024). The factors underlying the financial performance in Islamic financial institutions are zakat and murabahah.

Zakat is a form of worship that purifies wealth and also serves as a form of social concern for others. This illustrates the essence of purifying a person's wealth from worldly traits that may harm their spirituality. Zakat has become an important instrument in the process of wealth distribution within society and is a distinctive mechanism in the Islamic economy aimed at creating a fair, balanced, and sustainable social and economic system. The regulation of zakat remains firmly grounded in Islamic law (sharia) (Bin Nashwan, 2025; Bin-Nashwan et al., 2021). Zakat also has broader goals, namely combating poverty, reducing economic inequality, and promoting social justice in Muslim communities. Zakat also supports microeconomic stability by empowering the poor, which indirectly strengthens the economic base that supports Islamic banking businesses (Elbanna, 2024). The implementation of zakat not only reflects adherence to Sharia principles but also enhances the reputation and credibility of Islamic banks in the eyes of the community. This condition leads to increased customer loyalty, which in turn contributes to the company's profitability growth (Hussain,

2021; Sawmar & Mohammed, 2021). Meanwhile, Novitasari et al., (2022) revealed that zakat functions as an effective instrument for wealth redistribution, enhancing the welfare and purchasing power of the community, while also promoting sustainable economic growth. In the end, this condition also strengthens the resilience and overall financial performance of Islamic banking.

Optimal zakat expenditures can enhance the company's reputation, strengthen relationships with stakeholders, and influence the level of public trust in the company. Banking zakat does not have a significant impact on Return on Assets (ROA) because zakat funds are not effectively allocated to improve financial performance (Suciarti & Wafiroh, 2023). Additionally, zakat functions as a form of economic redistribution that can enhance social inclusion, thereby supporting the long-term sustainability of the company (Nurhayati & Wasilah, 2021). Inconsistent research is shown on the influence of zakat on ROA, where zakat increases social legitimacy and public trust, thereby improving the profitability of Indonesian Islamic banks and Islamic banking in Southeast Asia (Oktaviani et al., 2022; Sulaeman et al., 2022). In contrast, research states that zakat does not show a consistent effect on ROA, so the effectiveness of zakat as a driver of profitability is still debated (Hidayah et al., 2023; Suciarti & Wafiroh, 2023). This is because zakat functions more as a social distribution instrument rather than a commercial instrument (Munandar et al., 2021; Novitasari et al., 2022).

Inconsistency also occurs with zakat, which has been proven to have a positive and significant effect on ROE, indicating that the social function of Islamic banks can enhance legitimacy and impact capital-based profitability (Sulaeman et al., 2022). ROE has a positive relationship with corporate zakat payments at Indonesian Islamic Commercial Banks. The higher the ability to generate capital-based profits, the greater the capacity for zakat distribution (Aris Safii et al., 2019; Mais & Hastuti, 2023). Hidayah et al., (2023) and Novitasari et al., (2022), found that zakat does not show a consistent effect on firm performance indicators, including profitability, so the benefits of zakat do not automatically translate into an increase in ROE. Therefore, there is still room for research to reexamine whether zakat can improve the ROA and ROE of Islamic commercial banks in Indonesia.

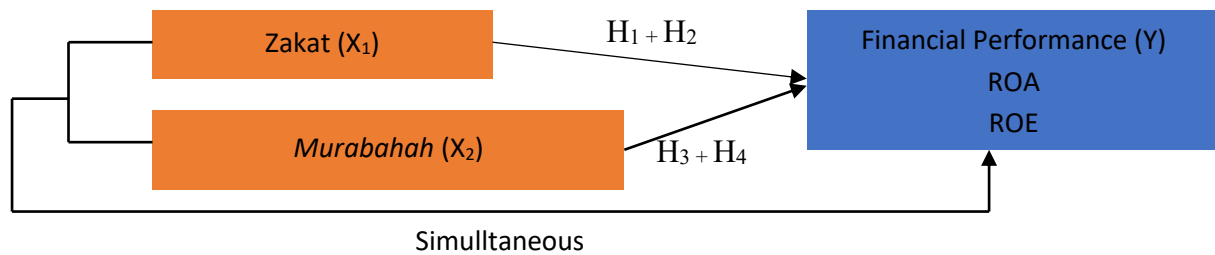
Murabahah is a form of sale and purchase transaction that requires the seller to disclose information to the buyer about the costs incurred to acquire the goods (cost price) and the desired profit margin included in the sale price (Wahid, 2021). Murabahah financing has a significant positive impact on financial performance, highlighting the importance of optimizing this financing to enhance the competitiveness of Islamic banks (Hidayah et al., 2023). Murabahah is a sales-based financing contract that is most dominantly applied in Islamic financial institutions because it provides certainty of profit margin and has a relatively lower risk level compared to profit-sharing contracts. In practice, Islamic banks purchase the goods needed by customers and then resell them at a price that includes a profit margin as agreed upon by both parties. The dominance of murabahah financing indicates that this contract has become an important instrument in maintaining income stability and increasing the profitability of Islamic banks. International research shows that murabahah financing

positively impacts the financial performance and operational efficiency of Islamic banking because it can generate stable income and minimize financing risk uncertainty (Atal et al., 2020; Chetioui et al., 2024).

Research gaps in several studies show different research results. It is proven that (Erniati et al., 2024; Fariza et al., 2023; Hasyim et al., 2024; Indrawati, 2021) state that murabahah financing has a positive and significant effect on ROA. (Ramadhani & Almuttaqin, 2024; Ridarmelli, 2019) found a negative effect of murabahah on ROA. Murabahah is considered to increase margin income stability and asset efficiency. This is different from the research of (A'yuni et al., 2021; Firdayati & Canggih (2020) which states that the increase in murabahah volume is not always followed by an increase in ROA because it is influenced by operational efficiency and financing quality. Based on previous research, the relationship between murabahah and ROA still shows contradictory findings. Some studies state that murabahah increases profitability through the stability of margin income and asset efficiency, while other studies show that the dominance of murabahah financing does not necessarily increase ROA because it is influenced by the structure of operational costs, financing risks, and fund management efficiency.

Research inconsistencies also occur with murabahah regarding ROE, which states that murabahah financing has a positive and significant impact on ROE. This is because the increase in murabahah margins boosts the profits available to shareholders. Murabahah is viewed as financing with relatively low risk and stable margins (Hasyim et al., 2024). (Nurhayati & Wasilah, 2021) found that murabahah has a positive effect on ROE because it directly contributes to the increase in net profit. Firdayati & Canggih (2020) murabahah does not have a significant effect on ROE. The high murabahah financing does not automatically increase shareholder returns due to the influence of capital structure and operational costs. Based on previous research, the relationship between murabahah financing and ROE still shows contradictory results. Some studies find that murabahah increases return on equity through margin-based profit increases, while other research shows that murabahah financing does not necessarily improve ROE due to the influence of capital structure, operational efficiency, and profit distribution mechanisms. Thus, there is still room for research to reexamine whether murabahah financing can improve the ROA and ROE of Sharia Commercial Banks in Indonesia, particularly through the approach of Legitimacy Theory. In addition, the optimization of murabahah financing is also considered capable of enhancing the competitiveness and sustainability of Islamic financial institutions amidst the developments in the global financial industry. Figure 1 below illustrates the conceptual framework of the research as follows:

Figure 1. Conceptual Framework



Source: *Framework of Thought*, 2026

Zakat Affects Return on Asset

Zakat is one of the Islamic economic instruments that has both social and economic functions for Islamic financial institutions. The payment of corporate zakat by Islamic banks is seen as a form of compliance with Sharia principles that can enhance social legitimacy, strengthen the company's reputation, and increase stakeholder trust. The increase in trust has the potential to drive the growth of third-party funds, expand market share, and enhance operational efficiency, thereby impacting the bank's ability to generate profits from its assets (Return on Assets). Empirically, (Ali et al., 2023; Sulaeman et al., 2022) found that zakat performance is the main determinant of the profitability of Islamic banks in Indonesia, where zakat significantly contributes to the increase in ROA. Furthermore, (Oktaviani et al., 2022; Tuan Ibrahim et al., 2020) found that the disclosure of zakat is positively related to the performance of Islamic banks, indicating that transparency in zakat reporting can strengthen the company's ethical value and enhance the bank's profitability. Nomran & Haron (2021), found that the zakat ratio is a Sharia performance indicator with high validity in measuring the profitability of Islamic banks, measured through Return On Asset (ROA).

According to Legitimacy Theory, companies strive to obtain and maintain social legitimacy by conducting activities that align with the values, norms, and expectations of the society in which the company operates (Deegan, 2002; Suchman, 1995). In the context of Islamic banking, the payment of corporate zakat is viewed as a form of compliance with Sharia principles and social responsibility that can enhance social legitimacy, strengthen the company's reputation, and build trust among stakeholders. The increased trust has the potential to drive the growth of third-party funds, expand market share, improve operational efficiency, and ultimately enhance the bank's ability to generate profit on its assets, as reflected in the increase in Return on Assets (ROA). Therefore, it can be concluded that the hypothesis is:

H1: Zakat has a positive effect on return on assets.

Murabahah Affects Return on Assets

Murabahah financing is a sales contract with the determination of an agreed profit margin at the outset, thus providing income certainty and a relatively lower level of risk compared to profit sharing based financing. From the perspective of Legitimacy Theory,

Islamic banks that consistently apply murabahah financing in accordance with Sharia principles will gain social legitimacy, enhance institutional reputation, and strengthen public and stakeholder trust in the bank's Sharia compliance. This increased trust has the potential to drive growth in financing, fund collection, and operational efficiency, ultimately improving the bank's ability to generate profits from its assets, as reflected in the increase in Return on Assets (ROA).

Research conducted by Chetoui et al., (2024); Hidayah et al., 2023; Sobiyanto & Fatwa, 2023) emphasizes that murabahah is a financing instrument capable of supporting the sustainability and operational efficiency of Islamic financial institutions. While Atal et al. (2020) found that the perception of Sharia compliance and religiosity are important factors driving the use of murabahah financing by the community. Furthermore, recent research shows that murabahah financing has a positive and significant impact on the profitability of Islamic banks, as proxied by ROA, because it can generate stable margin income and strengthen the financial performance of Islamic banks (Ramadhanti et al., 2023). Therefore, it can be concluded that the hypothesis is:

H2: Murabahah affects Return On Asset

Zakat Affects Return on Equity

Zakat is one of the Islamic social finance instruments that not only functions as a mechanism for wealth redistribution but also has the potential to improve the financial performance of Islamic banks, particularly Return on Equity (ROE), because good zakat management can strengthen stakeholder trust, enhance institutional reputation, and encourage effective capital management. The more optimal the distribution and management of zakat by Islamic banks, the greater the bank's opportunity to increase net profit generated from the capital owned by shareholders. Empirically, (Ali et al., 2023; Aris Safii et al., 2019; Sulaeman et al., 2022) found that zakat performance is the main determinant of the profitability of Islamic banks in Indonesia and significantly contributes to the increase in ROE. Furthermore, (Nomran & Haron, 2021) proved that the zakat ratio is a valid indicator of Islamic performance in explaining the profitability of Islamic banks measured using ROE. Therefore, zakat has a positive impact on the increase in ROE in Islamic financial institutions. In line with the research conducted by (Haron et al., 2021; Munandar et al., 2021) this study justifies that zakat is an appropriate measure to assess the performance of Islamic banks. Thus, Islamic banks should pay zakat in larger amounts as their profits increase. Therefore, zakat plays an important role in supporting Islamic social finance in the context of Islamic banks.

Based on Legitimacy Theory, Islamic banks strive to obtain and maintain societal legitimacy by conducting activities in accordance with Sharia values and principles, one of which is through the payment and management of zakat. Optimal implementation of zakat demonstrates the bank's compliance with social responsibility and Islamic principles, thereby increasing stakeholder trust, strengthening the institution's reputation, and encouraging improved financial performance, including Return on Equity (ROE). Thus, the better the

management of zakat by Islamic banks, the greater the opportunity for ROE improvement through the strengthening of legitimacy and support from stakeholders (Deegan, 2002; Suchman, 1995). Therefore, it can be concluded that the hypothesis is:

H3: Zakat affects return on equity

Murabahah Affects Return on Equity

Murabahah financing is a margin-based sale and purchase contract that generates relatively stable and predictable income for Islamic banks, thereby contributing to the increase in net profit and the bank's ability to generate returns on shareholders' equity, as reflected in the Return on Equity (ROE). Effective management of murabahah financing allows banks to obtain larger profit margins, which can ultimately enhance profitability. The positive relationship between murabahah financing and ROE has been supported by several previous studies (Al-Ramahi et al., 2025; Hasanah et al., 2022; Maulidiyah et al., 2025; Novyanti & Wirman, 2022; Nugroho & Faozan, 2022; Sawaldi & Surur, 2024). From the perspective of Legitimacy Theory, the implementation of murabahah based on the principles of transparency, margin certainty, and Sharia compliance reflects the alignment of the bank's activities with the values and expectations of stakeholders, thereby strengthening institutional legitimacy, increasing public trust, and supporting the improvement of the bank's financial performance (Dowling & Pfeffer, 1975; Haniffa & Hudaib, 2007; Suchman, 1995). Therefore, murabahah financing is expected to have a positive impact on the ROE of Islamic banks.

H4: Murabahah Affects Return on Equity

RESEARCH METHOD

The quantitative method is also known as the discovery method, because with this method, new science and technology can be found and developed using research data in the form of numbers and statistical analysis. This research will be conducted on Sharia Commercial Banks (BUS) registered with the Financial Services Authority (OJK) and Bank Indonesia (BI). The study includes Sharia banks that have complete financial report data for the period 2019-2023. The population in this study consists of 14 Sharia Commercial Banks in Indonesia from 2019 to 2023. The sample selection was conducted using the purposive sampling method, which is a technique for determining samples based on specific criteria, resulting in 8 Sharia Commercial Banks in Indonesia being selected as the sample. The criteria for sample selection in this study are as follows:

- a. Sharia Commercial Banks registered with the Financial Services Authority (OJK) or Bank Indonesia (BI)
- b. Sharia Commercial Banks that report annual financial statements for the years 2019-2023
- c. Sharia Commercial Banks that have zakat and murabahah values in their financial statements

Therefore, there are 8 names of Sharia Commercial Banks in Indonesia that are used as samples in this study, as follows:

Tabel 2. Sample of Sharia Commercial Banks in Indonesia

No	Name of The Islamic Bank
1	Bank Aceh Syariah
2	Bank Central Asia Syariah
3	Bank Jabar Banten Syariah
4	Bank Mega Syariah
5	Bank Muamalat Indonesia Tbk
6	Bank Panin Dubai Syariah Tbk
7	Bank Syariah Indonesia Tbk
8	Bank Victoria Syariah

Source: Bank Indonesia (BI) and Otoritas Jasa Keuangan (OJK), 2026

Table 2 above shows that the number of samples is 8 banks from 2019-2023, bringing the total to 40 samples.

Tabel 3. Variable Measurement

No	Variabel	Indikator
1	Financial Performance (Y)	Return on Assets = $\frac{\text{Net Profit After Tax}}{\text{Total Assets}} \times 100\%$ Return on Equity = $\frac{\text{Net Profit After Tax}}{\text{Shareholders Equity}} \times 100\%$
2	Zakat (X1)	Ln (Total Zakat)
3	Murabahah Financing (X2)	Ln (Total Murabahah)

The measurement of variables in this study was conducted using the EViews application as a tool for statistical and econometric data analysis. The financial performance variables are proxied using Return on Assets (ROA) and Return on Equity (ROE), which are calculated based on the ratio of net profit after tax to total assets and shareholders' equity. The zakat variable is measured through the total zakat managed by Islamic banking, reflecting the effectiveness of zakat fund management from collection to distribution. Meanwhile, the murabahah financing variable is measured based on the income obtained from murabahah transactions. All the data that has been obtained is then processed and analyzed using the EViews application to determine the impact of zakat and murabahah financing on the financial performance of Islamic financial institutions.

RESULT AND DISCUSSION

Descriptive Statistical Analysis

Descriptive statistical analysis is used to provide an overview of the characteristics and distribution of the research variables. This analysis presents summary measures, including the

mean, maximum, minimum, and standard deviation, to describe the data and support a better understanding of the variables before further regression analysis is conducted.

Table 4. Descriptive Statistics Results

	Zakat	Murabahah	ROA	ROE
Mean	508.07	26.784.02	1.1908	0.1218
Median	6.37	421.13	1.1700	0.1180
Maximum	14.392.95	184.390,46	4.0800	0.1820
Minimum	0.01	4.78	0.0200	0.0680
Std. deviation	2.296.17	50.675,55	0.8977	0.0307
Observations	40	40	40	40

Source: Data Eviews, 2026

Table 4 presents the descriptive statistics of the study variables based on 40 observations. The results show that zakat and murabahah financing exhibit relatively high variability, as indicated by their large standard deviations compared to the mean values. Meanwhile, ROA has an average value of 1.1908 with a range between 0.0200 and 4.0800, while ROE records an average of 0.1218 with values ranging from 0.0680 to 0.1820. Overall, the descriptive statistics indicate variations in the financial and operational characteristics of Indonesian Islamic commercial banks during the observation period.

Panel Data Regression Model

This study employs panel data regression to analyse the effect of zakat and murabahah financing on the financial performance of Indonesian Islamic commercial banks. Panel data combines cross-sectional and time-series observations, allowing the analysis to capture both differences among banks and changes over time, thereby producing more reliable estimation results.

Chow Test

Table 5. Chow Test Results: Dependent Variable

Dependent Variable	Effect Test	Statistik	Prob	Information
ROA	Cross-Section Chi Square	45.1230	0.0000	Fixed Effect (FEM)
ROE	Cross-Section Chi Square	82.4512	0.0000	Fixed Effect (FEM)

Source: Data Eviews, 2026

Based on the data in Table 5, which indicates that the return on asset has a Probability value of $0.0000 < 0.05$, it explains that the best model for return on asset is the Fixed Effect Model (FEM). Similarly, the return on equity has a Probability value of $0.0000 < 0.05$, which explains that the best model for return on equity is the Fixed Effect Model (FEM).

Hausman Test

Table 6. Hausman Test Results

Dependent Variable	Effect Test	Statistik	Prob	Keterangan
ROA	Cross-Section Random	14.8521	0.0006	Fixed Effect (FEM)
ROE	Cross-Section Random	2.1145	0.3474	Random Effect Model (REM)

Source: Data Eviews, 2026

Based on the data in Table 6, which indicates that the return on asset has a Probability value of $0.0006 < 0.05$, it explains that the best model for return on asset is the Fixed Effect Model (FEM). In contrast, the research results for return on equity have a Probability value of $0.3474 < 0.05$, which explains that the best model for return on equity is the Random Effect Model (REM).

Lagrange Multiplier Test

Table 7. Lagrange Multiplier Results

Dependent Variable	Lagrange Multiplier Test	Cross-Section	Prob	Information
ROA	Breusch Pagan	18.4512	0.0000	Random Effect
ROE	Breusch Pagan	12.1145	0.0000	Random Effect

Source: Data Eviews, 2026

Based on Table 7 above, which explains that the Prob. Breusch-Pagan (Cross-section) return on value is $0.0000 < 0.05$; the hypothesis is rejected. This means that there is an effect of disturbance variables (residual) that is not constant across companies, so the Random Effect model is more appropriate than the Common Effect model. Although the Lagrange multiplier test on ROA shows that REM is better than CEM (Prob 0.0000), since the previous Hausman test has already established Fixed Effects (FEM) as the best model, the result of the Lagrange multiplier test only serves to reinforce that the CEM model is not suitable for use. Similarly, the Return on Equity test results show a Prob. value of $0.0000 (< 0.05)$. This reinforces the decision that, for the Return on Equity variable, the Random Effect (REM) model is more efficient than the Common Effect Model (CEM).

Selected Regression Model: Random Effect Model

Table 8. Selected Regression Model

Variable ROA	Coefficient	Std. Error	T-Statistic	Prob.
C	1.120512	0.210432	5.324818	0.0000

Variable ROA	Coefficient	Std. Error	T-Statistic	Prob.
X1	0.000214	0.000102	2.098039	0.0421
X2	0.000543	0.000215	2.525581	0.0158
R-Squared	0.452018		F-Statistic	15.24102
Adj. R-Squared	0.422441		Prob(F-Statistic)	0.003512
Dependent: ROA				

Source: Data EViews, 2026

Table 9. Selected Regression Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.115042	0.025143	4.575508	0.0000
X1	0.000012	0.000011	1.090909	0.2854
X2	0.000005	0.000012	0.416667	0.6421
R-squared	0.065012		F-statistic	1.285412
Adj. R-squared	0.014521		Prob(F-statistic)	0.412034
Dependent: ROE				

Source: Data EViews, 2026

Based on the table above, the regression equation in this study is:

$$Y = \alpha + \beta X + \varepsilon$$

$$Y1 = 1.120512 + 0.000214 * X1 + 0.000543 * X2 + e$$

$$Y2 = 0.115042 + 0.000012 * X1 + 0.000005 * X2 + e$$

Multicollinearity Test

Table 10. Multicollinearity Results

Variable	Zakat (X1)	Murabahah (X2)
Zakat	1.000000	0.241512
Murabahah	0.241512	1.000000

Source: Data EViews, 2026

Based on Table 10 above, it explains that multicollinearity symptoms occur if the correlation value between independent variables is greater than 0.80. Based on the table above, the correlation value between the Zakat and Murabahah variables is 0.2415. Since the correlation value of $0.2415 < 0.80$, it can be concluded that there is no multicollinearity problem in this regression model, so the Zakat and Murabahah variables can be used together in the research model.

Heteroskedasticity Test

Table 11. Heteroskedasticity Test

Dependent Model	LM Statistic	Prob.	Decision
ROA	7.4215	0.0245	Subject to Heteroskedasticity
ROE	11.8542	0.0026	Subject to Heteroskedasticity

Source: Data EViews, 2026

The probability values for both models are < 0.05 ; thus, the Hypothesis is rejected. This means that both of your panel data models are experiencing heteroskedasticity issues.

Autocorrelation Test

Table 12. Autocorrelation Test

Dependent Model	F-Statistic	Prob.	Decision
ROA	5.8412	0.0463	Terkena Autokorelasi
ROE	6.1145	0.0428	Terkena Autokorelasi

Source: Data EViews, 2026

The F-statistic probability value for the ROA model is 0.0463, and for the ROE model is 0.0428, both below alpha 0.05, meaning the null hypothesis of no first-order autocorrelation is rejected. This model is indicated to have an autocorrelation problem.

Cross Sectional Dependence Test

Tabel 13. Cross Sectional Dependence Test

Dependent Model	Statistik	Prob.	Decision
Model ROA	2.8541	0.0043	There is Cross Sectional Dependence
Model ROE	3.1204	0.0018	There is Cross Sectional Dependence

Source: Data EViews, 2026

Prob. Value < 0.05 indicates that there is no cross-sectional dependence. This is common in the Islamic banking industry because Islamic Commercial Banks generally respond uniformly to macroeconomic shocks (such as BI regulations or inflation rates).

T Test

Table 14. t Test Results

Variable	T-Statistic	Prob.	Keterangan
Zakat --> ROA	2.098039	0.0421	Effects
Murabahah --> ROA	2.525581	0.0158	Effects
Zakat --> ROE	1.090909	0.2854	No Effects
Murabahah --> ROE	0.416667	0.6421	No Effects

Source: Data EViews, 2026

Based on the results of the t-test in Table 14, it is evident from the ROA model that the Zakat variable has a t-statistic value of 2.098 $>$ t-table (2.026) and is reinforced by a probability value of 0.0421 $<$ 0.05. This indicates that Zakat has a positive and significant effect on Return on Assets (ROA) in Islamic Commercial Banks during the period 2019-2023. The Murabahah variable shows a t-statistic value of 2.525 $>$ t-table (2.026) with a probability of 0.0158 $<$ 0.05. This result proves that Murabahah financing significantly affects the increase

in ROA. Meanwhile, the ROE model has a Zakat probability value of $0.2854 > 0.05$, indicating that Zakat does not significantly affect ROE. Based on the t-table value of 2.026, the Zakat value of $1.0909 < 2.026$. The amount of Zakat expenditure by Islamic banks does not have a significant impact on the fluctuations in the return on equity (ROE) for shareholders. The probability value of Murabahah is $0.6421 > 0.05$, so the Murabahah variable does not have a significant effect on ROE. The t-statistic value of Murabahah is $0.4166 < 2.026$. This indicates a very weak influence. Murabahah financing does not have a significant impact on ROE. This means that the increase in Murabahah distribution during this period does not automatically enhance the profit efficiency for the bank's equity.

Coefficient of Determination

Table 15. Coefficient of Determination results

Dependent Variable	R-squared (R ²)
ROA	0.4520
ROE	0.0650

Source: Data EViews, 2026

Based on Table 15 above, the R² value for ROA of 0.4520 indicates that the fluctuations in ROA for 8 Sharia Commercial Banks during the 2019–2023 period can be explained by the variables Zakat and Murabahah by 45.20%. The remaining 54.80% is explained by other variables outside this research model, such as Mudharabah financing, Musyarakah, or the inflation rate. Meanwhile, the R² value for the ROE variable of 0.0650 indicates that the Zakat and Murabahah variables only have the ability to explain the variation in ROE by 6.50%. The low value below 10% indicates that the Zakat and Murabahah variables have a very small influence on capital profitability. Most of the variation in ROE, amounting to 93.50%, is influenced by other factors not examined in this model.

DISCUSSION

The Effect of Zakat on Return on Assets

The research results show that zakat has a significant impact on Return on Assets (ROA). These findings indicate that implementing social functions in Islamic banking enhances the efficiency of asset utilisation in generating profits. The influence indicates that zakat not only serves as a compliance obligation with Sharia law but also has economic value that can support the bank's operational performance. These results are consistent with the research of (Ali et al., 2023; Dariati & Mustika, 2025; Hussain, 2021; Mais & Hastuti, 2023; Novitasari et al., 2022; Oktaviani et al., 2022; Sawmar & Mohammed, 2021; Sulaeman et al., 2022) which found that the implementation of zakat can strengthen social legitimacy and enhance the positive perception of stakeholders toward Islamic financial institutions. Increased trust can drive growth in third-party funds and enhance the effectiveness of intermediation, thereby improving the optimisation of productive assets.

The relationship between zakat and ROA can be explained through the Legitimacy Theory. This theory explains that organisations strive to maintain the alignment between corporate values and societal expectations. In the context of Islamic banking, the management of zakat becomes a form of social accountability that strengthens the institution's legitimacy. When legitimacy increases, banks gain greater support from the community, allowing assets to be used more productively and resulting in increased profitability. These findings expand the previous literature by showing that Islamic social finance instruments not only have a welfare distribution function but can also add economic value through improved operational efficiency of banks.

The Effect of Murabahah on Return on Asset

The research results show that murabahah financing has a significant impact on Return on Assets (ROA). These findings indicate that margin-based financing remains the main source of income generation and asset efficiency in Islamic Commercial Banks. These results support the research of Atal et al. (2020); Chetioui et al. (2024); Erniati et al. (2024); Fariza et al. (2023); Hasyim et al. (2024); Hidayah et al. (2023); Indrawati (2021); Nuaimi et al. (2024); Ramadhanti et al. (2023); Wahid (2021) which found that the dominance of murabahah financing provides income stability, thereby enhancing the bank's ability to generate profits from its assets. Murabahah provides a more stable income pattern compared to profit-sharing contracts because the margin amount is determined at the beginning of the contract. These conditions help the bank manage risk and maintain the quality of productive assets. As a result, the efficiency of asset utilization increases and is reflected in the rise of ROA.

From the perspective of Legitimacy Theory, the use of murabahah contracts in accordance with Sharia principles also strengthens public trust in the institution. That trust supports the growth of financing activities and enhances the bank's ability to optimize the available assets. These findings indicate that legitimacy in Islamic banking is not only built through social activities such as zakat but also through the implementation of financing products that comply with Sharia principles and can create operational stability.

The Effect of Zakat on Return on Equity

This study found that zakat does not have a significant impact on Return on Equity (ROE). These results indicate that although zakat can strengthen social legitimacy and improve operational efficiency, these benefits have not yet been directly translated into an increase in capital returns for shareholders. These findings are consistent with (Hidayah et al., 2023; Novitasari et al., 2022), which show that the influence of zakat on profitability is more dominant in operational aspects compared to the equity return dimension. This indicates that the achievement of social legitimacy does not always have a direct impact on the increase in capital owners' profits.

The difference in results between ROA and ROE can be explained by the characteristics of the two indicators. ROA measures the company's ability to generate profit from total assets, while ROE is heavily influenced by capital structure, leverage, profit distribution

policies, and the company's funding strategy. Thus, although the management of zakat can improve the quality of relationships with stakeholders and asset efficiency, this influence is not strong enough to enhance the efficiency of using equity capital. Theoretically, these results indicate that the Legitimacy Theory does not always produce uniform economic consequences across all financial performance indicators. Legitimacy obtained from social activities turns out to have a stronger influence on the operational dimension compared to the capital return dimension.

The Effect of Murabahah on Return on Equity

This study found that murabahah financing does not have a significant effect on Return on Equity (ROE). The results indicate that an increase in the volume of financing does not necessarily lead to an increase in the rate of return on capital received by shareholders. These findings are consistent with (Dariati et al., 2023; Firdayati & Canggih, 2020; Nugroho & Faozan, 2022; Verizaliani & Mubarakah, 2021; Zaidan, 2019) studies that indicate equity-based profitability is influenced by more complex factors compared to asset-based profitability.

The difference in results between ROA and ROE indicates that the increase in income through murabahah financing is more absorbed in maintaining liquidity, forming risk reserves, and supporting operational expansion rather than increasing profits distributed to shareholders. Additionally, the characteristics of murabahah, which tend to generate stable but relatively conservative margins, result in an increase in financing not always being accompanied by an increase in capital efficiency. In other words, the growth of financing can increase productive assets but does not necessarily improve return on equity. From the perspective of Legitimacy Theory, this result shows that the bank's success in maintaining legitimacy through adherence to Sharia principles and the use of safe products does not necessarily yield optimal economic returns for capital owners. Thus, institutional legitimacy is more translated into operational stability rather than an increase in shareholder value.

CONCLUSION

This study aims to analyze the influence of zakat and murabahah financing on the financial performance of Sharia Commercial Banks in Indonesia, proxied through Return on Assets (ROA) and Return on Equity (ROE). The research results indicate that zakat and murabahah financing have an impact on asset-based profitability (ROA), but do not significantly affect equity-based profitability (ROE). These findings indicate that the implementation of social functions and Sharia financing activities is more effective in improving operational efficiency than in providing returns on shareholder capital. Theoretically, this research expands the Legitimacy Theory by demonstrating that adherence to Sharia principles through the management of zakat and murabahah financing can strengthen institutional legitimacy and encourage improvements in operational performance, although it has not yet directly increased the economic value for capital owners.

This research has several limitations, namely being limited to the sample of Sharia Commercial Banks in Indonesia, the use of zakat and murabahah variables as the main determinants, a limited observation period, and the use of a panel data model that has not yet incorporated advanced estimation approaches. Therefore, future research is recommended to expand the sample scope, add control and moderation variables, extend the observation period, and use more robust analysis methods to obtain more comprehensive and generalizable results.

REFERENCES

- Ali, M. A., Shuib, M. S. & Nor, A. M. (2023). Zakat As a Corporate Social Responsibility: How Does It Affect the Financial Performance of Islamic Banks? *Jordan Journal of Business Administration*, 19(2), 275–293. <https://doi.org/10.35516/jjba.v19i2.1052>
- Al-Ramahi, N. M., Almubaydeen, T. H. & Alasad, M. Z. (2025). The Effect of Changing Murabaha Rates on the Financial Performance of the Islamic Banks Listed on a Stock Exchange. In A. M. A. Musleh Al-Sartawi, A. I. Nour & I. Abdeljawad (Eds.), *Business Resilience and Business Innovation for Sustainability: The Double-Edged Role of Artificial Intelligence and Other Disruptive Technologies* (pp. 123–135). Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-87584-7_10
- Aris Safii, M., Iain, F., Ninda, P. & Arismawati, D. (2019). *Return On Equity: Alokasi Dana Zakat, Profit Sharing Financing Dan Good Corporate Governance Pada Bank Umum Syariah Di Indonesia* (Vol. 2, Issue 2).
- Atal, N. U., Iranmanesh, M., Hashim, F. & Foroughi, B. (2020). Drivers of intention to use Murabaha financing: religiosity as moderator. *Journal of Islamic Marketing*, 13(3), 740–762. <https://doi.org/10.1108/JIMA-07-2019-0147>
- A'yuni, D. S., Fauziah, N. D. & Purwanto. (2021). The Effect of Mudharabah, Musyarakah, Murabahah Finance on Return On Asset (ROA). *MJIFM: Majapahit Journal of Islamic Finance and Management*, 1(2), 139–150. <https://doi.org/https://doi.org/10.31538/mjifm.v1i2.18>
- Bin Nashwan, S. A. (2025). Beyond complexity: do alms tax (zakat) law intricacies justify non-compliance behaviour? *Journal of Financial Regulation and Compliance*, 33(3), 307–325. <https://doi.org/10.1108/JFRC-08-2024-0165>
- Bin-Nashwan, S. A., Abdul-Jabbar, H. & Aziz, S. A. (2021). Does trust in zakat institution enhance entrepreneurs' zakat compliance? *Journal of Islamic Accounting and Business Research*, 12(5), 768–790. <https://doi.org/10.1108/JIABR-09-2020-0282>

- Chetioui, Y., Lebdaoui, H., Belouali, Z. & Sarea, A. (2024). Antecedents of Murabaha home financing among Muslim household – an integrated framework. *International Journal of Social Economics*, 51(12), 1646–1661. <https://doi.org/10.1108/IJSE-10-2022-0680>
- Dariati & Mustika. (2025). Zakat and Islamic Bank Financial Performance: Do Third Party Funds Play an Important Role? *Journal of Business Management and Islamic Banking*, 4(1), 015–024. <https://doi.org/10.14421/jbmib.2025.0401-02>
- Dariati, A. M., Heriyani, H. & Mustika, D. (2023). Pengaruh Intellectual Capital Terhadap Kinerja Perusahaan dengan Corporate Governance Sebagai Variabel Intervening Pada Perusahaan Perbankan. *Jurnal Akuntansi Dan Ekonomika*, 13(2), 185–193.
- Deegan, C. (2002). Introduction: The legitimising effect of social and environmental disclosures – a theoretical foundation. *Accounting, Auditing & Accountability Journal*, 15(3), 282–311. <https://doi.org/10.1108/09513570210435852>
- Dowling, J. & Pfeffer, J. (1975). Organizational Legitimacy: Social Values and Organizational Behavior. *The Pacific Sociological Review*, 18(1), 122–136. <https://doi.org/10.2307/1388226>
- Elbanna, M. (2024). The Development of Zakat, Infaq, Sadaqah in Egypt: A Literature Review Approach. *Demak Universal Journal of Islam and Sharia*, 2(03), 375–388. <https://doi.org/10.61455/deujis.v2i03.218>
- Erniati, Jatmiko, E. & Marfudin. (2024). *Pengaruh Pembiayaan Murabahah terhadap Profitabilitas*. <https://doi.org/10.51226/eksyda.v4i2.651>
- Fariza, C., Ayumiati & Muksal. (2023). *Pengaruh Pembiayaan Murabahah terhadap Return on Asset*. <https://doi.org/10.22373/jihbiz.v5i1.17257>
- Firdayati, E. & Canggi, C. (2020). *Pengaruh Pembiayaan Murabahah terhadap Profitabilitas*. <https://doi.org/10.26740/jekobi.v3n3.p67-79>
- Haniffa, R. & Hudaib, M. (2007). Exploring the Ethical Identity of Islamic Banks via Communication in Annual Reports. *Journal of Business Ethics*, 76, 97–116. <https://doi.org/10.1007/s10551-006-9272-5>
- Haron, R., Barre, G. M. & Othman, A. H. A. (2021). *Zakat and the Performance of Islamic Banks: Empirical Evidence* (pp. 67–84). IGI Global Scientific Publishing. .
- Hasanah, N., Jabid, A. W. & Sirat, A. H. (2022). Pengaruh Pembiayaan Mudharabah, Musyarakah, dan Murabahah terhadap Return On Equity Melalui Non Performing Financing sebagai Variabel Intervening. *Syntax Literate: Jurnal Ilmiah Indonesia*, 7(8). <https://doi.org/https://doi.org/10.36418/syntax-literate.v7i8.9127>

- Hasyim, F., Hidayat, M. F. & Pangesti, P. I. (2024). *Determinant of Type Financing on Islamic Commercial Bank's Profitability*. <https://doi.org/10.21093/inasjif.v3i1.9213>
- Hidayah, N., Wastuti, W. & Nasution, S. (2023, July 11). *The Role of Financing and Zakat on the Performance of Indonesian Islamic Banks*. <https://doi.org/10.4108/eai.19-7-2022.2329724>
- Hussain, S. (2021). Tamlik-proper to Quasi-tamlik: Unconditional Cash Transfer (UCT) of Zakat Money, Empowering the Poor and Contemporary Modes of Distributing Zakat Money with Special Reference to British Muslim Charities. *Journal of Muslim Minority Affairs*, 41(1), 179–201. <https://doi.org/10.1080/13602004.2021.1894388>
- Indrawati, R. (2021). *The Effect of Mudharabah, Murabahah, and Ijarah Financing on Profitability (ROA)*. <https://doi.org/10.24252/attawazun.v1i3.26116>
- Kontan.co.id. (2024, 11. December). *Laba Bank Muamalat Merosot 83,68% pada Kuartal III-2024, BPKH Ungkap Penyebabnya*. <https://keuangan.kontan.co.id/news/laba-bank-muamalat-merosot-8368-pada-kuartal-iii-2024-bpkh-ungkap-penyebabnya>
- Mais, R. & Hastuti, D. D. (2023). *Profitability and zakat payment: The role of firm size*. <https://doi.org/10.36407/jrmb.v8i1.882>
- Maulidiyah, N., Indiraswari, S. D. & Tyasari, I. (2025). Return on Equity pada Bank Syariah: Dampak Pembiayaan Murabahah, Mudharabah, Musyarakah, Ijarah dan Qard. *Al-Kharaj: Jurnal Ekonomi, Keuangan & Bisnis Syariah*, 7(9). <https://doi.org/10.47467/alkharaj.v7i9.8561>
- Munandar, A., Ekonomi, F. & Bisnis, D. (2021). Do Zakat and Tax Payment Increase Islamic Organization Performance? In *Academy of Accounting and Financial Studies Journal* (Vol. 25, Issue 3).
- Nomran, N. M. & Haron, R. (2021). Validity of zakat ratios as Islamic performance indicators in Islamic banking: a congeneric model and confirmatory factor analysis. *ISRA International Journal of Islamic Finance*, 14(1), 41–62. <https://doi.org/10.1108/IJIF-08-2018-0088>
- Novitasari, M., Aviyanti, R. D. & Wan Ismail, W. A. (2022). The role of third-party funds on the effect of intellectual capital and zakat performing ratio on firm performance in Islamic banks. *Journal of Islamic Accounting and Finance Research*, 4(2), 283–300. <https://doi.org/10.21580/jiafr.2022.4.2.11890>
- Novyanti, L. A. & Wirman, W. (2022). Pengaruh Pembiayaan Mudharabah Dan Murabahah Terhadap Profitabilitas. *Gorontalo Accounting Journal*, 5(1), 42. <https://doi.org/10.32662/gaj.v5i1.1968>

- Nuaimi, A., Alaryani, E., Yaqubi, S. & Nobanee, H. (2024). Murabaha in Islamic Finance: An In-Depth Review and Analysis of Recent Contributions. *SSRN Electronic Journal*, 1. <https://doi.org/10.2139/ssrn.4978528>
- Nugroho, B. S. & Faozan, A. (2022). The Effect of Mudharabah, Musyarakah and Murabahah Financing on Profitability (A Study on Sharia Commercial Banks For The 2016-2021 Period). *Jurnal Syarikah: Jurnal Ekonomi Islam*, 8(2), 208–216.
- Nurhayati, S. & Wasilah. (2021). *Islamic Banking Financing and Profitability in Indonesia*. <https://doi.org/10.1108/JIABR-08-2020-0241>
- Oktaviani, I. N., Alaidrus, S. & Siswanto. (2022). The Influence of Qard and Zakat on Profitability of Islamic Banks in Indonesia. *Indonesian Interdisciplinary Journal of Sharia Economics*. <https://doi.org/10.31538/ijse.v5i1.1968>
- Ramadhani, N. & Almuttaqin, M. A. (2024). Pengaruh Pembiayaan Mudharabah, Musyarakah, dan Murabahah terhadap Profitabilitas melalui Non-Performing Financing sebagai Variabel Intervening (pada Bank Pembiayaan Rakyat Syariah di Indonesia Periode 2020-2022). *Al Qalam: Jurnal Ilmiah Keagamaan Dan Kemasyarakatan*, 18(1), 382. <https://doi.org/10.35931/aq.v18i1.3007>
- Ramadhanti, F., Atichasari, A. & Kristanti, K. (2023). Pengaruh Pembiayaan Murabahah Mudharabah Dan Musyarakah Terhadap Profitabilitas (ROA) Dengan Non Performing Financing (NPF) Sebagai Variabel Moderasi (Studi Pada Bank Muamalat Indonesia Periode 2012-2021). *FISCAL: Jurnal Akuntansi Dan Perpajakan*, 1, 70. <https://doi.org/10.25273/jap.v1i1.15332>
- Ridarmelli. (2019). Analysis of The Influence of Murabahah and Mudharabah Financing on The Profitability of Sharia Banking. *Russian Journal of Agricultural and Socio-Economic Sciences*, 93(9), 39–49. <https://doi.org/10.18551/rjoas.2019-09.04>
- Sawaldi, A. & Surur, M. (2024). Pengaruh Pembiayaan Musyarakah Mudharabah dan Murabahah Terhadap Profitabilitas Bank BSI. *Ranah Research: Journal of Multidisciplinary Research and Development*, 6(3), 330–339. <https://doi.org/10.38035/rrj.v6i3>
- Sawmar, A. A. & Mohammed, M. O. (2021). Enhancing zakat compliance through good governance: a conceptual framework. *ISRA International Journal of Islamic Finance*, 13(1), 136–154.
- Sobiyanto, A. & Fatwa, N. (2023). Pengaruh Pembiayaan Murabahah, Pembiayaan Mudharabah, dan Pembiayaan Musyarakah pada Profitabilitas Bank Perkreditan Rakyat Syariah. *Jurnal Ilmiah Ekonomi Islam*, 9(2), 1992. <https://doi.org/10.29040/jiei.v9i2.8560>

- Suchman, M. C. (1995). Managing Legitimacy: Strategic and Institutional Approaches. *The Academy of Management Review*, 20(3), 571–610. <https://doi.org/10.2307/258788>
- Suciarti, P. & Wafiroh, N. L. (2023). Zakat Funds, Non-Halal Funds, Islamic Social Reporting On The Islamic Commercial Banks Performance And Reputation. *JAS (Jurnal Akuntansi Syariah)*, 7(1), 42–57. <https://doi.org/10.46367/jas.v7i1.1105>
- Sulaeman, S., Adam, M. & Supriani, I. (2022). The Nexus Between Zakat Performance, COVID-19 Crisis and Islamic Banks' Profitability. *International Journal of Zakat*, 7(2). <https://doi.org/10.37706/ijaz.v7i2.427>
- Tuan Ibrahim, T. A. F., Hashim, H. A. & Mohamad Ariff, A. (2020). Ethical values and bank performance: evidence from financial institutions in Malaysia. *Journal of Islamic Accounting and Business Research*, 11(1), 233–256. <https://doi.org/10.1108/JIABR-11-2016-0139>
- Verizaliani, V. D. & Mubarakah, I. (2021). Pengaruh Pembiayaan Murabahah dan Musyarakah Terhadap Profitabilitas. *Competitive: Jurnal Akuntansi dan Keuangan*, 5(2), 205–210. <https://doi.org/10.31000/competitive.v5i2.4324>
- Wahid, N. (2021). *Perbankan Syariah: Tinjauan Hukum Normatif dan Hukum Positif* (1st ed.). Kencana.
<https://books.google.co.id/books?id=RCwzEAAAQBAJ&printsec=copyright&hl=id#v=onepage&q&f=false>
- Zaidan, F. (2019). Pendapatan Murabahah, Mudharabah, dan Musyarakah Terhadap Profitailitas Terhadap Profitabilitas Bank Dengan NPF Sebagai Moderating. *Al-Urban: Jurnal Ekonomi Syariah Dan Filantropi Islam*, 3(1), 13–23. https://doi.org/10.22236/alurban_vol3/is1pp13-23