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The Interactions Price Synchronicity: Connections between Indonesia's Stock Index and Asian Equities Markets

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Abstract

Introduction / Main Objectives: *This research aims to investigate how other Asian stock markets have affected the Indonesian market and how much of an effect they have had.* ***Background Problems:*** *Looking at the capital market is a way to measure the health and growth of a country's economy. Consequently, a nation will employ a wide range of measures to lessen the impact of potential threats and make the most of its available resources.* ***Research Methods:*** *Using daily time series data from 2010 to 2022, the number of observations in this study reached 2712. This study employs vector autoregression (VAR).* ***Findings/Results:*** *The study's findings indicated that the stock indices of Malaysia and Thailand affected the Indonesian indices. The Indonesian stock market index (IHSG) reacted negatively to the indices of the Philippines (PSEI), Malaysia (KLCI), and South Korea (KOSPI) and positively to those of Hong Kong (HANG SENG), Thailand (SETI), and Japan (NIKKEI).* ***Conclusion:*** *Capital market portfolio diversification allows investors to evaluate alternative investing techniques. It is essential to have a diversified worldwide portfolio while trading on Asian exchanges. The study's findings shed light on the Asian stock market's tendencies and patterns in novel ways.*

Keywords: Asian; Market; Portofolio; Stock; VAR
JEL Classification: G30; G32

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INTRODUCTION

Looking at the vitality of a country's stock market can provide valuable indications in determining the country's economic growth rate and the period required to sustain that

growth. As a result, a nation will engage in diverse activities to lessen the severity of the prospective threats it faces and make the most of the resources it presently possesses. The country is actively trying to integrate the economy, especially the capital market, to provide an overview of activities in the capital market. The increased market integration causes the announcement of an imminent financial crisis in one industry, which has repercussions throughout the economy.

If the current global financial crisis were to expand to other wealthy countries, it could have a detrimental influence on their capital markets. Out of fear of incurring even more significant losses, many investors pulled their money off the market, contributing to a domino effect. This constitutes a step toward the ultimate goal of developing unified financial markets. One method to determine the level of integration between two countries' financial markets is to observe the extent to which one market transmits the effects of a shock to the other. The spillover impact will likely prove that this united approach is working.

The current global economic crisis manifests the threat posed by the increasing globalization of financial markets, which has exacerbated this threat. As a result of the crisis involving subprime mortgages in the United States, the value of institutions across the globe's financial markets, including those in Asia, dropped. Asia plays an essential role in the global economy because it is home to some of the developed and developing world's largest stock markets. There is great diversity across Asia in the economic and political systems.

As a result of the expansion of ASEAN+3, the ASEAN member states' relations with Japan, South Korea, and China, which encompass a wide variety of domains, continue to prosper. Financial market integration in the ASEAN+3 region will have several beneficial impacts, including facilitating capital flows from developed countries. To reduce the likelihood of a currency crisis, initiatives such as the ASEAN+3 Bond Market Initiative and the Chiang Mai Initiative promote issuing bonds denominated in the respective countries' native currencies. Regional financial integration can promote climate competitiveness for financial services companies while also aiding the growth of the ASEAN+3 Macroeconomic Research Office (AMRO).

Kao et al. (2019) investigated the integration of capital markets by focusing on the United States market in addition to seven main stock markets in Asia, twelve major stock markets in Europe, and four essential stock markets in North and South America. Gkillas et al. (2019) researched the degree to which international capital markets are integrated in 68 different nations. Aladesanmi et al. (2019) researched how the capital markets of the United States and the United Kingdom are related. Batten et al. (2019) researched the integration of the capital markets of eleven Asian countries.

In a separate piece of research, Robiyanto & Hartanto (2018) investigate the interconnectedness of the financial markets of several countries, including the United States

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of America, Japan, the United Kingdom, France, Germany, and Spain, as well as Malaysia, Singapore, Thailand, and the Philippines. Ardana (2017) investigates the integration of financial markets in several different nations, including the United States of America, Japan, the United Kingdom, Germany, France, and Spain. These countries include Indonesia, Malaysia, the Philippines, Singapore, and Thailand. The research presented by Adisetiawan et al. (2020) looks into the domestic capital market in Indonesia and the international monetary system.

Setiawan & Taufik (2016) analyzed how the United States of America, Indonesia, Malaysia, the Philippines, Singapore, and Thailand have integrated their respective capital markets. Al Nasser & Hajilee (2016) examine the extent to which the financial markets of Brazil, China, Mexico, Russia, and Turkey are intertwined. Seth & Sharma (2015) investigated the effectiveness of capital markets and their level of integration. For their research, the authors looked at markets in India, China, Hong Kong, Indonesia, Malaysia, Japan, Singapore, South Korea, Taiwan, Israel, Pakistan, and the United States of America.

Investigations into the interconnection of the world's capital markets are fascinating since the investigations alter and adapt to the markets. The primary distinction between this study and similar others is that this is the first time anyone has ever taken samples on Asia capital market index countries to the author's knowledge. The investigation used comprehensive data from over twelve years of daily data. In addition, the author considers the current state of the global economy.

This inquiry explores the factors that have led to this diversity growth, its immediate and long-term repercussions, the reaction of the American financial markets, and the value diversity brings. Specifically, this investigation focuses on the value that diversity adds. This study suggests that investors in the capital market might consider effective investing strategies for portfolio diversification. If there are problems with the capital market, the government can devise strategic strategies to fix them. The third step is to recommend enhancing the knowledge and experience already available concerning capital market integration.

METHOD

This study investigates the degree to which Indonesia's financial markets are integrated with those of the United States and Asia. It uses daily time series data spanning the years 2010 to 2022, consisting of stock indexes from the following nations and markets: Indonesia (IHSG), Malaysia (KLCI), the Philippines (PSEI), Thailand (SETI), Japan (NIKKEI), South Korea (KOSPI), and Hong Kong (HANG SENG).

The first step in answering the research objective is a data stationarity test with a unit roots test utilizing Augmented Dickey-Fuller (ADF) and Phillips Perron (PP). This test determines whether or not the data is stationary, as well as at what degree level the data will be stationary. After that, proceed with the Granger Causality test and Johansen Cointegration test to determine the long-run relationship between variables. Suppose the results of the

Cointegration test show that there is a long-term relationship between the capital markets. In that case, the additional analysis uses the Vector Error Correction Model (VECM) method.

$$\Delta y_t = \Pi y_{t-1} + \sum_{i=1}^{p=1} \Gamma_i \Delta y_{t-1} + \sum_{i=1}^{p=1} \emptyset_i x_{t-1} + D_t + \varepsilon_t$$

If, on the other hand, the cointegration test results indicate that no relationship exists over a more extended period, then the following analysis will use vector autoregression (VAR). Afterwards, the forecasting will be conducted using the Impulse Response Function (IRF) test and the Forecast Error Variance Decomposition (FEVD). Where Δ is operator differencing with $\Delta y_t = y_t - y_{t-1}$, Δy_{t-1} is an endogenous variable vector, ε_t is error vector (k × 1), D_t is a constant vector (k × 1), Π is cointegration coefficient matrix, Γ_i is a coefficient matrix (k × k), Φ_i is the coefficient vector (1 × k).

RESULTS AND DISCUSSION

Stationary Test

Table 1. Stationary Test Results

Variable	Augmented Dickey-Fuller (ADF)		Philips Peron (PP)	
	Level	Difference	Level	Difference
SETI	0.0001	0.0000	0.0001	0.0001
PSEI	0.0001	0.0000	0.0001	0.0001
NIKKEI	0.0001	0.0000	0.0001	0.0001
KOSPI	0.0001	0.0000	0.0001	1.0000
KLCI	0.0001	0.0000	0.0001	0.0001
IHSG	0.0001	0.0000	0.0001	0.0001
HANGSENG	0.0001	0.0000	0.0001	1.0000

Source: data processed

The data on time series is stationary if the mean, variance, and covariance for each lag remain the same throughout time. The unit root test is the approach utilized on a significant scale in examining data considered to be stationary. The test for the unit root was either the Augmented Dickey-Fuller (ADF) test or the Philips Peron (PP) test. Both of these tests were employed in this investigation. According to the outcomes of the tests, all variables have stationary data at a level where the likelihood has a value lower than 5% (<5%). Based on Table 1, the findings of the tests, the data used in this investigation for each variable remains unchanged across time.

In addition, these results show that the data in this study can be considered stationary, which means that essential statistical characteristics such as mean, variance, and covariance do not undergo significant changes throughout the observed period. This is an essential assumption

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in time series analysis and provides a solid basis for further statistical analysis and model estimation. Thus, this study can confidently verify that the data analysis met the necessary stationary assumptions.

Optimal Lag Test

Lag checks are performed to determine the optimal lag length for subsequent analysis. These tests also locate Vector Autoregressive (VAR) model parameter estimates. They are executed to ascertain the most suitable lag time for the future analysis that will be performed. The lag length indicates the degrees of freedom within the VAR model's framework. The Akaike Information Criterion (AIC) that produces the lowest score represents the ideal latency for this inquiry.

This study concluded that lag 1 was the most effective because it had the lowest Akaike Information Criterion (AIC) score (Table 2). By determining lag one as the optimal lag, this study can ensure that subsequent analysis will consider the interrelationships between the observed variables in the most efficient and informative way. The optimal lag length helps avoid overfitting and simplifies the model, making the analysis results more accessible to interpret and use in making relevant decisions.

Table 2. Optimal Lag Test Results

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-27825.02	NA	2.056	20.586	20.601*	20.591*
1	-27771.77	106.185	2.049*	20.583*	20.705	20.627
2	-27726.54	89.951	2.055	20.585	20.815	20.668
3	-27683.83	84.725	2.065	20.590	20.926	20.712
4	-27643.90	79.019	2.079	20.597	21.039	20.757
5	-27589.23	107.875	2.069	20.593	21.142	20.792
6	-27530.03	116.516	2.054	20.586	21.242	20.822
7	-27488.88	80.782	2.066	20.591	21.355	20.867
8	-27454.72	66.883*	2.089	20.601	21.472	20.917

Source: data processed

VAR Lag Order Selection Criteria; Endogenous variables: IHSG HANG SENG KLCI KOSPI NIKKEI PSEI SETI; Exogenous variables: C; Sample: 1 2712; Included observations: 2704; *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

Correlation Test

Table 3. Correlation Test Results

	IHSG	KOSPI	KLCI	HANGSENG	NIKKEI	PSEI	SETI
IHSG	1.000	0.014	-0.041	0.062	-0.025	0.041	0.014
KOSPI	0.014	1.000	0.023	0.293	0.004	-0.017	-0.018
KLCI	-0.041	0.023	1.000	-0.005	-0.005	0.012	-0.003
HANGSENG	0.062	0.293	-0.005	1.000	0.034	-0.024	0.015
NIKKEI	-0.025	0.004	-0.005	0.034	1.000	0.011	0.014
PSEI	0.041	-0.018	0.012	-0.024	0.011	1.000	-0.013
SETI	0.0142	-0.018	-0.003	0.015	0.015	-0.013	1.000

Source: data processed

The research data was confirmed to be level and stationary following the results of the stationary tests. As a result, it is essential to do a correlation test to determine whether the variables in question have a strong or weak relationship. It is advised to use the Structural Vector Autoregression (SVAR) model if the correlation is high; however, use the Vector Autoregression (VAR) model with level data if the correlation is low.

The result of the Pearson correlation test is one of the correlation measures that can be used to determine the strength of the linear relationship between two variables and the direction in the relationship points (Table 3). The strength of the association between the variables might be anywhere from 0 to 1. If it is close to 1, the relationship between the two variables strengthens. On the other hand, if it is close to 0, the relationship between the two variables gets weaker. If it is close to 1, the relationship between the two variables strengthens. This research uses the VAR approach with level data since the findings of the correlation analysis for each variable have a low value (0.00 - 0.25).

Stability VAR

Checking the VAR stability condition in the form of roots of characteristic polynomials is done to determine whether or not the estimated VAR that has been constructed is stable. This is done so that the stability of the selected lag may be tested. If every root in a VAR system has a smaller modulus than one, the system is said to be stable. According to the research findings on the VAR's stability (Table 4), the selected lags all had a modulus value of less than one (1).

Table 4. Stability VAR Test Results

Root	Modulus
-0.084	0.084
0.077	0.077
0.001 - 0.038i	0.038
0.001 + 0.038i	0.038
0.032 - 0.016i	0.035
0.032 + 0.016i	0.035
-0.019	0.019

Source: data processed

Roots of Characteristic Polynomial; Endogenous variables: IHSG HANG SENG KLCI KOSPI NIKKEI PSEI SETI; Exogenous variables: C; Lag specification: 1 1; No root lies outside the unit circle; VAR satisfies the stability condition.

These results suggest that the VAR model used in the analysis is stable. Model stability is essential in time series analysis, as an unstable model may produce unreliable forecasts. As such, the results of an analysis based on a stable VAR model can be more credible and useful in decision-making.

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VAR Model

Integration of the capital markets refers to a condition in which the stock prices of the world capital markets have a very close relationship (are highly linked) with one another. This allows the capital markets of the globe to arrive at an international price for shares. They allow investors worldwide to own them without restricting their access or making it difficult for them (Cakici & Zaremba, 2022; Wang et al., 2022; Zubair et al., 2020). Capital market integration is defined as lowering trade barriers and coordinating monetary and fiscal policies across countries to increase trade between countries that have agreed with one another (Jacob et al., 2021; Montinari & Stracca, 2016).

An integrated capital market offers substantial benefits, one of which is the creation of investment portfolios, particularly under volatile economic activity (Neanidis, 2019; Pástor et al., 2021; Rizvi & Arshad, 2016; Saiti et al., 2014). It is possible to determine whether or not the financial market is integrated by observing whether or not two distinct markets move in the same direction and whether or not there is a correlation between the movements of the indexes (Abedifar et al., 2016; Mubarok, 2023; Wu, 2019). On the other hand, the antithesis of an integrated capital market is something called a fragmented capital market.

According to the findings of the investigation that was carried out with the help of the Vector Autoregression (VAR) model, the stock indices of Malaysia (KLCI) and Thailand (SETI) have an impact on the value of the Indonesian stock index (IHSG), although other stock indices do not. The existence of solid cooperation between companies listed on each of the stock exchanges of the two countries, particularly in the economic field, such as export and import activities, can cause the relationship between stock indices that influence each other.

This relationship can be caused by the fact that stock indices are related and influence each other. Companies operating in different nations engage in trade operations such as exporting and importing goods and services in order to satisfy the requirements of their respective domestic markets (Sinyakov & Yudaeva, 2016; Theophilus et al., 2022). This is evident from how these countries fare against one another in terms of their balance of trade. Cooperation between Indonesia and Malaysia in the energy sector has long been one of Malaysia's primary trading partners with Indonesia (Islam et al., 2022; Laksana, 2022). Because of its proximity to Indonesia, the Southeast Asian nation of Malaysia serves as a market for the export of Indonesia's energy goods, most notably coal.

The continuation and expansion of Indonesia's coal shipments to Malaysia is undoubtedly a goal of the country's government. We have to consider the household's requirements, which are the most important thing. Indonesia and Thailand have established a cooperative relationship due to the numerous similarities that exist between the two countries. These commonalities include similarities in cultural arts, climate, architecture, religion, and many more.

Table 5. VAR Test Results

Index	IHSG
IHSG(-1)	0.045
	(0.019)
	[2.326]
HANGSENG(-1)	-0.013
	(0.019)
	[-0.684]
KLCI(-1)	-0.101
	(0.032)
	[-3.106]*
KOSPI(-1)	-0.009
	(0.022)
	[-0.399]
NIKKEI(-1)	0.012
	(0.016)
	[0.749]
PSEI(-1)	-0.013
	(0.017)
	[-0.739]
SETI(-1)	0.033
	(0.020)
	[1.655]**
C	0.034
	(0.021)
	[1.612]

Source: data processed

Vector Autoregression Estimates; Sample (adjusted): 2 2712; Included observations: 2711 after adjustments; Standard errors in ( ) & t-statistics in [ ]; *significant 5% (t_{table} 1.96); **significant 10% (t_{table} 1.645)

Thailand and Indonesia collaborate in various areas, including commerce, education, investment, transportation, culture, and technical cooperation. These are just a few of the areas in which they collaborate. Indonesia and Thailand have growing industrial sectors and robust commercial ties. Most goods from Thailand exported to Indonesia are motor cars and their parts. The countries of Indonesia, Japan, the United States of America, Malaysia, and China are Thailand's primary export customers for the things it manufactures and sells.

Impulse Response Function (IRF)

According to the findings of the Impulse Response Function (IRF) test, the Indonesian stock index (IHSG) responded to shocks to the stock indexes of the United States (NASDAQ), Malaysia (KLCI), Philippines (PSEI), Thailand (SETI), Japan (NIKKEI), South Korea (KOSPI), and Hong Kong (HANG SENG). The Indonesian stock index (IHSG) had an adverse reaction to the Philippine stock index (PSEI), the Malaysian stock index (KLCI), and the South Korean stock index (KOSPI). In contrast, it had a positive reaction to the Hong Kong stock index (HANG SENG), the Thailand stock index (SETI), and the Japanese stock index (NIKKEI).

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Figure 1. Impulse Response Function

If the market goes down, investors can look for indices that respond positively and profit from it. Due to this development, investors will be able to maintain ownership of assets in other nations and continue to reap the benefits of that ownership (Driss et al., 2021; Huang et al., 2020). The Indonesian Stock Exchange (IHSG) must engage in diversification for this to be possible.

Portfolio diversification is vital to managing risk and achieving stable investment returns. By allocating assets to diverse stock indices, investors can offset potential losses in one market with gains in other markets that respond positively to global market shocks. This also helps mitigate systemic risks that can significantly affect a portfolio. In addition, a deeper understanding of the relationship between the IHSG and other Asian stock indices can also help make smarter investment decisions. Investors can utilize this information to assess the potential impact of global events on the IHSG and identify potential investment opportunities.

Furthermore, IHSG must also be actively involved in diversification efforts and developing investment products that allow investors to access global stock markets easily. This could create a more inclusive investment environment and allow investors to benefit from the positive response of the IHSG to Asian stock indices. Within this overall context, the results of this study provide valuable insights into how the JCI interacts with regional and global stock markets. This is critical information for investors, market participants, and regulatory authorities to understand and manage risks and seize opportunities in an ever-changing stock market.

Forecast Error Variance Decomposition

According to the findings of the Variance Decomposition (VD) analysis, the Indonesian stock index was the one that contributed the most, followed by the Malaysian stock index (KLCI) of 34.8%, the Thai stock index (SETI) of 0.097%, and the Philippines

stock index (PSEI), Japan (NIKKEI), South Korea. (KOSPI), and Hong Kong (HANG SENG), with almost the same proportion of around 0.02%.

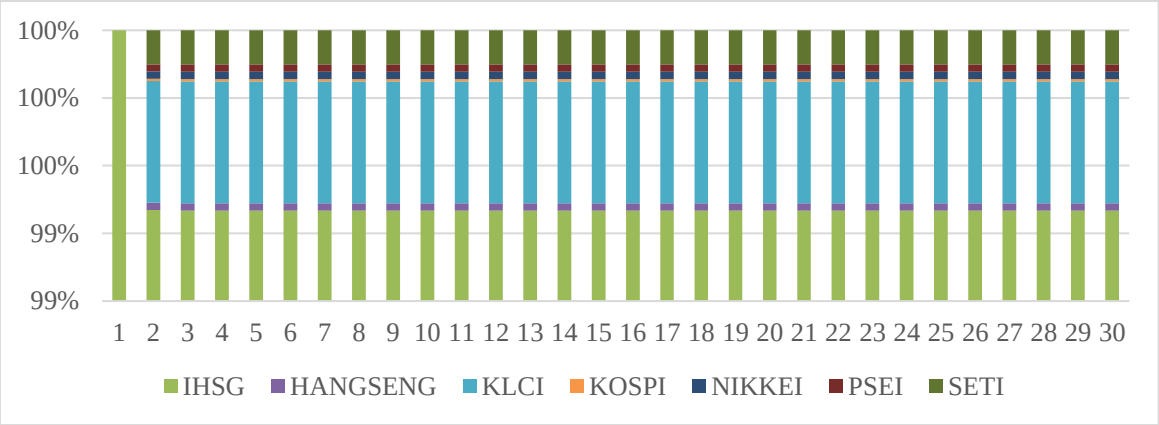

Figure 2. Variance Decomposition

Contributions from outside investors significantly aid the development of Indonesia's economy. One of the most popular places in the world for businesses to establish themselves and invest abroad is Indonesia. Investors will find it simpler and more convenient to put their money to work in any nation with international collaboration in the capital market (Mama, 2018; Silvers, 2021). Investors can now diversify their holdings over a broader range of sectors and nations because of the integration of stock exchanges (Dyck et al., 2019; Liu, 2020). This is in addition to the traditional diversification of holdings across different countries.

The only risk that is important for investors to consider is the risk that diversification cannot mitigate (Batten et al., 2019; Seth & Sharma, 2015). Because of this, the appeal of international diversification to investors will increase proportionally to the overall risk that may be mitigated through diversification strategies (Dendramis et al., 2018; Neanidis, 2019). Investors will face a minor reduction in risk compared to the reduction in the cost of capital. A decrease in the cost of capital will unquestionably increase the investment's return on investment. Therefore, collaboration in the financial industry has the potential to result in higher benefits.

CONCLUSION

This study aims to investigate the impact that stock indices from other Asian countries have had and the shocks that those indexes have caused on the Indonesian stock market. According to the findings of the research conducted, the stock indices of Malaysia and Thailand affected the stock index of Indonesia. The Indonesian stock market index (IHSG) has a negative sensor on the stock market indices of the Philippines (PSEI), Malaysia (KLCI), and South Korea (KOSPI), but the Hong Kong (HANGSENG) stock market index

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has a positive reaction—the stock index for the Thai (SETI) and the Japanese (NIKKEI) stock indexes.

Diversifying one's holdings across many different markets is one option for investors looking to craft the most effective investing strategy. The importance of maintaining a diversified international market portfolio cannot be overstated when dealing with Asian markets. The research findings offer a new point of view that helps one grasp and analyze trends and patterns in the Asian stock market.

AUTHORSHIP CONTRIBUTION STATEMENT

The article's writers shared responsibilities for research, writing, and analyzing data.

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