VAR Method in Analyzing IBFin and Economic Growth

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Abstract. This journal examines the relationship between Total Islamic Banking Financing (IBFin), which is a financial system operating based on Sharia principles, and the economic growth rate in Indonesia, using the Vector Autoregressive (VAR) method to analyze data from 2003 to 2023. This research aims to understand the role of Islamic banking in driving economic growth and to identify any causal relationship between the two variables. The analysis results indicate that there is no significant causal relationship between Islamic Banking Financing (IBFin) and Gross Domestic Product (GDP), suggesting that the two variables do not directly influence each other.

Keywords: VAR, IBFIN, Economic Growth

1 Introduction

The rate of economic growth in a country is often influenced by various factors, including the role of financial institutions, particularly Islamic banking. According to Fauziyah and Vigory (2021), Islamic banking has currently developed and plays an important role in the economy.(Adzimatinur and Manalu 2021) With the presence of Islamic banking in Indonesia, it is hoped that it can encourage advanced economic growth. According to Eka and Sofyan (2024), theoretically, the characteristics of Islamic banking are related to the provisions found in the Quran and Hadith. This means that every transaction in Islamic banking must be free from interest (Riba) and anything that contains uncertainty (Gharar and Maysir), with an emphasis on profit-sharing principles and risks in real economic sector transactions.(Islamic and Finance 2024) According to Hasan and Dridi (2010), the framework of Islamic law in the field of finance and banking is also capable of enhancing the performance of economic activities.(Dridi and Hasan 2010)

According to Ammar et al. (2013), the Islamic financial system has an ambiguous impact on economic activities, and there are no specific advantages of a non-interest-based financial system compared to an interest-based one.(Ammar, Ben Slama, and Saidane 2013) According to Hachicha (2015), the existence of the Islamic financial system is expected to provide welfare and sustainable growth through poverty alleviation.(Hachicha and Amar 2008) The development of Islamic banking influences the rate of economic growth, and vice versa. According to Jamel and Fatma (2017), the relationship between Islamic banking and its financing can support the rate of economic growth, as it can help alleviate existing economic issues.(Boukhatem and Ben Moussa 2018) If Islamic banking experiences good growth, then more financing sources will be allocated to the productive economic sector, which indirectly can enhance the capital development of the real economic sector to boost its productivity in supporting economic growth. According to Muhamad Abduh (2012), the relationship between economic growth rates and Islamic banking has drawn the attention of economists, as there is a cause-and-effect relationship that mutually influences both, namely Supply-Leading and Demand-Following.(Abduh Muhamad 2012) According to Muhamad Abduh and Nazreen T (2012), the Supply Leading theory states that financial development can drive the rate of economic growth. This can be observed based on the regression of real GDP per capita and its sources. Meanwhile, the Demand-Following theory exists as a consequence of growth in the real sector of the economy.(Abduh and Chowdhury 2012) According to Yazdan Gudarzi and Masood Dastan (2013), another relationship can also be seen from indirect funding, where the activities of financial intermediaries are far more important than direct funding. They also established four indicators that serve as measurement tools for the rate of economic growth. First, there is "Financial Depth," commonly known as the liquidity obligation ratio of the financial system in Islamic banking to GDP. Second, there is the ratio of domestic bank savings assets to the savings assets of deposit banks, plus the domestic assets owned by the central bank, which is used to measure the relative importance of each financial institution. Thirdly, it is the indicator of financial development. Fourth, it is the distribution of domestic assets.(Gudarzi Farahani and Dastan 2013) According to Furqani (2009), there is no causality between Islamic bank financing and economic growth in the short term; however, in the long term, there

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is a cause-and-effect relationship where economic growth will create demand for intermediation from Islamic financial institutions.(Hachicha and Amar 2008)

According to Sallahuddin (2006), growth factors can also be measured by GDP, GDP per capita, Gross National Product (GNP), and GNP per capita. GDP itself has a positive relationship with the inflow of FDI. Additionally, the neoclassical model explains that developing countries with low initial capital stock tend to have higher marginal returns and growth rates if capital is sufficient.(Abdullah, Abu Bakar, and Hassan 2006) Economic issues related to the growth rate can be addressed through the role of financial institutions, such as Islamic banking. Islamic banks provide financing to various economic sectors, either directly to the community in the form of funds for businesses or in other forms. Funding from Islamic banks also plays a crucial role in driving economic growth. According to Panizza (2014), his literature indicates a positive relationship between financial development and economic growth, which is measured using the amount of domestic private credit or stock market capitalization relative to gross domestic product. (PDB).(Panizza 2014) However, there is another study that provides evidence of missing positive impacts, such as the research conducted by Rousseau (2011), which explains the non-linear and complex relationship between the level of development and the economic growth of a country with the quality of financial institutions.(Rousseau and Wachtel 2011) According to Chu (2020), new findings reveal a high level of financial condition patents in relation to economic growth, indicating a potential for excessive funding.(Chu et al. 2020) According to Peter (2018), based on his research in Europe, it shows that non-linear funding impacts economic growth by controlling the composition of financing based on its sources (bank loans, bonds, and stock markets) and the recipients of the funds.(Benczúr, Karagiannis, and Kvedaras 2019) Therefore, this research aims to prove the extent of the influence of total Islamic banking funding (IBfin) on economic growth in Indonesia. Does the total funding of Islamic banking (IBfin) influence economic growth, or is it economic growth that influences the total funding of Islamic banking? (IBfin). This is certainly backed by the growth of Islamic banking in Indonesia, which has begun to rise and show renewal to compete with other financial institutions. Thus, this research raises an assumption that it seems that financing in Islamic banking may have an impact on economic growth.

2 Literature Review

2.1 Economic Growth

Economic growth is a measure of the success of a country's development and represents an increase in economic activities that impact the production of goods and services in society. According to Kuznets (1967), economic growth not only encompasses aggregate output but is also related to the transformation of an economy, including its sectoral structure, demographic composition, and geography. (Deane and Kuznets 1967) As Prasetyo also stated in the Journal of Zahari MS (2017), economic growth simply means an increase in production or an increase in gross national income over a certain period, for example, one year. A country can be said to be experiencing change when the real returns from the use of production factors in a given year are higher than in the previous year. The indicator used to measure economic growth is the growth rate of gross domestic product (GDP), which measures the total income of each person participating in the economy (MS 2017).

The influence of a high GDP will increase the income of the community, leading to a rise in demand for goods and services. This boosts company profits and encourages further investment. In other words, along with the increase in GDP, investment also rises in the long term. For example, King and Levine (1993) investigated this issue using data from 80 countries during the period from 1960 to 1989. They developed four indicators for the level of development in the financial sector. These indicators are linked to real gross domestic product (GDP) per capita and its sources. The first is "financial depth," which refers to the ratio of current liabilities to GDP within the financial system. Second, to measure the relative importance of a particular financial institution, the ratio of the assets of domestic deposit-taking banks to the deposits of deposit-taking banks plus the domestic assets of the central bank is calculated. The third and fourth financial development indicators aim to measure the distribution of wealth within a country. According to Ebru Beyza (2012), there are three fundamental factors in economic growth: capital accumulation and investment, population growth and employment rates, and technological advancement. It can be said that economic growth in the current global era is characterized by innovation to increase GDP and capital accumulation through investment.(Bayarçelik and Taşel 2012) According to the work of Abduh and Chowdhury (2012), which analyzes the relationship between Islamic banking and economic growth in Bangladesh, the research employs cointegration tests and Granger causality tests. The results indicate a significant positive relationship between Islamic banks in Bangladesh and both long-term and short-term economic growth.(Abduh and Chowdhury 2012) Abduh and Omar (2012) also used the ARDL methodology to analyze the long-term and short-term relationships between Islamic banking and economic growth in Indonesia. The research results indicate that there is a significant correlation and relationship between the distribution of

Islamic bank credit and long-term and short-term economic growth. It means that Islamic banks have demonstrated effective performance as financial intermediaries.(Abduh Muhamad 2012)

2.2 Economic Growth Rate

The rate of economic growth is an important indicator to assess how well the economy of a country is performing. Simply put, it shows how quickly a country's economy is developing. According to Ruslan (2020), there are many factors that influence it, such as investment, both domestic and foreign.(Ruslan, Hastuti, and Irawan 2020) In addition, according to Ganar (2017), the quality and quantity of the workforce, government spending policies, technological advancements, the availability of natural resources, and political and economic stability are also factors that can influence the economic growth rate of a country.(Ganar, Zulfitra, and Sampurnaningsih 2021) According to Daron Acemoglu (2012), a country's growth rate has a significant impact on the well-being of its citizens. (Acemoglu 2012)

Various economic theories attempt to explain the factors that drive long-term economic growth. Some emphasize the importance of investment and technology, while others focus on internal factors such as innovation and education. However, achieving high and sustainable economic growth is not easy. The challenges include income inequality, environmental damage due to the exploitation of natural resources, and the impacts of climate change. As described by Salahudin (2017) in his research titled "The Effect of Islamic Banking on Economic Growth in Indonesia," the economic growth rate of Indonesia experienced a decline from 2010 to 2016. This is due to the impact of the 2008-2009 crisis, which created uncertainty in the global financial markets and disrupted global economic stability. From 2010 to 2012, the growth rate was over 6%. However, in 2015, that figure dropped by 1.15%. In 2016, GDP grew by 5.02%. Growth occurred across all business sectors. Financial services and insurance have reached the highest growth. Quarterly, the GDP for the fourth quarter recorded a decrease of 1.77% compared to the third quarter of 2016, driven by the agriculture, forestry, and fisheries sectors. (BPS, 2017).

2.3 IBFin

According to Puji Yuniarti, an Islamic bank is a bank that conducts its business by adhering to and upholding the principles of Islamic law as regulated in the fatwa (MUI). (MUI).(Yuniarti, Wianti, and Rini 2022) According to Anna L (2021), Islamic banks are those that adhere to Sharia principles, such as justice, balance (adl' wa tawazun), public interest (maslaha), universality (aalmiyyah), and do not contain usury or prohibited objects. Islamic banks conduct several transactions that are utilized, such as savings and loans, deposits, buying and selling, leasing, and financing. In the world of Islamic banking, the total financing of Islamic banks, often referred to as Islamic Banking Financing, indicates the extent of the role that Islamic banks play in providing funds to the community for various productive needs. Unlike conventional banks that apply an interest rate system, Islamic banks operate using profit-sharing principles, buying and selling, and leasing in accordance with Sharia principles.(Sobiech, Chronopoulos, and Wilson 2021) According to Seho (2020), financing instruments from Islamic banking must be attached to real economic activities, and in Islamic banking, each transaction depends on the nature of the activities or tangible assets being financed.(Šeho, Bacha, and Smolo 2020) However, in contrast to Iqbal (2013), who argues that there is a possibility of a lower risk comparison of financial instruments compared to the contracts of each Sharia transaction served. (Iqbal and Mirakhor 2013)
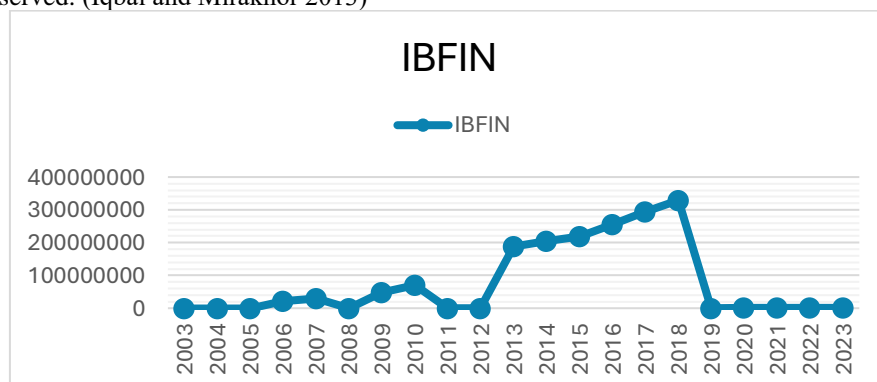
Source: Islamic Banking Statistics (www.bi.go.id)

Fig. 1. IBFIN 2003-2023

Based on the graph above, it shows that the funding provided by Islamic banks in Indonesia has consistently increased from 2003 to 2023. The growth of IBFin is influenced by many factors, such as the level of public trust in Islamic banks, which is very important, along with government regulatory support and favorable economic conditions. The higher the IBFin (a financial system operating based on Sharia principles), the more people are able to start businesses, buy homes, and meet other needs in accordance with Sharia. The positive impact is quite significant, as the growth of IBFin can encourage a more equitable and widespread economic growth. Certainly, there are several challenges that must be faced. One of the challenges is the lack of public understanding of Islamic banking products and services. Competing with traditional banks is also a challenge in itself. Therefore, there is a need for further strengthening in efforts related to education and public relations regarding Islamic banking. The government must also strengthen regulations and oversight of the Islamic banking sector to ensure it is healthier and more developed.

3 Research Methods

This research uses the Vector Autoregressive (VAR) approach with a statistical time series model. The variables used in this research are the total funding of Islamic banking (IBFin) or financial systems that operate based on Sharia principles, from the financial sector, and the economic growth rate from the real economic sector. The data used in this research consists of secondary data obtained from the Central Statistics Agency from the year 2003 to 2023. In the VAR method, if there are variables that contain a unit root and are not cointegrated with each other, then the data that contains a unit root must be differenced. Subsequently, the stationary variables and the differenced results can be used in the VAR model.

In 1980, Christopher A. Sims introduced the VAR model as an alternative in macroeconomic analysis. The VAR method was first introduced by C.A. Sims in 1972 as a form of thinking from Granger (1969). According to Granger, if two variables, say x and y, have a causal relationship where x influences y, then past information of x can help predict the condition of y. The VAR model is a non-structural model because it is atheoretical. The VAR model has a simpler structure with a minimal number of variables, where all the variables are endogenous and the independent variables are lags. The VAR model is designed for stationary variables that do not contain trends. The stochastic trend in the data indicates that there are long-run and short-run components in the time series data.(Zirek, Celebi, and Kabir Hassan 2016) Research on stochastic trends in economic variables continues to evolve, leading to the development of the cointegration concept by Granger in 1981. In 1987, Engle and Granger further advanced the concepts of cointegration and error correction. (error correction). Then, in 1990, Johansen and Juselius developed the VECM concept. (Vektor Error Correction Model). VECM offers a straightforward working procedure to separate the long-run and short-run components of the data formation process. Thus, VECM differs from VAR in that VECM can be used to model time series data that are cointegrated and non-stationary. VECM is often referred to as a restricted form of VAR.(Sulistiana 2017)

The steps in econometric model testing are as follows:
1) Unit Root Test (Uji Stasioner)
    The stationarity test of the data can be observed using the Augmented Dickey-Fuller (ADF) method with a significance level of $(1 - \alpha)$ 100%,The hypothesis H_0 is rejected if the ADF statistic is smaller than the critical value at (α), or if the p-value is smaller than the significance level (α) , or *p value* the p-value is smaller than the significance level (α) ,In other words, if H_0 then the data is stationary.
2) Cointegration Test
    The cointegration test of the data can be observed using the two-step Engle-Granger test method and the Johansen test.
3) Causality Analysis
    The analysis of the long-term causal relationship between independent and dependent variables in VECM modeling can be observed through the coefficients of the error correction term (ECT), which is based on the sign and the results of the significance test of the coefficients using the t-test statistic in the Ordinary Least Squares method. (OLS). Meanwhile, for short-term causality analysis for each variable, the Granger causality test can be used.
4) Estimation and Model Examination
    The procedure for selecting the optimal lag in VECM can use information criteria, namely the Akaike Information Criteria (AIC) and Schwarz Criteria (SC).
5) Forecasting and Structural Analysis Structural Analysis

According to Ali Rama (2015), the VAR method also requires all its variables to be stationary, so a stationarity test is needed first for each variable. In addition, a root test was also conducted to determine the stationarity of the time series data. A time series data is said to be stationary if the mean, variance, and covariance at each lag remain constant over time. Therefore, if the data does not meet these criteria, it is considered non-stationary. If a time series data has a unit root, it can be described as a random walk and non-stationary.(Hodge

2018) The VAR method according to Gujarati (2012) is a statistical model in the form of simultaneous equations that has several endogenous variables simultaneously, but each endogenous variable will be explained by lags of its own values and other endogenous variables. The data used in the VAR model is stationary data at a certain level. The advantages of the VAR method include:
1) There is no need to differentiate between independent and dependent variables.
2) Use the Ordinary Least Squares (OLS) method to estimate each equation.
3) Analysis using the VAR method will examine the relationships formed without considering dependence and independence.

In general, the Vector Autoregressive (VAR) Model can be formulated as follows:
$$x_t = A_0 + A_1 x_{t-1} + A_2 x_{t-2} + A_3 x_{t-3} + A_4 x_{t-4} + \cdots + A_p x_{t-p} + e_t$$
Where:
x_t = A vector of size nxl containing n as a variable in the VAR model.
A_0 = The intercept vector is of size n x l.
A_1 = A coefficient matrix of size nxn.
e_t = The residual vector is of size n x l.

The determination of the optimal lag length is used to establish the optimal lag length that will later be used in subsequent analyses to obtain parameter estimates for the Vector Autoregressive (VAR) model. A good model is one that has the smallest Akaike Information Criterion (AIC) value.(Febrianti, Tiro, and Sudarmin 2021) This criterion can be formulated as follows:

$$AIC\ (K) = T\ ln\left(\frac{SSR\ (k)}{T}\right) + 2n$$

Where
T = The number of observations used
K = It's taking too long
SSR = The Residual Sum of Squares (RSS)
n = The number of estimated parameters

4 Discussion and Results

4.1 Stationarity Test

In this stationarity test, the unit root test is used with the ADF (Augmented Dickey-Fuller) model. The ADF is employed to examine whether the data exhibits stationarity at what level by observing the probability value of the ADF (Juanda & Junaidi, 2012).(Juanda and Junaidi 2012)

Table 1. Results of the stasionarity test.

Variabel	Stationarity Test		Stationarity Description
	Level	1st Difference	
PDB	0.5724	0.4646	1st difference
IBFin	0.0215	0.0045	1st difference

source: Data processed

From the table above, it can be seen that stationarity occurs at the 1st difference. This indicates that the data does not yet meet the requirements for direct estimation using the VAR (Vector Autoregressive) model. However, it is still possible to perform a VAR in Difference model as long as the subsequent requirements are met, namely: optimal lag, stability test, causality test, and cointegration test. In this case, the cointegration test must show that there is no cointegration in order to proceed with the VAR test. This optimal lag aims to eliminate the issues of autocorrelation in the VAR model. (auliya, 2024). (Dwi, Umaiyah, and Nurhadi 2024)

Tabel 2. Optimal Lag Test

Lag	LogL	LR	FPE	AIC	SC	HQ
			6.48e+20	53.59620	53.69278	53.60115
0	-426.7696	NA*	*	*	*	*
1	-426.2711	0.810094	1.01e+21	54.03389	54.32361	54.04873
2	-424.9716	1.786761	1.47e+21	54.37146	54.85432	54.39618
3	-424.0317	1.057464	2.34e+21	54.75396	55.42998	54.78858
4	-418.9543	4.442689	2.42e+21	54.61929	55.48845	54.66380

In the table above, it can be seen that this research was conducted at lag "0," but due to data processing limitations, it could not be done at lag "0." Therefore, it was carried out at the optimal lag, which is lag "1."

4.2 Stability Test

This stability test is conducted by calculating the roots of the polynomial function. The underlying assumption of the stability test is that when its absolute value is <1, the model is stable and considered valid (Firdaus 2018).

Tabel 3. Stability Test

Roots of Characteristic Polynomial
Endogenous variables: D(IBFIN) D(PDB)
Exogenous variables: C
Lag specification: 1 1
Date: 08/28/24   Time: 19:40

Root	Modulus
0.242472	0.242472
-0.031791	0.031791

No root lies outside the unit circle.
VAR satisfies the stability condition.

Based on the table above, it shows that the modulus test results are less than 1, indicating that the VAR is stable.

4.3 Cointegration Test

This cointegration test is used to determine whether the equation being analyzed has long-term equilibrium or not.

Tabel 4. Uji Kointegrasi

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.366638	11.88853	15.49471	0.1624
At most 1	0.184342	3.667692	3.841465	0.0555

From the table above, it can be seen that there is no cointegration because the p-value is greater than 0.05, indicating that there is no long-term relationship among the variables in this cointegration test. Therefore, the equation can be resolved using the VAR in Difference model.

4.4 VAR Analysis

After conducting the cointegration test between the two variables, the next step is to perform VAR analysis. However, if the researcher finds that there is cointegration between the variables, then VECM analysis must be conducted.

Tabel 5. Analisis VAR

	D(IBFIN)	D(PDB)
D(IBFIN(-1))	-0.060535	-0.428935
	(0.31058)	(0.95707)
	[-0.19491]	[-0.44817]
D(PDB(-1))	0.020305	0.271216
	(0.09672)	(0.29806)
	[0.20993]	[0.90995]
C	-10953.53	388081.1
	(53988.1)	(166369.)
	[-0.20289]	[2.33265]

The formed VAR model is a variable model estimated using the least squares method. From the VAR analysis results at lag 1 between the IBFin variable (total funding of Islamic banks operating under the Sharia system) and GDP, there is no significant influence, meaning that there is no reciprocal relationship between the two.

4.5 Causality Test

In this test, the researcher used the Granger test to examine the causal relationship between the two variables.

Tabel 6. Granger causality

Null Hypothesis:	Obs	F-Statistic	Prob.
PDB does not Granger Cause IBFIN	20	0.02876	0.8673
IBFIN does not Granger Cause PDB		2.67381	0.1204

From the results obtained, it can be seen that the two variables do not have a causal relationship at a profitability value greater than 0.05. Therefore, there is no reciprocal relationship between the two variables.

4.6 Analisis Impluse Response Function (IRF)

This analysis is used to observe the positive and negative responses of one variable to another, particularly regarding the occurrence of shocks to certain variables. In the short term, the response tends to change and is quite significant, while in the long term, it tends to be consistent and gradually diminishes.

Tabel 7. Hasil Analisis Forecast Error Variance Docomposition (FEVD)

Variance Decomposition of D(IBFIN): Period	S.E.	D(IBFIN)	D(PDB)
1	94831.86	100.0000	0.000000
2	94970.39	99.75708	0.242919
3	94975.95	99.74633	0.253671
4	94976.27	99.74567	0.254329
5	94976.29	99.74563	0.254367
6	94976.29	99.74563	0.254370
7	94976.29	99.74563	0.254370
8	94976.29	99.74563	0.254370
9	94976.29	99.74563	0.254370
10	94976.29	99.74563	0.254370

Variance Decomposition of
D(PDB):

Period	S.E.	D(IBFIN)	D(PDB)
1	292232.3	37.77458	62.22542
2	298953.5	36.16740	63.83260
3	299342.8	36.08395	63.91605
4	299365.7	36.07900	63.92100
5	299367.0	36.07871	63.92129
6	299367.1	36.07869	63.92131
7	299367.1	36.07869	63.92131
8	299367.1	36.07869	63.92131
9	299367.1	36.07869	63.92131
10	299367.1	36.07869	63.92131

Cholesky Ordering: D(IBFIN) D(PDB)

Based on the table above, IBFin (total funding of Islamic banks operating under the Sharia system) is generally influenced by shocks to IBFin itself, with a variance of 100 percent in the first period and continuing to decline in subsequent periods, reaching 99.745 percent in the tenth period. Meanwhile, GDP has a small impact on IBFin (total funding of Islamic banks operating under the Sharia system), or in other words, does not show a negative response. On the other hand, IBFin (total funding of Islamic banks operating under the Sharia system) has a significant impact, but the response is less favorable, decreasing from 37.77 percent at the beginning of the period to 36.07 percent.

5 Conclusions

This research finds that, although the total financing of Islamic banking (IBFin) in Indonesia continues to increase, there is no significant correlation between IBFin and Gross Domestic Product (GDP) from 2003 to 2023. This indicates that the increase in Islamic banking financing does not directly drive economic growth. First, the government must create a better plan to integrate Islamic banking with other sectors of the economy. Second, Islamic banking institutions should develop more innovative products to encourage investment and meet the needs of the community. Third, to encourage more individuals and companies to use Islamic financial services, it is crucial for the public to have a better understanding of them. In addition, further research is needed to understand additional variables that influence the relationship between IBFin and economic growth, as well as concrete actions that can be taken.

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