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Cointegration Analysis of the Indonesian Stock Exchange with the Stock Exchanges of the United States, China, and Southeast Asia

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Abstract

This research investigates the long-term cointegration and short-run causality among seven key equity indices—Dow Jones Industrial Average (United States), Shanghai Composite (China), Hang Seng (Hong Kong, China), IDX Composite (Indonesia), FTSE Straits Times (Singapore), FTSE Malaysia KLCI (Malaysia), and SET Index (Thailand)—to assess the effectiveness of geographical portfolio diversification amid increasing globalization and liberalization of financial markets. Utilizing daily closing price data from January 2007 to February 2025, the study applies the Johansen and Engle-Granger cointegration tests, as well as the Vector Error Correction Model (VECM), across three distinct periods: 2007–2009, 2020–2022, and 2007–2025. The findings reveal that, over the 2007–2025 period, there is significant cointegration between the Hang Seng (Hong Kong) and IDX Composite (Indonesia), suggesting limited diversification benefits between these markets in the long run. During 2020–2022, cointegration is also observed between the FTSE Straits Times (Singapore) and IDX Composite (Indonesia), as well as between the Hang Seng and IDX Composite. Additionally, VECM analysis for 2007–2009 uncovers short-run causality from the Hang Seng to the Shanghai Composite, indicating dynamic interdependence during that period. Overall, the results highlight that while some Asian equity markets exhibit integration, others remain segmented, underscoring the importance of monitoring cointegration patterns when making international investment decisions.

Keywords: Southeast Asian Stock Indices; Hong Kong Stock Index; Cointegration; Diversification

INTRODUCTION

Currently, stock investment is increasingly connected to globalization and financial and trade liberalization in the capital market, so that foreign capital flows can easily move from one country to another (Obuobi et al., 2022; Peng et al., 2021). In addition, portfolio diversification can also be done geographically, where stock investments are carried out in addition to developed countries and also flow to developing countries in the hope of getting higher returns. Countries in Southeast Asia that have liberalized capital market trade include Singapore, which has been a financial center since the 1970s. Indonesia, which began to open the capital market gradually since the 1980s and the enactment of Law No. 25 of 2007, has increasingly opened itself up to the liberalization of international trade and foreign investment in Indonesia. In Thailand capital market liberalization was regulated through the Securities and Exchange Act B.E. 2535 (1992), in Malaysia financial liberalization began in the 1990s and in 2007 removed foreign ownership restrictions through the Capital Markets and Services Act 2007.

China began to open its capital market on a limited basis starting in the 2000s with the Qualified Foreign Institutional Investor (QFII) program in 2002. In 2014, the Shanghai-Hong Kong Stock Connect program was launched to enable cross-border investments, while Hong Kong has been an international financial hub since the 1960s where Hang Seng started in 1964. In the United States, open financial markets have been around since the beginning of the 20th century. The main rules governing stock investment include the Securities Act of 1933 and the Securities Exchange Act of 1934. According to Kusairi et al. (2023), states that "Some developing countries, as well as countries in transition, have become more open to FDI (Foreign Direct Investment) and are exploring ways to increase their inflows."

With the liberalization of the capital market, the liquidity of capital flows from foreign countries is easier to enter and exit, causing fluctuations in stock indices in various countries. Setyawan et al. (2021) stated that "The value and fluctuations of the index on a country's stock exchange reflect the situation and fluctuations of the country's economy. Along with the world free trade system, there is a linkage between the economies of countries in the world."

There is also a relationship between stock exchanges in the world as evidenced by the results of research on the cointegration between the stock markets of Indonesia, Singapore, Malaysia, Thailand, the Philippines, Vietnam and Laos from Aprianto et al. (2017). Using stock market data from 2011-2016 using the Engle Granger cointegration test, it was found that there was cointegration between the Indonesian stock exchange and the Malaysian, Thai, Philippines and Laos stock exchanges. Meanwhile, the Indonesian stock exchange is not cointegrated with the Singapore and Vietnam stock exchanges.

From the trade balance, Indonesia has the largest trade surplus in 2024 against the United States of USD 14,344.1 million and the largest trade deficit in 2024 against China of USD 10,290.1 million. The above inter-country trade data shows that the United States and China have a great influence in international trade with Indonesia.

Likewise, countries in the Southeast Asian region, especially Malaysia and Singapore, where the value of Indonesia's exports in 2024 from Indonesia will both reach USD 12 million and Thailand where the value of imports from Indonesia has reached USD 10 million in 2022 and 2023. This shows that Indonesia's trade with the United States, China, Malaysia, Singapore and Thailand has high activity.

Based on World Bank data, the world's largest Gross Domestic Income (GDP) according to (2025) in 2023 will be the United States of $ 27.72 trillion, followed by China of $ 17.79 trillion. As for the group of countries in Southeast Asia, according to the World Bank (2025), Indonesia has the highest GDP of $1.37 trillion, followed by Thailand at $514 billion and Singapore at $501 billion, while for Malaysia it has a GDP of $399 billion.

On a global scale, the United States and China show the largest and second largest economic power in the world, and for the Southeast Asian region, Indonesia, Thailand and Singapore are the top three in the order of GDP in Southeast Asia. An explanation of the relationship between economic relations between Indonesia and its neighboring countries, especially Malaysia and Singapore, is explained by Anhar et al. (2024:187), as follows:

Indonesia and Malaysia have similar types of export commodities in the plantation sector (oil palm and rubber) and mining such as tin. Meanwhile, Singapore dominates in the field of foreign investment in Foreign Investment in Indonesia. Within five years Singapore became the largest foreign investor in Indonesia, in 2019 their investment amounted to USD 6.5 billion, in 2020 it increased to USD 9.8 billion, in 2021 it increased to USD 9.4 billion, in 2022 it increased to USD 13.3 billion and in 2023 it was USD 15.4 billion.

By analyzing the level of GDP and trade activities globally and regionally, it shows that "The integration of the world, the shift in value that occurs within a region seems to have an effect on other countries in the world that conduct international trade." (Evendy and Isynuwardhana, 2015)

The study of stock market cointegration is very important because it is a direct consequence of globalization and has important implications for investors. According to Endri et.al (2024)

The high economic growth and globalization of developing countries, especially Asia, have increased integration and the shared movement of stock markets compared to developed countries. The liberalization of financial markets by many Asian countries has also led to explosive growth in international economic transactions and capital flows, especially their linkages with developed countries.

This phenomenon has attracted the interest of many researchers who want to investigate the dynamic linkages between emerging Asian stock markets and their linkages to developed stock markets.

In relation to international diversification, it will provide greater benefits than investing in the local market. In the long run, in the form of a return contribution... will be higher... Similarly, portfolio risk will be reduced by better diversification benefits through international diversification, (Tandelilin, 2010).

Based on a chart obtained from Yahoo finance, the performance of the Indonesian stock market with the code JKSE in 2025 is seen to be declining in line with the performance of the Thai stock market with the code SET. BK. Meanwhile, the performance of the United States capital market with the DJI code is seen to have increased in line with the movement of the Singapore capital market with the STI code. As for the performance of the Chinese capital market with the code 000001.SS seen to have the same downward pattern as JKSE and SET. BK at the end of 2024, then tends to stabilize in 2025. The Hong Kong capital market coded HSI has the same downward pattern as DJI and STI at the end of 2022 and has an upward trend in 2025, just like the American and Singapore capital markets. Meanwhile, the Malaysian capital market with the KLSE code does not follow the same pattern as other capital markets, and tends to be more stable without drastic increases or decreases.

Research conducted by Natalia (2020), which used tests with correlation tests and multiple regression tests, found that there is a relationship between the United States capital market, the Chinese capital market (Shanghai), and the Hong Kong capital market (Hang Seng) to the Indonesian capital market. This is different from the results of the research by Setyawan et al. (2021), where the results of the cointegration test showed that there was no integration between the Hang Seng capital market index, and the stock exchange in Indonesia (JCI), but there was bivariate cointegration in the index in the United States (DJIA) against the JCI. Likewise, there is a bivariate cointegration of the index in Malaysia (KLCI) against the JCI, the index in Japan (Nikkei) against the Hang Seng, the DJIA index against the KLCI and the Nikkei index against the KLCI.

Research in market integration and cointegration has been undertaken across various regions. Previous studies, such as Setyawan et al. (2021) and Aprianto et al. (2017), demonstrated significant cointegration among ASEAN stock markets, particularly Indonesia's IDX and the Malaysian, Thai, and Singaporean stock exchanges. Meanwhile, research by Caporale et al. (2022) examined the relationship between the U.S., Chinese, and Southeast Asian stock markets, identifying cointegration trends during the 2002-2020 period. These studies provide foundational insights but also highlight the ongoing uncertainty regarding market interdependencies, especially in light of recent global events like the COVID-19 pandemic, which has affected global stock market behavior differently over various periods.

According to Worthington and Higgs (2004) among APEC countries, namely Australia, Canada, Hong Kong, Japan, New Zealand, Singapore, the United States, China, Chile, Indonesia, Korea, Malaysia, Mexico, Peru, the Philippines, Russia, Taiwan and Thailand, the results of the Granger casualty test were obtained, that the Thai stock market is the most influential among the stock markets of APEC members. The Thai stock market affects Australia, Chile, Indonesia, Korea, Mexico and Singapore.

From some of the above researches, it was found that there is cointegration between the Indonesian stock market and the United States, China, Thailand, and Malaysia. Along with changes in geopolitical fluctuations in the world, and differences in observation periods, the results of the current research can be different from the results of previous research. Therefore, from the results of previous research, there are still uncertain conclusions about the cointegration between the stock market of one country and another.

In 2025, there will be an increase in trade conflicts between the United States and China, after President Donald Trump issued decisions regarding the addition of trade tariffs both to China, and globally, which made several stock markets in the world react, and to find out the relationships between the stock markets, research was carried out related to the cointegration between the stock markets of the United States, China, Hong Kong, Indonesia, Malaysia, Singapore and Thailand. The observation period was carried out from January 01, 2007 - February 28, 2025, with stock price data on the stock market in the United States (Dow Jones Industrial Average), China (Shanghai Composite), Hong Kong - China (Hang Seng), Indonesia (IDX Composite), Singapore (FTSE Straits Times Singapore), Malaysia (FTSE Malaysia KLCI) and Thailand (SET Index).

This study aims to analyze the long-term cointegration between the Indonesian stock exchange (IDX) and major global and Southeast Asian stock exchanges, including those of the U.S., China, Hong Kong, Malaysia, Singapore, and Thailand. Specifically, it seeks to investigate whether cointegration exists among the stock indices of these countries over different time periods (2007–2009, 2020–2022, and 2007–2025), explore how economic factors such as GDP and international trade influence the integration of stock markets, and identify the implications of stock market cointegration for international portfolio diversification. The findings of this research will provide crucial insights for several stakeholders. For investors, understanding the relationships between stock markets will help in making more informed decisions about portfolio diversification, potentially reducing risk and maximizing returns through international exposure. For policymakers, the results will offer guidance on the dynamics of market integration and the role of liberalization in enhancing financial market stability, both in Southeast Asia and globally. Furthermore, for academics and researchers, the study will contribute to the growing body of literature on financial market integration, providing a comprehensive analysis of stock market relationships across developed and emerging economies.

RESEARCH METHODS

Regarding the classification of research designs, Juanda (2009) explained that there are three types: exploratory research, descriptive research, and causal relationship research. In this study, the objective was to conduct a descriptive analysis using time series data to examine the relationship between the Indonesian stock market (IDX Composite) and the stock markets of the United States (Dow Jones Industrial Average), China (Shanghai Composite), Hong Kong (Hang Seng), Singapore (FTSE Straits Times), Malaysia (FTSE Malaysia KLCI), and Thailand (SET).

The research methodology employed was quantitative descriptive, utilizing correlative analysis techniques. The research process was deductive, with hypotheses formulated to address the research questions. These hypotheses were then tested using time series data processed through the Eviews application and cointegration tests, allowing for descriptive conclusions regarding the acceptance or rejection of the hypotheses.

The research paradigm was based on positivism, focusing on the phenomenon of relationships among stock indices in various countries using time series data. The research strategy involved longitudinal data collection over a ten-year period, from January 2007 to February 2025, using daily stock price indices from Indonesia, the United States, China, Hong Kong, Singapore, Malaysia, and Thailand. Data were obtained from books, research journals, websites, and other supporting sources.

The unit of analysis was at the organizational level, analyzing each country's stock index as a representation of its entire stock market (e.g., IDX Composite for Indonesia, Hang Seng for Hong Kong, DJIA for the United States). At the group level, the study categorized markets into three groups: Southeast Asian markets (Indonesia, Singapore, Malaysia, Thailand) and global markets (China, Hong Kong, United States).

The researcher's involvement was minimal, as the study relied solely on secondary data without direct interaction with subjects. The researcher's role was limited to data collection, processing, and statistical analysis. The research was conducted in a non-contrived, natural environment, with variables observed without intervention. Data were collected as the phenomena occurred naturally.

This research adopted a longitudinal time horizon, utilizing daily stock price index data from January 2007 to February 2025. The longitudinal approach was appropriate for cointegration research, which requires long-term data to capture structural changes and evolving patterns of market integration.

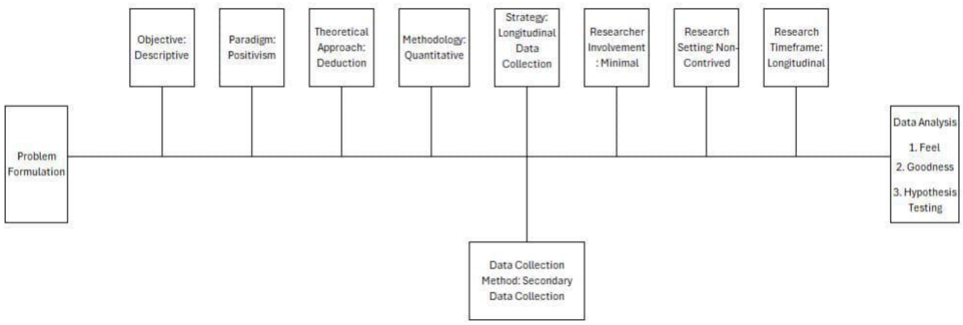

Figure 1. Research Methodology
Source: Research

The data collection method uses secondary data collection methods, through documentation techniques using information based on literature, both through previous research journals, books and information through websites such as *Investing.com*, *Investopedia* and

Yahoo Finance. The data analysis methods used were the root test of the Augmented Dickey-Fuller unit (ADF), the Johansen cointegration test, the Granger cointegration test and *the Vector Error Correction Model* (VECM) test using the Eviews application.

RESULT AND DISCUSSION

Research Results

Stationary Test and Optimal Lag Determination

The data stationer test is carried out to ensure that the data does not have a unit root that causes the data to be not stationary. In the test, unit *root test* was carried out using *the Eviews* 13 application, where the method chosen was ADF – Fisher. For the root test of this unit, testing was carried out at the level without constant and without trend (*level*) and testing at constant and without trend (*first difference*).

The test was carried out on the variables of the stock indices DJIA, JCI, FTSE KLCI, FTSE STS, SSE, Hang Seng and SET. The time period of the above variables is 2007 – 2025, 2007 – 2009 and 2020 – 2022. With the results of the data summarized in a single table for all three test periods.

Table 1. Stationer ADF Level Test Without Trend

Null Hypothesis: Unit root (individual unit root process)
Sample: 1/03/2007 2/28/2025
Exogenous variables: Individual effects
Automatic selection of maximum lags

Source: Reprocessed Eviews output (2025)

Method	Year 2007 - 2025		Year 2007 - 2009		Year 2020 - 2022	
	Statistic	**Prob.****	**Statistic**	**Prob.****	**Statistic**	**Prob.****
ADF - Fisher Chi-square	22.9034	0.0619	5.28236	0.9815	183.027	0.0000
ADF - Choi Z-stat	-1.12545	0.1302	1.31168	0.9052	-5.86701	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution.
All other tests assume asymptotic normality.

Intermediate ADF test results

Series	2007 - 2025 Prob.	Lag	Max Lag	Obs	2007 - 2009 Prob.	Lag	Max Lag	Obs	2020 - 2022 Prob.	Lag	Max Lag	Obs
D(DJIA)	0.9971	31	31	4706	0.7345	1	20	780	0.4978	9	20	773
D(FTSE_KLCI)	0.2721	25	31	4712	0.6796	3	20	778	0.0253	10	20	772

Intermediate ADF test results

	Year											
	2007 - 2025				**2007 - 2009**				**2020 - 2022**			
D(FTSE_STS)	0.103	24	31	4713	0.7561	0	20	781	0	0	20	782
D(HANG_SENG)	0.0649	31	31	4706	0.5682	0	20	781	0.1672	15	20	767
D(IHSG)	0.4333	5	31	4732	0.6958	1	20	780	0.6641	5	20	777
D(SET)	0.3263	6	31	4723	0.7028	2	20	779	0.4311	5	20	777
D(SSE)	0.0414	26	31	4711	0.6796	4	20	777	0.4142	6	20	776

Based on table 2, it is known that the results of the root test at the level show non-stationary data, where the probability of all variables is above 0.0000. This is in accordance with the research results of Endri et al. (2024), Setyawan et al. (2021) and Aprianto et al. (2017).

Table 2. ADF First Difference Stationer Test Without Trend

Null Hypothesis: Unit root (individual unit root process)
Series : DJIA, FTSE_KLCI, FTSE_STS, HANG_SENG, IHSG, SET, SSE
Sample: 1/03/2007 2/28/2025
Exogenous variables: Individual effects
Automatic selection of maximum lags

Method	**Year**		**Year**		**Year**	
	2007 – 2025		**2007 - 2009**		**2020 - 2022**	
	Statistic	Prob.**	Statistic	Prob.**	Statistic	Prob.**
ADF - Fisher Chi-square	1105.53	0.0000	1066.46	0.0000	604.041	0.0000
ADF - Choi Z-stat	-32.3775	0.0000	-31.7938	0.0000	-23.4605	0.0000

Source: Reprocessed Eviews output (2025)

**** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution.**
All other tests assume asymptotic normality.

Intermediate ADF test results

	Year											
	2007 – 2025				**2007 - 2009**				**2020 - 2022**			
Series	**Prob.**	**Lag**	**Max Lag**	**Obs**	**Prob.**	**Lag**	**Max Lag**	**Obs**	**Prob.**	**Lag**	**Max Lag**	**Obs**
D(DJIA)	0.0000	31	31	4705	0.0000	0	20	780	0.0000	8	20	773
D(FTSE_KLCI)	0.0000	24	31	4712	0.0000	2	20	778	0.0000	9	20	772
D(FTSE_STS)	0.0000	23	31	4713	0.0000	0	20	780	0.0000	17	20	764

**** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution.**

All other tests assume asymptotic normality.

Intermediate ADF test results

	Year											
	2007 – 2025				2007 - 2009				2020 - 2022			
Series	**Prob.**	**Lag**	**Max Lag**	**Obs**	**Prob.**	**Lag**	**Max Lag**	**Obs**	**Prob.**	**Lag**	**Max Lag**	**Obs**
D(HANG_SENG)	0.0000	30	31	4706	0.0000	0	20	780	0.0000	19	20	762
D(IHSG)	0.0000	4	31	4732	0.0000	0	20	780	0.0000	4	20	777
D(SET)	0.0000	5	31	4723	0.0000	1	20	779	0.0000	4	20	777
D(SSE)	0.0000	25	31	4711	0.0000	3	20	777	0.0000	5	20	776

Meanwhile, after testing the root of the unit at the first difference level, seen in table 4.3, it is known that the probability of all variables is smaller than the significance level, which is prob 0.0000. The results of the unit root test at the first difference window have stationary data results. The root testing of this unit had the same results as Setyawan et al. (2021) and Aprianto et al. (2017).

The next step is to determine the optimal lag. In this study, there are three different optimal lags for the period 2007-2025, 2007-2009 and 2020-2022. In the test using Eviews 13, there were five types of optimal lag tests, namely the LR test, Final Predicton Error (FPE), Akaike Information Criterion (AIC), Schwatz Criterion (SC), and Hannah Quinn Information Criterion (HQ). In this study, the Akaike Information Criterion (AIC) was used.

Table 3. Optimal Lag Test for the Period 2007-2025

VAR Lag Order Selection Criteria
Endogenous variables: DJIA IHSG FTSE KLCI FTSE STS SSE HANG_SENG SET
Exogenous variables: C
Date: 05/31/25 Time: 07:33
Sample: 1/03/2007 2/28/2025
Included observations: 4721

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-258905.8	NA	1.02e+39	109.6856	109.6952	109.6889
1	-181022.1	155503.4	4.88e+24	76.71178	76.78840	76.73871
2	-180419.4	1201.631	3.86e+24	76.47719	76.62087	76.52769
3	-180248.3	340.6287	3.66e+24	76.42546	76.63618	76.49953
4	-180127.0	241.0994	3.55e+24	76.39484	76.67260	76.49247
5	-179993.9	264.2549	3.43e+24	76.35919	76.70400	76.48039
6	-179489.3	1000.039	2.83e+24	76.16617	76.57803*	76.31094*
7	-179433.5	110.2236	2.82e+24*	76.16333*	76.64224	76.33167
8	-179397.0	72.13921*	2.83e+24	76.16862	76.71458	76.36053

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

The results obtained in table 4.4 for the optimal lag test in the period 2007 – 2025 using the AIC method are lag 7, where the FPE method also shows the same results as AIC.

Table 4. Stability Test

Roots of Characteristic Polynomial	
Endogenous variables: DJIA	
IHSG FTSE_KLCI	
FTSE_STS SSE	
HANG_SENG SE	
Exogenous variables: C	
Lag specification: 1 1	
Date: 05/31/25 Time: 07:34	
Root	Modulus
0.999363 - 0.000692i	0.999363
0.999363 + 0.000692i	0.999363
0.995053 - 0.001684i	0.995055
0.995053 + 0.001684i	0.995055
0.992372	0.992372
0.980762	0.980762
0.960985	0.960985
No root lies outside the unit circle.	
VAR satisfies the stability condition.	

Source: Reprocessed Eviews output (2025)

After that we check the stability test, according to the results of table 4.5, the result is that no root unit is found for the variables that are tested.

Table 5. Optimal Lag Test for the Period 2007-2009

VAR Lag Order Selection Criteria
Endogenous variables: DJIA_PRICE IHSG_PRICE FTSE_KLCI_PRICE FTSE_STS_PRICE HANG_SENG_PRICE SSE_PRICE SET_PRICE
Exogenous variables: C
Date: 05/29/25 Time: 10:25
Sample: 1/03/2007 12/31/2009
Included observations: 774

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-37715.51	NA	5.07e+33	97.47419	97.51626	97.49038
1	-27873.59	19480.40	5.19e+22	72.16948	72.50603*	72.29897
2	-27715.64	309.7718	3.92e+22	71.88796	72.51899	72.13075*
3	-27646.99	133.3984	3.73e+22	71.83718	72.76269	72.19328
4	-27597.80	94.70036	3.72e+22*	71.83668*	73.05667	72.30608
5	-27562.78	66.77143*	3.86e+22	71.87282	73.38729	72.45552
6	-27530.99	60.04523	4.04e+22	71.91730	73.72624	72.61329
7	-27504.65	49.28179	4.28e+22	71.97584	74.07927	72.78514
8	-27476.76	51.67136	4.53e+22	72.03039	74.42830	72.95299

VAR Lag Order Selection Criteria						
Endogenous variables: DJIA_PRICE IHSG_PRICE FTSE_KLCI_PRICE FTSE_STS_PRICE HANG_SENG_PRICE SSE_PRICE SET_PRICE						
Exogenous variables: C						
Date: 05/29/25 Time: 10:25						
Sample: 1/03/2007 12/31/2009						
Included observations: 774						
Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

Source: Reprocessed Eviews output (2025)

For the optimal lag test in the period 2007 – 2009, the following results are obtained in table 4.6. By using the AIC method, the optimal lag result is 4, where the FPE method also shows the same results as AIC.

Table 6. Optimal Lag Test for the 2020-2022 Period

VAR Lag Order Selection Criteria						
Endogenous variables: DJIA_PRICE IHSG FTSE_KLCI FTSE_STS HANG_SENG SSE SET						
Exogenous variables: C						
Date: 05/29/25 Time: 10:52						
Sample: 1/01/2020 12/30/2022						
Included observations: 775						
Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	-42086.61	NA	3.54e+38	108.6287	108.6707	108.6448
1	-35128.65	13772.26	6.40e+30	90.79911	91.13531*	90.92846
2	-35030.21	193.0682	5.63e+30	90.67152	91.30191	90.91405
3	-34931.10	192.6010	4.95e+30	90.54219	91.46676	90.89790*
4	-34881.72	95.05925	4.95e+30	90.54122	91.75997	91.01011
5	-34847.26	65.72368	5.14e+30	90.57874	92.09167	91.16081
6	-34747.16	189.0974*	4.50e+30*	90.44686*	92.25397	91.14211
7	-34729.06	33.86157	4.88e+30	90.52660	92.62790	91.33503
8	-34701.90	50.32468	5.17e+30	90.58297	92.97844	91.50458
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

Source: Reprocessed Eviews output (2025)

And for the results of the optimal lag test for the 2020 – 2022 period, in table 4.7, the optimal lag results based on the AIC method are lag 6. These results are the same as the results of the LR and FPE test methods.

Johansen Cointegration Test

The Johansen Cointegration test was carried out after optimal lag results were obtained. The results of the Johansen test based on the observation period 2007 - 2025 can be seen in table 4.8 below.

Table 7. Johansen Cointegration Test for the Period 2007-2025

Source: Reprocessed Eviews output (2025)

Date: 05/31/25 Time: 07:35				
Sample: 1/03/2007 2/28/2025				
Included observations: 4738				
Lags interval (in first differences): 1 to 7				
Endogenous variables: DJIA IHSG FTSE_KLC FTSE_STS SSE HANG_SENG SET				
Deterministic assumptions: Case 3 (Johansen-Hendry-Juselius): Cointegrating relationship includes a constant. Short-run dynamics include a constant.				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		**Trace**	**0.05**	**Prob.****
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Critical Value**
None	0.009398	114.1220	125.6154	0.2023
At most 1	0.005121	69.54212	95.75366	0.7376
At most 2	0.003426	45.30531	69.81889	0.8210
At most 3	0.002721	29.10290	47.85613	0.7634
At most 4	0.001975	16.23946	29.79707	0.6954
At most 5	0.001318	6.907954	15.49471	0.5884
At most 6	0.000144	0.680273	3.841465	0.4095
Trace test indicates no cointegration at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegration Rank Test (Max-eigenvalue)				
Hypothesized		**Max-Eigen**	**0.05**	**Prob.****
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Critical Value**
None	0.009398	44.57987	46.23142	0.0744
At most 1	0.005121	24.23681	40.07757	0.8130
At most 2	0.003426	16.20241	33.87687	0.9485
At most 3	0.002721	12.86344	27.58434	0.8923
At most 4	0.001975	9.331502	21.13162	0.8048
At most 5	0.001318	6.227681	14.26460	0.5842
At most 6	0.000144	0.680273	3.841465	0.4095
Max-eigenvalue test indicates no cointegration at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

From the results of the Johansen cointegration test in the period 2007-2025, using an optimal lag of 7, it shows that there is no cointegration between the stock exchanges of Indonesia, the United States, China, Hong Kong, Malaysia, Singapore and Thailand. This is similar to the results of research from Irmalis et al. (2019) who examined the Johansen cointegration test on the Indonesian, Malaysian and Singapore stock exchanges in the period 2013 – 2018, and Irmalis et al (2020), who conducted research on the Indonesian, Malaysian and Chinese stock exchanges in the period 2012-2018.

Table 8. Johansen Cointegration Test for the Period 2007-2009

Date: 05/29/25 Time: 10:30
Sample: 1/03/2007 12/31/2009
Included observations: 782
Lags interval (in first differences): 1 to 4
Endogenous variables: DJIA IHSG FTSE_KLCI FTSE_STS HANG_SENG SSE SET
Deterministic assumptions: Case 3 (Johansen-Hendry-Juselius): Cointegrating relationship includes a constant. Short-run dynamics include a constant.

Source: Reprocessed Eviews output (2025)

Unrestricted Cointegration Rank Test (Trace)

Hypothesized		Trace	0.05	Prob.**
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Critical Value**
None *	0.047981	135.3952	125.6154	0.0110
At most 1 *	0.045839	97.18976	95.75366	0.0397
At most 2	0.030834	60.73053	69.81889	0.2136
At most 3	0.025155	36.39561	47.85613	0.3767
At most 4	0.011881	16.60008	29.79707	0.6694
At most 5	0.006620	7.313163	15.49471	0.5415
At most 6	0.002766	2.152462	3.841465	0.1423

Trace test indicates 2 cointegrating equation(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Max-eigenvalue)

Hypothesized		Max-Eigen	0.05	Prob.**
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Critical Value**
None	0.047981	38.20545	46.23142	0.2777
At most 1	0.045839	36.45923	40.07757	0.1209
At most 2	0.030834	24.33492	33.87687	0.4314
At most 3	0.025155	19.79552	27.58434	0.3554
At most 4	0.011881	9.286922	21.13162	0.8086
At most 5	0.006620	5.160701	14.26460	0.7214
At most 6	0.002766	2.152462	3.841465	0.1423

Max-eigenvalue test indicates no cointegration at the 0.05 level

Unrestricted Cointegration Rank Test (Max-eigenvalue)				
Hypothesized		**Max-Eigen**	**0.05**	**Prob.****
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Critical Value**
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

The results of the Johansen cointegration test in the period 2007-2009, using an optimal lag of 4, according to table 4.9 show that there are two cointegrations with the *Trace Statistical method,* this is evidenced by the *Trace Statistic* > *Critical Value* values. The *trace statistical* value is 135.3952 with *a critical value* of 125.6154, and the *trace statistical* value is 97.18976 with a *critical value* of 0.05 of 95.75366 However, for cointegration testing using Maximum Eigenvalue, no cointegration was found. The cause of this contradiction may be the result of the *subprime mortgage* financial crisis in the United States that shook the global financial world in 2008.

Previous research that indicated cointegration in the period 2002 – 2020 was a study conducted by Caporale et al. (2022) where the object of the research was the stock exchanges of the United States, China, Indonesia, Malaysia, the Philippines, Singapore and Thailand. In the Johansen cointegration test conducted by Caporale et al. (2022), it was found that the cointegration pair between the United States and Indonesia with a Maximum Eigenvalue was at a significant level of 10%. Then Caporale et al (2022) conducted a study in 2007-2008 which showed the relationship between the United States stock market and Southeast Asian stock exchanges.

Due to the cointegration in the 2007-2009 period, the next test was by the VECM method.

Vector Error Correction Estimates
Sample (adjusted): 1/10/2007 12/31/2009
Included observations: 777 after adjustments
Standard errors in ( ) & t-statistics in [ ]
Lags interval (in first differences): 1 to 4

Error Correction:	D(DJIA)	D(IHSG)	D(FTSE_KLCI)	D(FTSE_STS)	D(HANG_SENG)	D(SET)	D(SSE)
COINTEQ1	0.000841	-0.000121	1.61E-05	0.000832	0.012481	-3.56E-05	0.000686
	(0.00133)	(0.00029)	(9.7E-05)	(0.00033)	(0.00322)	(8.0E-05)	(0.00064)
	[0.63180]	[-0.42071]	[0.16664]	[2.52937]	[3.88122]	[-0.44561]	[1.06798]
D(DJIAE(-4))	-0.005431	0.012339	0.003673	0.020890	0.100853	0.000791	0.020869
	(0.04434)	(0.00955)	(0.00322)	(0.01095)	(0.10712)	(0.00266)	(0.02140)
	[-0.12248]	[1.29235]	[1.14191]	[1.90725]	[0.94148]	[0.29767]	[0.97533]
D(IHSG(-4))	0.101326	0.019472	-0.01821	-0.021449	-0.475393	-0.01483	0.154624
	(0.25132)	(0.05411)	(0.01823)	(0.06207)	(0.60711)	(0.01506)	(0.12126)
	[0.40317]	[0.35984]	[-0.99883]	[-0.34553]	[-0.78305]	[-0.98464]	[1.27510]
D(FTSE_KLCI(-4))	1.227945	0.150174	0.050849	0.074446	2.528378	0.022233	0.267269
	(0.64705)	(0.13932)	(0.04694)	(0.15982)	(1.56305)	(0.03878)	(0.31221)
	[1.89775]	[1.07791]	[1.08329]	[0.46582]	[1.61759]	[0.57335]	[0.85607]
D(FTSE_STS(-4))	-0.283962	-0.063612	-0.036156	-0.097435	-1.01758	0.005090	-0.225289
	(0.24792)	(0.05338)	(0.01799)	(0.06124)	(0.59889)	(0.01486)	(0.11962)
	[-1.14536]	[-1.19165]	[-2.01033]	[-1.59116]	[-1.69910]	[0.34257]	[-1.88331]
D(HANG_SENG(-4))	0.026292	0.003380	0.003314	0.008747	0.132696	0.001865	0.024224
	(0.02381)	(0.00513)	(0.00173)	(0.00588)	(0.05752)	(0.00143)	(0.01149)
	[1.10421]	[0.65929]	[1.91883]	[1.48736]	[2.30702]	[1.30718]	[2.10849]
D(SET(-4))	-0.345938	-0.02752	0.046561	0.130875	-1.458567	-0.054266	-0.193589
	(0.75116)	(0.16174)	(0.05449)	(0.18553)	(1.81453)	(0.04502)	(0.36244)
	[-0.46054]	[-0.17015]	[0.85447]	[0.70541]	[-0.80382]	[-1.20547]	[-0.53413]
D(SSE(-4))	-0.137069	0.018372	0.007268	0.006349	-0.202042	-0.001232	0.040166
	(0.08395)	(0.01808)	(0.00609)	(0.02074)	(0.20281)	(0.00503)	(0.04051)
	[-1.63265]	[1.01631]	[1.19340]	[0.30616]	[-0.99623]	[-0.24492]	[0.99153]
C	-2.235455	1.276655	0.251129	0.446830	8.450185	0.243126	0.830147
	(5.72618)	(1.23293)	(0.41539)	(1.41433)	(13.8324)	(0.34316)	(2.76291)
	[-0.39039]	[1.03547]	[0.60456]	[0.31593]	[0.61090]	[0.70849]	[0.30046]
R-squared	0.061897	0.139560	0.196955	0.227642	0.274450	0.153775	0.080664
Adj. R-squared	0.025478	0.106156	0.165780	0.197658	0.246282	0.120923	0.044974

t-table = 1.960

Figure 1. VECM Period 2007-2009

Source: Reprocessed Eviews output (2025)

From the results of the VECM test using an optimal lag of 4 for the period 2007-2009, the results were obtained based on t-table 1,960 (for *a large degree of freedom*) referring to Widardjono (2018: 385)). The result is a short-term casualty in the Hang Seng against SSE with a statistical t at the fourth lag of 2.10849, greater than the t-table of 1.960. However, SSE does not affect the Hang Seng in the short term, as the t statistic in the fourth lag is -0.99623 which is smaller than the t-table.

The change in the Hang Seng affects the movement of the SSE in the short term, but not the other way around. This shows SSE's dependence on Hong Kong market dynamics during the 2007–2009 crisis period. Meanwhile, in the movements of the DJIA, JCI, FTSE KLCI, FTSE STS, and SET indices, there is no evidence of short-term casualty reflected in the t-statistics of these variables which are smaller than the t-table.

Table 9. Johansen Cointegration Test for the 2020-2022 Period

Date: 05/31/25 Time: 08:34
Sample: 1/01/2020 12/30/2022
Included observations: 783
Lags interval (in first differences): 1 to 6
Endogenous variables: DJIA_PRICE IHSG_PRICE FTSE_STS_PRICE FTSE_KLCI_PRICE HANG_SENG_PRICE SET_PRICE SSE_PRICE

Deterministic assumptions: Case 3 (Johansen-Hendry-Juselius): Cointegrating relationship includes a constant. Short-run dynamics include a constant.

Source: Reprocessed Eviews output (2025)

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		**Trace**	**0.05**	**Prob.****
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Critical Value**
None *	0.140262	209.5883	125.6154	0.0000
At most 1	0.049285	92.31326	95.75366	0.0843
At most 2	0.023711	53.09343	69.81889	0.5011
At most 3	0.021377	34.47218	47.85613	0.4762
At most 4	0.013647	17.70407	29.79707	0.5880
At most 5	0.005400	7.040928	15.49471	0.5729
At most 6	0.003652	2.839293	3.841465	0.0920
Trace test indicates 1 cointegrating equation(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

Unrestricted Cointegration Rank Test (Max-eigenvalue)				
Hypothesized		**Max-Eigen**	**0.05**	**Prob.****
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Critical Value**
None *	0.140262	117.2750	46.23142	0.0000
At most 1	0.049285	39.21983	40.07757	0.0622
At most 2	0.023711	18.62125	33.87687	0.8443
At most 3	0.021377	16.76812	27.58434	0.5999
At most 4	0.013647	10.66314	21.13162	0.6808
At most 5	0.005400	4.201635	14.26460	0.8375
At most 6	0.003652	2.839293	3.841465	0.0920
Max-eigenvalue test indicates 1 cointegrating equation(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

**MacKinnon-Haug-Michelis (1999) p-values

The Johansen cointegration test for the period 2020 – 2022, as shown in table 4.11, shows the results of cointegration between the Dow Jones *Industrial Average* (DJIA*),* Shanghai *Composite* (SSE), Hang Seng (HSI), FTSE *Straits Times* (STI), FTSE Malaysia KLCI (KLCI) and SET and IDX *Composite* (JCI) indices. This is evidenced by the *Trace Statistic* > *Critical Value values.* The *trace statistic* value is 209.5883 and the *critical value* is 0.05 is 125.6154. The existence of this cointegration is also evidenced by the Maximum Eigenvalue of 117.2750 above the critical value of 0.05 which is 46.23142. Due to the discovery of cointegration, it was continued with the VECM test.

Based on the results of the VECM test in table 4.12 using an optimal lag of 4 for the period 2020-2022, the results were obtained based on t-table 1.960 (for *a large degree of freedom*) referring to Widardjono (2018:385)). The results obtained in the absence of short-term casualties in the movements of the DJIA, JCI, FTSE KLCI, FTSE STS, Hang Seng, SET and SSE indices, are reflected in the t-statistics of these variables which are smaller than the t-table.

The results of this study are in line with the results of research by Setyawan, et al. (2021), where on the stock exchanges of the United States, Hong Kong, Japan, Malaysia and Indonesia in 2008-2020 which showed the absence of short-term casualty with the VECM.

Table 10. VECM Test for the 2020-2022 Period

Vector Error Correction Estimates
Sample (adjusted): 1/10/2020 12/30/2022
Included observations: 776 after adjustments
Standard errors in ( ) & t-statistics in [ ]
Lags interval (in first differences): 1 to 6
include a constant.

Error Correction:	D(DJIA)	D(FTSE_KLCI)	D(FTSE_STS)	D(HANG_SENG)	D(IHSG)	D(SET)	D(SSE)
COINTEQ1	-0.00232 (0.00233) [-0.99434]	-0.000167 (7.3E-05) [-2.29739]	0.530589 (0.05115) [10.3736]	-0.004428 (0.00716) [-0.61851]	-0.000117 (0.00034) [-0.34459]	-9.68E-05 (8.9E-05) [-1.08850]	3.35E-05 (0.00023) [0.14614]
D(DJIA(-6))	-0.122977 (0.04232) [-2.90583]	-0.002153 (0.00132) [-1.63043]	-1.884047 (0.92790) [-2.03045]	-0.05337 (0.12988) [-0.41092]	-0.011422 (0.00617) [-1.85216]	-0.003015 (0.00161) [-1.86947]	-0.004661 (0.00416) [-1.12064]
D(FTSE KLCI(-6))	-0.085549 (1.27001) [-0.06736]	-0.031162 (0.03963) [-0.78627]	-14.74451 (27.8453) [-0.52951]	-2.971139 (3.89755) [-0.76231]	-0.119331 (0.18506) [-0.64481]	-0.02816 (0.04840) [-0.58177]	-0.005295 (0.12481) [-0.04242]
D(FTSE STS(-6))	-0.001735 (0.00170) [-1.01786]	-2.85E-05 (5.3E-05) [-0.53584]	0.001686 (0.03737) [0.04510]	-0.00119 (0.00523) [-0.22743]	6.16E-05 (0.00025) [0.24792]	-2.47E-06 (6.5E-05) [-0.03797]	-0.000108 (0.00017) [-0.64252]
D(HANG SENG(-6))	0.002034 (0.01375) [0.14786]	-0.000747 (0.00043) [-1.74106]	-0.1016 (0.30157) [-0.33691]	0.000588 (0.04221) [0.01392]	-0.001874 (0.00200) [-0.93498]	-0.00019 (0.00052) [-0.36185]	0.000788 (0.00135) [0.58283]
D(IHSG(-6))	-0.166348 (0.27009) [-0.61590]	-0.00496 (0.00843) [-0.58846]	1.506138 (5.92177) [0.25434]	-0.216402 (0.82888) [-0.26108]	0.031676 (0.03936) [0.80485]	-0.011088 (0.01029) [-1.07717]	-0.022799 (0.02654) [-0.85892]
D(SET(-6))	2.287652 (1.20675) [1.89572]	0.065473 (0.03766) [1.73858]	31.92072 (26.4583) [1.20646]	1.297267 (3.70340) [0.35029]	0.226844 (0.17584) [1.29003]	0.042921 (0.04599) [0.93322]	0.226121 (0.11860) [1.90664]
D(SSE(-6))	-0.352652 (0.42594) [-0.82793]	0.005815 (0.01329) [0.43750]	6.800721 (9.33894) [0.72821]	-0.979933 (1.30719) [-0.74965]	-0.008517 (0.06207) [-0.13722]	-0.004539 (0.01623) [-0.27957]	-0.067257 (0.04186) [-1.60667]
C	8.183151 (15.2611) [0.53621]	-0.225181 (0.47625) [-0.47282]	-33.34829 (334.603) [-0.09967]	-17.68775 (46.8350) [-0.37766]	0.753478 (2.22381) [0.33882]	0.004470 (0.58164) [0.00768]	-0.15922 (1.49983) [-0.10616]
R-squared	0.173661	0.208082	0.518997	0.257465	0.155461	0.155879	0.144497
Adj. R-squared	0.125119	0.161563	0.490741	0.213846	0.105850	0.106293	0.094242
		t-table = 1.960					

Source: *Output Eviews* has been reprocessed (2025).

Granger Cointegration Test

The Granger cointegration test was used to determine the cointegration between the variables of the Indonesian stock exchange index (JCI) and stock exchange indices in the United States (DJIA), Hong Kong (Hang Seng), China (SSE), Malaysia (FTSE KLCI), Singapore (FTSE STS) and Thailand (SET). From the data of the Granger cointegration test, the statistical t-value used in the ADF test is used, where the variable has the statistical value of the root test of the Augmented Dickey Fuller unit with a combination of two variables that have a value that is smaller than the critical value. The critical value used is the MacKinnon critical value at 5% for two untrending variables with values of β_∞ -3.3377, β_1 −5.967 and β_2 −8.98 (MacKinnon, 2010:9). So the calculation of the critical value is as follows:

$$\text{Critical value } T = \beta_\infty + \beta_1/T + \beta_2/T^2 \quad (4.1)$$

The calculation of the critical value of T for each period is as follows:

Table 11. Calculation of Critical Value T MacKinnon

Period	Number of observations (T)	Calculation of Critical Value T	Critical Value (5%)
2007–2009	782	= $-3.3377-5.67782/782-8.98/782^2$	-3.345
2020–2022	783	= $-3.3377-5.67782/783-8.98/783^2$	-3.345
2007–2025	4,738	= $-3.3377-5.67782/4738-8.98/4738^2$	-3.339

Source: Reprocessed Eviews output (2025)

trend) in the regression of cointegration according to Table 4.14, it was found that in the period 2007 – 2009 there was no cointegration between the JCI stock index and other stock indices. Meanwhile, in the 2020 – 2022 period, there are two cointegrations between FTSE STS – JCI with a statistical t-value of -28.06558 and Hang Seng – JCI with a value of -4.025771, both of which have a value below the critical t-point of MacKinnon. The results of the Granger cointegration test also show that there is cointegration between Hang Seng and JCI in the 2007-2025 period with an ADF statistical t-value of -4.04771, which is smaller than the MacKinnon critical t-value of -3,339.

Table 12. Granger Cointegration Test

Variable	Period						Conclusion
	2007 -2009		2020 - 2022		2007 - 2025		
	Statistical t-values of ADF	MacKinnon's t-critical value	Statistical t-values of ADF	MacKinnon's t-critical value	Statistical t-values of ADF	MacKinnon's t-critical value	
IHSG - DJIA	-1.330501	-3.345	-1.673043	-3.345	-1.71272	-3.339	No Cointegration
DJIA - IHSG	-1.163446	-3.345	-1.830862	-3.345	-0.58673	-3.339	No Cointegration
IHSG - FTSE KLCI	-1.756466	-3.345	-0.711376	-3.345	-1.14475	-3.339	No Cointegration
FTSE KLCI - IHSG	-1.745937	-3.345	-2.825413	-3.345	-1.97957	-3.339	No Cointegration
IHSG - FTSE STS	-1.343821	-3.345	-1.221503	-3.345	-2.72729	-3.339	No Cointegration
FTSE STS - IHSG	-1.251268	-3.345	-28.06558	-3.345	-2.15524	-3.339	There is Cointegration*
IHSG - HANG SENG	-2.081753	-3.345	-1.874574	-3.345	-1.64292	-3.339	No Cointegration
HANG SENG - IHSG	-2.321884	-3.345	-4.025771	-3.345	-4.04771	-3.339	There is Cointegration**
IHSG - SET	-2.074568	-3.345	-2.65185	-3.345	-1.165	-3.339	No Cointegration
SET - IHSG	-1.973792	-3.345	-2.847077	-3.345	-1.3691	-3.339	No Cointegration

IHSG - SSE	-1.477129	-3.345	-1.003764	-3.345	-1.63854	-3.339	No Cointegration
SSE - IHSG	-1.414504	-3.345	-1.682977	-3.345	-2.67042	-3.339	No Cointegration

* Observation period 2020-2022

** Observation period 2007 – 2025 and 2020 – 2022

Source: Reprocessed Eviews output (2025)

Based on the table above, the results obtained from the Granger cointegration test differ from the Johansen cointegration test. Where in the Johansen cointegration test, cointegration was found in the test results for the 2007-2009 period there were two cointegrations with the Trace test. Through the VECM test, in the period 2007-2009 there was a short-term casualty from the Hang Seng to the Shanghai Stock Exchange (SSE).

Meanwhile, in the Granger cointegration test for the period 2007-2009, there was no cointegration between JCI and other stock indices. This can happen if the cointegration is multivariate and does not involve JCI as a source of cointegration that occurred in 2007-2009.

Another difference is the cointegration test in the period 2007 – 2025, where the Johansen cointegration test did not find multivariate cointegration. In that period, the Granger cointegration test found that there was cointegration between Hang Seng and JCI with a statistical t-value of ADF that was less than the critical value.

In the 2020-2022 period, there were cointegration findings in both the Johansen cointegration test and the Granger cointegration test. In the Johansen cointegration test, 1 multivariate cointegration vector was found with a test trace value of 209.5883 and a Maximum Eigenvalue of 117.2750, both of which are greater than the critical value. Meanwhile, in the Granger cointegration test, two cointegrations were found, namely in FTSE STS – JCI and Hang Seng – JCI. The difference between the Johansen cointegration test and the Granger cointegration test is that the Johansen test is a multivariate cointegration between the cointegration vectors of JCI, DJIA, FTSE STS, FTSE KLCI, SSE, Hang Seng and SET. Meanwhile, the Granger test is a bivariate test between cointegration vectors, in this case it includes JCI with FTSE STS and JCI with Hang Seng. The results show that there is cointegration both in terms of multivariate and bivariate cointegration tests that are consistent during the Covid 19 pandemic period.

The results of research during the Covid 19 pandemic period, which show the cointegration of FTSE STS – CI and Hang Seng – JCI, namely the Singapore stock exchange with Indonesia and the Hong Kong stock exchange with Indonesia, have similarities with the results of research from Anhar et al. (2024). Research by Anhar et al. (2024) examined the stock market dynamics of Indonesia, Malaysia, Singapore, Thailand, the Philippines, the United States, Japan and China in the 2020-2021 pandemic period and the 2022-2023 post-pandemic period, using the ARDL method. where in the long term during the pandemic, the Singapore and Philippine stock exchanges actively affect the Indonesian stock market, while China has a negative influence on the Indonesian stock market.

Based on the results of the Johansen cointegration test and the Granger cointegration test, for the following hypothesis there are the following results:

1. H_0 = There is no cointegration between the Dow Jones Industrial Average (DJIA), Shanghai Composite (SSE), Hang Seng (HSI), FTSE Straits Times (STI), FTSE Malaysia KLCI (KLCI) and SET stock indices with the IDX Composite (JCI) in 2007-2025.
H_1 = There is a cointegration between the Dow Jones Industrial Average (DJIA), Shanghai Composite (SSE), Hang Seng (HSI), FTSE Straits Times (STI), FTSE Malaysia KLCI (KLCI) and SET stock indices with the IDX Composite (JCI) in 2007-2025.

The test results show that there is cointegration between Hang Seng and JCI in the period 2007 – 2025 using the Granger cointegration test. The result of the ADF's statistical t-value of -4.04771 is smaller than Mackinnon's critical value (-3.339). Based on the above results, H_1 is accepted.

H_0 = There was no cointegration between the Dow Jones Industrial Average (DJIA), Shanghai Composite (SSE), Hang Seng (HSI), FTSE Straits Times (STI), FTSE Malaysia KLCI (KLCI) and SET stock indices with the IDX Composite (JCI) in 2007 – 2009.
H_1 = There was a co-integration between the Dow Jones Industrial Average (DJIA), Shanghai Composite (SSE), Hang Seng (HSI), FTSE Straits Times (STI), FTSE Malaysia KLCI (KLCI) and SET stock indices with the IDX Composite (JCI) in 2007 – 2009.

The test results showed that there was no cointegration between the Dow Jones Industrial Average (DJIA), Shanghai Composite (SSE), Hang Seng (HSI), FTSE Straits Times (STI), FTSE Malaysia KLCI (KLCI) and SET stock indices with IDX Composite (JCI) in the period 2007 – 2009 using the Granger cointegration test. In the Johansen cointegration test, there was also no cointegration between JCI and the stock indices above. So based on the above results H_1 is rejected.

H_0 = There is no cointegration between the Dow Jones Industrial Average (DJIA), Shanghai Composite (SSE), Hang Seng (HSI), FTSE Straits Times (STI), FTSE Malaysia KLCI (KLCI) and SET stock indices with the IDX Composite (JCI) in 2020 – 2022.
H_1 = There was a cointegration between the Dow Jones Industrial Average (DJIA), Shanghai Composite (SSE), Hang Seng (HSI), FTSE Straits Times (STI), FTSE Malaysia KLCI (KLCI) and SET stock indices with the IDX Composite (JCI) in 2020 – 2022.

The results of the Granger cointegration test found two cointegrations, namely in FTSE STS – JCI with an ADF statistical t-value of -28.06558 and Hang Seng – JCI with an ADF statistical t-value of -4.025771, smaller than Mackinnon's critical value (-3.339). The results of the cointegration test above prove that H_1 is acceptable.

CONCLUSION

Analysis of stock indices from Indonesia, the United States, China, Hong Kong, Malaysia, Singapore, and Thailand using EViews 13 showed that there was long-term cointegration between the Hong Kong and Indonesian stock exchanges from 2007 to 2025, and cointegration between Singapore-Indonesia and Hong Kong-Indonesia during the COVID-19 pandemic (2020–2022). No cointegration was found between Indonesia and other markets during the 2007–2009 global financial crisis, although short-term causality was detected between the Hong Kong and Chinese stock exchanges. These results reflect the strong trade ties between Indonesia and China, with Hong Kong acting as a financial proxy for China and highlighting China's influence on Indonesia's stock market. The integration with Hong Kong and Singapore suggests that Indonesian investors seeking portfolio diversification should consider reducing their exposure to these markets. Future research should examine the impact of macroeconomic variables and geopolitical events on stock market integration to provide a deeper understanding of the factors driving these relationships.

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