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Dynamic Relationship of Indofood and Mayora Stock Prices: A VAR, Granger Causality, and FEVD Analysis

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Abstract

This study analyzes the dynamic relationship between the stock prices of PT. Indofood Sukses Makmur Tbk (INDF) and PT. Mayora Indah Tbk (MYOR) using historical daily stock-price data recorded during 2025. The study employs a quantitative time-series approach using Vector Autoregression (VAR), Granger causality, Impulse Response Function (IRF), and Forecast Error Variance Decomposition (FEVD). The dataset consists of 236 trading-day observations for each company obtained from Yahoo Finance. The Augmented Dickey-Fuller (ADF) test indicates that the INDF series is stationary at level, whereas the MYOR series becomes stationary after first differencing. The Granger causality test shows that lagged movements in INDF significantly predict MYOR, while the reverse relationship is not statistically significant. The IRF results indicate that MYOR responds positively to a shock originating from INDF, with the strongest response occurring around the third period. Furthermore, the FEVD results show that the contribution of INDF to MYOR forecast-error variance increases from 0.46% in period 1 to 10.82% in period 12. These findings indicate that movements and information contained in INDF may become increasingly relevant to MYOR over the modeled horizon. The study contributes empirical evidence regarding stock-price dynamics in Indonesia's consumer-goods sector and provides practical information for investors in assessing inter-stock relationships and market information transmission.

Keywords:
Stock Price; VAR; FEVD; Granger Causality.

1. INTRODUCTION

Investment has become a common practice in contemporary society. It entails committing a certain sum of money today to generate future profits. Among the various financial investment options, participation in the capital market is one prominent method. Investment can be defined as the commitment of funds to an asset or project in anticipation of obtaining returns in the future (Arrifqi, T., & Putri, A. S. (2022)).

Investment in the capital market can yield high returns, but it also entails proportional risk. The dynamics of supply and demand in the market serve as the fundamental determinants of stock price movements. Moreover, a company's financial performance plays a critical role in these movements. Good financial results typically result in higher stock prices, thereby impacting the firm's broader financial dynamics (Pratama, A., & Wijaya, 2021). Stock price serves as an indicator of a company's value. Consequently, a higher stock price tends to signify greater valuation by investors (Wijaya & Sedana, 2015).

According Bursa Efek Indonesia (BEI), (2025), there are a number of companies operating in the food and beverage sector, including PT Indofood Sukses Makmur Tbk and PT Mayora Indah Tbk. This creates a correlation between the stock prices of these two companies, meaning that movements in their respective stock prices can influence one another. Specifically, within the food and beverage industry, consumers are highly sensitive to promotions, service, and the quality of the products offered. Food and beverage products are basic human needs, so this sector offers quite promising business opportunities. Additionally, as Indonesia's

economic conditions improve, many entrepreneurs are increasingly motivated to run their businesses domestically. The researchers chose the food and beverage sector because this industry has shown significant growth every year, both nationally and internationally (Hidayatullah, 2021). Financial performance reflects a company's financial results over a specific period and indicates the health of a business entity. The purpose of measuring financial performance is to assess the progress made in each period, to serve as a benchmark for the company's future planning, and to evaluate contributions toward achieving the company's overall objectives, as well as to provide a basis for investment decisions aimed at increasing production capacity. One way to evaluate a company's performance is to analyze its financial statements using financial ratio analysis. Financial ratios can be categorized into four main types: liquidity ratios, solvency ratios, activity ratios, and profitability ratios (Hidayatullah, 2021).

Stock price forecasting using the Vector Autoregressive (VAR) approach is a multivariate data analysis method used to forecast multiple stock prices simultaneously. This approach is capable of capturing the interdependent interactions among stocks or other economic indicators, such as interest rates or exchange rates, over time. Previous studies that have applied the VAR model include: A study titled "Testing Granger Causality Between Indonesia's Exports and Imports: An Analysis Using the VAR Model." This study found that, overall, Indonesia's exports and imports have a bidirectional causal relationship (Himawan Yusuf, 2025). According to the study "The Vector Autoregressive (VAR) Method in Analyzing the Effect of Exchange Rates on Exports and Imports in Indonesia," there are two unidirectional causal links, namely from exchange rates to exports and from exports to imports (Sudarmin, 2021).

A stock price is one indicator that reflects a company's success in managing its operations. When a company's stock price continues to rise, investors and prospective investors will be interested in buying those shares because the company is viewed as successful in running its business. A stock price is the value of each share as quoted on the stock exchange. The stock price is a crucial factor that investors must consider when investing, as it reflects the company's performance (Egam, G. E., Ilat, V., & Pangerapan, 2017).

PT Indofood Sukses Makmur Tbk (INDF) is a subsidiary of the Salim Group and is the largest company in Indonesia's food and consumer goods sector from a domestic market perspective. In line with its vision to become the leading processed food manufacturer in Indonesia, PT Indofood Sukses Makmur Tbk has a market research division tasked with conducting market surveys so that the company can proactively respond to changes in consumer trends, preferences, and desires. Its marketing strategy focuses on achieving high market penetration for its products. PT Indofood Sukses Makmur Tbk's core business is the instant noodle industry, which, based on market research, is estimated to hold a market share of approximately 90%. PT Mayora Indah Tbk (MYOR) is a leading food production conglomerate in Indonesia. Mayora Indah has grown to become one of the major players in the internationally recognized Fast-Moving Consumer Goods (FMCG) industry. This is evidenced by the company's success in introducing a variety of high-quality products that are now recognized as global brands, such as Kopiko, Danisa, Astor, Energen, Torabika, and others. The company was founded on February 17, 1977, as a small business in the biscuit industry, and has since grown into one of Indonesia's most integrated business groups. As it has expanded, the company has also transitioned to becoming a publicly traded company.

Time series analysis examines patterns within sequential data. Historical observations are utilized to forecast future values. The data are gathered at regular intervals, such as hourly, daily, weekly, monthly, or annually, and specific forecasting techniques are then applied to project future outcomes (Basari, M. S. N. and Achmad, 2021).

A p-order vector autoregressive (VAR (p)) model derived from an AR(p) model, with the general form of a p-order autoregressive (AR(p)) model being:

$$Y_t = \phi_1 Y_{t-1} + \phi_2 Y_{t-2} + \phi_3 Y_{t-3} + \cdots + \phi_p Y_{t-p} + e_t \quad (1)$$

The VAR model treats all endogenous variables collectively in a single system. Consequently, each endogenous variable is modeled as a function of its past values and the past values of the other endogenous variables within the model (Febrianti, D. R., Tiro & S, 2021). The general equation for a p Vector Autoregressive (VAR(p))) model is given below:

$$Y_{jt} = \alpha_j + \sum_{i=1}^{p} \beta_{ji} Y_{1,t-i} + \sum_{i=1}^{p} \theta_{ji} Y_{2,t-i} + \ldots + \sum_{i=1}^{p} \gamma_{Ki} Y_{K,t-1} + \varepsilon_{jt} \quad (2)$$

Stationarity of data can be classified into two categories: stationarity in variance and stationarity in mean.

- To examine stationarity in variance, the Box-Cox transformation may be applied. This transformation is a power transformation expressed as follows (Wei, 2006):

$$T(Y_t) = \frac{Y_t^{(\lambda)} - 1}{\lambda} \quad (3)$$

With Y_t is the observed variable in period t.

- Stationarity in the mean means that data fluctuations occur around a constant mean value and are not affected

by changes in the observation time. This is tested as follows:
Hypothesis:
$H_0: \gamma =$ (which means that Y_t contains a unit root or is nonstationary)
$H_1: \gamma <$ (which means that Y_t contains no unit roots or stationary points)

Test statistics

$$\tau = \frac{\hat{\gamma}}{SE(\hat{\gamma})} \tag{4}$$

Test criteria

H_0 is rejected if τ is less than the DF (α, n) test statistic or if the $p - value < a$

According to (Ariefiranto, 2012), Lag selection follows the formula 1 $Pmax = T^{\frac{1}{3}}$, with T representing the total number of observations employed in model construction. The specific lag order for the VAR model is then determined according to various criteria outlined in (Lütkepohl, 2005). One of these criteria is the AIC, with the following formula:

$$AIC(p) = In\left|\widehat{\sum u}\,(p)\right| + \frac{2pK^2}{n} \tag{5}$$

The estimation of VAR model parameters in this paper uses the Ordinary Least Squares (OLS) method. The OLS estimates are obtained by minimizing the sum of the squares of the residuals. The parameters estimated in the VAR (2) model using OLS are β_{ji} and θ_{ji}, where $j = 1, 2$ and $i = 1, 2$. The OLS calculation for a VAR model with two variables is as follows:

$$\begin{aligned} Y_{1,t} &= \alpha_1 + \beta_{11}Y_{1,t-1} + \beta_{12}Y_{1,t-2} + \theta_{11}Y_{2,t-1} + \theta_{12}Y_{2,t-2} + \varepsilon_1, t \\ Y_{2,t} &= \alpha_2 + \beta_{21}Y_{1,t-1} + \beta_{22}Y_{1,t-2} + \theta_{21}Y_{2,t-1} + \theta_{22}Y_{2,t-2} + \varepsilon_2, t \end{aligned} \tag{6}$$

The VAR (2) model in equations (6) and (7) can be expressed in matrix form as follows:

$$\begin{bmatrix} Y_{1,t} \\ Y_{2,t} \end{bmatrix} = \begin{bmatrix} \alpha_1 \\ \alpha_2 \end{bmatrix} \begin{bmatrix} \beta_{11} & \theta_{11} \\ \beta_{21} & \theta_{21} \end{bmatrix} \begin{bmatrix} Y_{1,t-1} \\ Y_{2,t-1} \end{bmatrix} + \begin{bmatrix} \beta_{12} & \theta_{12} \\ \beta_{22} & \theta_{22} \end{bmatrix} \begin{bmatrix} Y_{1,t-2} \\ Y_{2,t-2} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1,t} \\ \varepsilon_{2,t} \end{bmatrix} \tag{7}$$

Equation (8) can be expressed in the form of a linear model as follows:

$$Y = \mathrm{A}\delta + \varepsilon \tag{8}$$

Here's how to square the error:

$$\begin{aligned} Y &= \mathrm{A}\delta + \varepsilon \\ \varepsilon'\varepsilon &= (Y - A\delta)'(\mathrm{Y} - \mathrm{A}\delta) \\ \varepsilon'\varepsilon &= Y'Y - Y'\mathrm{A}\delta - \delta'\mathrm{A}'\mathrm{Y} + \delta'\mathrm{A}'\mathrm{A}\delta \\ \varepsilon'\varepsilon &= Y'Y - 2\mathrm{A}'\mathrm{Y} + 2\mathrm{A}'\mathrm{A}\delta \end{aligned} \tag{9}$$

Here, $\varepsilon'\varepsilon$ represents the sum of squared errors (SSE) to be minimized. Minimization requires that the first derivative of $\varepsilon'\varepsilon$ with respect to δ be set to zero. Moreover, the second derivative of ε′ε with respect to δ must be positive to ensure a minimum is attained. As can be seen, the first derivative yields the following result:

$$\frac{\partial \varepsilon\prime\varepsilon}{\partial \delta} = 2A'Y + 2A'A\delta = 0 \tag{10}$$

For the second derivative, the result is:

$$\frac{\partial^2 \varepsilon\prime\varepsilon}{\partial \delta \partial \delta} = 2A'A \tag{11}$$

$\boldsymbol{A'A}$ is a positive definite matrix, that is, a symmetric matrix whose diagonal elements are all positive. Since $\boldsymbol{A'A}$ is positive definite, then

$$\frac{\partial^2 \varepsilon\prime\varepsilon}{\partial \delta \partial \delta} = 2A'A \tag{12}$$

Next,

$$A'Y = A'A\delta \quad (13)$$

From equation (14), we obtain the least-squares formula:

$$\delta = (A'A)^{-1}A'Y \quad (14)$$

A causality test is conducted to determine whether there is a cause-and-effect relationship among the variables involved in the VAR model. If causality exists in economic behavior, then there are no exogenous variables in this econometric model; all variables are endogenous.
Hypothesis:

$H_0 : \gamma = 0$ (Y_t is nonstationary due to the presence of a unit root)
$H_0 : \gamma < 0$ (Y_t is stationary as no unit root exists)

Test statistic

$$F = \frac{(RSS_R - Rss_{UR})/m}{Rss_{UR}} \quad (15)$$

Rejection Criteria

H_0 is rejected if $F > F_{(\alpha,m,(n-k))}$ on $prob<$

AR Stability Test
A model is said to be stable if it satisfies the following equation:

$$\det (I_k - \beta_1 m) \neq 0 \text{ for any modulus } (m), |m| \leq 1 \quad (16)$$

with the condition that the eigenvalues of the matrix β_1 have magnitudes less than 1. If Y_t is a VAR (p) as defined in equation (16), it corresponds to the VAR (1) error model

$$Y_t = \alpha + \beta Y_{t-1} + \varepsilon_t \quad (17)$$

Testing Residual Assumptions
In the multivariate case, the independence test uses the Portmanteau test (Lütkepohl, 2005).

Hypotheses

H_0: $\rho 1 = \rho 2 = \rho 3 = \cdots = \rho k = 0$ (there is no correlation among residuals across lags)
H_1: there is at least one $\rho i \neq 0$ for i $= 1, 2, \ldots,$ k (there is correlation among residuals across lags)

Significance Level α
Test Statistic

$$Q_p = n \sum_{j=1}^{p} tr\, (\widehat{C}_j \widehat{C_0^{-1}} \widehat{C}_j C_0^{-1} \quad (18)$$

Rejection Criteria

H_0 is rejected if the $p - value < \alpha$ or $Q_h \geq x^2_{(K^2 p,\alpha)}$
Multinormal Residual Test
Testing the assumption of multinormal residuals. Hypotheses
H_0: The residuals from the VAR model are multinormally distributed
H_1: The residuals from the VAR model are not multinormally distributed Significance level α

Test Statistic

$$\lambda_{sk} = \lambda_s + \lambda_k \quad (19)$$

Rejection Criteria

H_0 is rejected if $\lambda_{sk} > x^2_{2K}$ or $p < \alpha$

In a VECM, the Impulse Response Function operates much like in a VAR, except that it includes error correction mechanisms and cointegrating vectors. When analyzing residual shocks, the VECM framework is used to generate forecasts of endogenous variables. For Cholesky decomposition shocks, a recursive ordering is applied according to the interdependencies of contemporaneous endogenous variables, where the variable order in the VECM dictates the structure (Ekananda, 2015).

Forecast Error Variance Decomposition (FEVD) in the VAR model is used to estimate the percentage contribution of each variable's variance that is attributed to shocks from particular variables in the system. While impulse response analysis assesses how a shock to one variable affects others, FEVD highlights the relative significance of each variable within the VAR framework (Mukarromah & Hasan, 2023).

2. RESEARCH METHOD

This research seeks to predict the share prices of PT. Indofood Sukses Makmur Tbk and PT. Mayora Indah Tbk for the year 2025. The study utilizes Granger Causality testing and Forecast Error Variance Decomposition within a Vector Autoregression framework, processed using RStudio software. The dataset covers daily closing stock prices of both companies from January 1 to December 31, 2025, resulting in 236 time-period observations.

The data used in this study is quantitative and consists of historical stock price records. Secondary data were retrieved from www.yahoofinance.com. Data gathering was performed through an online review of available sources.

The operational definitions of the variables are outlined below. The stock price of PT. Indofood Sukses Makmur Tbk, denoted as (Y_(1,t)), refers to the company's historical share price data over time, expressed in millions of Indonesian rupiah. Similarly, the stock price of PT. Mayora Indah Tbk, denoted as (Y_(2,t)), represents the firm's historical share price data over time, also measured in millions of rupiah.

a. Collect daily stock price data for PT. Indofood Sukses Makmur Tbk and PT. Mayora Indah Tbk for the year 2025.
b. Gather daily closing stock prices of PT. Indofood Sukses Makmur Tbk and PT. Mayora Indah Tbk for the entire year of 2025.
c. Perform descriptive statistical analysis to identify the basic characteristics of the dataset.
d. Assess data stationarity through the Augmented Dickey-Fuller test. This step is essential to confirm that the series is stationary at level, which is a requirement for applying the VAR model.
e. Select the most appropriate lag length based on the Akaike Information Criterion. The lag with the lowest AIC score is chosen as optimal.
f. Estimate a Vector Autoregression model using the chosen lag, specifically a VAR (3) specification. Evaluate the stability of the VAR model by analyzing the modulus of its characteristic roots. Stability is achieved when all modulus values are less than 1.
g. Carry out diagnostic checks on the model, covering autocorrelation and residual normality tests, to verify that the BLUE assumptions are met.
h. Apply the Granger causality test to determine the directional influence between INDF and MYOR variables.
i. Perform Impulse Response Function analysis to observe how one variable reacts to shocks originating from another variable within the system.
j. Conduct Forecast Error Variance Decomposition to quantify how much of the variation in one variable is explained by shocks to another variable over an extended period.
k. Formulate conclusions and provide recommendations based on the findings from the VAR model estimation.

3. RESULTS AND DISCUSSION

This study uses daily historical stock-price data for 2025 obtained from Yahoo Finance. The data consists of stock prices for two food industry companies: PT. Indofood Sukses Makmur Tbk and PT. Mayora Indah Tbk. The results of the descriptive statistical analysis of the two stocks are presented in Table 1.

3.1. Descriptive Statistics

The data used in this research consist of daily stock prices for 2023 sourced from finance.yahoo.com. The sample includes two food industry firms, namely INDF and MYOR. Descriptive statistics for the two stocks are summarized in Table 1.

Table 1. Descriptive Statistics

Stock Price	Number of Data Points	Minimum	Maximum	Mean	Standar Deviation
INDF	236	1.880	0.090514	2.780	0.1554
MYOR	236	6.575	0.0645385	8.525	0.4578

Source: Data Processed using RStudio 2026
*INDF: PT. Indofood Sukses Makmur Tbk and MYOR: PT. Mayora Indah Tbk

Table 1 shows that there are 236 observations for each stock, INDF and MYOR. The mean value of MYOR stock, at 7.5742, is higher than that of Indofood's stock, which is 2.1984. This indicates that during the observation period, Mayora's stock price was at a relatively higher level compared to INDF. Meanwhile, MYOR standard deviation of 0.4578 is also greater than INDF of 0.1554. Therefore, it can be concluded that MYOR stock has a higher level of volatility, meaning its price movements tend to be more fluctuating compared to INDF stock.

3.2. Data Stationarity Test

To assess stationarity, the data are tested at both the level and first-difference forms. The first-difference series is computed as the difference between today's price and yesterday's price. The Augmented Dickey-Fuller (ADF) test, implemented in RStudio, is employed to evaluate data stationarity. Table 2 presents the results of the test.

Table 2. Results of the Data Stationarity Test Using the Augmented Dickey-Fuller Test

Variable	Level Data	First Difference Data	Notes
INDF	-4,0399	-12,1498	Stationary at First Difference
MYOR	-1,4506	-12,2307	Stationary at First Difference
5% Critical Value	-2,88	-2,88	

Source: Data Processed using RStudio 2026
*INDF: PT. Indofood Sukses Makmur Tbk and MYOR: PT. Mayora Indah Tbk

Based on Table 2, the t-statistic value for INDF is -4.0399. After taking the first difference, the t-statistic value becomes -12.1498. Therefore, since -12.1498 < -2.88, it can be concluded that the variable for INDF is stationary at the first difference. Meanwhile, at the data level, the t-statistic value for the variable of MYOR is -1.4506. At the level, the computed t-statistic exceeds the critical value of -2.88, so the data are non-stationary. Upon first differencing, the t-statistic is -12.2307, which is smaller than -2.88. This implies that the MYOR series is stationary in first differences. Thus, both INDF and MYOR are stationary at first difference, meaning they are I (1) processes. Since both datasets meet the stationarity criteria at the same order, the analysis can proceed to the stage of determining the optimal lag and conducting the Johansen cointegration test.

3.3. Determination of the Optimal Lag

To select the optimal lag for the VAR model, the lag selection was based on the smallest values of several information criteria. The criteria used include AIC, SC, HQ, and FPE, which were computed with the help of R software. Table 3 presents the results of the optimal lag selection.

Table 3. Results of the Optimal Lag

Criterion	Selected Optimal Lag
AIC	3
HQ	2
SC	1
FPE	3

Source: Data Processed using RStudio 2026
*INDF: PT. Indofood Sukses Makmur Tbk and MYOR: PT. Mayora Indah Tbk

As shown in Table 3, the AIC and FPE criteria yield identical results by selecting lag 3. In contrast, the HQ criterion points to lag 2, while the SC criterion points to lag 1. Since two of the four criteria namely AIC and FPE have the same value (lag 3), lag 3 is designated as the optimal lag used in this study. Determining this optimal lag is important so that the VAR model can accurately capture the dynamic relationship between INDF and MYOR.

3.4. Estimation of the 3-Lag VAR Model

Table 4. Test Results for the Estimation of the 3-Lag VAR Model

Independent Variables	Dependent Variable: INDF		Dependent Variable: MYOR	
	Coefficient	Prob.	Coefficient	Prob.
INDF(-1)	0.944750	0.0000	0.317879	0.086663.
MYOR(-1)	-0.050580	0.03228	0.696130	0.0000
INDF(-2)	-0.112148	0.21723	0.210764	0.404904
MYOR(-2)	0.056867	0.04682	0.268975	0.000817
INDF(-3)	0.089460	0.16321	-0.445131	0.013212
MYOR(-3)	-0.009703	0.68470	0.007117	0.914868
Constant	0.194	0.00794	0.025635	0.899153
R-Square	0.8844	0.9128		
Adjusted R-Square	0.8813	0.9105		
F-Statistic	288.2	394.5		
	[0.0000]*	[0.0000]*		

Notes:
** significant at 1%; * significant at 5%; . significant at 15%
*INDF: PT. Indofood Sukses Makmur Tbk and MYOR: PT. Mayora Indah Tbk
Source: Data processed using RStudio 2026

Table 4 shows that the VAR (3) model is stable with a largest root of 0.976 < 1. The model fits well, with F-statistics significant at 1% for both equations. Adjusted R-squared values are 0.8813 for INDF and 0.9105 for MYOR, meaning the model explains 88.13% and 91.05% of their price variation. The remaining variation comes from variables outside the model. Partially, INDF is significantly influenced by INDF (-1), MYOR (-1), and MYOR (-2). The coefficient for MYOR (-1) is negative, meaning that an increase in MYOR one period ago will decrease INDF. MYOR Equation: The MYOR stock price is significantly influenced by the MYOR prices from the previous 1 and 2 periods (MYOR (-1) and MYOR (-2)), as well as the INDF price from three periods ago (INDF (-3)). Thus, there is a short-term reciprocal relationship between INDF and MYOR stocks. This means that movements in the MYOR price can affect INDF, and movements in the INDF price can also affect MYOR.

3.5. Diagnostic Tests for the VAR Model with a Lag of 3

Table 5. Results of Diagnostic Tests for the VAR Model with a Lag of 3

Test Type	Test Statistic	Df	Prob.	Decision
Autocorrelation: Portmanteau Test	36.721	36	0.4353	No autocorrelation
Normality: Skewness	1.6724	2	0.4334	Normally distributed
Heteroscedasticity: ARCH-LM Test	143.72	108	0.0623	No heteroscedasticity

Source: Data processed using RStudio 2026

Table 5 presents the diagnostic test results. The Portmanteau test gives p = 0.4353 > 0.05, so there is no autocorrelation in the VAR (3) residuals. The skewness test gives p = 0.4334 > 0.05, so residuals are normal. The ARCH-LM test gives p = 0.0623 > 0.05, so there is no heteroscedasticity. Since all assumptions are met, the analysis can proceed to VAR, Granger, IRF, and FEVD.

3.6. Vector Autoregression (VAR) Stability Test

The VAR stability test is conducted to ensure that the estimated model is unbiased and produces valid results for further analysis, such as IRF and FEVD. A VAR model is considered stable if all the modulus values of the characteristic roots lie within the unit circle, that is, they are less than 1. The results of the VAR stability test are presented in Table 6.

Table 6. VAR Stability Test

Root No	Root Modulus	Criteria	Note
1	0.97600528	< 1	Stable
2	0.92802076	< 1	Stable
3	0.38947106	< 1	Stable
4	0.38947106	< 1	Stable
5	0.37603520	< 1	Stable
6	0.07127207	< 1	Stable
Maks	0.97600528	< 1	Stable Model

Source: Data processed in RStudio 2026

Based on Table 4, it can be seen that all the resulting characteristic root modulus values are less than 1, or < 1. The largest modulus value obtained is 0.97600528. Since the maximum value of 0.97600528 is less than 1, it can be concluded that the VAR model with an optimal lag of 3 used in this study meets the stability criteria. Thus, the model is suitable for use in the Impulse Response Function and Forecast Error Variance Decomposition analysis stages.

3.7. Granger Causality Test

Table 7. Results of the GC Test

Direction of Relationship	F-statistic	p-value	Conclusion
INDF → PT. MYOR	3.5304	0.0149	Significant
MYOR → INDF	1.8709	0.1337	Not Significant
Instantaneous Causality	1.0559	0.3041	Not Significant

Source: Data processed using RStudio 2026
*INDF: PT. Indofood Sukses Makmur Tbk and MYOR: PT. Mayora Indah Tbk

Table 3 presents the results of the Granger causality test, revealing a one-way relationship. The test shows that INDF Granger-causes MYOR at a significance level of 5% with a p-value of 0.0149. This implies that INDF's stock price contains information that helps forecast MYOR's stock price. In contrast, MYOR does not Granger-cause INDF, with a p-value of 0.1337 > 0.05, meaning MYOR's price movements are not useful for predicting INDF's price. Furthermore, the test for instantaneous causality shows a p-value of 0.3041 > 0.05, indicating that the impact is not contemporaneous and occurs with a lag of several days. Therefore, the causality is unidirectional from INDF to MYOR, positioning INDF as the leading variable and MYOR as the following variable in the consumer goods sector.

3.8. Impulse Response Function (IRF) Test

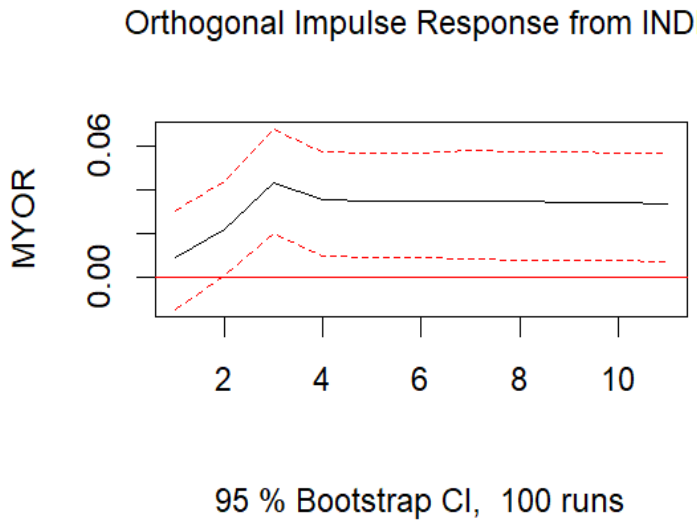

Figure 1. IRF graph

Based on Figure 1, the Impulse Response Function results indicate several things: MYOR stock responds positively to a shock from INDF stock. This is evident from the response line, which lies above zero. Furthermore, the highest response from MYOR occurred in the third period. This means that the impact of changes in INDF on MYOR was most pronounced after three trading days. Consequently, after the third period, PT. Mayora Indah Tbk's response tended to stabilize and did not return to zero. This indicates that the influence of INDF and MYOR is permanent in the long term. Conclusion: A shock to INDF will be met with a positive response from MYOR, with the greatest impact occurring on the third day and the effect lasting permanently.

3.9. Forecast Error Variance Decomposition (FEVD) Test

Table 8. FEVD Test Results

Period	INDF oleh INDF	INDF by MYOR	MYOR by INDF	MYOR by MYOR
1	100.00%	0.00%	0.46%	99.54%
6	98.89%	1.11%	8.61%	91.39%
12	98.60%	1.40%	10.82%	89.18%

*INDF: PT. Indofood Sukses Makmur Tbk and MYOR: PT. Mayora Indah Tbk
Source: Data processed using RStudio 2026

Based on Table 8, the FEVD results for INDF show that this variable is highly exogenous. Over the 12-period period, INDF was influenced by MYOR by only 1.40% in the final period. For MYOR: The influence of INDF increased significantly from 0.46% in period 1 to 10.82% in period 12. Conclusion: There is a one-way causal relationship from INDF to MYOR. INDF acts as the leading variable, while MYOR acts as the lagging variable.

4. CONCLUSION

The following conclusions can be drawn from the research findings:

a. Descriptive Statistics: MYOR stock has a higher average price (6,575) than INDF (1,880). However, MYOR has a larger standard deviation (0.4578) than INDF (0.1554), indicating that its price movements tend to be more volatile.
b. Data Stationarity Test: Based on the ADF test, both variables INDF and MYOR are not stationary at the level, but are stationary at the first difference (integration order I (1)).
c. Determination of the Optimal Lag: Based on the AIC and FPE criteria, a lag of 3 was determined to be the optimal lag for accurately capturing the dynamic relationship between the two stocks.
d. Estimation of the 3-Lag VAR Model: The 3-lag VAR model passed the stability test with a largest root value of 0.976 < 1 and was deemed a good fit because the F-statistic was significant at the 1% level.
e. Diagnostic Tests: The model is deemed valid because there is no autocorrelation (Prob. 0.4353 > 0.05), the residuals are normally distributed (Prob. 0.4334 > 0.05), and there is no heteroscedasticity (Prob. 0.0623 > 0.05).
f. VAR Stability Test: All characteristic root moduli are below 1 or < 1 (maximum 0.976), so the VAR model is deemed stable and valid for further analysis.
g. Granger Causality Test: The causal relationship is unidirectional, flowing from INDF to MYOR (Prob. 0.0149 < 0.05); thus, the stock price of INDF can predict the price movements of MYOR.
h. Impulse Response Function (IRF) Test: MYOR stock responds positively to a shock from INDF with the greatest impact felt on the third day and the effect persisting permanently.
i. Forecast Error Variance Decomposition (FEVD) Test: INDF acts as a highly exogenous leader variable (leader), while MYORk acts as a follower variable, with its dependence on INDF increasing to 10.82% by the 12th period.

Based on the research findings, the following recommendations can be made:

a. For PT. Indofood Sukses Makmur Tbk and PT. Mayora Indah Tbk. Recommendation for PT. Indofood Sukses Makmur Tbk: As the influencing variable (leader), the company is advised to maintain the stability of its operational and fundamental performance, as its stock price movements serve as an important signal for the consumer goods sector. As for PT. Mayora Indah Tbk: As the influenced variable, investors and management are advised to monitor the dynamics of PT. Indofood Sukses Makmur Tbk's stock price as a supporting indicator and to anticipate risks due to high stock price volatility.
b. For Future Researchers. This study still has limitations; for example, given that the cointegration test results indicat, future researchers are advised to use the Vector Error Correction Model (VECM) to analyze short-term and long-term relationship dynamics more accurately. Another suggestion is that, since stock price variations are influenced by variables outside the model, it is advisable to include macroeconomic variables in future research to broaden the analysis.

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REFERENCES

Ariefiranto, M. D. (2012). Ekonometrika (E. Jakarta (ed.).

Basari, M. S. N. and Achmad, A. I. (2021). Metode Singular Spectrum Analysis untuk Meramalkan Indeks Harga Konsumen Indonesia Tahun 2019. Prosiding Statistika, 7, 484-491.

Bursa Efek Indonesia (BEI). (2025). Laporan Keuangan Tahunan 2020. [Online]. Diakses dari Website IDX.

Egam, G. E., Ilat, V., & Pangerapan, S. (2017). Pengaruh return on asset (ROA), return on equity (ROE), net profit margin (NPM), dan earning per share (EPS) terhadap harga saham perusahaan yang tergabung dalam indeks LQ45 di Bursa Efek Indonesia periode tahun 2013-2015. Jurnal Emba, 5(1), 105-114.

Ekananda, M. (2015). Ekonometrika Dasar (untuk Penelitian Ekonomi, Sosial Dan Bisnis (M. W. Media (ed.)).

Febrianti, D. R., Tiro, M. A. and S., & S. (2021). Metode Vector Autoregressive (VAR) dalam Menganalisis Pengaruh Kurs Mata Uang Terhadap Ekspor Dan Impor di Indonesia. VARIANSI: Journal of Statistics and Its Application on Teaching and Research, 3(1), 23–30. https://doi.org/https://doi.org/10.35580/variansiunm14645

Hidayatullah, S. (2021). Analisis Perbandingan Kinerja Keuangan Pada Perusahaan Pt Mayora Indah Tbk. Dan Pt Indofood Sukses Makmur Tbk. Jurnal manajemen, 1(2), 56-66.

Himawan Yusuf, R. K. H. (2025). Uji Kausalitas Granger Antara Ekspor dan Impor Indonesia: Analisis Dengan Model Var. Politeknik Keuangan Negara STAN, Universitas Gadjah Mada, Vol. 9, No, Hal. 157-168.

Lütkepohl, H. (2005). New Introduction to Multiple Time Series Analysis, (N. Springer Books, Springer (ed.)). https://doi.org/10.1007/978-3-540-27752-1

Mukarromah, H. L., & Hasan, A. (2023). Analisis Pengaruh Variabel Makroekonomi Terhadap Penerimaan Zakat Pada Baznas Periode 2016-2021. Jurnal Ilmiah Ekonomi Islam, 9(2 SE-Articles), 2229–2237. https://doi.org/10.29040/jiei.v9i2.8677

Arrifqi, T., & Putri, A. S. (2022). Pengaruh literasi keuangan, toleransi risiko dan persepsi risiko terhadap keputusan investasi pegawai di Bandar Lampung. Jurnal Bisnis, Manajemen, Dan Keuangan, 3(2), 432-443. https://doi.org/10.21009/jbmk.0302.08

Pratama, A., & Wijaya, H. (2021). Analisis Kinerja Keuangan terhadap Harga Saham Perusahaan di Pasar Modal. Jurnal Akuntansi Dan Keuangan, 23(1), 33–45.

Sudarmin, D. R. F. M. A. T. S. (2021). Metode Vector Autoregressive (VAR) dalam Menganalisis Pengaruh Kurs Mata Uang Terhadap Ekspor Dan Impor Di Indonesia. VARIANSI: Journal of Statistics and Its Application on Teaching and Research, Vol 3, No 1 (2021), 23–30. https://ojs.unm.ac.id/jvariansi/article/view/14645/8740

Wei, W. (2006). Time Series Analysis: Univariate and Multivariate Methods, 2nd edition, 2006.

Wijaya, B. I., & Sedana, I. B. P. (2015). Pengaruh profitabilitas terhadap nilai perusahaan (kebijakan dividen dan kesempatan investasi sebagai variabel mediasi) (Doctoral dissertation, Udayana University).