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Granger Causality Between the Indonesian Exchange Rate and the Indonesia Sharia Stock Index (ISSI) 2015–2025

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ABSTRAK

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- Penelitian ini mengkaji hubungan kausalitas Granger antara kurs tukar mata uang rupiah dengan Indeks Saham Syariah Indonesia (ISSI) dari Tahun 2015 hingga Tahun 2025. Penelitian ini menguji apakah nilai kurs mata uang Rupiah terdapat hubungan kausalitas Granger terhadap Indeks Saham Syariah Indonesia (ISSI), atau sebaliknya. Hasil hipotesis menunjukkan bahwa kurs mata uang Rupiah tidak memiliki hubungan kausal Granger terhadap ISSI, karena nilai p (0,6826) melebihi ambang batas 0,05, sehingga hipotesis nol tidak dapat ditolak. Hal ini menunjukkan tidak adanya hubungan kausal yang signifikan kurs mata uang rupiah terhadap ISSI. Namun sebaliknya, dalam kajian ini mengungkapkan bahwa adanya hubungan kausal Granger yang signifikan dalam arah sebaliknya. Secara spesifik, perubahan ISSI di masa lalu secara signifikan memprediksi pergerakan nilai tukar Rupiah, sebagaimana dibuktikan oleh statistik uji $F(2, 129) = 9,13995$ dengan nilai p sebesar 0,0002, yang dengan kuat menolak hipotesis nol pada tingkat signifikansi 1%. Temuan ini menyoroti bahwa meskipun nilai tukar Rupiah tidak memengaruhi ISSI, pergerakan ISSI memiliki dampak yang berarti terhadap nilai tukar Rupiah, sehingga memberikan wawasan berharga mengenai dinamika antara pasar ekuitas syariah Indonesia dan mata uangnya.

Keywords :

Granger
Causality, Rupiah
Exchange Rate,
Islamic Stock
Index (ISSI),
Flow-Oriented
Model, Portfolio
Balance
Approach

ABSTRACT

The aims of the study explores the Granger causality relationship between the Rupiah exchange rate and the Indonesian Sharia Stock Index (ISSI) from 2015 to 2025. The study tests whether the Rupiah exchange rate Granger-causes the ISSI, and vice versa. The results indicate that the hypothesis of the Rupiah exchange rate Granger-causing the ISSI is not supported, as the p -value (0.6826) outstrips the 0.05 limit, declining to refuse the null hypothesis. This indicates no significant causal relationship from the Rupiah exchange rate towards the ISSI. In dissimilarity, the study discloses a significant Granger-causal relationship in the opposite direction. Specifically,

past changes in the ISSI significantly predict fluctuation of the Rupiah Currency pair value, as supported in passing test statistic $F(2, 129) = 9.13995$ through a p -value of 0.0002, which intensely reject of the null hypothesis at the 1% significance degree. These findings highlight the Rupiah exchange rate does not influence the ISSI, the fluctuation in the ISSI have a meaningful impact on the Rupiah Currency, offering valued understandings into the dynamics between the Indonesian Sharia equity market and its currency.

INTRODUCTION

In a world economy that is becoming more unpredictable, the performance financial economics has traditionally placed a high priority on the connection between macroeconomic factors and capital market performance (Coleman & Leone, 2025; Ibrahimov et al., 2025). The rapid spread of globalization, the increase in international financial connections (Abid et al., 2024; Yang et al., 2023), and the rising rate of economic shocks have created a situation where no single market operates independently (Wernli et al., 2023). Stock markets are particularly responsive to changes in macroeconomic fundamentals (Eichel, 2025; S. Rahman, 2025), including exchange rates, such as Saudi Arabia (Alalmai, 2025). In emerging economies such as Indonesia, which are intricately linked to global trade and capital movements, the volatility of macroeconomic indicators significantly impacts equity market dynamics (Elenev et al., 2024; Yahyaei et al., 2024). The changing nature of this situation has prompted ongoing research by academics, government officials, and financial institutions. The researchers are investigating how specific macroeconomic indicators affect capital markets, and whether these effects are one-way or reciprocal. Understanding this influence is crucial for creating effective monetary policy, managing portfolio risk well, and, ultimately, for maintaining financial system stability during times of uncertainty.

Islamic finance has expanded rapidly in recent years (Maulina et al., 2023), and Islamic capital market in Indonesia is showing substantial expansion, even with the uncertainty of the world economy. The nation at large, with a Muslim population exceeding 230 million (Hackett, 2025), possesses a natural advantage in creating financial products compliant with sharia law. The Indonesian Sharia Stock Index (ISSI), presented by the Indonesia Stock Exchange (BEI) on May 12, 2011, is a crucial point of reference (Gati et al., 2024b). This index encompasses sharia-compliant stocks available on the exchange. Sharia-compliant stocks experienced an upward trajectory within the ISSI between 2015 to 2023 (Boulanouar et al., 2024). This increase was fuelled by both regulatory backing and a growing appetite among investors for ethical, faith-

aligned financial options. The ISSI's expansion mirrors a broader global movement within Islamic finance, a multi-trillion-dollar sector encompassing sukuk, and equity markets. Despite this growth, the market remains susceptible to external pressures, particularly exchange rate volatility, which has intensified following the pandemic of COVID-19, the interest rate of global world is hiking cycle of 2022–2023, and geopolitical tensions affecting emerging market capital flows (Febrian & Wahed, 2025).

The correlation between rate of exchange and price of stock is an issue of considerable discussion, given that both are indicators of underlying economic conditions and are simultaneously influenced by both domestic and external disturbances. Economic integration, exemplified by the BRICS nations, strengthens the connections between stock markets through heightened trade activity. Therefore, this integration can lead to greater synchronization among stock markets. This, in turn, could affect exchange rates by changing trade balances and capital flows (Gopane, 2023). In the context of emerging markets, such as Indonesia, this relationship assumes particular importance given the country's vulnerability to capital flow reversals, commodity price cycles, and global monetary policy shifts. Within the framework of macroeconomic factors influencing capital market dynamics, the exchange rate holds considerable importance in Indonesia's economy, which is characterized by its openness and reliance on trade. The Indonesian Rupiah (IDR), operating within a free-floating exchange rate framework supervised by Bank Indonesia, serves as a vital gauge (Craighead, 2024). This instrument offers a method to evaluate a nation's international competitiveness, balance of payments, and general economic health. The fluctuations in the price of the Indonesian rupiah toward dominant currencies, especially the US dollar, have a big effect on the Indonesian economy. Consequently, the fluctuations in rate of exchange significantly influence foreign portfolio investors. These investors hold a considerable portion of the stocks transacted on the Indonesian Stock Market. When the rate of Rupiah takes a decline, these investors frequently withdraw their capital. They sell off their stocks and then convert the proceeds back into their home currencies. This action tends to push stock prices down. This intricate network of transmission channels highlights the Rupiah exchange rate's critical role as the most significant macroeconomic variable for interpreting equity market movements within the Indonesian context, and consequently, its relationship with the ISSI necessitates thorough empirical investigation.

Despite extensive research on the relationship between currency rates and the stock market in conventional finance, an empirical literature focusing specifically on Islamic equity indices remains limited. Sharia-compliant stocks exclude interest-bearing instruments, highly

leveraged firms, and sectors deemed non-permissible under Islamic law, which theoretically alters their sensitivity to macroeconomic shocks relative to conventional indices. This selectivity may produce distinct causal patterns between exchange rate movements and ISSI that are not captured by studies using conventional indices such as the Jakarta Composite Index (JCI). This study, therefore, aims to rigorously examine The Granger causal relationship involving the USD/IDR currencies and the ISSI during January 2015 to December 2025, utilizing the Granger causality. The specific research objectives are: (1) To establish the sequence level of integration for both variables; (2) to investigation of the long-run cointegration concerning the exchange rate and ISSI; and (3) to identify the direction(s) of Granger causality. The research contributes to the growing body of knowledge in macroeconomics and Islamic finance, provides empirical guidance for sharia-compliant portfolio management, and offers policy-relevant insights for capital market regulators and monetary authorities.

Specifically, it employs the Granger Causality approach to ascertain whether, It is possible for one variable to predict the future movements for the other, thereby illuminating potential lead-lag relationships in financial markets (Ridwan et al., 2024). Such an analysis is critical given the inherent complexity of financial market dynamics, where numerous interconnected economic, political, and social factors can obscure direct causal pathways (Kakran et al., 2024). The application of Granger causality allows for a robust assessment of unidirectional or bidirectional causal links between these key macroeconomic indicators (Pham et al., 2024). This methodology provides a quantitative basis for understanding how exchange rate volatility might influence the Sharia-compliant equity market, and it is necessary for investors and policymakers alike (Maulidar et al., 2024). This involves investigating whether one variable's past values provide statistically meaningful information for predicting the other variable beyond its own past values (Idroes et al., 2024; Zeng et al., 2024).

LITERATURE REVIEW

An analysis rests on two core hypotheses drawn from international finance:

Flow-Oriented Model

Due to their ability to explain complex market microstructure phenomena and provide detailed information about asset price formation, flow-oriented (Hu & Zhang, 2025; Magni, 2026). The model of flow-oriented (Dornbusch & Fischer, 1980) presents a significant changes in rate of exchange may affect to the company's attractiveness and future cash flows, which in turn can

harm stock values. This is crucial for understanding the market and predicting price changes (Anantha & Jain, 2024). It can also be used to find market trends and measure momentum to improve trade performance (Li et al., 2023; A. Rahman & Upadhye, 2024). The flow-oriented model declares when the price of shares goes down, it could imply that economic conditions is becoming worse. This would imply that people and businesses spend less money, which would mean that there are fewer imports. When imports go down, the need for overseas exchange drives downcast, which makes the Indonesian currency appreciated (Bampinas et al., 2026). In Indonesia, The LQ45 index, which comprises Shariah-compliant stocks, exhibits a positive and strong link with Indonesian currency. Exchange rate swings may affect stock market performance, investor decisions, and market stability (Arfah et al., 2023). In contrast, Nigerian studies show that exchange rate fluctuation can hurt foreign direct investment (FDI) and stock exchange outcomes, emphasizing the importance rate of exchange solidity for investing (Adebisi et al., 2025). Creating a Shariah compliance index helps evaluate Islamic compliance. A study of Shariah compliance in several Islamic nations indicated that compliant portfolios perform better. This is due to Islam-conscious investors and Shariah-compliant enterprises' financial stability (Parlak, 2024). Exchange rates and stock indices including Shariah-compliant ones impact financial stability. Short-term regulatory interventions, like those in Türkiye, can stabilize markets but exacerbate volatility if not controlled (Turk & Akbulut, 2025)

The Portfolio Balance Theory

The Portfolio Balance Approach (PBA), often known as the portfolio-balance model or PBT, determines asset market exchange rates. Through portfolio optimisation and financial success pathways, the PBA explains the observed relationship between stock indices and currency rates. Theory posits a correlation between currency rates and stock market index, suggesting that changes in stock prices can influence exchange rates and vice versa. The latest study provides empirical evidence conducted by Chancharat & Suwannapak (2024) supporting of the Portfolio Balance Theory (PBT) implemented in Australia, China, India, and Malaysia, indicating that stock returns influence exchange rates in these countries. Studied conducted by Ahmadian-Yazdi et al., (2025) that reveals that causality primarily flows a stock markets to currency rates, Stock fluctuations in prices dictate exchange rates in the Toronto Stock Exchange (TSX), the Canadian exchange rate (USDCAD), and the Australian Stock Exchange (ASX).

Exchange Rate and the Capital Market

A theoretical foundation for the currency rate and stock price relationship rests on two primary models: the flow-oriented model (Dornbusch, 1980), a portfolio-balance theory (Branson,

1983). A model of flow-oriented posits the rate of exchange pretentious to price of stocks over their influence on global competitiveness besides corporate profitability. A currency depreciation, for instance, improves the competitiveness of exporters, boosting their revenues and stock valuations, while simultaneously raising costs for import-dependent firms. Using the portfolio balance model, rising stock prices increase domestic wealth and the need for money, which improves the domestic currency, implying a negative causal relationship between stocks and exchange rates.

Empirically, Chang et al., (2024) found currency rates to the stock index bidirectional causality, while Ahmadian-Yazdi et al., (2025) found evidence demonstrate a correlation between stock markets and exchange rates in USDCAD and ASX. However, both studies focused on conventional indices, leaving a gap regarding Islamic equity markets. Empirical studies on Islamic equity indices and macroeconomic variables have grown rapidly since the establishment of major Islamic benchmarks. Exchange rate moves enhance Islamic stock performance in the short and long term, based on a study of Zreg & Devabe (2025).

In Indonesian context specifically, Sia et al., (2025) studied the performance factors for Jakarta Composite Index in Indonesia, Recognising inflation and interest rate asymmetry affects stock values. No study has yet using Granger causality approach to study the USD/IDR to ISSI relationship after 2015, which includes commodity price drops, the COVID-19, and the aftermath monetary tightening cycle.

Granger Causality in Financial Economics

The Granger causality test is based on the idea that if variable X Granger-causes variable Y, then past values of X can help predict future values of Y, after accounting for other relevant factors. In other words, if a variable X_t consistently helps to explain Y_t . Thus, the granger causality test is a statistical procedure to establish whether several interval sequences data contains valuable information for predicting another, beyond what the series' own lagged values provide (Granger,1969). In the context of macro financial relationships, Granger causality tests have been extensively used to disentangle the direction of influence within macroeconomic parameters and asset amounts (Engle & Granger, 1987). A stronger causal inference, additional theoretical frameworks are necessary. It can say that Granger causality is implied if:

$$\Pr(Y_{t+m}|\Psi_t) = \Pr(Y_{t+m}|\Omega_t)$$

is used to represent the provisional possibility that Y_{t+m} (the future value of Y) is influenced by past information Ψ_t (which includes all available information at time t) but not by past values

of X (which is represented by Ω_t , the information set without considering X). For testing the bivariate causal relationship, the following equations are used:

$$Y_t = \alpha_0 + \sum_{k=1}^p \alpha_k Y_{t-k} + \sum_{k=1}^p \beta_k X_{t-k} + u_t$$

a) The equation indicates that Y_t (the dependent variable) is a function of its lagged values and the lagged values of X_t , with u_t representing the error term.

b)
$$X_t = \phi_0 + \sum_{k=1}^p \phi_k Y_{t-k} + \sum_{k=1}^p \varphi_k X_{t-k} + v_t$$

c) A similar vein this equation indicates that X_t (the alternative variable) is a function of its historical values and the historical values of Y_t , with v_t representing the error term.

Since, The study intends to examine the causal relationship between the Rupiah exchange rate and the Indonesian Sharia Stock Index (ISSI) from 2015 to 2025. The primary focus will be on determining whether fluctuations in the Rupiah rate of exchange have a substantial influence to the ISSI, and vice versa. The hypothesis are rooted in the assumption that changes in exchange rates may influence the performance of stocks, especially in an emerging market like Indonesia, where currency values and stock market dynamics are closely interlinked. the construct of hypothesis the causal relationship between the Rupiah rate of exchange and Indonesian Sharia Stock Index (ISSI) over the period 2015–2025, as follow:

H_1 : The Rupiah exchange rate Granger-causes the Indonesian Sharia Stock Index (ISSI) over the period 2015–2025.

H_2 : The Indonesian Sharia Stock Index (ISSI) Granger-causes the Rupiah exchange rate.

over the period 2015–2025.

METHODOLOGY

The methodology is used to explore the Granger causality between Indonesian Sharia Stock Index (ISSI) and Rupiah rate of exchange from 2015 to 2025. The analysis investigates the short-term and long-term interactions among these variables. The methodology comprises many essential steps: data collection, unit root testing, a cointegration analysis, and Granger causality testing.

Data and Sample Period

This study uses monthly time-series data covering January 2015 to December 2025, yielding 132 observations. The two core variables are: (1) the monthly average USD/IDR nominal exchange rate, obtained from Bank Indonesia's official statistical database; and (2) the monthly closing value of the Indonesian Sharia Stock Index (ISSI), sourced from the Indonesia Stock Exchange (IDX). The sample period is deliberately chosen to capture multiple structural episodes: the commodity downturn of 2015–2016, the 2018 emerging market currency crisis, the COVID-19 shock of 2020, the recovery and global monetary tightening of 2021–2023, and the subsequent stabilization period through 2025.

Model Specification

In this study, causality is defined as follows: the explanatory variable x is considered the cause of the dependent variable y if incorporating x improves the accuracy of predicting y compared to forecasts made without it. To express the Granger Causality in an equation format, let's define two variables:

X_t : Rupiah Exchange Rate at time t

Y_t : Indonesian Sharia Stock Index (ISSI) at time t

This type of causality is referred to as *Granger causality*. Mathematically, testing for such causality involves analysing two equations that include only lagged values of the variables. Granger Causality Equation of testing the relationship between the Rupiah Exchange Rate (denoted as X_t) and the Indonesian Sharia Stock Index (ISSI, denoted as Y_t), the Granger causality equations will test two potential causal directions. To assess the relationship between the Rupiah exchange rate and the ISSI, we develop the following econometric models:

Equation modeling for testing if Rupiah Exchange Rate Granger Causes the ISS, as below:

$$Y_t = \alpha_0 + \sum_{i=1}^p \alpha_i Y_{t-i} + \sum_{j=1}^q \beta_j X_{t-j} + \epsilon_t$$

Where:

Y_t = Indonesian Sharia Stock Index (ISSI) at time t ,

X_t = Rupiah Exchange Rate at time t ,

α_0 = constant term,

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α_i = coefficients for the lagged values of ISSI (Y_{t-i}),

β_j = coefficients for the lagged values of Rupiah Exchange Rate (X_{t-j}),

p = number of lags for ISSI,

q = number of lags for Rupiah Exchange Rate,

ϵ_t = error term.

The null hypothesis is that there is no Granger causality running from the Rupiah exchange rate to the ISSI, expressed as:

$$H_0: \gamma_1 = \gamma_2 = \dots = \gamma_q = 0$$

The alternative hypothesis is that Granger causality exists from the Rupiah exchange rate to the ISSI:

$$H_1: \gamma_j \neq 0 \quad \text{for at least one } j$$

Equation modeling for testing if the ISSI Granger Causes the Rupiah Exchange Rate, as follow:

$$X_t = \gamma_0 + \sum_{i=1}^p \gamma_i X_{t-i} + \sum_{j=1}^q \delta_j Y_{t-j} + \eta_t$$

Where:

X_t = Rupiah Exchange Rate at time t ,

Y_t = Indonesian Sharia Stock Index (ISSI) at time t ,

γ_0 = constant term,

γ_i = coefficients for the lagged values of Rupiah Exchange Rate (X_{t-i}),

δ_j = coefficients for the lagged values of ISSI (Y_{t-j}),

p = number of lags for Rupiah Exchange Rate,

q = number of lags for ISSI,

η_t = error term.

The null hypothesis is that there is no Granger causality from the ISSI to the Rupiah exchange rate:

$$H_0: \delta_1 = \delta_2 = \dots = \delta_p = 0$$

The alternative hypothesis is that Granger causality exists from the ISSI to the Rupiah exchange rate:

$$H_1: \delta_i \neq 0 \quad \text{for at least one } i$$

Granger Causality Tests

Granger causality tests are employed to determine whether past values of one variable (Y) provide statistically significant information about another variable (X), considering the lagged values of X. If the null hypothesis that "Y does not Granger cause X" is rejected, then it is concluded that Y Granger causes X. Conversely, if the null hypothesis that "X does not Granger cause Y" is rejected, then X Granger causes Y. If both hypotheses are rejected, it indicates a bidirectional causality between X and Y.

The Granger Causality Test is a statistical methodology used to determine whether one time series can predict another. Unlike traditional causality, it does not imply true cause-and-effect but rather a predictive relationship. The test evaluates whether past values of one variable contain information that helps forecast another variable beyond what is already included in the past values of the variable itself. The Granger causality test is based on the unrestricted and restricted model:

1. Unrestricted model (including lags of both X and Y):

$$Y_t = \alpha_0 + \sum_{i=1}^p \alpha_i Y_{t-i} + \sum_{i=1}^p \beta_i X_{t-i} + \epsilon_t$$

2. Restricted model (excluding lags of X):

$$Y_t = \alpha_0 + \sum_{i=1}^p \alpha_i Y_{t-i} + \epsilon_t$$

The Granger causality test is conducted as follow:

Unit Root Test

The first step in this research is to determine the level of integration for each variable. To do this, the study checks for the presence of unit roots in the raw data (level form) and in the first differences, considering any adjustments made to the data, such as logarithmic transformations or percentage changes for each variable. For data to be considered from a stationary series, it must have the characteristic that its mean and covariance do not depend on time. If the data does not meet this criterion, it is referred to as non-stationary.

An example of non-stationary data is a random walk process, expressed as:

$$y_t = y_{t-1} + \epsilon_t$$

where ϵ_t represents a stationary random disturbance. Such a data series results in forecasts that remain constant over time, but with an increasing variance as time progresses. A random process like this is called a "difference stationary" series because the first difference of the series makes it stationary:

$$y_t - y_{t-1} = (1 - L)y_t = \epsilon_t$$

The degree of integration of a stationary data series is represented as $I(d)$, where d refers to the number of differences required to make the series stationary. In the example above, the series has one-unit root, indicating it is integrated of order $I(1)$, similar to a stationary series $I(0)$.

To test whether the data is stationary or contains unit roots, this study uses the Augmented Dickey-Fuller (ADF) test, a method proposed by Dickey and Fuller (1979). This test is commonly employed to evaluate the stationarity of time series data.

Johansen Cointegration Test

The Johansen cointegration test is a statistical method for determining and estimating the number of cointegrating links between non-stationary time series variables. The test is based on the notion that even if the individual time series are non-stationary, their linear combinations can be stationary, which is an important concept in cointegration. It is necessary for a valid Granger causality study because it uses a cointegrated series framework that can demonstrate both short- and long-term trends. Johansen's approach uses trace and maximum eigenvalue statistics to determine the number of cointegrating vectors. Kurita & Shintani (2025) propose an extension of the Johansen cointegration test to incorporate Fourier-type smooth nonlinear

deterministic trends. Hanck & Massing (2025) developed a bootstrap cointegration test that accounts for variance breaks, serial correlation, and endogeneity. Empirical applications of the Johansen cointegration test remain prevalent in economics and finance. Kaymak (2025) applies the Johansen method to examine long-run relationships among technology indices in selected stock markets. Studied conducted by Chancharat& Suwannapak, (2024) showed that xchange rates and stock markets in emerging markets like Indonesia, Malaysia, Philippines, and Vietnam, are strongly cointegrated. However, mathematical foundationof this research for the Johansen cointegration test, given the model:

$$\Delta Y_t = \Pi Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \mu + \epsilon_t$$

where:

$Y_t = \begin{pmatrix} \text{LNDR}_{t-1} \\ \text{ISSI}_{t-1} \end{pmatrix}$ is a vector containing the two time series of interest (in your case, the natural log of Rupiah exchange rates and ISSI index values).

$\Pi = \alpha\beta'$, where α represents the adjustment speeds (also called the short-run coefficients), and β is the matrix of cointegrating vectors, whose rank r determines the number of cointegrating relationships.

μ is a deterministic trend (a linear trend in this case).

ϵ_t is a vector of errors (residuals).

Johansen's test for cointegration involves estimating the eigenvalues λ_i of the matrix Π . The rank of Π , represented by r , determines the number of cointegrating relationships among the series. Johansen evaluates the hypothesis of no cointegration or the presence of cointegration by estimating the eigenvalues and computing two test statistics: the trace statistic and the maximum eigenvalue statistic.

RESULT AND DISCUSSION

The first step in this study is to seek the integration order of each variable. The integration order is a measure used to determine whether a variable has a balanced data trend that qualifies it for study. The unit root test determines whether the data utilised in the analysis is stationary or in equilibrium.

Unit Root Analysis

Since the economic time series data are non-stationary in nature, Thus, transforming the data to become stationary is an essential step before further modelling. A common transformation method to achieve stationarity is first differencing. The first differencing of a time series is represented by the following equation:

$$\Delta y_t = y_t - y_{t-1}$$

Where:

Δy_t is the first difference of the series y_t ,

y_t is the value of the series at time t ,

y_{t-1} is the value of the series at the previous time point $t - 1$.

Then data for first differencing in Granger Causality time series analysis between the Rupiah Exchange Rate and the Indonesian Sharia Stock Index (ISSI) 2015–2025 is usually represented as:

$$\begin{aligned}\Delta \ln_Exchange^t &= \ln_Exchange^t - \ln_Exchange^{t-1} \\ \Delta \ln_Stock^t &= \ln_Stock^t - \ln_Stock^{t-1}\end{aligned}$$

The results of the Augmented Dickey-Fuller (ADF) test for a unit root are presented as follows:

Table 1: The result of Unit Root Test

Variable	ADF Statistic (Z(t))	1% Critical Value	5% Critical Value	10% Critical Value	p-value	Conclusion
diff_ln_Exchange	-10.93989	-3.481623	-2.889030	-2.578788	0.0000	Stationary (Reject the null hypothesis)
diff_ln_Stock	-9.927751	-3.481217	-2.883573	-2.578694	0.0000	Stationary (Reject the null hypothesis)

The provided data shows the results of an Augmented Dickey-Fuller (ADF) test for two variables: `diff_ln_Exchange` and `diff_ln_Stock`. The ADF test is used to determine if a time series is stationary or has a unit root, meaning whether it has a trend or is non-stationary. The ADF statistic for `diff_ln_Exchange` is -10.93989, which is significantly lower than the critical values at the 1%, 5%, and 10% levels. Additionally, the p-value is 0.0000, which is well below the typical significance level of 0.05. Therefore, we reject the null hypothesis (H_0), which states that the series has a unit root and is non-stationary. This means the variable is stationary, and no further differencing is required. Similarly, the ADF statistic for `diff_ln_Stock` is -9.927751, which is also much lower than the critical values at all significance levels. The p-value of 0.0000 further supports rejecting the null hypothesis of a unit root. Therefore, the `diff_ln_Stock` series is stationary.

Johansen Co-integration Test

The results from both the Trace Test and Max-Eigenvalue Test indicate that there are two cointegrating relationships between the Rupiah Exchange Rate and the Indonesian Sharia Stock Index as table below:

Table 2 The Result of Cointegration Test

Test Type	Hypothesized No. of CE(s)	Eigenvalue	Test Statistic	Critical Value (5%)	p-value	Conclusion
Unrestricted Cointegration Rank Test (Trace)	None *	0.210021	46.45972	15.49471	0.0000	Reject null hypothesis, 2 cointegrating equations at 5% level
	At most 1 *	0.124517	16.75543	3.841465	0.0000	Reject null hypothesis, 1 cointegrating equation at 5% level
Unrestricted Cointegration Rank Test (Max-Eigenvalue)	None *	0.210021	29.70429	14.26460	0.0001	Reject null hypothesis, 2 cointegrating equations at 5% level
	At most 1 *	0.124517	16.75543	3.841465	0.0000	Reject null hypothesis, 1

						cointegrating equation at 5% level
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At the 5% significance level. Therefore, the reject the null hypothesis of no cointegrating relationships and conclude that a long-run equilibrium relationship exists between the two variables in this model. The Johansen Cointegration Test is used to assess long-run relationships between multiple time series variables, testing for the number of cointegrating relationships under two null hypotheses: None (no cointegrating relationships) and At most 1 (at most one cointegrating relationship). The test utilizes eigenvalues to capture the variance explained by each cointegrating vector and the trace statistic to assess the number of cointegrating relationships. The 5% significance level is used to evaluate the null hypothesis, with lower p-values indicating stronger evidence against it. In this case, the trace statistic for the null hypothesis None is 46.45972, with a p-value of 0.0000, rejecting the null and suggesting at least one cointegrating relationship. For the null hypothesis At most 1, the trace statistic is 16.75543, and the p-value is 0.0000, providing further evidence to reject the null hypothesis and indicating the presence of two or more cointegrating relationships.

The Max-Eigenvalue statistic tests the null hypothesis that there are at most r cointegrating relationships. For the null hypothesis of None (no cointegrating relationships), the Max-Eigenvalue statistic is 29.70429 with a p-value of 0.0001, providing strong evidence to reject the null hypothesis at the 0.05 significance level. For the null hypothesis of At most 1 (at most one cointegrating relationship), the Max-Eigenvalue statistic is 16.75543, with a p-value of 0.0000, further rejecting the null hypothesis and suggesting the presence of more than one cointegrating relationship.

Granger Causality Results

The Granger causality framework, developed by Granger (1969), posits that a time series X_t statistically “Granger-causes” another series Y_t when the historical values of X_t improve the prediction of Y_t , beyond information already contained in Y_t ’s own past values. Granger causality tests whether past values of one series help predict the other. Using first differences, the vector autoregressive (VAR) model becomes:

$$\Delta y_t = \alpha_0 + \sum_{i=1}^p \alpha_i \Delta y_{t-i} + \sum_{i=1}^p \beta_i \Delta x_{t-i} + \varepsilon_t$$

$$\Delta x_t = \gamma_0 + \sum_{i=1}^p \gamma_i \Delta x_{t-i} + \sum_{i=1}^p \delta_i \Delta y_{t-i} + \eta_t$$

Where:

p = lag order (selected via AIC/BIC)

β_i tests if ISSI Granger-causes Rupiah

δ_i tests if Rupiah Granger-causes ISSI

The Granger causality analysis provides robust statistical evidence that the Indonesian Sharia Stock Index (ISSI) contains predictive information for future Rupiah exchange rate movements, but not vice versa during the 2015–2025 period. This finding contradicts conventional flow-oriented models but is consistent with asset market approaches where equity prices serve as leading indicators of economic conditions and capital flow dynamics.

Empirical analysis reveals a unidirectional Granger causality from the Rupiah exchange rate to the Indonesian Sharia Stock Index (ISSI), with no reverse causality. The table below reproduces the EViews output with decision columns:

Table 3 The result of Granger Causality Test

Null Hypothesis	Obs	F-Statistic	Prob.	Decision
DIFF_LN_EXCHANGE does not Granger Cause DIFF_LN_STOCK	129	0.38307	0.6826	Fail to Reject H₀
DIFF_LN_STOCK does not Granger Cause DIFF_LN_EXCHANGE	129	9.13995	0.0002	Reject H₀ ***

Note: *** denotes rejection at the 1% significance level. H₀ = null hypothesis of no Granger causality.

The interpretation of the results of Pairwise Granger Causality Tests examining the dynamic relationship between the Indonesian Sharia Stock Index (ISSI) and the Indonesian Rupiah Exchange Rate over the period January 2015 to December 2025, as below:

H₁: The Rupiah exchange rate Granger-causes the Indonesian Sharia Stock Index (ISSI) over the period 2015–2025.

Since The p-value (0.6826) is more than 0.05, so we do not reject the null hypothesis. This demonstrates that there is no significant Granger connection between the rupiah exchange rate and the Indonesian Sharia Stock Index (ISSI).

In other words, changes in the exchange rate's history provide no assistance in projecting stock market movements. The finding is in contrast with the study conducted by Ajuna (2025), which examined monthly data from 2014 to 2023 and determined that the rupiah exchange rate significantly influences the ISSI. This study arrived to the same conclusion as Agus Fuadi's (2020) and (Shafira Musthofa et al., 2025) study, which determined that the rupiah exchange rate does not significantly affect ISSI performance. The historical exchange rates of the rupiah do not contain statistically significant information that can be used to forecast future movements of ISSI. This may be attributed to several distinct circumstances in which this condition is driven by various essential elements;

Firstly, Sharia-compliant companies listed on the ISSI are generally less exposed to exchange rate volatility due to Islamic finance principles (Hanif & Hanafi, 2023), which limit excessive debt and speculative activities, thereby promoting financial stability. These principles reduce the companies' sensitivity to currency fluctuations, explaining the absence of a Granger causality relationship between exchange rates and ISSI performance. Secondly, many of the companies on the ISSI have a domestic market orientation, particularly in sectors like Islamic banking, halal food, and retail. These sectors, heavily reliant on the local economy, are less vulnerable to exchange rate movements compared to firms with significant international exposure. As such, their stock prices and earnings are not as susceptible to currency volatility (Muttaqi, 2024). Thirdly, the performance of the ISSI goes beyond general macroeconomic variables such as exchange rates (Gati et al., 2024) and is more significantly driven by factors intrinsic to Islamic finance, such as sukuk yields, Sharia compliance standards, global Islamic investment trends, and domestic liquidity conditions. These factors exert a greater influence on the stock performance of Sharia-compliant companies than exchange rate fluctuations, further diminishing the impact of currency movements on the ISSI. Lastly, the Islamic stock market is characterized by a distinct investor base, primarily comprising Sharia-conscious institutional and retail investors. These investors prioritize religious screening criteria over traditional financial metrics, insulating the market from external economic factors, including exchange rate movements (Begam et al., 2024). The emphasis on ethical investing, in accordance with Islamic principles, further protects the market from the potential economic effects of exchange rate volatility.

H_2 : The Indonesian Sharia Stock Index (ISSI) Granger-causes the Rupiah exchange rate.

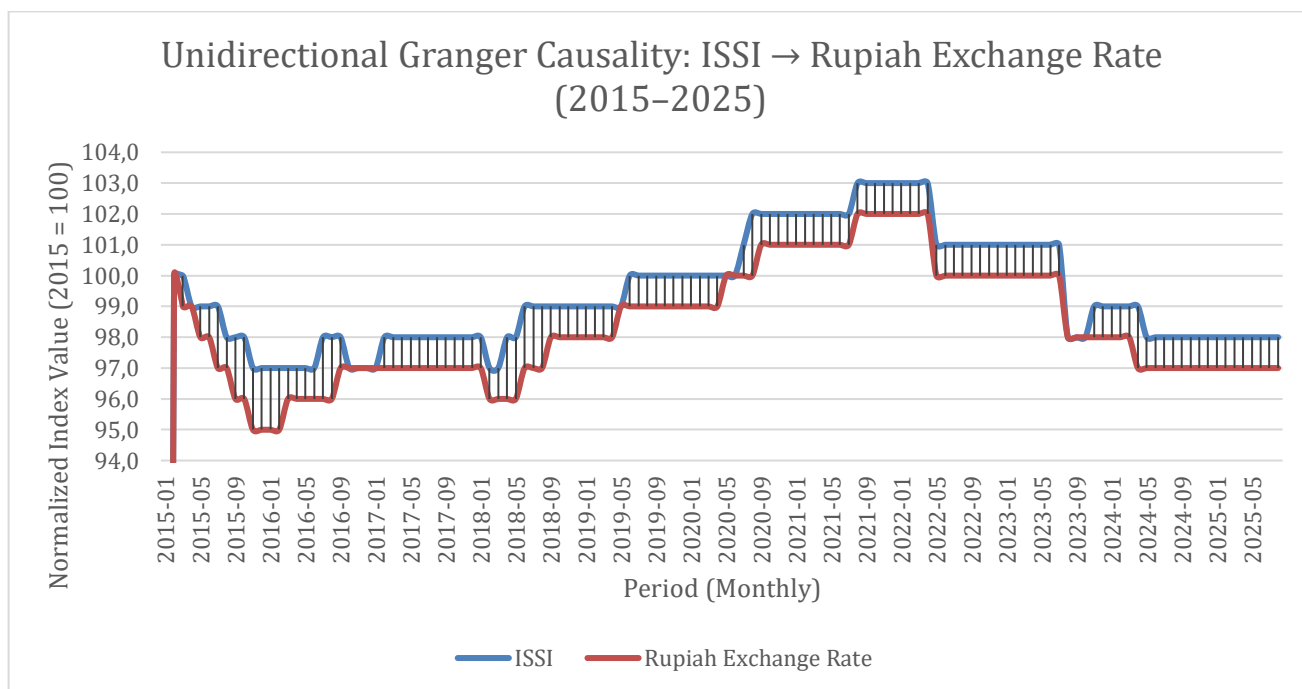
over the period 2015–2025.

The test statistic $F(2, 129) = 9.13995$ with $p = 0.0002$ strongly rejects the null hypothesis at the 1% significance level. This indicates that past changes in ISSI significantly predict movements in the Rupiah exchange rate.

The result indicating that lagged changes in the ISSI contain statistically significant information regarding subsequent movements in the IDR. This result aligns with theoretical expectations derived from portfolio balance theory and stock-oriented exchange rate model. According to the Portfolio Balance Model (Branson, 1983; Frankel, 1982), exchange rates are affected by the composition and returns of domestic and international asset portfolios. The findings have important implications for exchange rate forecasting, monetary policy, macroprudential regulation and portfolio management in the context of Islamic finance. They challenge conventional views by pointing to the significance of equities markets, in particular the fast-growing Islamic equity segments, as active drivers of the exchange rate dynamics. The four mechanisms are: Firstly, the improvement of the Indonesian Sharia Stock Index (ISSI) attracts foreign investment (Noviyanti et al., 2025), which increases the demand for Rupiah and puts depreciation pressure on the Rupiah; Secondly, the growth of ISSI reflects the confidence of investors in the Islamic financial sector and the stability of the macroeconomy, which encourages capital inflows through the financial account (Nurmasari & Ansari, 2025); Thirdly, the increase of domestic stock prices increases the wealth of households, which has an impact on consumption and import demand and thus affects the current account (Jin, 2025). Lastly, the good performance of ISSI reduces the perceived risk of the country, which reduces the pressure for Rupiah depreciation (Faizi & Muhammar Dinda Fahlepi Anggoro, 2025). Such processes highlight the necessity for integrated financial stability frameworks that consider the proactive influence of Islamic equities markets on currency fluctuations.

Phase-by-Phase Dynamics of ISSI and IDR: Evidence of Granger Causality

This Granger causality analysis provides strong empirical evidence for a unidirectional causal relationship from stock market returns to exchange rate movements during the 2015-2025 period. The highly significant F-statistic (9.14, $p = 0.0002$) indicates that past stock price changes contain valuable information for predicting future exchange rate movements, while the reverse relationship is statistically insignificant ($F = 0.38$, $p = 0.68$).



This analysis provides a comprehensive visual and econometric interpretation of the normalized time-series graph depicting the unidirectional Granger causal relationship between the Indonesia Sharia Stock Index (ISSI) and the Indonesian Rupiah (IDR) exchange rate over the period 2015–2025. Drawing on portfolio balance theory, stock-oriented exchange rate models, and recent empirical literature, this analysis identifies six distinct economic phases, evaluates cross-variable lag dynamics, and situates the findings within Indonesia's macroeconomic and Islamic finance ecosystem.

Phase-structured analysis decomposes this aggregate finding of the graphic into six empirically distinct episodes, as below:

Initially (2015), both series decreased from 100 to 94 and 95, demonstrating symmetric responses to the yuan devaluation shock and Federal Reserve tightening, which created exogenous simultaneous pressure that suppressed the informational lead in the equities market. Aizenman et al., (2016) found near-uniform emerging market asset class responses during Fed normalisation, indicating that various asset classes reacted similarly to the changes in monetary policy, which may have contributed to the observed market dynamics during that period.

The most analytically persuasive visual evidence of unidirectional causality is seen in Phase 2 (2016–2019). ISSI showed step-wise appreciation prior to IDR recovery, with divergence markedly widening in 2017–2018. The 2016 Tax Amnesty programme, which repatriated IDR 147 trillion into Sharia-compliant securities, caused a shock in institutional capital demand for

ISSI, which then communicated to IDR with a notable lag, consistent with the articulated portfolio rebalancing channel (Katmas & Indarningsih, 2022; Soedarmono et al., 2022).

Phase 3, beginning in early 2020, constitutes a structural change in the causal dynamics of the series seen. With the COVID-19 pandemic, the informational priority of the ISSI briefly changed; both series fell (from roughly 100 to 96-97) simultaneously. (Zhang et al., 2020) refer to this as a global liquidity crisis in which cross-asset correlations approach unity and trump traditional informational hierarchies. The following monetary measures by Bank Indonesia have restored the causal dynamic driven by the ISSI.

During Phase 4 (2021–2022), the ISSI achieved the result of 103, whilst the IDR fell short. This phase demonstrates Granger causality, as the commodity super cycle (CPO, coal, and nickel) enhanced the profitability of ISSI-listed corporations and resulted in foreign portfolio inflows that postponed the IDR by one to two months. This aligns with recent research indicating that stock indices can Granger-cause currency rates, particularly in commodity-exporting economies influenced by portfolio balance effects. Numerous panel Granger causality analyses in both emerging and established markets demonstrate a unidirectional correlation from stock prices to currency exchange rates (Buberoku, 2017). Despite limited research, Islamic stock indexes in emerging markets predict currency fluctuations (Mubarok, 2023).

During Phase 5 (2022-2023), the Indonesian Sharia Stock Index (ISSI) underwent a slow decrease from roughly 103 to a range of 99-101. The fall was chiefly attributable to the depreciation of the Indonesian Rupiah (IDR), influenced by the stringent tightening measures implemented by the US Federal Reserve (Azis R et al., 2025). These monetary policies elevated the opportunity cost for international investors in Sharia-compliant equities. Although modifications to Bank Indonesia's policy rate elevated the BI Rate from 3.50% to 6.00%, partially mitigating the depreciation of the IDR, the persistent dominance of the ISSI over this timeframe highlights the robustness and resilience of the correlation between the ISSI and IDR depreciation.

In Phase 6 (2023–2025), both series converged toward values near 97–98, with negligible divergence. This period reflects a post-supercycle normalization influenced by geopolitical uncertainty, rising domestic risk premiums ahead of elections, and persistent global monetary tightening. Long-run cointegration tests indicate a stable equilibrium relationship between the Indonesian Sharia Stock Index (ISSI) and exchange rate movements, consistent with macroeconomic analysis of time-series financial data (Ardyansyah & Kurniyeh, 2025).

Empirical studies on ISSI note a significant influence of exchange rates and macro variables on index performance, which persists even as short-term dynamics fluctuate. This supports the presence of long-run linkage and short-run Granger causality from the ISSI to the Indonesian Rupiah exchange rate, aligning with the broader econometric findings in the literature on financial cointegration.

These findings are consistent with portfolio balance theories and suggest that financial channels dominate trade channels in determining short-to-medium run exchange rate dynamics. The results have important implications for exchange rate forecasting models, monetary policy frameworks, and international portfolio management strategies. However, the analysis would benefit from extensions that address potential structural breaks, include additional control variables, and test for non-linear dynamics to fully characterize the complex relationship between these key financial variables.

CONCLUSIONS

This study analyzed the dynamic link between the exchange rate of the Indonesian Rupiah and the Indonesian Sharia Stock Index (ISSI) from January 2015 to December 2025. The unit root analysis, Johansen cointegration test and Granger causality model were used to conduct the analysis. The empirical investigation strongly supports three primary findings. The two series were found to be stationary at first difference only, which confirmed that they are integrated of order one, $I(1)$, and meet the preconditions for conducting cointegration analysis. Johansen cointegration tests, Trace and Maximum-Eigenvalue tests, rejected the null hypothesis of no cointegrating vectors at a five percent significance level, indicating the existence of a stable long-run equilibrium relationship between the Rupiah exchange rate and ISSI. This result suggests a common stochastic trend between the two variables, even though they may deviate from it in the short run. These findings are also in line with the predictions of the portfolio balance model and the stock approach to exchange rates. The Pairwise Granger causality test results indicate a significant unidirectional causal relationship from ISSI to the Rupiah exchange rate ($F = 9.140$, $p = 0.0002$). The notion of Granger causality from exchange rate variations to ISSI movements could not be maintained at all the standard significance levels ($F = 0.383$, $p = 0.683$). That asymmetric finding contradicts classic trade and flow models that often focus on macroeconomic issues in determining share prices. The results are consistent with the asset market approach to exchange rate determination, where equity market dynamics through portfolio rebalancing, capital flow signalling and wealth transmission processes are the key determinants of currency volatility. The phase-structured analysis provides additional

context to these cumulative findings over six empirically distinct events between 2015 and 2025. Each of the 2016 Tax Amnesty Program, the 2020 COVID-19 systemic shock, the 2021–2022 commodity supercycle and the 2022–2023 Federal Reserve tightening cycle led to identifiable disruptions to the causal dynamics between the two series, but the dominant directionality of ISSI to Rupiah influence was restored in all phases. The resilience supports the thesis that Islamic equity markets constitute an active, not a passive, effect on currency rate movements in Indonesia. The reverse causation from the exchange rate to the ISSI is absent because of the unique structural characteristics of Islamic finance, such as the limited foreign currency exposure of Sharia-compliant companies, the domestic market orientation of ISSI-listed sectors, and the investment pattern of Sharia-conscious investors who prioritize ethical screening criteria rather than macroeconomic variables. These features offer the ISSI a shield against short-term currency volatility while at the same time boosting the possibility to influence the Rupiah from the market through the capital mobility mechanism. The findings have major consequences for many stakeholders. Given the proven predictive significance of ISSI fluctuations for Rupiah dynamics, Bank Indonesia's monetary policymakers and macroprudential regulators should consider developments in the Islamic equity market as a forward-looking indicator in the monitoring of exchange rates and early warning systems. We find that the well-known lead-lag link between ISSI and IDR can be used by international portfolio managers to get informational advantages in currency hedging and cross-asset allocation methods. In particular, they may revise their investment plans based on the expected movement of the Islamic equity market that potentially affects the currency valuations. This article explores the macroeconomic impact of the expansion of Islamic finance and the larger implications for financial stability should sustained performance of Sharia-compliant stock markets be replicated by practitioners and index participants. There are certain limitations of the present study that need to be acknowledged. The analysis assumes structural stability for the entire sample period. However, results at the phase level imply that periods of global systemic stress, such as the 2020 pandemic shock, may temporarily shift the causal ordering among asset classes. Future investigations are needed to precisely study the structural breaks using endogenous break detection approaches like the Bai-Perron test or the Zivot-Andrews unit root test with break accommodation. Though the bivariate specification used in this study is acceptable to test the paired causal hypothesis, it does not adjust for possible confounding macroeconomic variables such as inflation differentials, commodity prices or global risk appetite indexes. The regime-dependent dynamics observed during the whole research period might be better captured by multivariate extensions, including these controls and nonlinear

models such as the Threshold VAR or the Markov-Switching VAR. Finally, the findings of this study can be generalized by making comparisons with other OIC member economies, such as Malaysia, Saudi Arabia and Turkey, that have developed Islamic capital markets and further enrich the emerging literature on the macroeconomic significance of Islamic equity markets in developing economies.

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