

THE NEXUS BETWEEN ISLAMIC FINANCE AND ECONOMIC DEVELOPMENT IN INDONESIA BASED ON TIME-SERIES MODEL

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ABSTRACT

The purpose of this research is to investigate the long-term and dynamic correlation between Islamic financing and economic development in Indonesia. We have analyzed yearly time-series data on GDP per capita and total Islamic financing assets taken from 2011 to 2022 in the country. Using time-series model, particularly OLS and VAR models. It has been found that Islamic financial systems have a positive and substantial link with GDP per capita both in the short and long term. It highlights that Islamic finance development is an important component that the government should address in order to boost the country's economic growth.

1. INTRODUCTION

According to the development strategy of developing countries, they put more focus on financial sector development and deepening in their efforts to reduce poverty. It is fact that financial sector is considered as having a crucial role in promoting economic growth and, indirectly via growth, poverty reduction through mobilizing savings, facilitating payments and trade of goods and services, and encouraging effective resource allocation.

Over the last several decades, one of the key goals of development aid has been to support the expansion of the financial sector.

As we studied the relationship between Islamic finance and economic development in the case of Indonesia in our research, in recent years, Indonesia has been facing a number of social, economic, and environmental difficulties that must be addressed in order to reach the development of the country.

However, one of the most significant factors is economic growth that can assist the country in overcoming many of its current issues. The expansion of economic sectors and the free market economy have offered several opportunities for the economic growth of Indonesia. The banking sector contributes significantly to the economic growth of the country. The countries where the Muslim population lives, which is predicted to make it up more than 25% of the world's population by 2030, are contributing to the expansion of Islamic finance (Suhardi M. Anwar and Junaidi Junaidi, 2020). Throughout that period, it is likely to rise from 2.6 million to 6.2 million in the USA. Furthermore, it's possible that it will rise by more than 10% of the overall population in a number of European countries (Solomon, 2018). The Muslim community naturally plays a significant role in the development of Islamic financial institutions (Hassan et al., 2011; Lebdaoui and Wild, 2016).

The seven Muslim-majority countries, including Bangladesh, Egypt, Indonesia, Iran, Nigeria, Pakistan, and Turkey, have the potential to have the largest economies in the world (Muhamad and Mizerski, 2013). With the largest Muslim population in the world, Indonesia has a significant Islamic finance industry that stands in fourth in the world's Islamic finance market, after Iran, Malaysia, and Saudi Arabia (Mohd. Yusof and Bahlous, 2013). It only had two Islamic banks in 1999, but now there are 164 Islamic rural banks, 14 full-edged Islamic banks, and 19 Islamic windows (OJK, 2019). In context of this, it is crucial to assess the Islamic bank of Indonesia's (IIB) role to economic growth.

Indonesia's Islamic finance assets increased to US\$ 169.7 billion in 2022, and this trend is projected to continue as the Indonesian government and financial institutions show greater support for this developing industry. With positive signs in Islamic retail banking, Islamic bond (Sukuk), project and infrastructure finance, Islamic insurance (Takaful), and Islamic microfinance, Indonesia has proven to be a strong contender against established Islamic finance jurisdictions such as Malaysia and Bahrain in recent years. The number of banks and financial organizations offering Islamic banking services and products has expanded, and international investors are flocking to the country, recognizing the Islamic capital markets' potential for expansion.

Economic development refers to changes that affect a local economy's capacity to create wealth for local residents. Economic development for Indonesia can be identified through number of indicators, including GDP growth, poverty issues, employment, healthcare, environment, education, trade and commerce etc.

Furthermore, it is generally recognized that the aims of the establishment of Islamic banks are not just profit-oriented goals for the enterprise, but also to promote welfare in society and, finally, to boost the country's economic growth.

Due to this reason, it is crucial to look at how Islamic finance (IF) has influenced Indonesia's economic growth. However, the theoretical and empirical research indicates that the link between Islamic finance and economic development is limited (Boukhatem and Ben Moussa, 2017), particularly in the context of financial intermediation (Kassim, 2016).

According to previous studies have indicated that Islamic financing has a positive impact on economic growth. For instance, it supports the economies of Saudi Arabia (Kim et al., 2018), Bangladesh (Chowdhury et al., 2018), the GCC and East Asian countries (Mohd. Yusof and Bahlous, 2013), Indonesia (Abduh and Omar, 2012), Malaysia (Abd. Majid and Kassim, 2015), the OIC countries (Kim et al., 2018), the GCC, and East Asian countries (Jouini, 2016).

Nevertheless, some of the conclusions from earlier study were ambiguous, as some claimed that Islamic banking had no substantial impact on Bangladesh's economic growth (Hye and Islam, 2012).

Regarding some previous studies, there have been scholarly debates over the relationship between Islamic finance and economic development in the countries studied. Furthermore, our study shows that used methodology, approaches and variables in the scientists' research differ from each other.

Apart from that since three decades of the foundation of Islamic banking in Indonesia, research undertaken within the context of Islamic finance in Indonesia has largely ignored this topic, focusing instead on the development, performance, and efficiency of Islamic banks. Therefore, the purpose of this study is to conduct empirical research on the long term and dynamic interaction between the Islamic finance and economic development in Indonesia.

This article is divided into five sections, each of which focuses on a different topic. The introduction, which covers the background and purpose of the study, is covered in the first part. The second component of the literature review focuses on the impact of Islamic financial development on economic growth. The third section goes extensively into the specifics of the data and research methodology developed. The fourth section includes the results and discussion. The final part provides an overview of the conclusion.

2. LITERATURE REVIEW

The nexus between financial development and economic growth has attracted economists' attention more in the last decade.

There are a variety of studies have been published to understand how the financial sector's expansion affects household savings, accumulation of capital, technological advance, rising incomes, and economic growth.

Nevertheless, the link between financial development and economic growth is a major topic of debate. Regarding Schumpeter's (1934) hypothesis, which was validated by King and Levine (1993) and a number of subsequent scientific studies, gaps in financial system development have an influence on economic growth differentials across countries.

However, as Panizza (2014) suggested in the early empirical research that financial development and economic growth were positively connected, the former measured by e.g. the amount of domestic private credit or stock market capitalization due to gross domestic product (GDP).

In spite of the fact that this link is complicated and can change based on a country's economic progress and financial institution quality (Masten et al., 2008; Rioja and Valev, 2014).

As we have given some findings of researchers in the field above, there are various views and arguments among scientists as to whether there is a link between financial development and economic growth.

On the hypothesis introduced by the above researchers, we shall continue this discussion with the thoughts and findings of scholars working in Islamic finance.

There is a high interest and demand in Islamic finance as amounts of Muslims expanding in the 21st century. Additionally, there is an increase in scientific activities related to the creation of analytical materials and scientific research in Islamic finance.

We aim to analyze other academics' perspectives on their findings below. Several scholars have looked into the hypothesis we put forward in our study to determine whether there is a link between Islamic financing and economic development.

Islamic banks encourage economic activity such as capital initiatives in the real economy, which are more efficient than pure lending. They also have a more favorable influence on economic growth. In earlier research, five methodologies were used to investigate the causal link between Islamic banking and economic growth. The first method is supply-side leading, in which an Islamic bank promotes economic growth as a productive input (Samargandi et al., 2014).

Numerous recent studies have examined this method. Abd. Majid and Kassim (2015) and Kassim (2016) investigated how Islamic banking and financial institutions (IBFIs) affected Malaysian economic growth from 1997 to 2013. They

used vector error correction models (VECM), autoregressive distributed lag (ARDL), and variance decompositions (VDCs). This study discovered that intermediation, as opposed to the efficient resource allocation of Islamic banks, has a significant influence on the positive transmission of total deposits (TD) to GDP.

However, empirical study in Turkey by Yüksel and Canöz (2017) indicated that between 2005 and 2016, Islamic banks did not significantly affect economic growth. This might be ascribed to the country's limited Islamic banking sector. As a result, Islamic banking should be promoted in Turkey in order to contribute to GDP growth and industrial development. There are a number of findings on the economic circumstances in various countries that vary due to the banking system, financial markets, institutional quality, degree of socio-economic development, the methodology utilized, and the time period investigated.

This study's main objective is to evaluate how Islamic financing has impacted Indonesia's economic development. There were three primary factors that led to the decision to investigate the situation of Indonesia. First of all, Indonesia is one of the first countries to attempt to modernize its financial system such that both conventional and Islamic banks are being governed by the same regulation. Second, relative to other countries with Islamic finance integrated, Indonesia has a strong system and potential for expansion in Islamic finance institutions. Last but not least, IIB offices and assets (T1) are expanding quickly alongside traditional banks. Nevertheless, the central bureau of statistics reports that between 2009 and 2019, Indonesia's economy grew by little over 5%. (BPS, 2019). The link between Islamic banking systems and economic growth requires further investigation. Therefore, this paper gives empirical proof of the impact of Islamic finance on Indonesia's economic growth.

Moreover, our study demonstrates that the econometric models used in the scientific research on the economic effects of Islamic finance have been used in countries that have successfully managed the Islamic financial system for many years. However, the research utilizing the time-series model of multi-factor is insufficient for Indonesia, which is ranked 4th in the world in terms of Islamic financial assets. We thus aim to explore the level to which Indonesia's economic development over the previous ten years has been impacted by the Islamic finance system. Our study varies from other studies in terms of other variables and methodological approach as well.

3. METHODS

We have used a quantitative approach using a multi-factor time-series model in order to determine the link between Islamic finance and economic development.

In order to conduct this hypothesis test, the following variables were chosen:

- the amount of Islamic financial assets (IslamicFinanceAssets) was selected as an independent variable for our model;
- GDP per capita (GDPpercapita) was selected as a dependent variable. This indicator serves to determine the living standards of the population.

The following is our hypothesis:

H0: There is no relationship between Indonesian economic development and Islamic financing.

H1: There is a relationship between Islamic finance and economic development in Indonesia, this represents our alternative hypothesis.

In particular, we have examined the amount of Islamic financial assets and the per capita GDP value in the Indonesian economy from 2011 to 2022 and have developed an econometric model and equations using multi-factor time series.

The following model has been developed in order to investigate the interaction between Islamic finance and Indonesia's economic development:

Linear model

$$\text{GDPpercapita}_i = \beta_0 + \beta_1 \text{IslamicFinanceAssets}_i + \varepsilon_i \quad (1)$$

Where:

β_0 : the intercept of the model

ε_i : error term.

The VAR model specification is given as follows:

$$Y_t = \alpha + \beta_1 Y_{t-1} + \beta_2 Y_{t-2} + \dots + \beta_p Y_{t-p} + \varepsilon_t \quad (2)$$

where α is the intercept, a constant and β_1, β_2 till β_p are the coefficients of the lags of Y till order p.

Order 'p' means, up to p-lags of Y is used and they are the predictors in the equation. The $\varepsilon_{-}\{t\}$ is the error, which is considered as white noise.

In our research, we also developed a forecast for chosen indicators by applying VAR model in multi-factor time series. We have used Stata 17 software to model and forecast data that is currently commonly used by researchers worldwide. The variables are put to the test through three main cointegration dependent conditions in order to accomplish the aforementioned purpose.

Stationary Test

A unit root is tested with Augmented Dickey-Fuller (ADF) test. Do the variables observed have a tendency to return to the long-term trend following a shock or the variables follow a random walk? If the variables follow a random walk after a temporary or permanent shock, the regression between variables is spurious.

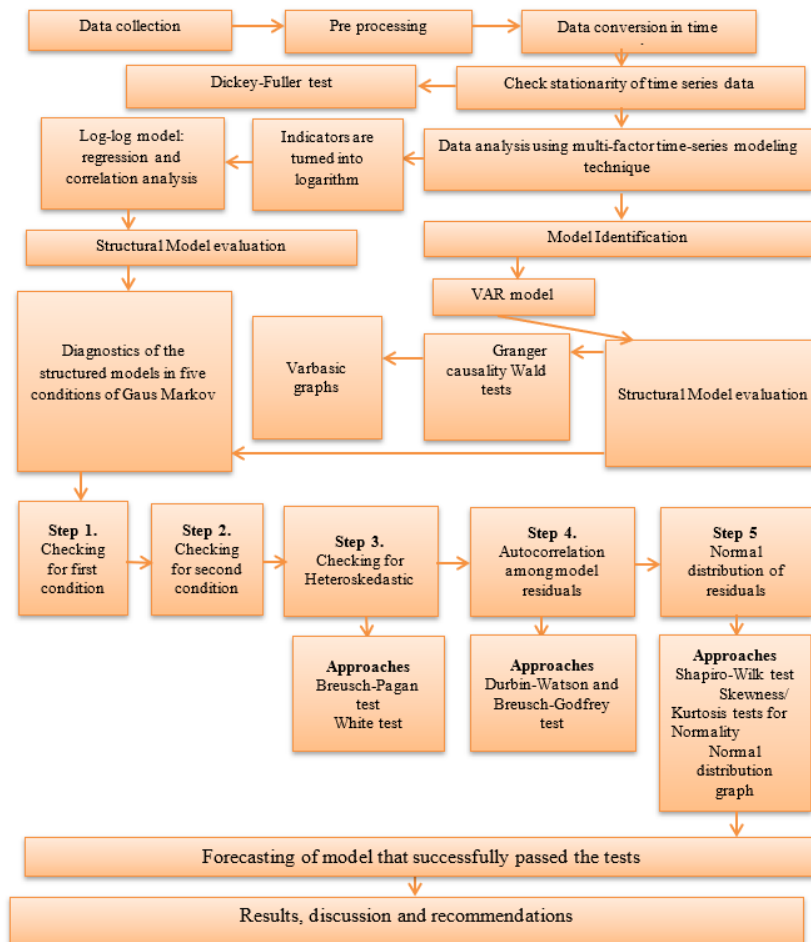


FIGURE 1. Research steps

Hence, the OLS will not produce consistent parameter estimates. All series should be stationary at the same level. ADF test is can be determined as in Equation (3).

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \alpha_i \sum_{i=1}^m \Delta Y_{t-1-i} + \varepsilon_t \quad (3)$$

The hypothesis tested:

H0: $\delta = 0$ (contains a unit root, the data are not stationary)

H1: $\delta < 0$ (does not contains a unit root, the data are stationary).

Cointegration Test

Considering cointegration, even if the variables are not stationary individually, the linear combination of two or more variables may be stationary. The Johansen cointegration test is used to assess cointegration.

Components in vector Y_t is said to be cointegrated at d,b degree, presented by CI (d,b) if:

(i) All components of Y_t is I(d)

(ii) There is a non-zero vector $\beta = (\beta_1, \beta_2, \dots, \beta_n)$ so that the linear combination of $\beta Y_t = \beta_1 Y_{1t} + \beta_2 Y_{2t} + \dots + \beta_n Y_{nt}$ will be cointegrated at (d – b) degree where b>0. Vector β is the cointegration vector. In the case of b=d=1, Y_t is I(1) and their linear combination is I(0).

Johansen (1991) and Johansen and Juselius (1990) produced the maximum likelihood approach using the VAR model to estimate the cointegration relationship among components in vector k variable Y_t . Consider VAR model for y_t :

$$A(L) x_t = \varepsilon_t \quad (4)$$

The parameter can be presented in the form of Vector Autoregressive Error Correction Mechanism:

$$\Delta Y_t = \sum_{i=1}^{p-1} \Pi_i \Delta Y_{t-i} + \alpha \beta' Y_{t-p} + \varepsilon_t \quad (5)$$

Where vector $\beta = (-1, \beta_2, \dots, \beta_n)$ that contain r cointegration vectors, and speed of adjustment parameter is given as $\alpha = (a_1, a_2, \dots, a_n)$ when rank $\beta = r < k$, k is the number of endogenous variables. If the number of cointegration relations is known, hypothesis testing on α and β can be performed. Lag length specification for the model can be determined by VAR equation using the AIC and SC criteria.

Furthermore, before conducting the model's forecast, Gauss-Markov's five conditions were applied to determine the direction and density of the indicators: the heteroskedastic problem, the model's residual autocorrelation problem, and regression models.

4. RESULTS AND DISCUSSION

According to Table 1, Indonesian Islamic financial assets expanded 13-fold between 2011 and 2022, while GDP per capita increased as well, from \$3643,05 in 2011 to over \$4788,00 by 2022.

The variables that indicate the amount of functioning Islamic financial assets (IslamicFinanceAssets) were chosen as an independent variable in our model, whereas GDP per capita (GDPpercapita) was selected as a dependent variable.

The reason we decided to select these variables is that Islamic financial assets reflect the amount of growth of the Islamic financial industry in a country, whereas GDP per capita shows the country's economic progress due to World Bank methodology.

That is why these variables were chosen to prove our hypothesis.

The data was taken from the World Bank's official website (Trading Economics) for the independent variable in this research, while the data for the dependent variable was obtained from the Global Islamic Finance Report.

The first step in the multi-factor time series criterion is to examine the data for the variables that the Dickey-Fuller test identifies as stationary or non-stationary variables and determine whether they are cointegrated or not. Consequently, we can select a certain appropriate models.

TABLE 2. Results of the Dickey-Fuller test on Islamic financial assets

Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value	Obs	P-value
-5.610	-3.750	-3.000	-2.630	10	0.0000

Table 2 shows the Indonesian Islamic financial assets according to the Dickey-Fuller test. The statistical test value for the $Z(t)$ test is fewer than three critical values and has a negative score of "-5.610". The 1 percent critical value, 5 percent critical value, and 10 percent critical value are all bigger than the statistical test value and indicate that there is strong stationary that satisfies the Dickey-Fuller test criterion requirement. These values are -3,750, -3,000, and -2,630, respectively. After one integration, this result was achieved. Moreover, the p-value is 0.0000, which indicates a strong stationary presence with a small value.

The Dickey-Fuller test will also be used to test the GDP per capita in the following step.

TABLE 3. Results of the Dickey-Fuller test on GDP per capita

Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value	Obs	P-value
-4.623	-3.750	-3.000	-2.630	9	0.0001

According to the Dickey-Fuller test (table 3), the statistical test value for the GDP per capita is -4.623, which is smaller than the three critical values. The 1% critical value is -3,750; the 5% critical value is -3,000; and the 10% critical value is -2,630. These numbers are all higher than the statistical test result, proving that there is a substantial stationary component as well. The Islamic financial assets were turned into stationary after one integration, while it was shown that the result of the Dickey-Fuller test for GDP per capita was not stationary, but after two integrations, it was attained as well. Furthermore, the p-value is 0.0001, which is less than 0,05 and demonstrates stationary.

In this case, the chosen variables weren't stationary initially, but after integration, both variables turned stationary.

The next step is to investigate the scatter plot's correlation between the two variables and the observations to determine how well they stand on line or approach a straight line.

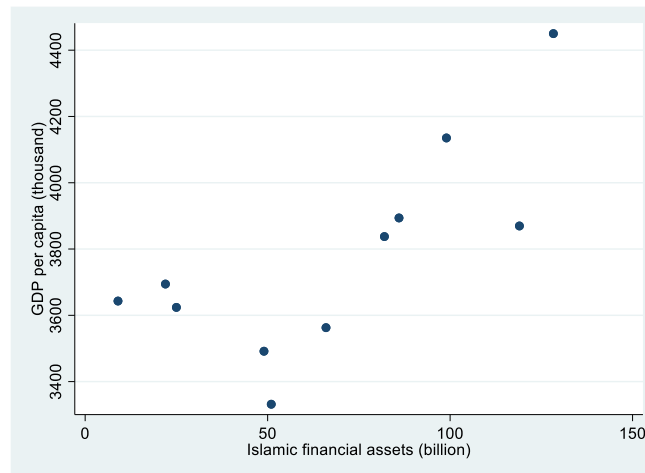


FIGURE 1. The relationship between GDP per capita and Islamic financial assets is represented by a scatter plot. From Figure 1, we can analyze the impact of Islamic financial assets on GDP per capita in Indonesia from 2011 to 2022 and have found a significant correlation between the two factors according to the scatter plot. In addition, a number of observations have stood on line or have approached the straight line.

The next step of our study's major objective is to develop a regression and correlation model to examine how Islamic financial assets impact on GDP per capita in Indonesia.

The factor influencing GDP per capita (GDPpercapita) is expressed in the following simple regression and correlation econometric formula:

$$\text{GDPpercapita}_i = \beta_0 + \beta_1 \text{IslamicFinanceAssets}_i + \varepsilon_i \quad (6)$$

TABLE 4. Results of simple regression and correlation analysis

Dependent variable: GDP per capita (GDPpercapita)				
Method: OLS				
Time: 2011-2022				
Number of observations: 12				
Variables	Coefficient	Std. Err.	t-statistics	Probability
Islamic financial assets (IslamicFinanceAssets)	5.760783	1.79119	3.22	0.011
C	3390.186	137.7861	24.60	0.000
R-squared	0.5347	The average value of the dependent variables		3775.792
Adj R-squared	0.4830	Standard deviation of dependent variables		313.1977
Standard error of regression	225.19	Akaike's information criterion (AIC)		21.11918
SSR	50710.2081	Bayesian information criterion(BIC)		21.31641
Log likelihood	74,09099	Durbin-Watson criterion		1.350868
F-statistics	10.34	HQIC		151,6803
Probability (F-statistics)	0.0106			

In order to develop an econometric model discussed above, the "Ordinary least squares method" was used.

Table 4 shows the findings of this simple regression and correlation econometric model.

From the calculations shown in the table above, the following one-factor regression model has been developed:

$$\text{GDPpercapita}_i = 3390,2 + 5,76 \text{ IslamicFinanceAssets}_i + \varepsilon_i \quad (7)$$

The relationship between these model indicators implies a long-term interaction. A 1 percent change in Islamic financial assets results in a 5.76 percent change in GDP per capita, according to this regression coefficient.

The data in Table 4 above were applied to a regression analysis, which revealed a significant link between the amount of Islamic financial assets (lnIslamicFinanceAssets) as an independent variable, and per capita GDP (lnGDPpercapita) as a dependent variable. Furthermore, the adjusted determination coefficient demonstrated how well it fitted the data of

the formed model. This is because the independent variable explains the effect of changes in the dependent variable when the adjusted coefficient of determination is close to 1. In other words, it enables reliable estimate of GDP per capita values.

According to the developed model's coefficient of determination, the volume of Islamic financial assets explains 53.5 percent of the variation in GDP per capita (GDP per capita). Generally, a higher R-squared indicates a better fit for the model. The remaining 46.5 percent is due to other factors that were not considered. It's also been determined that the coefficient of the level of impact on the amount of Islamic financial assets-a factor influencing GDP per capita-is identified at the level of significance of 5%. The probability of a P-value in the Islamic financial assets ratio (IslamicFinanceAssets) of the regression model is less than 0.05 percent, indicating that this ratio has an impact on the change in GDP per capita.

Moreover, our findings showed that the probability of the P-value for the Fisher F-statistic in the developed regression model is less than 0.05, demonstrating that the constant and independent variable factor impacts the GDP per capita, which is regarded as a dependent variable in our model.

Before determining and making a forecast, we have to do the following step, where we will do a diagnostic study of the structured model's reliability. Having regard to Gaus Markov's conditions, which are widely used globally, we will perform diagnostic analysis on this model.

According to Gauss Markov's first condition, there should be six times more observations than indicators. With twenty-four observations and two indicators, we can see that our model has satisfied the first requirement of the Gauss-Markov condition.

The second requirement of Gauss-Markov condition that an empirical model must match the total of theoretical data. The following test clearly demonstrates that the empirical model equals the whole of the theoretical data, as given in table 5.

TABLE 5. Gaus Markov's 2nd condition on the model

Variable	Obs	Mean	Std. Dev.	Min	Max
Model	12	3775.792	313.1977	3331.695	4450
lnGDPperca~a	12	3775.792	229.0275	3442.033	4129.294

From the data in Table 5, we can conclude that our model has passed condition 2 successfully.

Regarding the Gaus Markov's third condition is that the residue does not have to be connected to the model. It is considered to be a heteroskedastic state if the residuals and model are associated. There are three methods for checking this. These are the test method, correlation table, and graph methods, respectively. We'll apply the Breusch-Pagan and White tests for the tests.

We will use the Breusch-Pagan test to start evaluating our model due to the third condition of Gaus Markov.

TABLE 6. Breusch-Pagan test result

	Chi2(1)	Prob >chi2
GDPpercapita	0.15	0,7028

Based on the findings of the Breusch-Pagan test, the p value of the test is higher than 0.05, which is considered the homoscedastic state due to this test criterion and reveals that the residues are not connected to the model. The alternative hypothesis is accepted since the zero hypothesis demonstrates that there is no heteroscedasticity in the residuals. The structured model's residuals, then, indicate a homoscedastic oscillation. We will also examine our model for the White test in the next step. This test requires that the p value has to be greater than 0.05, as in the Breusch-Pagan test above.

TABLE 7. White test results (Cameron & Trivedi's decomposition of IM-test)

Source	chi2	df	p
Heteroscedasticity	0.96	2	0.6175
Skewness	1.34	1	0.2474
Kurtosis	1.62	1	0.2033
Total	3.92	4	0.4168

Table 7 shows that the White test's p value is higher than 0.05, which disqualifies the heteroskedastic state by this test's criteria and allows us to accept alternative hypothesis 1.

The model residuals should not have an autocorrelation issue, which is the fourth condition of Gauss Markov for model evaluation. There are three different approaches to test the fourth condition such as graph, autocorrelation table, Durbin-Watson, and Breusch-Godfrey tests.

We will start testing the model using the Durbin-Watson test in the test method. The Durbin-Watson test result ranges between 0 and 4 in terms of the criteria of this test. There is no autocorrelation if the test result for the model is close to 2. When we conducted our model from this test, the outcome was 1.350868 and the model revealed that the residuals were not interrelated.

The Breusch-Godfrey test will be used in the following step to check for autocorrelation issues in the residuals (Table 8).

TABLE 8. Breusch-Godfrey autocorrelation test result

lags (p)	chi2	df	Prob>chi2
1	0.449	1	0.5029

From table 8, we can conclude that there is no autocorrelation between the residuals based on the findings of the Breusch-Godfrey test. The possibility that there is no autocorrelation among the residuals is accepted since the R-square probability value is greater than 0.05.

The fifth criterion of Gauss Markov requires that there be no correlation between the independent variables. Since we just have one independent variable and one dependent variable, this is not required. The residuals must follow a normal distribution in accordance with the final Gauss Markov criterion. There are three different ways to check this. These are graph method, correlation table, and test method. For the tests, we will use graph methods and Shapiro-Wilk test. Firstly, we will start to check the normal residual distribution through Shapiro-Wilk test.

TABLE 9. Shapiro-Wilk test results

Variable	Obs	W	V.	z	Prob>z
residual	12	0.97877	0.344	-1.739	0.95896

The Shapiro-Wilk test resulted in a value of 0.96, which is larger than $p > 0.05$ and fulfills Gauss Markov's final criteria (Table 9).

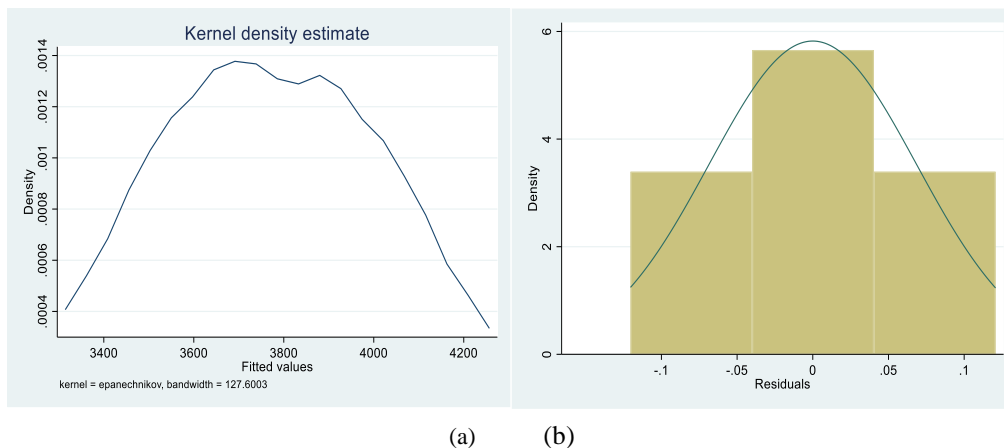


FIGURE 2. Normal distribution of residuals test

Figure 2 above shows that the residuals are normally distributed and have a normal vibration. To confirm the normal distribution of the residuals, we will also take the findings of test methods into consideration in the following step.

TABLE 10. Skewness/Kurtosis tests for Normality

Variable	Obs	Pr (Skewness)	Pr (Kurtosis)	adj chi2(2)	Prob>chi2
residual	12	0.9088	0.8653	0.04	0.9793

As it can be seen from table 10, the residuals are normally distributed and the residuals have a normal vibration. The results of Skewness and kurtosis are nearly the same, which are 0.90 and 0.86. Furthermore, the value of the probability is 0.98, and given that this value is also greater than $p > 0.05$, we can see that the normal residual distribution criteria have been successfully fulfilled in the test as well.

Last but not least, we tested our model in five Gauss Markov conditions.

These tests showed that our model satisfied all five of the Gauss-Markov conditions, allowing us to continue to the forecasting stage of our study after completing the identification and evaluation phases.

In the next step, we will use VAR model and to following this model we will test our variables in Granger causality Wald tests.

The Granger causality test examines the causal relationship between two variables in a time series to see whether one time series can be used to forecast another variable. The technique is a probabilistic theory of causation that looks for correlation patterns in sets of observed data. We can test "causality" in a sense with time series vector autoregression (VAR). We title this test the Granger causality test because Granger (1969) was the one who originally suggested it.

It is predicated on the notion that if X causes Y, then the prediction of Y based on the past trends in both Y and X should lead to the best forecast of Y based just on the past trends in Y.

To determine if a lag of Y causes Y, Granger causality should not be applied. Instead, it is typically used to exogenous variables (those without Y lag). Simply put, Y is said to be Granger-caused by X if it can be predicted more accurately from the histories of both X and Y than it can from the history of Y alone.

Granger causality tests should be used in particular when:

- Not the underlying theoretical concept, but performance predictions are what we are most interested in.
- If used data is stationary.

We can see that we have both reasons to use Granger causality Wald tests.

TABLE 12. Granger causality Wald tests

Equation	Excluded	chi2	df	Prob>chi2
GDPpercapitatho~d	Islamicfinancia~o	63.532	3	0.000
GDPpercapitatho~d	ALL	63.532	3	0.000
Islamicfinancia~o	GDPpercapitatho~d	5.5222	3	0.137
Islamicfinancia~o	ALL	5.5222	3	0.137

Due to the dynamic link between Islamic finance and economic development being the main subject of this study, we will only provide the results of the Granger Casualty Test in Table. Islamic financial assets are clear when GDP per capita is the dependent variable because the chi-square value for the independent and dependent variables is 63.532, showing that Islamic financial assets can cause GDP per capita.

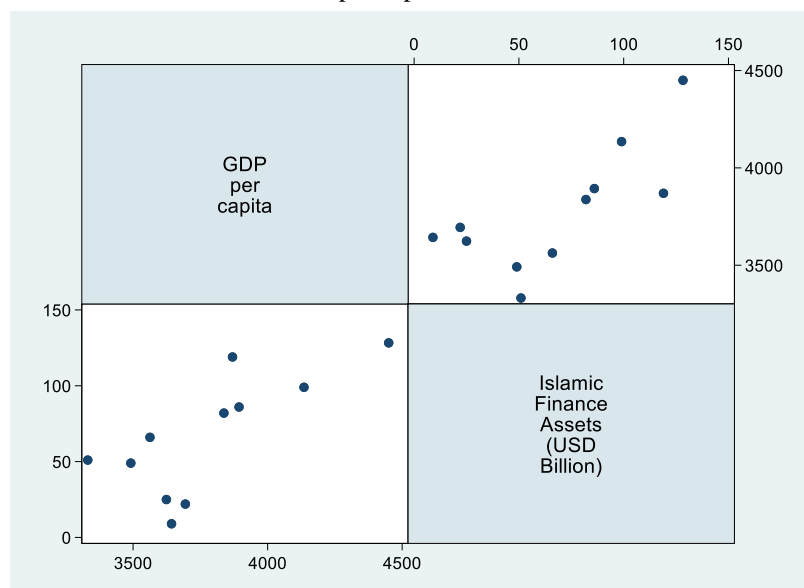


FIGURE 3. The relationship between Islamic finance assets and GDP per capita

We can see from this figure 3 that when GDP per capita is the dependent variable, Islamic financial assets are directly proportional to the dependent variable, and the observations are situated around the model line, demonstrating the accuracy of our model. In addition, the fact that the influence of GDP per capita as a factor x in the context of Islamic financing as a factor y is proportionate and that the observations are stayed around the model line and demonstrates that our model has minimal errors and a high level of reliability.

As a result, we can decide that the independent variable to be endogenous jointly for dependent variable.

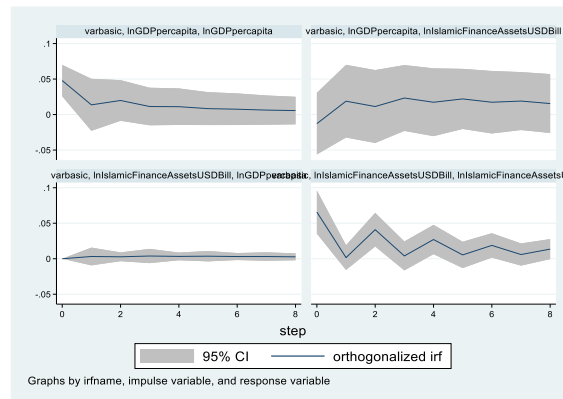


FIGURE 4. Varbasic graphs by irfname, impulse variable, and response variable

Varbasic fits a fundamental vector autoregressive (VAR) model and plots the impulse-response functions (IRFs), orthogonalized impulse-response functions (OIRFs), or forecast-error variance decompositions (FEVDs).

Since our model is an unrestricted VAR, we can ensure the maximum lag by selecting the lag order using lag exclusion tests and lag order selection criteria.

TABLE 13. VAR model regression indicators of Islamic financial assets and GDP per capita

Sample:2014 – 2022		Number of obs = 9			
Log likelihood=85.81404		AIC = 21.29201			
FPE=8036936		HQIC = 20.81911			
Det(Sigma_ml)=656076.4		SBIC = 21.51115			
Equation	Parms	RMSE	R-sq	chi2	P>chi2
GDPpercapitath~d	7	216.084	0.9491	149.0884	0.0000
Islamicfinanci~o	7	7.32691	0.9911	893.5602	0.0000
GDPpercapitathousand	Coef.	Std. Err.	t	P> t 	[95% Conf. Interval]
GDPpercapitathousand L1.	-1.278778	.3472978	-3.68	0.000	-1.959469 -.5980871
L2.	1.567663	.3939429	3.98	0.000	.7955489 2.339777
L3.	-1.56896	.3941463	-3.98	0.000	-2.341472 -.796447
Islamicfinancialassetsbillio L1.	-13.62473	6.2925	-2.17	0.030	-25.9578 -1.291658
L2.	-.7322864	5.167232	-0.14	0.887	-10.85988 9.395303
L3.	30.18709	9.78195	3.09	0.002	11.01482 49.35936
_cons	8039.69	1381.559	5.82	0.000	5331.884 10747.5

The VAR model specification is given as follows:

$$Y_t = a + \beta_1 Y_{t-1} + \beta_2 Y_{t-2} + \dots + \beta_p Y_{t-p} + \varepsilon_t \quad (9)$$

where a is the intercept, a constant and β_1, β_2 till β_p are the coefficients of the lags of Y till order p .

Order 'p' means, up to p-lags of Y is used and they are the predictors in the equation. The $\varepsilon_{\{t\}}$ is the error, which is considered as white noise. Table 13 shows that the independent variable has a negative impact on the dependent variable in terms of lag 1, which is -13.62 percent, and according to the results of 2 lags, the link is not statistically significant. Moreover, Regarding the outcomes of 3 lags, we can see that the independent variable has a positive impact on the dependent variable, the independent variable's coefficient is 30.18. The P-value for GDP per capita and Islamic financial assets are both less than 0.05 for lag 3, indicating that the lag for both variables should be 3. The order selection criterion with LR statistics also demonstrates that the lag should be 3. This leads us to the conclusion that, due to lag 3, there is a positive correlation between Islamic finance assets and GDP per capita.

Based on the information from our VAR regression table above, we formulated the following VAR model formula:

$$Y_t = 8039.69 - 1.27 \text{ L1 GDP per capita}_{t-1} + 1.56 \text{ L2 GDP per capita}_{t-2} - 1.56 \text{ L3 GDP per capita}_{t-3} - 13.62 \text{ L1 Islamic financial assets}_{t-1} + 30.18 \text{ L3 Islamic financial assets}_{t-2} + \varepsilon_t \quad (10)$$

In our next step, based on the results of our VAR model, we will forecast of GDP per capita for the period from 2023 to 2027.

We used the VAR model in our study, and it was found that the VAR model was more effective in getting the prognosis of our study in a positive position, and as result, we have achieved our research goal.

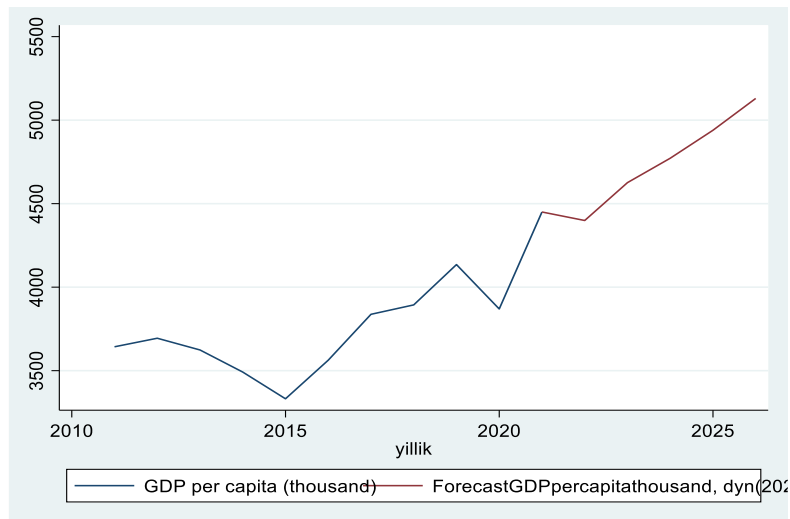


FIGURE 5. The amount of GDP per capita from 2011 to 2027 (a forecast from 2023 to 2027).

From table 14 and figure 5, it can be seen that the forecast of the dependent variable is from 2023 to 2027.

Additionally, forecasts indicate that by 2027, GDP per capita growth in Indonesia will reach \$ 5129,95 due to an increase in Islamic financial assets.

The paper's major goal was to bring attention to the effects of Indonesia's developing Islamic finance system on the country's economic growth from 2011 to 2022. Therefore, we use the World Bank's methodology to determine the level of development of countries in order to demonstrate specifically how the Islamic financial system can impact on the economic progress in Indonesia.

We used a multi-factorial time series to investigate how long- and short-term Islamic financial development can effect GDP per capita increase in order to support our hypothesis. Our results were tested in five Gauss Markov conditions, and all of our models passed successfully through all five evaluation tests.

Furthermore, we made the decision to only apply the VAR model when our models had completed the identification and assessment tests. Because we were able to get effective results from the VAR model when it came to forecasting.

In the case of Indonesia, which ranks fourth in the world for Islamic financial assets, the research using the multi-factor time series model revealed that the impact of Islamic financial assets on GDP per capita is significant. According to the OLS model, excluding other factors, a one percent increase in Islamic financial assets leads to a 5.76 percent increase in GDP per capita (*ceteris paribus*). Moreover, it was 30.18, according to the VAR model. As a result, we can conclude that Islamic finance supports economic growth both in the long and short term.

5. CONCLUSION

Based on the findings of our investigation, we can conclude that the role of Islamic finance in economic development, particularly in Indonesia, has had a positive short and long-term impact. Furthermore, our findings once more proved the hypothesis that Indonesia's economy development was impacted by the Islamic finance system. In consideration of this, it has once more shown advantageous to develop the Islamic financial system as a means of increasing the income of the people in the country with a majority of Muslims. This finding lets us suggest that developing the Islamic finance industry is one of the key policy alternatives for promoting economic development in Indonesia. In this scenario, improving Indonesia's Islamic financial infrastructure and regulations continuously may be able to help the country prosper economically. Study on the remaining issues is continuing, and it will be addressed in subsequent studies, based on the encouraging results that have been provided in this study.

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