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Indonesian capital market integration with Asian and U.S. capital markets during the COVID-19 crisis and the Russia-Ukraine war

Integración del mercado de capitales de Indonesia con los mercados de capitales de Asia y Estados Unidos durante la crisis de la COVID-19 y la guerra entre Rusia y Ucrania

Natanael Kristolife Ardana Hadi, Robiyanto Robiyanto [*], Andrian Dolfriandra Huruta

Satya Wacana Christian University, Indonesia

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Abstract

This study aims to analyze the integration of stock markets from the United States, China and ASEAN towards the stock market in Indonesia during geopolitical periods, such as COVID-19 and Russia-Ukraine war. This study uses secondary data, namely the daily closing prices of the United States S&P 500 index, Shanghai Composite, Indonesia Stock Exchange, Thailand SET, FTSE Straits Times Singapore, Philippine Stock Exchange, Kuala Lumpur Stock Exchange, and Vietnam Securities Exchange. The analytical method used to support this research is EGARCH (Exponential Generalized Autoregressive Conditional Heteroskedasticity). The findings show that the Indonesian stock market has a positive influence on the United States S&P 500 stock market, Shanghai Composite, Thailand SET, FTSE Straits Times Singapore, Philippine Stock Exchange, and Kuala Lumpur Stock Exchange, and Vietnam Securities Exchange.

[1*] Corresponding author.
E-mail address: robiyanto@staff.uksw.edu (R. Robiyanto).
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Resumen

Este estudio tiene como objetivo analizar la integración de los mercados bursátiles de Estados Unidos, China y la ASEAN hacia el mercado bursátil de Indonesia en períodos geopolíticos, como la COVID-19 y la guerra entre Rusia y Ucrania. Este estudio utiliza datos secundarios, a saber, los precios de cierre diarios del índice S&P 500 de Estados Unidos, el Composite de Shanghái, la Bolsa de Valores de Yakarta, el SET de Tailandia, el FTSE Straits Times de Singapur, la Bolsa de Valores de Filipinas, la Bolsa de Valores de Kuala Lumpur y la Bolsa de Valores de Vietnam. El método analítico utilizado para respaldar esta investigación es EGARCH (Heteroscedasticidad Condicional Autorregresiva Generalizada Exponencial). Los hallazgos muestran que el mercado bursátil de Indonesia tiene una influencia positiva en el mercado bursátil S&P 500 de Estados Unidos, el Composite de Shanghái, el SET de Tailandia, el FTSE Straits Times de Singapur, la Bolsa de Valores de Filipinas, la Bolsa de Valores de Kuala Lumpur y la Bolsa de Valores de Vietnam.

Código JEL: G11, G15, G19
Palabras clave: comovimiento; integración; mercado de valores; Estados Unidos; China; ASEAN-6; COVID-19; Rusia-Ucrania

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Introduction

From 2020 to 2023, the world was shaken by several crises. In January 2020 the world was shaken by the COVID-19 pandemic crisis, which was first discovered in Wuhan and quickly spread worldwide (Baker et al., 2020). This crisis caused major shocks in various sectors such as tourism, transportation, entertainment, energy, finance, etc. COVID-19 has become a tense crisis in recent periods. Almost three years after COVID-19 spread globally, it's still challenging to learn from mistakes to improve pandemic management (Khorram-Manesh et al., 2023). The increasing number of COVID-19 cases has created uncertainty, especially in global economic activities. Global economic uncertainty is reflected in the worsening development of the volatility index (VIX).

The volatility index (VIX) is an index that predicts economic volatility and measures the uncertainty of global market movements (Sarwar et al., 2017; Vuong et al., 2022). Before COVID-19, the average of VIX was 18.5 (Figure 1). The average level of the VIX at that time indicated relatively stable volatility in the global economy. However, in March 2020, the VIX jumped sharply from 13.68 to 82.69. Thus, the surge in the VIX during COVID-19 reflects the significant negative impact and uncertainty on the global economy.

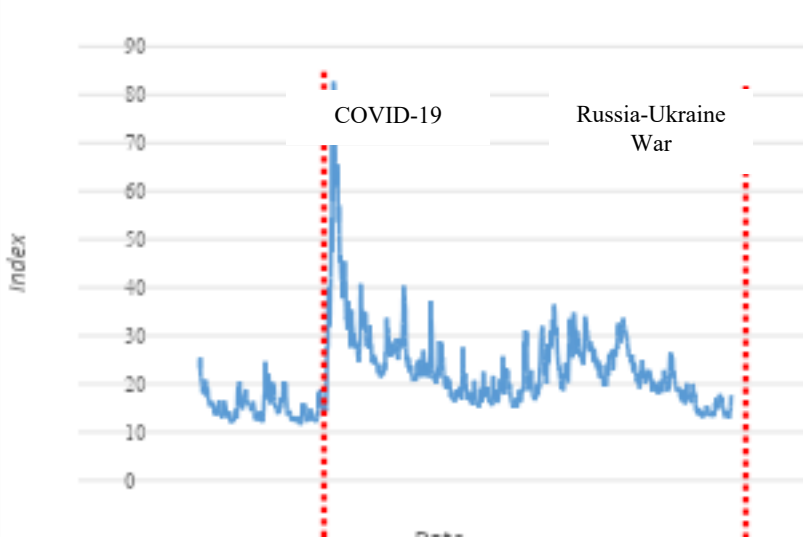

Figure 1. Movement of the Global Volatility Index (VIX) 2019 – 2023
Sources: https://www.cboe.com/tradable_products/vix/vix_historical_data/, processed

In line with the handling of COVID-19, the global economy experienced recovery until the end of 2020. While the global economy was recovering, it faced another shock with the onset of the war between Russia and Ukraine on February 24, 2022. This military action raised many concerns, especially for the global economy and financial markets (Boungou & Yatié, 2022). The impact of the Russian and Ukrainian war will have an impact on several main aspects. First, commodity prices will soar, such as food, energy and others. An increase in commodity prices will affect the stability of a country's inflation. Second, global transactions between countries will experience disruption and chaos. The Russia and Ukraine war will involve allies from the two alliances, and it will have an impact on world trade. Third, the emergence of distrust among business actors and investors regarding global economic conditions (Lower Business Confidence) has the potential to tighten financial market conditions in financing capital flows between countries (Kammer et al., 2022).

The ongoing war is negatively affecting the Russian economy, with expected decreases in GDP and rising inflation. Russia's GDP is projected to decline by 1.5% in 2022 and 2.6% in 2023. Inflation in Russia will rise due to higher import prices caused by the falling trouble and increased inflation expectations. Economic confidence is expected to weaken, resulting in lower real incomes and disrupted trade. Higher export revenues from energy will not fully offset the GDP decline, especially if sanctions extend to energy exports, leading to higher costs for the West. In the US, energy represents 7.3% of the Consumer Price Index (CPI), while in the UK, it is 6%. Rising energy costs will limit global economic growth, especially in net energy-importing countries. The war may also result in around 4 million

refugees, with a significant migration of people from Ukraine to Western Europe, particularly Poland. The ongoing conflict is creating economic challenges for Russia and contributing to global inflation, significantly impacting countries dependent on energy imports (Liadze, et al., 2023).

Regarding the war, Priyambodo and Yunita (2023) states that Russia and Ukraine are producers and exporters of major global commodities in the form of oil and gas, mining and food. In 2020, the European Union (EU) became Russia's main trading partner, contributing 37.3% of total trade in goods in Asia. The EU imposed restrictive measures on Russia's economy due to its military actions in Ukraine, affecting finance, arms, dual-use goods, and oil technologies. Russia responded with a ban on various EU agricultural imports (European Commission, 2023). Russia supplies 29% of the crude oil, 54% of solid fuels and 43% of the natural gas imported by the EU (Eurostat, 2020). The condition is made worse by the EU imposing sanctions on Russia to limit member countries' resources from entering Russia. The agreed sanctions raise concerns for stock market investors, thereby increasing uncertainty in world stock markets both developed and developing countries (Adekoya & Oliyide, 2020). Recurring crises in global financial markets have increased interest in studying correlations between financial markets (Song et al., 2022).

The COVID-19 crisis and the Russia-Ukraine war created uncertainty in the global economy and financial markets. Therefore, during a crisis, there is an increase in economic integration relations between markets (cross-markets), which are mutually dependent and influence the global economy, especially the stock market (Hoq, 2020).

Several previous studies have investigated stock market comovement and the interconnectedness of world stock markets. Research by Song et al. (2022) shows comovement relationship between the American and Chinese stock markets during the COVID-19 crisis. In addition, Al-Najjar (2022) research results show a significant relationship between the stock markets of developed countries. Research by Chien et al. (2021) also shows correlation or comovement in the movement of stock market returns during the COVID-19 pandemic in America, Europe, and China. However, Das and Gupta (2022) found that stock markets in India, the US, Russia, and the UK did not show significant integration.

These studies only examine developed countries and the COVID-19 era. Therefore, this research will examine America, China, and ASEAN-6 countries, specifically Indonesia. The main focus of this analysis is daily stock index price data for 2018 to 2023. The time frame chosen includes five periods: before COVID-19 (Pre), during COVID-19, recovery after COVID-19 (Post), during the Russia-Ukraine war and all periods. China and America as countries with the largest economies in the world, this had a dynamic impact on the Chinese and American economies in ASEAN-6 at a time when a major crisis rocked the global economy, especially Indonesia (Robiyanto, 2018; Song et al., 2022). Therefore, this research seeks to offer empirical evidence based on the integration of the stock markets of America, China,

and ASEAN-6 countries. Using the EGARCH (Exponential Generalized Autoregressive Conditional Heteroskedasticity) model, this study is also expected to provide empirical evidence that there is a joint movement between developed and developing countries. The EGARCH model is used in this research because this model allows researchers to overcome the volatility that often occurs in financial data. Thus allowing deeper analysis of complex stock price movements in global markets. The use of EGARCH facilitates an in-depth understanding of changes in volatility in the stock market and determines whether there is a significant relationship in stock movements between developed and developing countries. To sum it up, stock market interconnectedness describes the connections between various stock markets influenced by economic, political, or financial factors. Research on this topic provides insights into market reactions to global events, contagion risks, the effects of global trade, and investment flows.

This study consists of several sections. Section 2 covers the literature review and hypotheses. Section 3 discusses data and research methods. Section 4 presents discussions and empirical findings. The final section outlines the conclusion, limitations, and recommendations for future research.

Literature review and hypothesis formulation

Geopolitics refers to forces based on basic considerations in formulating various policy alternatives to realize national goals (Sinaga et al., 2019). Meanwhile, according to Lawreniuk (2020), geopolitics is a science that reflects the relationship between life and political activity, which refers to political and economic forces that intersect with geographical factors. Geopolitics can also be described as a good measuring tool for a country's geographical, strategic and political aspects to lay the foundations of the superstructure in building the country's strength (Overland et al., 2019).

Several factors can influence a country's geopolitics, which causes changes in various situations, which is what geopolitical risk is. Global conflict or crisis is one of the most significant factors influencing geopolitical risk. Global conflict can include war, social unrest, ideological conflict, and power competition between countries (Girgin, 2015; Sohag et al., 2023; Wang et al., 2022).

Changes in a country's geopolitics resulting from global conflict have profound implications, including changes in alliances, foreign policy, regional stability, and global stock market integration. Geopolitics and stock market interconnection often lead to stock market integration or comovement. Therefore, stock market comovement can indicate that geopolitical changes significantly impact price movements in global stock markets (Girgin, 2015).

In the era of globalization, interactions between countries have become very dynamic. The effects of globalization on the world economy not only create closer economic interconnections but also have a direct impact on the interdependence of economic activities across countries (Song et al., 2022).

Habiba et al. (2020) showed that during financial crises, volatility spillovers are significant from the US market to South Asian markets. This research is the first to reveal the changing interconnectedness between various global asset classes and those from Bangladesh, India, Pakistan, and Sri Lanka. It also assesses the potential downside risk and hedging effectiveness for these asset classes. According to Verma (2024), the cointegration of major stock indices in Asian nations over various periods, particularly focusing on the COVID-19 crisis. Cointegration was consistently found across all sample periods, indicating a general association among the stock markets. During the COVID-19 crisis, the level of cointegration decreased but returned to original levels the following year, then decreased again in the next year. There was no evidence showing that COVID-19 affected the dynamic cointegration relationship among the stock markets. The study provides insights into the dynamic nature of cointegration among Asian stock markets, particularly during the pandemic and surrounding years. A study by Jreisat et al. (2023) investigated how stock markets in Asia connected with those in the US and Europe during the Ukrainian crisis and compared it to past crises. The study measures dynamic connectedness and spillover effects among emerging Asian stock markets and developed markets. They also analyzed returns and volatility during the 2008 financial crisis, COVID-19, and the Ukrainian crisis. The findings suggest Asian stock markets are less influenced by the Ukrainian crisis compared to earlier crises. The resilience of Asian stock indices to global shocks has improved, presenting opportunities for investors. The results are significant for both investors and policymakers, indicating potential for better portfolio diversification and risk management in Asian markets. In addition, globalization has increased international trade as well as stock market movements, thereby integrating global stock markets (Mobarek et al., 2016). The stock market is an essential part of every country's financial market in order to encourage the development of the industrial and commercial sectors and advance the country's economy significantly (Robiyanto, 2018; Su et al., 2021; Umar et al., 2021). Apart from that, the stock market also opens up opportunities for investors to earn income from stock trading or what is called a liberal market (Umar et al., 2021). A liberal stock market is a market where foreign investors have a freedom to buy and sell domestic securities without any restrictions (Robiyanto, 2018).

In this regard, stock market dependence has become an important topic researched by various authors in the field of international finance (Bekaert & Harvey, 2003; Xu & Hamori, 2012; Robiyanto, 2018; Ramos-Requena et al., 2020; Al-Najjar, 2022; Song et al., 2022). Bekaert and Harvey (2003) revealed an increasing correlation between world markets, stock markets, and economic growth. Xu & Hamori (2012) also studied the dynamic relationship between the BRICS countries and the US before and after the 2008 crisis. The research found that during the crisis period, international capital transmission between BRICS and the US weakened.

Robiyanto (2018) also revealed that during the 2008 Subprime Mortgage crisis, the Indonesian stock market was increasingly connected to several stock markets in Asia, especially in the ASEAN

region. Additionally, Ramos-Requena et al. (2020) explore how the movements of one asset influence others is important for various financial activities. A new method called HP (Hurst exponent) is introduced to measure the co-movement of two time series. It uses the Hurst exponent of the product series to find correlations, even weak ones, and works well with cointegration and non-linear correlations. Results indicate that HP is more effective than traditional correlation methods in detecting asset relationships. The HP method offers a better way to measure the co-movement between assets, improving financial analysis and strategies. Al-Najjar (2022) also stated a significant relationship exists between the Amman Stock Exchange Index (ASEI) and several other country indices, such as the S&P 500, FTSE 100, and Nikkei 225. This is a guide for developing investment portfolio diversification and financial market efficiency to encourage international exposure to the capital market. Song et al. (2022) research also shows that the Chinese and US stock markets are mutually integrated and joint movements are increasing during the COVID-19 crisis. These findings indicate that the two markets are interdependent and that international investors need diversification to minimize risks in capital market activities.

This phenomenon reflects the complex interrelationship between stock markets in various countries, where stock price movements in certain countries can influence stock price movements in other countries (Bekaert & Harvey, 2003). This shows that relationships between stock markets can occur when an investor from abroad acquires shares listed on the stock exchange. However, there is a risk that it will cause financial instability, thereby hampering a country's growth (Song et al., 2022). This can indicate that global factors such as economic changes, political events, currency movements, and monetary policy can simultaneously influence the direction of global stock market movements (comovement). Comovement or stock market integration is a very important part of the study of financial economics, which, in principle, covers various aspects of relationships in the stock markets of developed and developing countries. Based on this literature, the following hypothesis is formulated:

H_1: There is integration between the Indonesian stock market with Asian stock markets and world stock markets.

Data and methodology

This study uses time series data analysis of stock price indices for several stocks worldwide. The stock markets that are the focus of the research include the United States S&P 500 index, Shanghai Composite, Indonesia Stock Exchange, Thailand SET, FTSE Straits Times Singapore, Philippine Stock Exchange, Kuala Lumpur Stock Exchange, and Vietnam Securities Exchange. Data was collected in five different periods to achieve this research's objectives. Date periods used in this study include 10/20/2018 to 01/19/2020 as pre-COVID-19 period, 01/20/2020 to 01/20/2021 as during COVID-19 period, 01/21/2021

to 02/23/2022 as post-COVID-19 period, and 02/24/2022 to 09/01/2023 as Russian-Ukrainian war period and all period.

This study using 10/20/2018 to 01/19/2020 as pre-COVID-19 period. This period contains 2 years before COVID-19 detected in the United States of America. COVID-19 was detected in the United States of America for the first time at January, 20 2020. As the United States of America has major influence in international capital markets, so this date is very crucial. Based on that the COVID-19 period started at 01/20/2020 to 01/20/2021. While post COVID-19 period started at 01/21/2021 to 02/23/2022. The emergence of Russia-Ukraine war began at February, 24 2022, so this study using 02/24/2022 to 09/01/2023 as the latest obtained data during this study for Russia-Ukraine war period. This study also scrutinize all those periods (10/20/2018 to 09/01/2023) to obtain general conclusion regarding those periods. This study using the linear method to calculate the daily market returns.

Analysis techniques

This research utilizes descriptive statistical methods to evaluate the general characteristics and level of normality of the data used. Apart from that, this research also tests the correlation between stock markets using a correlation test. The main focus of this research was to examine dynamic relationships in both the long and short term between stock market samples. To dig deeper into the analysis of long-term relationships between developed and developing countries, this research applies tests applied in the work of Johansen and Juselius in 2009. Important components of Johansen's cointegration analysis are the Tracking test and the Eigen value test.

$$\tau trace = -T \sum LN\,(1 - \tau_1) \tag{1}$$

$$\tau max = -TLN(1 - \tau_{t+1}) \tag{2}$$

Before applying the extended EGARCH model, several things must be fulfilled. First, the model must pass a checking stage, which means ARCH effects must be detected in the data. Heteroskedasticity and Autocorrelation need to be applied in this research. These steps will help us to ensure that our model is robust and that the results are reliable. The ARCHLM test was also used in this research to evaluate assumptions. Next, it is necessary to measure volatility in the stock index. Lastly, the EGARCH model can provide insight into the relationships between markets and identify significant changes originating from developed and developing countries. For example, market integration can be measured through the

EGARCH parameter, which reflects how changes can influence the share price volatility of one market in other markets.

$$R_t = \beta_0 + \beta_1 + \alpha_{Rt-1(stockindices)} + \varepsilon_t \quad (3)$$

$$In\,(h_t) = \emptyset_0 + \emptyset_1 \left[\frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}}}\right] + 6\,\frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}}} + In\;\emptyset_2 h_{t-1}$$

Using the EGARCH model, market integration can be tested to determine the extent to which the model can identify significant changes. Analysis of parameters and variables in this model can provide an in-depth picture of the relationship between markets and the impact of changes in returns from developed and developing countries on the Indonesian market. EGARCH is a widely used model in finance, particularly when dealing with certain characteristics of volatility. EGARCH is preferred for asymmetric volatility, where negative shocks impact volatility differently than positive ones of the same size. It captures leverage effects, meaning volatility increases more after negative shocks compared to positive ones. This model is suitable for data showing volatility clustering, asymmetry, and leverage effects. It is more flexible than other GARCH-family models and handles nonlinear relationships between returns and volatility effectively. If financial data indicates asymmetric volatility, EGARCH is often the most suitable model.

Result and discussion

Results

Stationarity testing was carried out using the Augmented Dickey-Fuller Test with a significance level of 1% (0.01). Table 1 shows the results of stationarity testing with the Augmented Dickey-Fuller Test. These results show that the variables in each period show stationarity based on their probability values and allows a Normality Test to be carried out. Normality testing uses the Jarque-Bera value to see whether the data is normally distributed or not, so that the data can be determined by selecting the appropriate GARCH model. Table 2 displays the results of normality testing for each variable in the periods before COVID-19, COVID-19, after COVID-19, Russia-Ukraine war, and All Periods.

Table 1
Unit root test data results

Period	Variable	t-statistic	Prob.
Pre-COVID-19	SSE	-15.58113	0.0000
	S&P500	-17.60435	0.0000
	JCI	-15.35624	0.0000
	KLCI	-16.59316	0.0000
	PSEI	-13.91481	0.0000
	STI	-14.97739	0.0000
	M	-16.25118	0.0000
	VNI	-14.92557	0.0000
During COVID-19	SSE	-9.469952	0.0000
	S&P500	-10.5615	0.0000
	JCI	-8.54646	0.0000
	KLCI	-8.565419	0.0000
	PSEI	-9.619951	0.0000
	STI	-9.765707	0.0000
	SETI	-9.620367	0.0000
	VNI	-8.257515	0.0000
Post-COVID-19	SSE	-14.82497	0.0000
	S&P500	-14.0723	0.0000
	JCI	-15.30608	0.0000
	KLCI	-8.358109	0.0000
	PSEI	-15.59198	0.0000
	STI	-14.69675	0.0000
	SETI	-14.88337	0.0000
	VNI	-15.06547	0.0000
Rusia-Ukraine War	SSE	-16.84497	0.0000
	S&P500	-16.9318	0.0000
	JCI	-10.43999	0.0000
	KLCI	-17.68	0.0000
	PSEI	-17.73197	0.0000
	STI	-15.69512	0.0000
	SETI	-16.22851	0.0000
	VNI	-16.86314	0.0000
All Periods	SSE	-29.12072	0.0000
	S&P500	-7.019662	0.0000
	JCI	-27.73792	0.0000
	KLCI	-18.60629	0.0000
	PSEI	-30.62560	0.0000
	STI	-8.179488	0.0000
	SETI	-8.524,969	0.0000
	VNI	-8.772,887	0.0000

Source: Bloomberg, processed.

Table 2
Normality test results

Pre-COVID-19									
Period	Mean	Median	Max	Min	SD	Skewness	Kurtosis	Jarque-Bera	Prob.
SSE (CHINA)	0.000674	0.000000	0.048859	-0.051847	0.012339	0.006992	5.239685	51.41793	0.0000*
S&P500 (US)	0.000822	0.001485	0.048934	-0.036206	0.010272	-0.26975	6.297411	114.4310	0.0000*
JCI (Indonesia)	0.000335	0.001058	0.021367	-0.025942	0.008038	-0.22525	3.493089	0.015831	0.1016**
KLCI (Malaysia)	-0.00029	0.000000	0.022512	-0.018583	0.005931	-0.05549	4.142960	13.51644	0.0011*
PSEi (Phillipines)	0.000317	-0.000125	0.028175	-0.029401	0.010322	0.061011	3.281621	0.965549	0.6170**
STI (Singapore)	0.000286	0.000000	0.026053	-0.022158	0.007336	0.086258	3.750445	6.077528	0.0478*
SETi (Thailand)	-0.00011	0.000000	0.027160	-0.024451	0.007324	-0.01122	4.071356	11.77016	0.0027*
VNi (Vietnam)	-6.75E-05	4.52E-05	0.025687	-0.054749	0.008893	-0.96263	9.287435	443.1943	0.0000*
During COVID-19									
SSE (CHINA)	0.002212	0.002467	0.162526	-0.102614	0.025078	2.198534	24.43332	1675.525	0.0000*
S&P500 (US)	0.002656	0.000581	0.247884	-0.119841	0.043445	1.964133	14.43428	511.6094	0.0000*
JCI (Indonesia)	0.001190	-0.000787	0.321822	-0.078831	0.043489	4.802168	36.76305	4312.654	0.0000*
KLCI (Malaysia)	0.000398	0.000000	0.167955	-0.052854	0.025034	3.551452	25.88672	2009.886	0.0000*
PSEi (Phillipines)	0.000462	-6.85E-05	0.310711	-0.133458	0.046637	3.318781	26.00203	2006.027	0.0000*
STI (Singapore)	-0.00062	-0.000546	0.103901	-0.073444	0.025613	0.662920	7.073963	64.24260	0.0000*
SETi (Thailand)	6.15E-05	0.001701	0.126860	-0.107994	0.032287	-0.08485	7.143831	60.20049	0.0000*
VNi (Vietnam)	0.002250	0.002380	0.257802	-0.063865	0.036042	4.100526	31.65826	3109.936	0.0000*
Post-COVID-19									
SSE (CHINA)	-0.00013	-5.09E-05	0.030694	-0.047662	0.010292	-0.39372	5.076119	41.29172	0.0000*
S&P500 (US)	0.000508	0.000954	0.030173	-0.030552	0.009939	0.130528	3.790957	5.810268	0.0547**
JCI (Indonesia)	0.000423	0.001091	0.031283	-0.040402	0.009492	0.012887	5.205987	40.76149	0.0000*
KLCI (Malaysia)	-1.95E-06	0.000152	0.020323	-0.022173	0.007106	-0.16570	3.264373	1.505244	0.4711**
PSEi (Phillipines)	0.000248	0.000000	0.075593	-0.036568	0.013801	0.635567	7.282586	167.1342	0.0000*
STI (Singapore)	0.000613	0.000713	0.037011	-0.020539	0.007613	0.365308	5.366262	51.36384	0.0000*
SETi (Thailand)	0.000599	0.000705	0.026634	-0.023766	0.007931	0.062359	4.131839	10.85914	0.0043*
VNi (Vietnam)	0.001407	0.002128	0.053322	-0.046104	0.014499	-0.55055	5.009450	43.97156	0.0000*
Russia-Ukraine War									
SSE (CHINA)	-0.00024	-0.000563	0.037978	-0.051317	0.011422	-0.45074	5.600246	89.94098	0.0000*
S&P500 (US)	0.000288	-0.000374	0.055434	-0.069099	0.014664	-0.22542	5.004306	50.11849	0.0000*
JCI (Indonesia)	0.000110	0.000493	0.022416	-0.044151	0.008252	-0.68423	6.221754	145.4976	0.0000*
KLCI (Malaysia)	-0.00025	-0.000497	0.029816	-0.030132	0.007490	-0.11254	4.459995	25.91423	0.0000*
PSEi (Phillipines)	-0.00039	0.000642	0.033780	-0.042582	0.013022	-0.28615	3.521325	7.116778	0.0284*
STI (Singapore)	-3.01E-05	0.000124	0.031167	-0.021873	0.007789	0.050129	3.517160	3.295383	0.1924**
SETi (Thailand)	-0.00015	4.68E-05	0.026977	-0.037926	0.008376	-0.56761	5.717282	102.9842	0.0000*
VNi (Vietnam)	-0.00068	0.000597	0.042199	-0.111217	0.015767	-1.84082	12.95331	1262.316	0.0000*
All Periods									
SSE (CHINA)	0.000312	0.000000	0.162526	-0.102614	0.013485	1.420139	32.84825	30565.50	0.0000*
S&P500 (US)	0.000747	0.000821	0.247884	-0.119841	0.017988	2.909862	51.77549	82039.18	0.0000*

JCI (Indonesia)	0.000366	0.000640	0.321822	-0.078831	0.016061	9.727256	201.4576	1351972	0.0000*
KLCI (Malaysia)	-0.00013	-0.000170	0.167955	-0.052854	0.010314	5.199321	92.33414	275016.5	0.0000*
PSEi (Phillipines)	6.73E-05	2.22E-05	0.310711	-0.133458	0.018960	5.067637	97.18569	305104.7	0.0000*
STI (Singapore)	0.000162	0.000296	0.103901	-0.073444	0.010885	0.807001	22.48529	12997.58	0.0000*
SETi (Thailand)	6.55E-05	0.000153	0.126860	-0.107994	0.012739	-0.19370	30.36591	25467.47	0.0000*
VNi (Vietnam)	0.000340	0.000873	0.257802	-0.111217	0.017212	3.421940	68.29928	143694.5	0.0000*

Source: Bloomberg, processed.

Notes: GARCH model helped address this issue and managed abnormal data distribution using General Error Distribution (GED) method.
**Normally distributed (Gaussian)
*Not normally distributed (GED)

The Pearson Correlation Test was used to analyze stock market correlations across different periods. Table 3 shows, before COVID-19, markets showed a unidirectional or weakly positive correlation. During the COVID-19 crisis, the correlation became strong and positive, indicating that markets moved together closely. After COVID-19, and during the Russia-Ukraine war, correlations were positive but weak, except for China, which had a strong positive correlation with several countries. Over the combined periods, correlations remained weakly positive, suggesting that while stock markets tended to move in the same direction, the relationships were not strong, influenced by factors such as economic conditions, government policies, and global uncertainty. While, Table 4 shows the Johansen cointegration test results.

Table 3
Pearson Correlation Test Results

Pre-COVID-19								
	SSE	S&P500	JCI	KLCI	PSEI	STI	SETI	VNI
SSE	1	0.274**	0.249**	0.177**	0.163**	0.430**	0.211**	-0.052
S&P500	0.274**	1	0.224**	0.148**	-0.029**	0.421**	0.318**	0.016
JCI	0.249**	0.224**	1	0.509**	0.457**	0.358**	0.314**	0.01
KLCI	0.177**	0.148**	0.509**	1	0.416**	0.411**	0.395**	-0.005
PSEI	0.163**	-0.029	0.457**	0.416**	1	0.320**	0.289**	-0.089
STI	0.430**	0.421**	0.358**	0.411**	0.320**	1	0.521**	-0.03
SETI	0.211**	0.318**	0.314**	0.395**	0.289**	0.521**	1	-0.012
VNI	-0.052	0.016	0.01	-0.005	-0.089	-0.03	-0.012	1
During COVID-19								
	SSE	S&P500	JCI	KLCI	PSEI	STI	SETI	VNI
SSE	1	0.6555**	0.8060**	0.7761**	0.7389**	0.7147**	0.6320**	0.8029**
S&P500	0.655**	1	0.7014**	0.5972**	0.7333**	0.6501**	0.6159**	0.6726**
JCI	0.8060**	0.7014**	1	0.8455**	0.8993**	0.7433**	0.6990**	0.8642**
KLCI	0.7761**	0.5972**	0.8455**	1	0.8062**	0.7906**	0.7166**	0.7640**
PSEI	0.7389**	0.7333**	0.8993**	0.8062**	1	0.7467**	0.7046**	0.8065**
STI	0.7147**	0.6501**	0.7433**	0.7906**	0.7467**	1	0.7767**	0.6993**
SETI	0.6320**	0.6159**	0.6990**	0.7166**	0.7046**	0.7767**	1	0.6647**

VNI	0.8029**	0.6726**	0.8642**	0.7640**	0.8065**	0.6993**	0.6647**	1
				Post-COVID-19				
	SSE	S&P500	JCI	KLCI	PSEI	STI	SETI	VNI
SSE	1	0.146**	0.334**	0.143**	0.150**	0.177**	0.297**	0.182**
S&P500	0.146**	1	0.263**	0.152**	0.148**	0.173**	0.155**	0.128**
JCI	0.334**	0.263**	1	0.248**	0.294**	0.371**	0.404**	0.238**
KLCI	0.143**	0.152**	0.248**	1	0.269**	0.257**	0.394**	0.066
PSEI	0.150**	0.148**	0.294**	0.269**	1	0.224**	0.294**	0.0821
STI	0.177**	0.173**	0.371**	0.257**	0.224**	1	0.399**	-0.032
SETI	0.297**	0.155**	0.404**	0.394**	0.294**	0.399**	1	0.058
VNI	0.182**	0.128**	0.238**	0.066	0.082	-0.032	0.058	1
				Russia-Ukraine War				
	SSE	S&P500	JCI	KLCI	PSEI	STI	SETI	VNI
SSE	1	0.067	0.069	0.263**	0.133**	0.223**	0.330**	0.220**
S&P500	0.067	1	0.195**	0.259**	0.105**	0.226**	0.306**	0.058
JCI	0.069	0.195**	1	0.409**	0.251**	0.334**	0.353**	0.290**
KLCI	0.263**	0.259**	0.409**	1	0.366**	0.396**	0.509**	0.319**
PSEI	0.133**	0.105**	0.251**	0.366**	1	0.318**	0.247**	0.151**
STI	0.223**	0.226**	0.334**	0.396**	0.318**	1	0.420**	0.233**
SETI	0.330**	0.306**	0.353**	0.509**	0.247**	0.420**	1	0.315**
VNI	0.220**	0.058	0.290**	0.319**	0.151**	0.233**	0.315**	1
				All Periods				
	SSE	S&P500	JCI	KLCI	PSEI	STI	SETI	VNI
SSE	1	0.3812**	0.4996**	0.4633**	0.4204**	0.4707**	0.4365**	0.4047**
S&P500	0.3812**	1	0.5410**	0.4428**	0.4819**	0.4906**	0.4880**	0.3856**
JCI	0.4996**	0.5410**	1	0.6921**	0.7130**	0.6009**	0.5948**	0.5821**
KLCI	0.4633**	0.4428**	0.6921**	1	0.6301**	0.6127**	0.6163**	0.4832**
PSEI	0.4204**	0.4819**	0.7130**	0.6301**	1	0.5607**	0.5483**	0.4671**
STI	0.4707**	0.4906**	0.6009**	0.6127**	0.5607**	1	0.6461**	0.3997**
SETI	0.4365**	0.4880**	0.5948**	0.6163**	0.5483**	0.6461**	1	0.4353**
VNI	0.4047**	0.3856**	0.5821**	0.4832**	0.4671**	0.3997**	0.4353**	1

Source: Bloomberg, processed.

** Correlation significant at 0.01 level (2-tailed)

Table 4
Johansen Cointegration Test Results

Hypothesized No. Of CE(s)	Eigen-value	Trace Statistic	0.05 Critical Value	Max-Eigen Statistic	0.05 Critical Value	Prob.
			Pre-COVID-19			
JCI-SSE						
None*	0.188805	99.87441	15.49471	50.42848	14.2646	0.0000
At Most 1*	0.185491	49.44592	3.841466	49.44592	3.841466	0.0000
JCI-SP&500						
None*	0.199296	100.9485	15.49471	53.56547	14.2646	0.0000
At Most 1*	0.178489	47.38301	3.841466	47.38301	3.841466	0.0000
JCI-KLCI						
None*	0.20411	104.716	15.49471	55.01883	14.2646	0.0000
At Most 1*	0.18634	49.69718	3.841466	49.69718	3.841466	0.0000
JCI-PSEI						
None*	0.25362	119.3829	15.49471	70.49749	14.2646	0.0000
At Most 1*	0.183594	48.8854	3.841466	48.8854	3.841466	0.0000

JCI-STI						
None*	0.202821	90.73103	15.49471	54.62888	14.2646	0.0000
At Most 1*	0.139121	36.10214	3.841466	36.10214	3.841466	0.0000
JCI-SETI						
None*	0.203053	99.49917	15.49471	54.69914	14.2646	0.0000
At Most 1*	0.169637	44.80003	3.841466	44.80003	3.841466	0.0000
JCI-VNI						
None*	0.192375	93.88098	15.49471	51.49152	14.2646	0.0000
At Most 1*	0.16129	42.38946	3.841466	42.38946	3.841466	0.0000
During COVID-19						
JCI-SSE						
None*	0.384208	58.35747	15.49471	39.27254	14.26460	0.0000
At Most 1*	0.209916	19.08493	3.841466	19.08493	3.841466	0.0000
JCI-SP&500						
None*	0.349697	53.67278	15.49471	34.85572	14.26460	0.0000
At Most 1*	0.207299	18.81706	3.841466	18.81706	3.841466	0.0000
JCI-KLCI						
None*	0.373349	59.28502	15.49471	37.85658	14.26460	0.0000
At Most 1*	0.232448	21.42844	3.841466	21.42844	3.841466	0.0000
JCI-PSEI						
None*	0.412498	62.53053	15.49471	43.08199	14.26460	0.0000
At Most 1*	0.213455	19.44854	3.841466	19.44854	3.841466	0.0000
JCI-STI						
None*	0.297697	46.50174	15.49471	28.62465	14.26460	0.0002
At Most 1*	0.198047	17.87709	3.841466	17.87709	3.841466	0.0000
JCI-SETI						
None*	0.252741	40.06895	15.49471	23.59886	14.26460	0.0013
At Most 1*	0.183995	16.47009	3.841466	16.47009	3.841466	0.0000
JCI-VNI						
None*	0.262285	43.36991	15.49471	24.64001	14.26460	0.0008
At Most 1*	0.206446	18.72990	3.841466	18.72990	3.841466	0.0000
Post-COVID-19						
JCI-SSE						
None*	0.277069	99.45122	15.49471	63.59055	14.26460	0.0000
At Most 1*	0.167201	35.86067	3.841466	35.86067	3.841466	0.0000
JCI-SP&500						
None*	0.280311	92.66040	15.49471	64.47155	14.26460	0.0000
At Most 1*	0.133957	28.18885	3.841466	28.18885	3.841466	0.0000
JCI-KLCI						
None*	0.266870	87.58490	15.49471	60.84467	14.26460	0.0000
At Most 1*	0.127532	26.74023	3.841466	26.74023	3.841466	0.0000
JCI-PSEI						
None*	0.268781	100.0199	15.49471	61.35624	14.26460	0.0000
At Most 1*	0.179026	38.66365	3.841466	38.66365	3.841466	0.0000
JCI-STI						
None*	0.263095	91.46319	15.49471	59.83803	14.26460	0.0000
At Most 1*	0.149008	31.62517	3.841466	31.62517	3.841466	0.0000
JCI-SETI						
None*	0.272751	94.66505	15.49471	62.42325	14.26460	0.0000
At Most 1*	0.151681	32.24180	3.841466	32.24180	3.841466	0.0000
JCI-VNI						
None*	0.270658	101.3327	15.49471	61.86017	14.26460	0.0000
At Most 1*	0.182407	39.47255	3.841466	39.47255	3.841466	0.0000
Russia-Ukraine War						
JCI-SSE						
None*	0.173375	102.1181	15.49471	53.31303	14.26460	0.0000

At Most 1*	0.159958	48.80503	3.841466	48.80503	3.841466	0.0000
JCI-SP&500						
None*	0.201571	106.6790	15.49471	63.03056	14.26460	0.0000
At Most 1*	0.144344	43.64846	3.841466	43.64846	3.841466	0.0000
JCI-KLCI						
None*	0.184589	106.6093	15.49471	57.13755	14.26460	0.0000
At Most 1*	0.161956	49.47179	3.841466	49.47179	3.841466	0.0000
JCI-PSEI						
None*	0.208061	115.0077	15.49471	65.31592	14.26460	0.0000
At Most 1*	0.162614	49.69180	3.841466	49.69180	3.841466	0.0000
JCI-STI						
None*	0.181538	100.5438	15.49471	56.09191	14.26460	0.0000
At Most 1*	0.146796	44.45191	3.841466	44.45191	3.841466	0.0000
JCI-SETI						
None*	0.229329	119.4794	15.49471	72.93829	14.26460	0.0000
At Most 1*	0.153139	46.54111	3.841466	46.54111	3.841466	0.0000
JCI-VNI						
None*	0.193068	95.64543	15.49471	54.48705	14.26460	0.0000
At Most 1*	0.149594	41.15838	3.841466	41.15838	3.841466	0.0000
			All Periods			
JCI-SSE						
None*	0.181006	312.1752	15.49471	161.9398	14.26460	0.0001
At Most 1*	0.169101	150.2354	3.841466	150.2354	3.841466	0.0000
JCI-SP&500						
None*	0.199002	330.3074	15.49471	179.9578	14.26460	0.0001
At Most 1*	0.169218	150.3496	3.841466	150.3496	3.841466	0.0000
JCI-KLCI						
None*	0.214556	340.6845	15.49471	195.8618	14.26460	0.0001
At Most 1*	0.163537	144.8227	3.841466	144.8227	3.841466	0.0000
JCI-PSEI						
None*	0.201936	335.1367	15.49471	182.9348	14.26460	0.0001
At Most 1*	0.171113	152.2019	3.841466	152.2019	3.841466	0.0000
JCI-STI						
None*	0.172685	287.5661	15.49471	153.7412	14.26460	0.0001
At Most 1*	0.152117	133.8250	3.841466	133.8250	3.841466	0.0000
JCI-SETI						
None*	0.193062	327.9051	15.49471	173.9660	14.26460	0.0001
At Most 1*	0.172887	153.9391	3.841466	153.9391	3.841466	0.0000
JCI-VNI						
None*	0.199927	291.9543	15.49471	175.0965	14.26460	0.0001
At Most 1*	0.138313	116.8578	3.841466	116.8578	3.841466	0.0000

Source: Bloomberg, processed.

The Granger Causality Test is used to determine if one variable significantly influences another. A strong, moderate, or weak significance is shown at the 1%, 5%, and 10% levels, respectively, while values above 10% indicate no significant influence. Table 5 shows, before COVID-19, the S&P 500 strongly influenced the JCI, while JCI weakly influenced PSEI, STI, and SETI. During COVID-19, no significant influence was found between JCI and other markets. After COVID-19, SSE and S&P 500 moderately influenced JCI, but JCI did not influence them. During the Russia-Ukraine war, SETI weakly

influenced JCI, but JCI had no effect on other markets. Overall, the JCI was moderately or strongly influenced by STI, PSEI, and KLCI but did not significantly affect them or other markets.

Table 5
Granger Causality Test Results

Null Hypotesis	F-Statistic	Prob.
Pre-COVID-19		
SSE does not Granger Cause JCI	0.16118	0.8512
JCI does not Granger Cause SSE	1.03397	0.3572
S&P500 does not Granger Cause JCI	8.98207	0.0002***
JCI does not Granger Cause S&P500	0.07604	0.9268
KLCI does not Granger Cause JCI	0.19403	0.8238
JCI does not Granger Cause KLCI	0.56699	0.568
PSEI does not Granger Cause JCI	0.04662	0.9545
JCI does not Granger Cause PSEI	2.78287	0.0639*
STI does not Granger Cause JCI	0.49767	0.6086
JCI does not Granger Cause STI	2.61906	0.0750*
SETI does not Granger Cause JCI	0.16818	0.8453
JCI does not Granger Cause SETI	2.65367	0.0725*
VNI does not Granger Cause JCI	0.20032	0.8186
JCI does not Granger Cause VNI	0.45345	0.636
During COVID-19		
SSE does not Granger Cause JCI	0.18424	0.8321
JCI does not Granger Cause SSE	0.28449	0.7532
S&P500 does not Granger Cause JCI	2.51612	0.0874*
JCI does not Granger Cause S&P500	0.48944	0.6149
KLCI does not Granger Cause JCI	0.80341	0.4515
JCI does not Granger Cause KLCI	0.25659	0.7743
PSEI does not Granger Cause JCI	1.08057	0.3445
JCI does not Granger Cause PSEI	1.8011	0.172
STI does not Granger Cause JCI	2.06238	0.1341
JCI does not Granger Cause STI	0.39678	0.6738
SETI does not Granger Cause JCI	0.28265	0.7546
JCI does not Granger Cause SETI	0.00515	0.9949
VNI does not Granger Cause JCI	0.13273	0.8759
JCI does not Granger Cause VNI	0.17292	0.8415
Post-COVID-19		
SSE does not Granger Cause JCI	3.19641	0.0431**
JCI does not Granger Cause SSE	0.49054	0.6131
S&P500 does not Granger Cause JCI	3.08847	0.0478**
JCI does not Granger Cause S&P500	1.5981	0.2049
KLCI does not Granger Cause JCI	0.22579	0.7981
JCI does not Granger Cause KLCI	0.28064	0.7556
PSEI does not Granger Cause JCI	0.75998	0.4691
JCI does not Granger Cause PSEI	0.24211	0.7852
STI does not Granger Cause JCI	0.96417	0.3831
JCI does not Granger Cause STI	1.77643	0.172
SETI does not Granger Cause JCI	0.33578	0.7152
JCI does not Granger Cause SETI	0.09749	0.9072
VNI does not Granger Cause JCI	1.43947	0.2396

JCI does not Granger Cause VNI	0.378	0.6857
Russia-Ukraine War		
SSE does not Granger Cause JCI	0.62822	0.5343
JCI does not Granger Cause SSE	1.16513	0.3134
S&P500 does not Granger Cause JCI	10.3642	5.E-05***
JCI does not Granger Cause S&P500	0.06469	0.9374
KLCI does not Granger Cause JCI	1.50857	0.223
JCI does not Granger Cause KLCI	0.39017	0.6773
PSEI does not Granger Cause JCI	2.04695	0.1311
JCI does not Granger Cause PSEI	0.40779	0.6655
STI does not Granger Cause JCI	1.56347	0.2112
JCI does not Granger Cause STI	0.15716	0.8546
SETI does not Granger Cause JCI	2.59547	0.0764*
JCI does not Granger Cause SETI	2.18072	0.1149
VNI does not Granger Cause JCI	0.00597	0.994
JCI does not Granger Cause VNI	0.29696	0.7433
All Periods		
SSE does not Granger Cause JCI	0.13949	0.8698
JCI does not Granger Cause SSE	0.10077	0.9042
S&P500 does not Granger Cause JCI	10.0764	5.E-05***
JCI does not Granger Cause S&P500	0.57638	0.5622
KLCI does not Granger Cause JCI	3.37292	0.0348**
JCI does not Granger Cause KLCI	0.84614	0.4294
PSEI does not Granger Cause JCI	3.5254	0.0299**
JCI does not Granger Cause PSEI	4.25012	0.0146
STI does not Granger Cause JCI	5.316	0.0051***
JCI does not Granger Cause STI	0.74431	0.4754
SETI does not Granger Cause JCI	1.94	0.1444
JCI does not Granger Cause SETI	0.79025	0.4541
VNI does not Granger Cause JCI	0.17548	0.8391
JCI does not Granger Cause VNI	0.29696	0.7433

Source: Bloomberg, processed.

*** Significant at 1% level of significance
** Significant at 5% level of significance
*Significant at 10% level of significance

The EGARCH analysis is used to assess stock market volatility and capture asymmetry and leverage effects that traditional GARCH models may miss. The results in Table 6 show significant volatility effects at the 1% level across several global stock markets before, during, and after the COVID-19 crisis and the Russia-Ukraine conflict. The Indonesian stock market (JCI) showed strong integration with several Asian and global markets, indicated by a significant positive β1 coefficient, reflecting unidirectional price movements. However, JCI had no significant influence on VNI before COVID-19. Overall, the Indonesian market displayed strong linkages with other markets, indicating dynamic and closely integrated relationships.

Table 6
EGARCH (Exponential GARCH) Test Results

Pre-COVID-19 Period					
	Mean Equation			Variance Equation	
Coefficients	SSE	JCI	Coefficients	SSE	JCI
β0	0.00031	0.00068	Ø0	-1.81501	-0.13456
β1	0.14359***	0.22395***	Ø1	0.17936	0.07277
αSSE	-0.2346	0.52824	∂	-0.11727	0.07759*
αJCI	0.21101	-0.51322	Ø	0.82894***	0.99156***
Coefficients	S&P500	JCI	Coefficients	S&P500	JCI
β0	0.00014	0.00109**	Ø0	-1.08297	-0.49869**
β1	0.15197***	0.15336***	Ø1	0.1053	0.05438
αSP_500	0.3503	-0.63702***	∂	-0.12725**	-0.22555***
αJCI	-0.46659	0.55117***	Ø	0.89793***	0.95401***
Coefficients	KLCI	JCI	Coefficients	KLCI	JCI
β0	0.0004	-0.00018	Ø0	-2.78031*	-11.7866***
β1	0.65718***	0.35251***	Ø1	0.22920**	-0.47221***
αKLCI	-0.25808	0.33085	∂	-0.17703**	0.18625*
αJCI	0.28235	-0.38094	Ø	0.74077***	-0.14303
Coefficients	PSei	JCI	Coefficients	PSei	JCI
β0	-0.00016***	0.00017	Ø0	-1.39554*	-0.19856***
β1	0.34141***	0.61637***	Ø1	0.0521	-0.09919**
αPSei	0.93371***	0.31330*	∂	-0.20055**	0.01199
αJCI	-0.99997***	-0.51756***	Ø	0.86462***	0.97148***
Coefficients	STI	JCI	Coefficients	STI	JCI
β0	-0.00025	0.00021	Ø0	-0.22820***	-9.97311
β1	0.38995***	0.31570***	Ø1	-0.10551*	0.01
αSTI	0.47141	0.005	∂	-0.07803***	0.01
αJCI	-0.47856	0.005	Ø	0.96804***	0.01
Coefficients	SETI	JCI	Coefficients	SETI	JCI
β0	0.00021	-0.00029	Ø0	-1.0084	-0.75951**
β1	0.30527***	0.28110***	Ø1	0.03132	-0.1490***
αSETI	-0.37536	-0.76126***	∂	-0.16987**	-0.19459***
αJCI	0.38394	0.76554***	Ø	0.89989***	0.91304***
Coefficients	VNI	JCI	Coefficients	VNI	JCI
β0	0.00042	-0.0002	Ø0	-1.44758	-15.1316***
β1	-0.02839	0.04469	Ø1	0.10882	-0.05056
αVNI	-0.22146	0.07012	∂	-0.13356**	0.21206
αJCI	0.21686	-0.08242	Ø	0.86032***	-0.59603**
During COVID-19 Period					
	Mean Equation			Variance Equation	
Coefficients	SSE	JCI	Coefficients	SSE	JCI
β0	-0.00219**	0.00190*	Ø0	-7.35752	-3.52393**
β1	1.18038***	0.46684***	Ø1	0.33137	0.29531
αSSE	-0.05731	-0.33246	∂	-0.09186	-0.20483
αJCI	-0.05019	0.12343	Ø	0.02522	0.63005***
Coefficients	S&P500	JCI	Coefficients	S&P500	JCI
β0	0.00110**	2.09E-05	Ø0	-0.8985	-0.27934
β1	0.53313***	0.69927***	Ø1	0.27396	-0.25355

αSSE	-0.00482	0.61230***	∂	-0.3674	-0.48010***
αJCI	-0.03953	-0.78793***	Ø	0.90448***	0.92693***
Coefficients	KLCI	JCI	Coefficients	KLCI	JCI
β0	-0.00239	-0.00030***	Ø0	-0.32803***	-8.48742
β1	1.28766***	0.37975***	Ø1	-0.36000***	0.2693
αSSE	-0.06838	-0.18929	∂	-0.25744***	0.16016
αJCI	0.14149	0.35694**	Ø	0.920103***	0.00677
Coefficients	PSei	JCI	Coefficients	PSei	JCI
β0	-0.00047	-0.00113**	Ø0	-7.75828	-0.17185
β1	0.75501***	0.95763***	Ø1	0.05682	-0.23614
αSSE	-0.08067**	0.75022***	∂	-0.28954	-0.27360***
αJCI	-0.07508**	-0.96215***	Ø	-0.01262	0.95063***
Coefficients	STI	JCI	Coefficients	STI	JCI
β0	-0.00073	-0.00132	Ø0	-7.14993**	-0.08246
β1	0.82475***	0.33125***	Ø1	-0.21754	-0.34290***
αSSE	-0.00598	-0.14254	∂	-1.08708	-0.39138***
αJCI	0.00984	0.11703	Ø	0.02669	0.96406***
Coefficients	SETI	JCI	Coefficients	SETI	JCI
β0	-0.00155***	0.00076***	Ø0	-10.6739**	-7.56278
β1	0.58111***	0.51718***	Ø1	0.13445	0.26103
αSSE	-0.0097	-0.06606	∂	-0.56569	0.39311
αJCI	0.01261	-0.06019	Ø	-0.47912	0.00347
Coefficients	VNI	JCI	Coefficients	VNI	JCI
β0	-0.00407**	0.00082	Ø0	-0.13916	-8.83602
β1	0.62649***	0.67004***	Ø1	-0.31069***	-0.32376
αSSE	-0.63741**	0.42707	∂	-0.38206***	0.17805
αJCI	0.72126***	-0.16257	Ø	0.94780***	-0.12531
		Post-COVID-19 Period			
	Mean Equation			Variance Equation	
Coefficients	SSE	JCI	Coefficients	SSE	JCI
β0	0.00041	0.00023	Ø0	-0.58965***	-11.9962
β1	0.21626***	0.32968***	Ø1	-0.23667***	-0.15517
αSSE	0.424	-0.86164***	∂	-0.03792	0.07373
αJCI	-0.49230*	0.80820***	Ø	0.91936***	-0.30073
Coefficients	S&P500	JCI	Coefficients	S&P500	JCI
β0	0.00031	0.00112***	Ø0	-0.49944***	-0.42024***
β1	0.20867***	0.11954*	Ø1	-0.22860***	-0.19489**
αSSE	0.34833	0.93792***	∂	-0.0354	-0.22181***
αJCI	-0.42187	-0.98544***	Ø	0.92943***	0.93931***
Coefficients	KLCI	JCI	Coefficients	KLCI	JCI
β0	0.00036	4.88E+00	Ø0	-0.52855***	-0.55941***
β1	0.31237***	0.17159***	Ø1	-0.23848***	-0.20209***
αSSE	0.23209	-0.57099***	∂	-0.08475***	0.135892***
αJCI	-0.31245	0.38337*	Ø	0.925527***	0.927662***
Coefficients	PSei	JCI	Coefficients	PSei	JCI
β0	0.000413	-0.00037	Ø0	-0.53506***	-0.46252***
β1	0.124596***	0.36928***	Ø1	-0.23266***	-0.10006
αSSE	0.305309	-0.62323**	∂	-0.06602**	-0.22136***
αJCI	-0.452715	0.52491*	Ø	0.92570***	0.93842***

Coefficients	STI	JCI	Coefficients	STI	JCI
β0	0.00037	0.0005	Ø0	-0.22335***	-11.1813***
β1	0.44677***	0.27737***	Ø1	-0.13249**	0.48245***
αSSE	0.25721	-0.2628	∂	-0.03393	-0.101
αJCI	-0.39751	0.11726	Ø	0.96675***	-0.0835
Coefficients	SETI	JCI	Coefficients	SETI	JCI
β0	-5.07E-05	0.00059	Ø0	-0.36657***	-15.4680***
β1	0.41203***	0.29343***	Ø1	-0.20069***	-0.12126
αSSE	0.40921	-0.53537	∂	-0.05977*	-0.22994*
αJCI	-0.47955	0.45407	Ø	0.94598***	-0.57220*
Coefficients	VNI	JCI	Coefficients	VNI	JCI
β0	0.0005	0.00149***	Ø0	-1.34242	-8.58241**
β1	0.14223***	0.46693***	Ø1	-0.03145	0.37266
αSSE	0.43411*	0.01602	∂	-0.06578	-0.06844
αJCI	-0.55457	-0.11775	Ø	0.85637***	0.02018
		Russia Ukraine War Period			
	Mean Equation			Variance Equation	
Coefficients	SSE	JCI	Coefficients	SSE	JCI
β0	0.00068*	-0.00041***	Ø0	-9.40312*	-4.41422***
β1	0.06328*	0.14849	Ø1	0.37060*	0.16637
αSSE	-0.98465***	0.94294***	∂	0.06388	-0.33503***
αJCI	0.99893***	-0.99754***	Ø	0.05825	0.52996***
Coefficients	S&P500	JCI	Coefficients	S&P500	JCI
β0	0.00041	-0.00062	Ø0	-15.9910***	-0.083892
β1	0.07765***	0.45249***	Ø1	0.294120*	-0.058671
αSSE	-0.98634***	-0.98973***	∂	0.113373	-0.12809***
αJCI	0.99943***	0.99531***	Ø	-0.616808	0.984873***
Coefficients	KLCI	JCI	Coefficients	KLCI	JCI
β0	0.00049	-0.00057	Ø0	-1.09106	-0.04639*
β1	0.39916***	0.34384***	Ø1	0.23467*	-0.03287
αSSE	-0.99106***	0.22856	∂	-0.0671	-0.0482
αJCI	0.99559***	-0.23557	Ø	0.90835***	0.99326***
Coefficients	PSei	JCI	Coefficients	PSei	JCI
β0	0.00033	-0.00079***	Ø0	-9.80700*	-0.19816***
β1	0.14779***	0.52703***	Ø1	0.34168*	-0.11335***
αSSE	-0.98042***	0.90403***	∂	0.00621	-0.13081***
αJCI	0.99998***	-0.98478***	Ø	0.02254	0.96787***
Coefficients	STI	JCI	Coefficients	STI	JCI
β0	0.0004	-0.00053	Ø0	-1.00228	-0.11913***
β1	0.31605***	0.30132	Ø1	0.20301	-0.07433
αSSE	-0.98760***	0.33807	∂	-0.03093	-0.06806*
αJCI	0.99659***	-0.29655	Ø	0.91343***	0.98173***
Coefficients	SETI	JCI	Coefficients	SETI	JCI
β0	0.00025	-0.00022	Ø0	-9.71833	-0.82947***
β1	0.29223***	0.28948***	Ø1	0.21052	-0.32138***
αSSE	-0.98566***	-0.51009	∂	0.07199	-0.26983***
αJCI	0.99998***	0.56657	Ø	0.02326	0.89189***
Coefficients	VNI	JCI	Coefficients	VNI	JCI
β0	0.00035	0.00024	Ø0	-9.75728	-0.90621***

β1	0.12490***	0.23877***	Ø1	0.27308	0.03079
αSSE	-0.98407***	-0.65667	∂	-0.00485	-0.22590***
αJCI	0.99998***	0.67567	Ø	0.02304	0.89818***

All Periods

	Mean Equation			Variance Equation	
Coefficients	SSE	JCI	Coefficients	SSE	JCI
β0	0.00027	-1.01E-05	Ø0	-0.16355***	-2.21545*
β1	0.14727***	0.35666***	Ø1	0.10300***	0.16826**
αSSE	-0.68587**	0.24277	∂	-0.09342***	-0.13439**
αJCI	0.67163**	-0.25094	Ø	0.99057***	0.76604***
Coefficients	S&P500	JCI	Coefficients	S&P500	JCI
β0	3.72E-05	0.00081***	Ø0	-8.59365	-0.32696***
β1	0.48564***	0.26148***	Ø1	0.01	0.15758***
αSSE	0.005	-0.51926***	∂	0.01	-0.18199***
αJCI	0.005	0.48186**	Ø	0.01	0.97731***
Coefficients	KLCI	JCI	Coefficients	KLCI	JCI
β0	0.00052	-0.00033***	Ø0	-0.13730***	-0.31898**
β1	0.51698***	0.37201***	Ø1	0.08759***	0.13726***
αSSE	0.19729	0.97082***	∂	-0.10763***	-0.005404
αJCI	-0.21694	-0.99867***	Ø	0.99266***	0.97812***
Coefficients	PSei	JCI	Coefficients	PSei	JCI
β0	0.00032	-0.00042*	Ø0	-0.13809***	-0.19518***
β1	0.25155***	0.64596***	Ø1	0.09367***	0.06617***
αSSE	0.10505	0.42215***	∂	-0.08880***	-0.11104***
αJCI	-0.1823	-0.59671***	Ø	0.99275***	0.98361***
Coefficients	STI	JCI	Coefficients	STI	JCI
β0	0.00013	-4.25E-05	Ø0	-0.10511**	-0.94725***
β1	0.45737***	0.32275***	Ø1	0.07423***	0.16311***
αSSE	-0.25243	0.97999***	∂	-0.09394***	-0.10828***
αJCI	0.21845	-0.99719***	Ø	0.99460***	0.91552***
Coefficients	SETI	JCI	Coefficients	SETI	JCI
β0	0.00029	-0.00014	Ø0	-0.14518***	-0.18842***
β1	0.40339***	0.35746***	Ø1	0.08237***	0.061365**
αSSE	-0.69832**	-0.75428***	∂	-0.08974***	-0.12661***
αJCI	0.6871	0.76044***	Ø	0.99096***	0.98520***
Coefficients	VNI	JCI	Coefficients	VNI	JCI
β0	0.00021	0.00044*	Ø0	-0.15051***	-0.19405**
β1	0.12866***	0.19640***	Ø1	0.09794***	0.10482***
αSSE	-0.99587***	0.33148	∂	-0.10035***	-0.04521**
αJCI	0.99310***	-0.32046	Ø	0.99165***	0.98577***

Source: Bloomberg, processed.

*** Significant at 1% level of significance
** Significant at 5% level of significance
*Significant at 10% level of significance

Discussion

The finding shows strong integration between the Indonesian stock market (JCI) and several Asian and global markets, such as the SSE, S&P 500, KLCI, PSEi, STI, and SETI. The Pearson Correlation test confirms a correlation between these markets, with generally positive but varying strengths across different periods. Vietnam's stock market (VNI) often diverges, showing a negative correlation in some periods. The Johansen cointegration test indicates a stable long-term relationship between the JCI and other markets, while the Granger Causality test reveals varying causal influences, depending on the period. The EGARCH analysis also demonstrates strong integration, with a significant β1 coefficient indicating unidirectional price movements. During crises, such as COVID-19 and the Russia-Ukraine conflict, interconnectedness tends to increase. Overall, the results highlight strong linkages between the Indonesian and other global stock markets, crucial for investment analysis and decision-making. This will lead to less benefit of global portfolio diversification strategy.

This result is in line with the research of Song et al. (2022), which shows that the Chinese and US stock markets are mutually integrated and that comovement increased during the COVID-19 crisis. These findings also show that the two markets are strongly interdependent. Robiyanto (2018) also indicates that the Indonesian stock market integrates with others. It shows the importance of considering stock market integration in decision-making in the Indonesian capital market. Ramos-Requena et al. (2020) also proved with a new method called HP (Hilbert-Huang Transform), which measures the dependence between two data sets. It is demonstrated in this study that the method can prove the relationship or comovement, especially in correlation, cointegration, and non-linear relationship of each research variable.

Conclusions

This research investigates the Indonesian capital market (JCI) integration with Asian and global capital markets during the COVID-19 crisis and Russia-Ukraine war. The approach taken in analyzing this phenomenon includes the use of closing price time series data for the United States S&P 500 index, Shanghai Composite, Indonesia Stock Exchange, Thailand SET, FTSE Straits Times Singapore, Philippine Stock Exchange, Kuala Lumpur Stock Exchange, and Vietnam Securities Exchange. This research mainly focuses on the analysis of return on correlation, cointegration, and integration of the Indonesian stock market with various stock markets in ASEAN-6 and globally. The approach used to support this research is the EGARCH model. The research results found that there was an integration

relationship between the Indonesian stock market and the Asian and global stock markets, especially in the overall periods.

This study found that the Indonesian stock market has a positive influence on the United States stock market, Shanghai Composite, Thailand SET, FTSE Straits Times Singapore, Philippine Stock Exchange, and Kuala Lumpur Stock Exchange, and Vietnam Securities Exchange. This shows that integrating the Indonesian capital market with Asian and global capital markets could have a significant impact. Global crisis often trigger market volatility and economic uncertainty, affecting capital flows and share prices on various stock exchanges. In the context of the COVID-19 crisis, it can be seen that there has been a sharp decline in most stock market indices around the world in response to the economic and social uncertainty caused by the pandemic. The impact is uncertainty in each country's global economy, specifically each country's capital market. On the other hand, geopolitical conflict crises, such as the Russia-Ukraine conflict, can trigger broader tensions in global financial markets, increase political risks, and disrupt international trade and capital flows.

In such a context, attention to integrating the Indonesian capital market with Asian and global capital markets becomes crucial. This research provides a deeper understanding of the Indonesian stock market's response to international events and its relationship with capital markets in other regions. These findings can produce better insight into the relationship between regional and global capital markets and their effects on the Indonesian stock market. Apart from that, this study also forms the basis for developing investment policies and strategies. Understanding the integration of the Indonesian capital market with Asian and global capital markets can help investors and policymakers to anticipate and manage risks, as well as identify investment opportunities amidst global economic and geopolitical uncertainty. Specifically, an integration relationship between the Indonesian stock market and the Asian and global stock markets, need to be considered by investor or fund manager in order to make global portfolios. Integrated capital markets will make less benefit of global portfolio diversification strategy.

The limitation of this research is that it only focuses on the capital markets of the United States, China and ASEAN-6 in the COVID-19 and Russia-Ukraine war periods. Further analysis can compare the impact of the capital market crisis in the Israel-Hamas and Israel-Iran periods in the eastern states. In addition, to maximize the study, it is recommended that future researchers extend the research period because this research was only studied in the period of the global war crisis that has not yet ended. The method used in this study is considered good, but other advanced methods like the Kwiatkowski–Phillips–Schmidt–Shin (KPSS) test can be used in future studies.

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