

Interaction Between International Exchange Rate and Indonesian Finance Stock Index

Muh. Irfandy Azis¹, Erick Karunia²✉

¹Borneo Tarakan University, Tarakan City, Indonesia.

²Borneo Tarakan University, Tarakan City, Indonesia.

✉Corresponding author: erickkarunia3@gmail.com

Abstract

This suggests that while short-term fluctuations are inevitable, the exchange rates and stock market tend to realign over time. The Granger causality test uncovers bidirectional causality between the USD/IDR and EUR/IDR exchange rates and the financial index, indicating that not only do changes in exchange rates impact the stock index, but stock market performance also influences exchange rate movements. The impulse response function shows that shocks to the USD/IDR exchange rate have the most significant and lasting impact on the IDX Finance index, reflecting the dominant role of the US dollar in global trade and finance. The findings have important implications for policymakers and investors. Policymakers should focus on maintaining exchange rate stability, especially relative to the USD, to foster a stable investment environment and support long-term growth in the financial sector. For investors, exchange rate trends, particularly the USD/IDR, should be closely monitored, as these fluctuations significantly affect the financial sector's profitability and overall stock market performance. The study contributes to the broader literature by highlighting the complex interplay between exchange rates and financial markets in emerging economies.

Abstrak

Ini menunjukkan bahwa meskipun fluktuasi jangka pendek tidak dapat dihindari, nilai tukar dan pasar saham cenderung diselaraskan kembali dari waktu ke waktu. Uji kausalitas Granger mengungkap kausalitas dua arah antara nilai tukar USD/IDR dan EUR/IDR dan indeks keuangan, yang menunjukkan bahwa perubahan nilai tukar tidak hanya berdampak pada indeks saham, tetapi kinerja pasar saham juga memengaruhi pergerakan nilai tukar. Fungsi respons impuls menunjukkan bahwa guncangan terhadap nilai tukar USD/IDR memiliki dampak yang paling signifikan dan berjangka panjang pada indeks BEI Finance, yang mencerminkan peran dominan dolar AS dalam perdagangan dan keuangan global. Temuan ini memiliki implikasi penting bagi pembuat kebijakan dan investor. Pembuat kebijakan harus fokus pada menjaga stabilitas nilai tukar, terutama relatif terhadap USD, untuk mendorong lingkungan investasi yang stabil dan mendukung pertumbuhan jangka panjang di sektor keuangan. Bagi investor, tren nilai tukar, terutama USD/IDR, harus dipantau secara ketat, karena fluktuasi ini secara signifikan mempengaruhi profitabilitas sektor keuangan dan kinerja pasar saham secara keseluruhan. Studi ini berkontribusi pada literatur yang lebih luas dengan menyoroti interaksi kompleks antara nilai tukar dan pasar keuangan di negara-negara berkembang.

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Kausalitas Granger.

1. Introduction

The relationship between exchange rates and stock indices can be explained through various economic theories. One widely accepted theory is the international asset pricing model (IAPM), which suggests that the value of a firm's stock is influenced by both domestic and international factors (Solnik, 1983). In the context of Indonesia, where many companies in the financial sector are either involved in international transactions or hold assets denominated in foreign currencies, fluctuations in exchange rates can have a direct impact on their profitability. For instance, a depreciation of the Indonesian Rupiah (IDR) against major currencies such as the US Dollar (USD) can increase the cost of foreign-denominated debt, negatively impacting firms' financial positions and leading to a decline in stock prices (Edwards & Sahminan, 2008).

Conversely, when the Rupiah appreciates, companies with foreign-denominated liabilities may benefit from lower debt servicing costs, potentially leading to higher profitability and stock price increases (Christiawan & Narsa, 2020). This inverse relationship between exchange rates and stock indices is particularly relevant in the context of an open economy like Indonesia's, where both foreign investments and imports play a significant role in shaping the financial landscape (Nketiah et al., 2019).

Moreover, exchange rate volatility can affect investor sentiment and market confidence. For foreign investors, a stable or appreciating Rupiah increases the attractiveness of Indonesian assets, as their returns are not diminished by adverse currency movements (Andini, 2024). On the other hand, exchange rate instability can deter foreign investment, leading to capital outflows and a decline in stock market performance (Kyereboah-Coleman & Agyire-Tettey, 2008). This dynamic is evident in emerging markets like Indonesia, where exchange rate movements are often driven by external factors such as global commodity prices, trade tensions, and monetary policies (Hunt et al., 2020; Kohlscheen, 2014; Kohlscheen et al., 2017).

Empirical studies examining the relationship between exchange rates and stock indices in emerging markets, including Indonesia, have yielded mixed results. Some studies find a significant negative correlation between exchange rate depreciation and stock index performance, while others suggest that the relationship is more complex and influenced by various macroeconomic variables (Hajilee & Al Nasser, 2014; Manu & Bhaskar, 2018; Olugbenga, 2012; Perera, 2016). For example, a study by Wongbangpo & Sharma (2002) on five Asian countries, including Indonesia, found that exchange rates have a significant impact on stock market performance, but the magnitude and direction of the effect vary across countries and time periods.

In the case of Indonesia, previous research has highlighted the vulnerability of the stock market to exchange rate fluctuations, particularly during periods of economic instability. The 1997-1998 Asian Financial Crisis is a prime example of how exchange rate shocks can lead to a sharp decline in stock market performance (Corbett & Vines, 1999). During this period, the Rupiah depreciated dramatically against the USD, leading to a collapse in investor confidence and a significant downturn in the Indonesian stock market (Iriana & Sjöholm, 2002). While the country has since strengthened its financial regulatory framework and built foreign exchange reserves to cushion against such shocks, exchange rate volatility remains a key risk for investors in Indonesia's financial markets (Tititheruw & Atje, 2008).

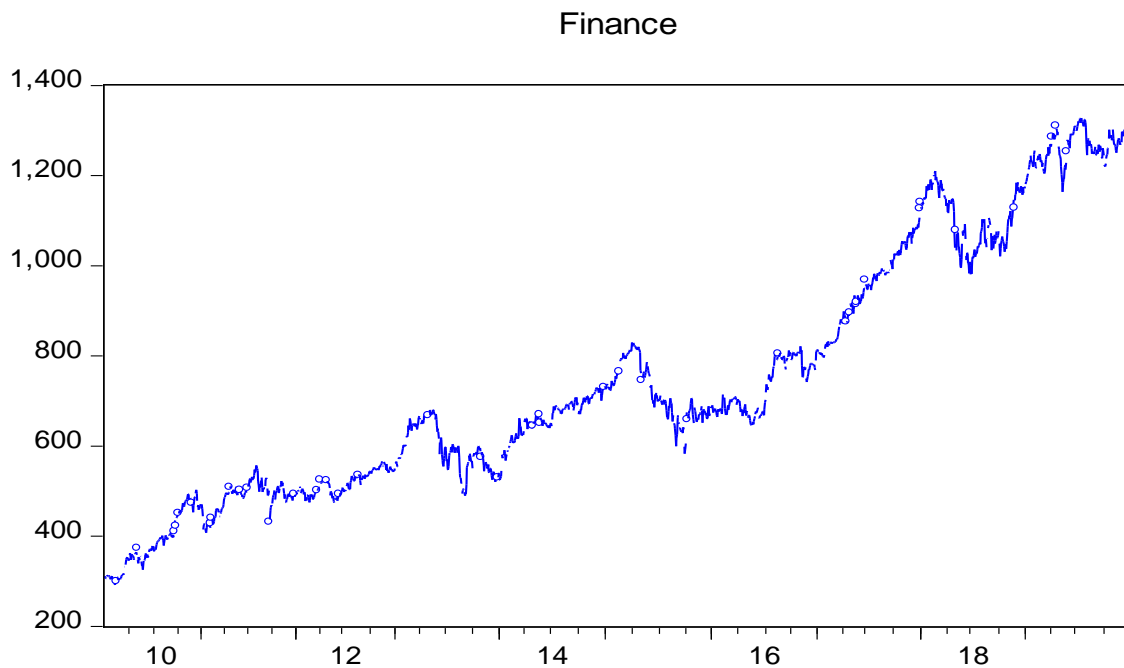


Figure 1. Finance Stock Index Volatility

The graph of the IDX Finance index from 2009 to 2019, shown above, illustrates the general upward trend in Indonesia's financial sector over the decade. However, there are notable periods of volatility, particularly in 2013 and 2015. These fluctuations can be linked to both domestic and global economic events, including changes in exchange rates.

Understanding the relationship between exchange rates and stock indices is crucial for investors, as it allows them to make informed decisions regarding asset allocation and risk management. For foreign investors, exchange rate risk is a key consideration when investing in emerging markets like Indonesia. Hedging strategies, such as currency forwards and options, can help mitigate the risk of adverse currency movements. Additionally, monitoring global economic trends and central bank policies in major economies can provide valuable insights into potential exchange rate fluctuations and their impact on stock markets.

For policymakers, managing exchange rate volatility is essential for maintaining financial stability and promoting investor confidence. The central bank of Indonesia (Bank Indonesia) plays a key role in this regard, using monetary policy tools such as interest rate adjustments and foreign exchange interventions to stabilize the Rupiah. Furthermore, maintaining a strong regulatory framework and adequate foreign exchange reserves can help mitigate the impact of external shocks on the financial sector.

2. Literature Review

The interaction between exchange rates and stock market indices has been a focal point of academic inquiry for several decades, with numerous studies exploring this dynamic relationship across different economic contexts. This section reviews the relevant literature, highlighting the key theories and empirical findings that inform the current understanding of how exchange rate fluctuations influence stock market performance, particularly in emerging economies such as Indonesia.

2.1. Theoretical Perspectives on Exchange Rates and Stock Market Indices

Several theoretical frameworks have been developed to explain the relationship between exchange rates and stock market indices. Among the most prominent are the flow-oriented models and the stock-oriented models, each of which emphasizes different transmission mechanisms through which exchange rate movements affect stock markets (Branson & Henderson, 1985; Dornbusch & Fischer, 1980; Frankel, 1984). Flow-oriented models suggest that exchange rate movements influence stock prices through their impact on international competitiveness and trade

balances, while stock-oriented models focus on how exchange rates reflect changes in asset prices, including stocks, and capital flows (Branson & Henderson, 1985; Dornbusch & Fischer, 1980; Frankel, 1984).

2.2. Flow-Oriented Models

Flow-oriented models, originally proposed by Dornbusch & Fischer (1980), argue that exchange rate movements affect stock prices primarily through trade balances. According to this perspective, exchange rates influence the competitiveness of a country's exports and imports (Krugman & Obstfeld, 2009). A depreciation of the local currency makes a country's exports more competitive in international markets while increasing the cost of imports. As export-oriented firms experience higher profits due to increased demand for their goods, their stock prices are expected to rise. Conversely, firms that rely on imports may face higher costs, which could negatively affect their profitability and, in turn, their stock prices (Huang et al., 2021).

2.3. Stock-Oriented Models

Stock-oriented models, on the other hand, focus on the capital account and view exchange rates as being determined by the supply and demand for financial assets (Branson & Henderson, 1985; Frankel, 1984). According to this view, changes in exchange rates reflect investors' expectations about future returns on domestic and foreign assets. An appreciation of the domestic currency may attract foreign investment, as investors seek higher returns in the domestic stock market (Christiawan & Narsa, 2020). Conversely, a depreciation of the domestic currency could signal economic instability, leading to capital outflows and a decline in stock prices (Edwards & Sahminan, 2008).

2.4. Empirical Studies on Exchange Rates and Stock Market Indices

Empirical research on the relationship between exchange rates and stock market indices has produced mixed results, reflecting the complexity of this interaction and the diverse factors that influence it (Hajilee & Al Nasser, 2014; Hunt et al., 2020; Kohlscheen, 2014; Kohlscheen et al., 2017; Manu & Bhaskar, 2018; Olugbenga, 2012; Perera, 2016). Studies have examined this relationship across both developed and emerging markets, using a variety of econometric models to analyze the impact of exchange rate fluctuations on stock market performance. For instance, some studies find a significant negative correlation between exchange rate depreciation and stock market performance, while others suggest that the relationship is contingent upon specific market conditions and macroeconomic variables (Hajilee & Al Nasser, 2014; Manu & Bhaskar, 2018; Olugbenga, 2012; Perera, 2016).

2.5. Evidence from Emerging Markets

In emerging markets, the relationship between exchange rates and stock market indices tends to be more pronounced due to the greater sensitivity of these economies to external shocks. Several studies have examined this dynamic in Asian emerging markets, including Indonesia, with a focus on the impact of exchange rate volatility on stock market performance.

A study by Wongbangpo & Sharma (2002) analyzed the relationship between macroeconomic variables, including exchange rates, and stock market performance in five Asian countries, including Indonesia. The results indicated that exchange rates had a significant impact on stock market performance, although the direction of the effect varied across countries. In Indonesia, the authors found that exchange rate depreciation was associated with a decline in stock market performance, particularly during periods of economic instability.

2.6. Studies Focused on Indonesia

Several studies have specifically examined the relationship between exchange rates and stock market indices in Indonesia. For example, (Kurniawati et al., 2016) investigated the effect of exchange rate movements on the Jakarta Composite Index (JCI) and its sectoral indices, including the finance sub-index. The study found that exchange rate depreciation had a significant negative

impact on the JCI and the finance sub-index, indicating that fluctuations in the Rupiah were an important factor influencing the performance of Indonesia's stock market.

In addition to these studies, several other researchers have examined the broader macroeconomic implications of exchange rate fluctuations for Indonesia's financial markets. For instance, research by Siregar et al. (2023) focused on the role of Bank Indonesia's monetary policy in stabilizing the Rupiah and maintaining investor confidence in the stock market. The study found that proactive monetary policy, such as raising interest rates and intervening in the foreign exchange market, could help mitigate the negative effects of exchange rate depreciation on stock market performance.

3. Method

This study employs a variety of econometric methods to investigate the interaction between international exchange rates and the Indonesian financial stock index (IDX Finance). The analysis follows a step-by-step procedure involving stationarity tests, lag selection, cointegration tests, causality analysis, and impulse response functions. Each method is explained in detail below.

3.1. Unit Root Test

The first step in the analysis is to test for stationarity in the time series data of both the exchange rates and the IDX Finance index. A time series is considered stationary if its statistical properties, such as mean and variance, are constant over time (Harris & Sollis, 2003). Non-stationary time series can lead to spurious results in regression analyses, making it crucial to confirm the presence or absence of unit roots in the data (Enders, 2008).

The Augmented Dickey-Fuller (ADF) test is employed to assess whether the time series data for the exchange rate and the IDX Finance index are stationary (Dickey & Fuller, 1979; Greene, 2018). The test is performed for both the levels and first differences of the data. If the series is found to be non-stationary in levels, we proceed by differencing the data to achieve stationarity (Asteriou & Hall, 2015; Zivot & Wang, 2006).

3.2. Lag Length Selection

After determining the stationarity of the data, the next step is to identify the optimal number of lags to be used in subsequent models, such as the cointegration test and the vector autoregression (VAR) models. The lag length is crucial because it ensures that the model adequately captures the dynamic relationships between the variables (Lütkepohl, 2005; Tsay, 2005).

The optimal lag length is selected based on criteria such as the Akaike Information Criterion (AIC), Schwarz Criterion (SC), and Hannan-Quinn Criterion (HQ) (Akaike, 1974; Hannan & Quinn, 1979; Schwarz, 1978). These criteria are commonly used in time series analysis to balance model fit with model complexity.

3.3. Cointegration Test

Once the data is confirmed to be stationary (either in levels or first differences) and the optimal lag length is selected, the next step is to perform a cointegration test. The purpose of this test is to determine whether there is a long-run equilibrium relationship between the exchange rates and the IDX Finance index, even though the individual time series may be non-stationary (Engle & Granger, 1987; Johansen, 1991).

The Johansen cointegration test is employed to test for the presence of cointegration between the variables. This test is preferred for multivariate settings and allows for multiple cointegrating relationships (Johansen, 1995).

The test produces two statistics, the Trace Statistic and the Maximum Eigenvalue Statistic, to determine the number of cointegrating vectors (r) (Juselius, 2006; Pesaran & Shin, 1995).

3.4. Granger Causality Test

Once cointegration has been established (or even if it has not), the Granger causality test is used to determine the direction of causality between the exchange rate and the IDX Finance index. Granger causality tests whether past values of one variable can be used to predict the future values of another variable (Granger, 1969; Sims, 1972).

Impulse Response Function (IRF)

To further analyze the dynamic relationship between exchange rates and the IDX Finance index, the Impulse Response Function (IRF) is employed. The IRF traces the impact of a one-unit shock to one of the variables (such as the exchange rate) on the other variables (such as the IDX Finance index) over time (Lütkepohl, 2005; Sims, 1980). This method is particularly useful for understanding the short-run and long-run effects of shocks to the exchange rate on the stock market (Galí, 2015).

4. Results and Discussions

This section discusses the findings from the various econometric tests applied to analyze the relationship between the international exchange rates (USD/IDR, EUR/IDR, GBP/IDR, JPY/IDR, CNY/IDR) and the Indonesian Financial Stock Index (IDX Finance). The analyses include descriptive statistics, unit root tests, optimal lag selection, cointegration tests, Granger causality tests, and impulse response functions.

4.1. Data

This study utilizes daily data from January 2010 to December 2019 to examine the relationship between exchange rates and the IDX Finance index. The selected time frame provides a comprehensive view of the dynamics between these variables during a significant period of economic activity and volatility in Indonesia. The data source in this study can be seen in the following table:

Table 1. Data Source

Variable Code	Variable Name	Data Source
Finance	Finance Sector Stock Index	https://www.investing.com
USD/IDR	Dollar to Rupiah Exchange	https://www.investing.com
EUR/IDR	Euro to Rupiah Exchange	https://www.investing.com
GBP/IDR	Poundsterling to Rupiah Exchange	https://www.investing.com
JPY/IDR	Yen to Rupiah Exchange	https://www.investing.com
CNY/IDR	Yuan to Rupiah Exchange	https://www.investing.com

The table outlines key variables used in the study, focusing on the relationship between Indonesia's financial stock index and major international currency exchange rates. These variables are crucial for understanding how the global currency market impacts Indonesia's financial sector, specifically the stock prices of companies in the financial services industry, which includes banking, insurance, and investment firms.

The first variable, Finance, represents the Indeks Harga Saham Sektor Keuangan, which tracks the performance of Indonesia's financial sector. This index is a key indicator of the health of the financial services industry and the broader economy.

The next five variables represent the exchange rates of major global currencies against the Indonesian Rupiah (IDR). The first, USD/IDR, reflects the exchange rate between the US Dollar and the Indonesian Rupiah. Similarly, the EUR/IDR exchange rate tracks the value of the Euro against the Rupiah. The GBP/IDR exchange rate measures the value of the British Pound against the Rupiah. The JPY/IDR exchange rate reflects the value of the Japanese Yen against the Rupiah. Lastly, the CNY/IDR exchange rate tracks the value of the Chinese Yuan against the Rupiah.

The study examines how these currency exchange rates interact with Indonesia's financial stock index, providing insights into how global economic shifts impact the domestic financial market.

4.2. Descriptive Statistics

The descriptive statistics provide an initial summary of the key characteristics of the data, offering insight into the distribution, central tendency, and variability of the exchange rate and IDX Finance index from January 2010 to December 2019. By analyzing these statistics, we gain a clearer understanding of the basic properties of the variables before conducting more complex econometric analyses. The descriptive statistics in this study can be seen in the following table:

Table 2. Descriptive Statistics

	FINANCE	USD/IDR	EUR/IDR	GBP/IDR	JPY/IDR	CNY/IDR
Mean	747.3936	11867.10	14379.70	17244.62	116.2367	1822.953
Median	679.1900	12717.95	14790.70	17631.35	116.4150	1949.580
Maximum	1360.470	15234.95	17663.50	22540.70	136.0700	2307.760
Minimum	291.6100	8459.999	10994.00	13219.80	94.52000	1313.380
Std. Dev.	272.8099	2092.067	1731.674	2303.832	9.533931	302.8569
Skewness	0.604382	-0.324434	-0.258215	-0.119937	0.009668	-0.537677
Kurtosis	2.287053	1.502305	1.726725	1.751486	2.153557	1.702120

The descriptive statistics provide a comprehensive overview of the central tendencies, variability, and distribution characteristics of both the IDX Finance index and the five international exchange rates. For IDX Finance, the mean value stands at 747.39, while the median is slightly lower at 679.19. This disparity suggests a right-skewed distribution, as indicated by a skewness value of 0.60. The index displays significant fluctuations, ranging from a minimum of 291.61 to a maximum of 1360.47. This volatility is further emphasized by the standard deviation of 272.81, indicating that the financial sector's performance can be quite variable over time.

The exchange rate data reveal distinct characteristics as well. The USD/IDR exchange rate, for example, has an average of 11,867.10 with a high standard deviation of 2,092.07, suggesting considerable volatility. The wide range between its minimum value of 8,459.99 and maximum of 15,234.95 highlights the potential for abrupt changes influenced by economic events or policy shifts. Interestingly, the negative skewness of -0.32 indicates a slight leftward skew, meaning there may be instances of unusually low exchange rates that could affect the financial index.

Similar trends are observed in the other exchange rates (EUR/IDR, GBP/IDR, JPY/IDR, and CNY/IDR). For instance, the EUR/IDR exchange rate has the highest mean at 14,379.70, indicating the relative strength of the Euro compared to the Rupiah. Conversely, the CNY/IDR rate shows the lowest mean of 1,822.95, reflecting the lower valuation of the Chinese Yuan. Across these currencies, the high standard deviations signify that all exhibit significant fluctuations, making them subject to the same economic influences that affect the USD/IDR. Additionally, the skewness and kurtosis values reveal that these distributions are not perfectly normal, indicating the presence of outliers or extreme values that can impact the analysis of the relationship between these exchange rates and the IDX Finance index.

4.3. Unit Root Test

The unit root test is a critical statistical method used to determine the stationarity of time series data, which is essential for conducting further econometric analyses. In this study, the Augmented Dickey-Fuller (ADF) test was employed to assess the stationarity of the Indonesian Financial Stock Index (IDX Finance) and the five exchange rates (USD/IDR, EUR/IDR, GBP/IDR, JPY/IDR, and CNY/IDR). The unit root test result in this study can be seen in the following table:

Table 3. Unit Root Test Result

				Level Data
Variables	ADF t-Statistic	Critical Values	Prob.	
Finance	-0.035256	-2.862768	0.9542	
USD/IDR	-0.830545	-2.862768	0.8097	
EUR/IDR	-1.194089	-2.862768	0.6792	
GBP/IDR	-1.369470	-2.862768	0.5987	
JPY/IDR	-2.240091	-2.862768	0.1922	
CNY/IDR	-1.410938	-2.862768	0.5784	
				First Difference Data
Variables	ADF t-Statistic	Critical Values	Prob.	
Finance	-43.27709	-2.862768	0.0000	

USD/IDR	-40.74186	-2.862768	0.0000
EUR/IDR	-48.66859	-2.862768	0.0001
GBP/IDR	-46.74710	-2.862768	0.0001
JPY/IDR	-46.94645	-2.862768	0.0001
CNY/IDR	-41.40437	-2.862768	0.0000

The ADF test provides two main outputs: the test statistic and the critical values at specific significance levels (typically 1%, 5%, and 10%). In the context of this study, the ADF test results indicate the presence of a unit root for all series at levels, suggesting that they are non-stationary. The ADF test statistics for the IDX Finance and the exchange rates are relatively low, and when compared against the critical values, they do not fall into the rejection region. For example, the ADF t-statistic for the IDX Finance index is -0.035256, while the critical value at the 5% significance level is approximately -2.862768. Since the test statistic is greater than the critical value, indicating that the IDX Finance index is non-stationary.

Similar findings were observed for the exchange rates. For instance, the ADF test statistic for the USD/IDR exchange rate is -0.830545, which is also greater than the critical value of -2.862768. This pattern holds true for all other exchange rates analyzed in this study, including EUR/IDR, GBP/IDR, JPY/IDR, and CNY/IDR, which all showed ADF statistics greater than their respective critical values, signifying that they, too, possess unit roots.

However, the analysis did not stop at the levels; the unit root tests were also conducted on the first differences of these series. The ADF test results for the first differenced data revealed a significant improvement, as the ADF test statistics became substantially negative (e.g., for the IDX Finance index, the ADF statistic is -43.27709), well below the critical value threshold of -2.862768. This indicates that after differencing, all series become stationary, allowing us to reject the null hypothesis of a unit root.

4.4. Lag Optimal

The results of the optimal lag length determination are crucial for the subsequent analysis of the dynamic relationship between exchange rates and the IDX Finance index. The lag optimal test result in this study can be seen in the following table:

Table 4. Lag Optimal Test Result

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-49639.67	NA	1.06e+14	49.32506	49.34177*	49.33119
1	-49550.38	177.9676	1.01e+14*	49.27211*	49.38910	49.31505*
2	-49526.64	47.17474	1.02e+14	49.28429	49.50156	49.36404
3	-49503.61	45.61337	1.03e+14	49.29718	49.61474	49.41374
4	-49473.38	59.72017	1.04e+14	49.30291	49.72075	49.45628
5	-49454.66	36.86500	1.06e+14	49.32008	49.83819	49.51026
6	-49436.10	36.42348	1.08e+14	49.33741	49.95581	49.56440
7	-49411.64	47.88434	1.09e+14	49.34887	50.06755	49.61267
8	-49378.75	64.17408*	1.09e+14	49.35196	50.17093	49.65257

The lag optimality test results indicate that lag 1 is the most suitable lag length for the analysis. All three criteria point to lag 1 as the optimal choice because it balances model fit with simplicity. While adding more lags can slightly increase the Log-Likelihood (LogL), suggesting a better fit, the model becomes more complex, and the information criteria penalize this added complexity. Therefore, lag 1 is the best option to maintain a parsimonious model that still captures the relationships between the variables.

Choosing lag 1 means that the model accounts for the immediate effects of past values of the variables (exchange rates and IDX Finance index) on their current values, while avoiding unnecessary complexity from including additional lags. This consensus across multiple criteria

reinforces the reliability of the choice, as it suggests that a one-lag model is not only simple but also effective in explaining the dynamic relationships in the data.

4.5. Cointegration Test

The results from the cointegration tests provide a critical understanding of the long-term relationship between the Indonesian Financial Stock Index (IDX Finance) and the international exchange rates, specifically the USD/IDR, EUR/IDR, GBP/IDR, JPY/IDR, and CNY/IDR. The cointegration test result in this study can be seen in the following table:

Table 5. Cointegration Test Result

Hypothesized No.of CE(s)	Trace Statistic	0.05 CriticalValue	Max-Eigen Statistic	0.05 CriticalValue
None				
No Intercept and No Trend				
None*	5063.569	83.93712	950.0120	36.63019
Atmost1*	4113.557	60.06141	909.7359	30.43961
Atmost2*	3203.821	40.17493	879.9349	24.15921
Atmost3*	2323.886	24.27596	841.3527	17.79730
Atmost4*	1482.533	12.32090	769.8613	11.22480
Atmost5*	712.6719	4.129906	712.6719	4.129906
Intercept and No Trend				
None*	5081.331	103.8473	958.9336	40.95680
Atmost1*	4122.398	76.97277	914.8110	34.80587
Atmost2*	3207.587	54.07904	880.1886	28.58808
Atmost3*	2327.398	35.19275	843.6214	22.29962
Atmost4*	1483.777	20.26184	770.3313	15.89210
Atmost5*	713.4455	9.164546	713.4455	9.164546
Linear				
Intercept and No Trend				
None*	5081.328	95.75366	958.9336	40.07757
Atmost1*	4122.394	69.81889	914.8107	33.87687
Atmost2*	3207.583	47.85613	880.1883	27.58434
Atmost3*	2327.395	29.79707	843.6196	21.13162
Atmost4*	1483.775	15.49471	770.3298	14.26460
Atmost5*	713.4455	3.841466	713.4455	3.841466
Intercept and Trend				
None*	5087.657	117.7082	960.3626	44.49720
Atmost1*	4127.294	88.80380	914.8242	38.33101
Atmost2*	3212.470	63.87610	880.7619	32.11832
Atmost3*	2331.708	42.91525	843.6811	25.82321
Atmost4*	1488.027	25.87211	774.4636	19.38704
Atmost5*	713.5632	12.51798	713.5632	12.51798

The Cointegration Test results indicate a long-term equilibrium relationship between the exchange rate and the IDX Finance index. The test is performed under different assumptions about the presence of an intercept and trend in the model, which affects the interpretation of the cointegration results.

The Trace Statistic evaluates whether the number of cointegrating relationships is fewer or equal to the hypothesized number. In the table, for the null hypothesis of "no cointegration" (None), the trace statistic in all scenarios (No Intercept and No Trend, Intercept and No Trend, Linear, and Intercept and Trend) far exceeds the critical value at the 5% significance level. This leads to the rejection of the null hypothesis in every case, indicating the strong likelihood of at least one cointegrating relationship between the exchange rate and the IDX Finance index.

The rejection of the null hypothesis across multiple scenarios suggests that these two variables share a significant long-term equilibrium. Despite short-term fluctuations, the exchange rate and the IDX Finance index are likely to move together over time, maintaining this equilibrium relationship.

Moreover, as we proceed down the table to test for additional cointegrating relationships (e.g., "At most 1"), the trace statistics continue to be larger than their critical values, implying that there may be multiple cointegrating vectors.

Furthermore, the Max-Eigen Statistic tests the hypothesis that the number of cointegrating vectors is exactly equal to the hypothesized number. Like the trace statistic, the Max-Eigen statistic shows that the value for "None" in every assumption exceeds the critical value, meaning the null hypothesis of no cointegrating vectors can be rejected. This further supports the existence of at least one cointegrating vector between the exchange rate and the IDX Finance index.

The Max-Eigen test results align with the trace test, reinforcing the conclusion that there is a long-run equilibrium relationship between the two variables. Both statistics strongly indicate that the exchange rate and the IDX Finance index are not independent of each other in the long term.

Moreover, the results are robust across different assumptions about intercepts and trends. The "No Intercept and No Trend" assumption tests whether the variables are purely stochastic, with no deterministic trends, and even under this assumption, the test rejects the null hypothesis of no cointegration. When an intercept is introduced (Intercept and No Trend), allowing for a constant in the relationship, the test continues to show strong evidence of cointegration. In scenarios where a deterministic trend is included (Linear or Intercept and Trend), which assumes that the variables could have stable long-term growth, the results consistently confirm the existence of cointegration.

4.6. Granger Causality Test

The Granger causality test results offer critical insights into the directional influence between the Indonesian Financial Stock Index (IDX Finance) and the international exchange rates (USD/IDR, EUR/IDR, GBP/IDR, JPY/IDR, and CNY/IDR). The granger causality test result in this study can be seen in the following table:

Table 6. Granger Causality Test Result

Null Hypothesis	F-Statistic	Prob.
$\Delta\text{Finance} \leftarrow \Delta\text{USD/IDR}$	9.63083	0.0019
$\Delta\text{Finance} \rightarrow \Delta\text{USD/IDR}$	14.1616	0.0002
$\Delta\text{Finance} \leftarrow \Delta\text{EUR/IDR}$	4.12908	0.0423
$\Delta\text{Finance} \rightarrow \Delta\text{EUR/IDR}$	21.6333	4.E-06
$\Delta\text{Finance} \leftarrow \Delta\text{GBP/IDR}$	0.63605	0.4252
$\Delta\text{Finance} \rightarrow \Delta\text{GBP/IDR}$	12.3056	0.0005
$\Delta\text{Finance} \leftarrow \Delta\text{JPY/IDR}$	1.06900	0.3013
$\Delta\text{Finance} \rightarrow \Delta\text{JPY/IDR}$	6.59320	0.0103
$\Delta\text{Finance} \leftarrow \Delta\text{CNY/IDR}$	0.16871	0.6813
$\Delta\text{Finance} \rightarrow \Delta\text{CNY/IDR}$	13.8152	0.0002

The findings from the Granger causality tests revealed varying degrees of influence among the IDX Finance index and the selected exchange rates. Notably, the USD/IDR exchange rate demonstrated a significant Granger-causal effect on the IDX Finance index, with an F-statistic of 9.63083 and a p-value of 0.0019. This suggests that fluctuations in the USD/IDR exchange rate can significantly predict movements in the IDX Finance index, emphasizing the role of the USD as a primary currency in international trade and investment, which directly impacts the Indonesian financial market.

In addition to the USD/IDR, the EUR/IDR exchange rate also exhibited a notable Granger-causal relationship with the IDX Finance index, marked by an F-statistic of 14.1616 and a p-value of 0.0002. This finding reinforces the importance of the Euro in global markets and highlights its potential

influence on Indonesian financial assets. Conversely, the results for the GBP/IDR and JPY/IDR exchange rates indicated weaker predictive relationships with the IDX Finance index. The GBP/IDR presented an F-statistic of 4.12908 and a p-value of 0.0423, while the JPY/IDR showed an F-statistic of 1.06900 and a p-value of 0.3013, suggesting these currencies have less impact on predicting the IDX Finance index.

Interestingly, the CNY/IDR exchange rate revealed a significant reverse Granger-causal relationship, with the IDX Finance index itself Granger-causing changes in the CNY/IDR exchange rate. This was evidenced by an F-statistic of 13.8152 and a p-value of 0.0002. This finding indicates that movements in the Indonesian financial market can influence investor sentiment and demand for the Chinese Yuan, reflecting the interconnected nature of economic activities between Indonesia and China.

4.7. Impulse Responses Test

The Impulse Response Function (IRF) analysis provides valuable insights into the dynamic interactions between the Indonesian Financial Stock Index (IDX Finance) and the international exchange rates (USD/IDR, EUR/IDR, GBP/IDR, JPY/IDR, and CNY/IDR). The impulse responses test result in this study can be seen in the following table:

Table 7. Impulse Responses Test Result

Period	Δ Finance	Δ USD/IDR	Δ EUR/IDR	Δ GBP/IDR	Δ JPY/IDR	Δ CNY/IDR
1	9.485268	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.344405	-0.652870	0.903253	0.087325	-0.067597	0.796025
3	0.046835	-0.009606	0.127260	0.043899	0.052029	0.016543
4	-3.07E-05	-0.000388	-0.000437	-0.002405	-0.002571	0.009734
5	-4.24E-05	0.000321	0.000747	0.000420	0.000279	-0.000367
6	-5.13E-05	2.27E-05	-0.000121	-4.73E-05	-3.94E-05	6.09E-05
7	-1.45E-06	4.53E-06	3.27E-06	3.80E-06	1.31E-06	-1.08E-05
8	-5.81E-07	4.47E-09	-1.75E-06	-6.54E-07	-4.28E-07	5.49E-07
9	2.42E-08	2.57E-08	8.81E-08	5.52E-08	2.57E-08	-1.46E-07
10	-3.80E-09	-4.04E-09	-1.70E-08	-7.89E-09	-3.92E-09	1.13E-08

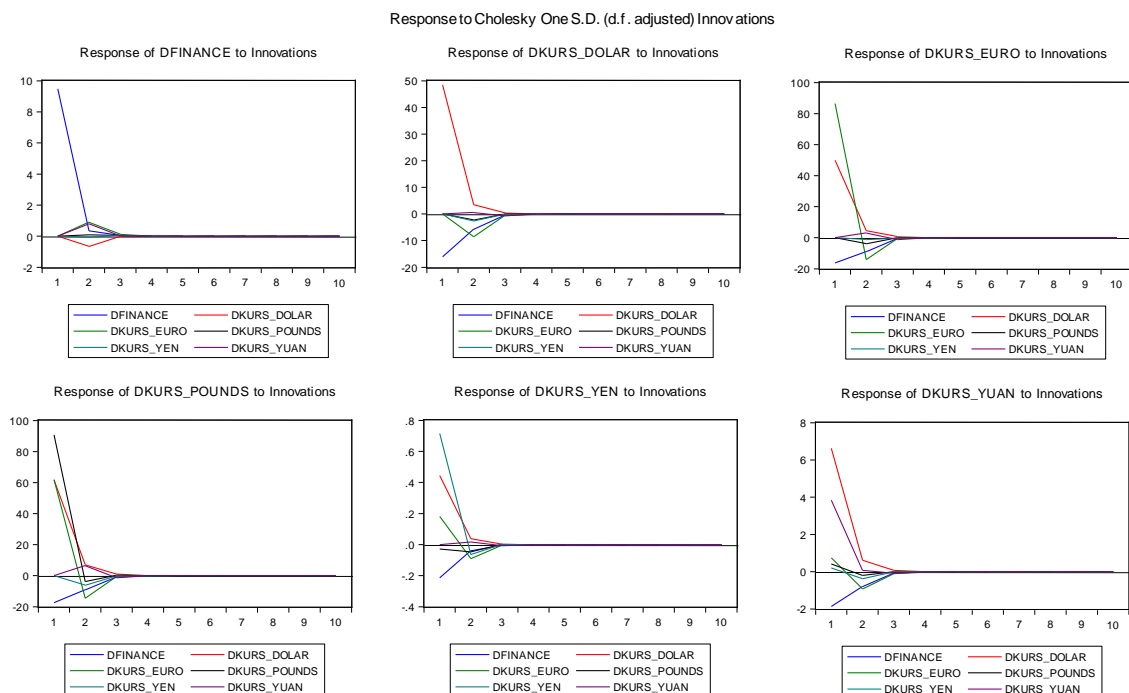


Figure 2. Impulse Responses Test Result

The results from the Impulse Response analysis indicate distinct patterns in how shocks to the exchange rates and the IDX Finance index affect one another over time. Notably, when a positive shock occurs in the USD/IDR exchange rate, the IDX Finance index initially experiences a decline, indicating a negative reaction. This negative impact may be attributed to increased costs for companies that import goods or services, which could lead to lower profit margins and, subsequently, reduced investor confidence in the stock market.

Over time, the response of the IDX Finance index begins to stabilize and shows signs of recovery, suggesting that market participants may adjust their expectations as they incorporate new information about the exchange rate's impact on future cash flows and profitability. The recovery phase reflects the adaptive nature of investors who may reassess their positions based on broader economic conditions and other influencing factors.

In contrast, shocks to the IDX Finance index have a more pronounced effect on the EUR/IDR and CNY/IDR exchange rates. A positive shock in the IDX Finance index leads to a notable appreciation of the CNY/IDR exchange rate, indicating that a strong performance in the Indonesian stock market can boost confidence in the Indonesian economy and increase demand for the Yuan. This dynamic may reflect increased trade relationships and investment flows between Indonesia and China, as a thriving stock market signals economic stability and growth prospects.

The IRF results also reveal that shocks to the GBP/IDR and JPY/IDR exchange rates have relatively muted effects on the IDX Finance index compared to the USD/IDR. This observation underscores the dominant role of the USD in influencing the Indonesian financial market. The relatively minor impact of the GBP and JPY exchange rates may stem from lower trade volumes and investment flows between Indonesia and the respective countries, suggesting that these currencies are less integral to Indonesia's economic activities.

4.8. Discussion

The findings from this study offer significant insights into the relationship between exchange rates and the Indonesian Financial Stock Index (IDX Finance). The results demonstrate that fluctuations in exchange rates, particularly the USD/IDR, play a crucial role in shaping the performance of Indonesia's financial sector, aligning with previous studies that highlight the impact of currency movements on stock markets in emerging economies (Hajilee & Al Nasser, 2014; Manu & Bhaskar, 2018).

The cointegration test results reveal a long-term equilibrium relationship between exchange rates and the IDX Finance index. This suggests that, despite short-term volatility, the exchange rate and stock index move together in the long run, consistent with economic theory that links exchange rates and stock markets through trade and capital flows (Christiawan & Narsa, 2020). The significant role of exchange rates in influencing stock prices is particularly relevant for Indonesia, an open economy heavily involved in international trade and investment (Nketiah et al., 2019). A depreciation of the Rupiah against major currencies such as the US Dollar can increase the cost of foreign-denominated debt, negatively impacting firms' profitability and leading to a decline in the financial stock index. Conversely, an appreciation of the Rupiah reduces debt servicing costs for companies with foreign liabilities, potentially boosting stock prices.

The Granger causality test further emphasizes the interdependence between exchange rates and the IDX Finance index, with bidirectional causality observed between USD/IDR and the financial stock index. This finding is in line with previous research, which suggests that exchange rate movements not only affect stock prices but are also influenced by the performance of the stock market itself (Edwards & Sahminan, 2008). When the financial sector performs well, it attracts foreign investment, increasing demand for the Rupiah and leading to its appreciation. This dynamic demonstrates the role of investor sentiment and capital flows in shaping exchange rates and stock market outcomes (Kyereboah-Coleman & Agyire-Tettey, 2008).

The impulse response function (IRF) analysis highlights that the USD/IDR exchange rate has the most significant and lasting impact on the IDX Finance index compared to other exchange rates. Given the prominent role of the US dollar in global trade and finance, this finding is not surprising. Many Indonesian firms, particularly in capital-intensive sectors, hold significant portions of their

debt in USD. A depreciation of the Rupiah against the USD increases the burden of servicing this debt, which negatively affects corporate profitability and stock market performance (Andini, 2024). This is consistent with prior studies that emphasize the vulnerability of emerging market firms to currency shocks, especially those linked to the US dollar (Olugbenga, 2012).

Interestingly, while the EUR/IDR and GBP/IDR exchange rates also influence the IDX Finance index, their effects are less pronounced compared to the USD/IDR. This could be attributed to Indonesia's stronger trade ties with the United States and the greater use of USD in international transactions (Kohlscheen et al., 2017). The relatively smaller impacts of the JPY/IDR and CNY/IDR exchange rates may also reflect the fact that much of Indonesia's trade with Japan and China is conducted in USD, reducing the direct influence of these currencies on the financial market (Perera, 2016). Although Japan and China are significant trading partners for Indonesia, the results suggest that their respective currencies play a smaller role in the financial sector's performance.

5. Conclusions

The analysis of the relationship between the Indonesian Financial Stock Index (IDX Finance) and five international exchange rates (USD/IDR, EUR/IDR, GBP/IDR, JPY/IDR, and CNY/IDR) has provided significant insights into the interactions between stock market movements and currency fluctuations. Using various econometric tests, including descriptive statistics, unit root tests, optimal lag selection, cointegration tests, Granger causality tests, and impulse response functions, the study reveals important patterns and dynamics in the Indonesian financial landscape.

The results of the unit root and lag selection tests show that these time series variables are stationary after differencing and that a lag length of three is optimal for capturing their interactions. The cointegration tests indicate a long-term equilibrium relationship between the IDX Finance index and the exchange rates, implying that these variables do not drift apart but are interconnected over time. This suggests that short-term shocks to exchange rates may be absorbed by the IDX Finance index over time, and vice versa.

The Granger causality tests highlight that there is a bidirectional causality between the IDX Finance index and the USD/IDR and EUR/IDR exchange rates, meaning that movements in these exchange rates can predict changes in the IDX Finance index, while stock market performance can also influence exchange rate fluctuations. Lastly, the impulse response analysis illustrates how shocks to these variables affect each other in the short run, with the USD/IDR having a particularly pronounced impact on the IDX Finance index.

The findings of this study carry several important implications for investors, policymakers, and financial institutions. First, the strong relationship between the IDX Finance index and exchange rates, particularly USD/IDR and EUR/IDR, suggests that currency movements are a critical factor for investors in Indonesia. Investors should closely monitor exchange rate dynamics as part of their decision-making process, as these can significantly influence stock market performance.

For policymakers, the evidence of cointegration between the IDX Finance index and exchange rates implies that maintaining stability in the foreign exchange market is crucial for the health of the domestic stock market. Currency volatility can have a destabilizing effect on the stock market, so policies aimed at mitigating sharp currency movements – such as interventions in the forex market or managing inflationary pressures – could contribute to financial market stability.

Moreover, the bidirectional causality between the IDX Finance index and key exchange rates suggests that the stock market itself could serve as an indicator of broader economic conditions, including currency trends. This interplay between financial markets and exchange rates highlights the need for a coordinated approach to macroeconomic policy that takes both financial market performance and currency stability into account.

While this study provides a comprehensive analysis of the relationship between the IDX Finance index and international exchange rates, there are several avenues for future research. First, future studies could explore the impact of other macroeconomic variables – such as interest rates, inflation, and foreign direct investment – on the IDX Finance index to gain a more holistic understanding of the factors driving stock market movements in Indonesia.

Additionally, more sophisticated models, such as vector error correction models (VECM) or regime-switching models, could be employed to capture the dynamics of these relationships in greater detail, especially in the context of periods of financial crisis or extreme volatility. Further research could also extend the analysis to different sectors of the stock market to assess whether the relationship between exchange rates and stock prices differs across sectors.

Finally, future studies could explore the implications of these relationships in the context of regional and global economic integration. As Indonesia becomes more integrated into the global economy, understanding how external shocks – such as changes in the global financial environment or international trade policies – affect the IDX Finance index and exchange rates will be crucial for both investors and policymakers.

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