Stock Exchange Cointegration in Developed and Developing Countries in Asia During the Covid-19 Pandemic

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Abstract

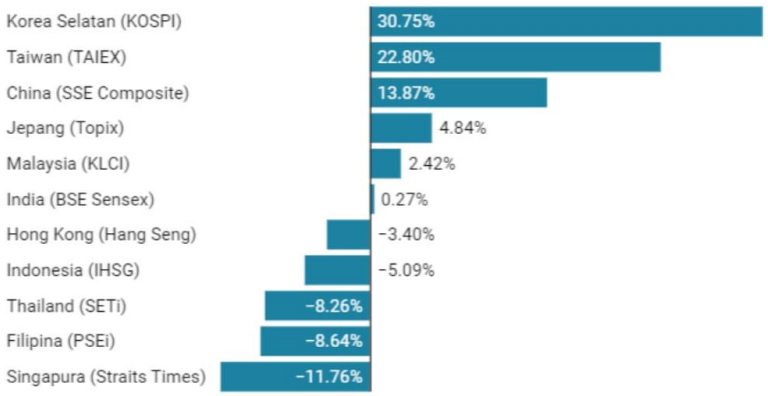
The capital market of a country with the capital market of other countries has a relationship, whether it has the same commodity, the same transaction hours or the same area. Like the capital markets of developed and developing countries, which will chase each other to have a significant impact on the economy of their respective countries. This study was conducted to determine the extent of the long-term relationship (cointegration) between the stock exchanges of developed and developing countries during the Covid-19 pandemic. In this study, the developed countries that were sampled were Japan and Singapore, while for developing countries are the stock exchanges of Indonesia, Malaysia and India. Data analysis used is descriptive statistical test, correlation test, unit root test and cointegration test. The data used is daily data on the main index of stock prices starting from January 2020 to April 2021. The results of the study using the correlation test identified that the five stock indices had a strong and unidirectional correlation. While the results of the cointegration test result in an interaction or cointegration of the Indonesian stock exchange with the stock exchanges of Malaysia, India, Singapore and Japan. However, if a cointegration test is carried out between state units, the Indonesian stock exchange is integrated with the Malaysian stock exchange, but it doesn't have any cointegration with India, Singapore and Japan stock exchanges during the Covid-19 pandemic.

Keywords: Cointegration, JCI, KLCI, BSE SENSEX, STI, NIKKEI

I. Introduction

The COVID-19 pandemic that occurred in early 2020 in Indonesia destroyed almost all aspects such as health, social, and even the economy. Many countries experienced a decline in economic performance and eventually entered into a recession. Almost all financial institutions are affected by this pandemic. This also affects the movement of stock markets in Asia. Here is the performance of the major stock indexes in Asia in 2020 :

Figure 1. Stock Price Index Performance in Asia in 2020



Source : www.cnbcindonesia.com/2021

Based on the figure above, many Asian countries ran into a decline in index performance, including countries that were the object of research, namely Indonesia (IHSG or JCI), Malaysia (KLCI), India (BSE Sensex), Singapore (STI) and for Japan, this study uses the Nikkei Index.

Cases in one country will often affect other countries. Likewise with the capital market. The capital market of a country with the capital market of other countries of course has a relationship. As with the largest investors from

other countries investing in Indonesia, there will always be a cointegration relationship between investors who invest their capital and those who need funds. Relations between these countries have a significant impact on the economies of their respective countries.

So far, it has always been identified that the performance of the capital markets of developing countries will always be influenced by the performance of the capital markets of developed countries. This is because developed countries are more likely to have free capital flows and are therefore more likely to be cointegrated. However, in recent years, more and more investors are looking to invest in developing countries **(Khan, 2011).** Investors who are willing and able to invest in emerging markets must consider related risk factors such as economic risk, political risk, social risk, etc. **(Bhutto et al., 2020)**, including the risk of the emergence of the Covid-19 virus pandemic which greatly shook the world economy, especially Asia.

The results of **Oktavia and Wijaya's (2020)** research show that the US, Indian, Malaysian, South Korean, and Thai stock indexes have a negative long-term relationship with the JCI, while the stock indexes of Japan, China, and Singapore have a positive long-term relationship with the JCI. **Sugiyanto & Sudarwan (2016)** shows that the results of the study from the Indonesian capital market responds to any changes in the stock price index in the regional market, especially from Japan (NIKKEI) and Singapore (STI). Changes in the regional stock price index were responded positively at the beginning of the period but as time went on their effect became smaller on changes in the stock price index in Indonesia. Changes in the regional stock price index were responded positively at the beginning of the period but as time went on their effect became smaller on changes in the stock price index in Indonesia. The research empirical results of **Batareddy et al., (2012)** show that the stock markets of India, China, Taiwan and South Korea are cointegrated with the United States and Japan after the Asian financial crisis. While the bivariate cointegration analysis for the US and Japan developed markets and each of the four Asian emerging markets found that only India was cointegrated with the US and Japanese markets. The other three markets, namely China, Taiwan and South Korea, are not cointegrated with either the United States or Japan. **Khan (2011)** found that the Chinese, Malaysian and Australian markets are not cointegrated with the US stock exchange. **Marashdeh & Shrestha (2010)** examined the dynamic relationship between the stock exchanges of countries that are members of the Gulf Cooperation Council (GCC), namely: Bahrain, Kuwait, Oman, Saudi Arabia, Qatar, and the United Arab Emirates with American and European exchanges. The results of the study indicate that exchanges in GCC countries are not fully integrated, thus allowing arbitrage to occur on these exchanges. However, exchanges in GCC countries are integrated with exchanges in America and Europe. **Wong et al (2004)** investigated the long-term relationship between the Indian stock market and the stock exchanges of developed countries, including the US, UK and Japanese stock exchanges. The findings are that the Indian stock exchange is integrated with the stock exchanges of developed countries and is very sensitive to the movement of returns from these exchanges. However, the findings shows that in the short term the stock exchanges of developed countries affect the Indian stock market but not vice versa. **Yang et al., (2003)** conducted a study on 10 emerging stock markets in ASIA to see the relationship between stock exchanges during the 1997-1998 crisis period. This study finds evidence that Asian stock markets have a long-term relationship.

This study uses two developing countries, Malaysia using the KLCI index, and India using the BSE Sensex index. The reason for choosing the malaysia stock exchange is because it has the closest region, the same commodity, and similar stock movement patterns. In addition, there are similarities between stock price indices in Indonesia and India. The Indian Stock Exchange focuses on the industrial, oil and gas, infrastructure, banking and technology sectors. Meanwhile, developed countries use Singapore with the STI index and Japan use the Nikkei index. Throughout the 2020 period, Singapore recorded as the country of origin of the largest investment in Indonesia. Meanwhile, Japan occupies the fourth position of the country with the largest investment in Indonesia (**www.idxchannel.com/2021**).

The integration of capital markets in Asian countries is the main condition for the smooth flow of capital and investment. By integrating capital market activities, it is expected that it can encourage investment growth among Asian countries, thereby accelerating the development process of an advanced and economically strong Asian region after the COVID-19 pandemic. With different periods and countries, several studies on this cointegration give different results. It is necessary to see during this pandemic is there still cointegration between the stock exchanges of several developing and developed countries in Asia? Considering the focus of the country during this pandemic is to prevent the increase in the number of COVID-19 cases.

II. LITERATURE REVIEW

Capital Market Cointegration

The concept of cointegration was first introduced by **Engle & Granger, (1987),** which deals with the problem of determining the long-run economic equilibrium relationship. Cointegration is a statistical implication of the existence of a long-term relationship between economic variables. **Husnan (2015)** said that an integrated market can be defined as a situation where there is no barriers to owning securities in any capital market and neither in cash inflow nor cash outflow. Market integration is a condition where stock prices in various capital markets in the world have a very close relationship, so that the world's capital markets can reach an international price for their shares and provide unrestricted access or any barriers to investors around the world to own them **(Eitment et all: 2007).** The capital market is said to be cointegrated if the two separate markets have the same movement and have a correlation between the index movements. Capital markets in one regional area tend to have the same movement and high contagion effect. Economic integration is the creation of a freer international economic structure by eliminating all barriers (barriers) placed on the operation of free trade and by introducing all forms of cooperation and unification. Integration can be used as a tool to access a larger market, stimulate economic growth as an effort to improve national welfare.

Jakarta Composite Index (JCI)

JCI is the main indicator that describes the movement of stock prices on the Indonesia Stock Exchange. JCI has several functions, namely as an indicator of market trends, as an indicator of the level of profit, as a benchmark for the performance of a portfolio and facilitating the formation of a portfolio with a passive strategy. Using all Listed Companies as a component of the Index calculation. In order for the JCI to describe a fair market condition, the Indonesia Stock Exchange has the authority to exclude and/or exclude one or more Listed Companies from the JCI calculation.

Kuala Lumpur Composite Index (KLCI)

The KLCI is a stock market index generally accepted as a barometer of the local stock market. Introduced in 1986 to respond the need for a stock market index that would serve as an indicator of the performance of the Malaysian stock market as well as the economy. It was used as the main index, and is now one of every major index for the Malaysian stock market of which the other two are FMB30 and FMBEMAS, Malaysian Exchange.

Bombay Stock Exchange Sensitive Index (BSE Sensex)

The BSE SENSEX, also referred to as the BSE 30, is an equity-weighted stock market index for 30 large and well-established companies on the Mumbai Stock Exchange, India. These 30 component companies which constitute some of the largest and most traded stocks, represent various industrial sectors in the Indian economy. SENSEX opened on January 1, 1986, and is considered the pulse of the domestic stock market in India.

Indeks Straits Times (STI)

The Straits Times Index is a stock market index by capitalization on the Singapore Stock Exchange. This index is used to recording and monitoring the daily changes of the 30 largest companies in the Singapore stock market and as a leading indicator of market performance in Singapore. This index is calculated together with Singapore Press Holdings (SPH), SingaporeExchange (SGX) and FTSEGroup (FTSE). The Straits Times Price Index (STI) was launched in order to re-clarify companies listed on the Singapore Exchange, replacing the Straits Times Industrial Index (STII), and started functioning on August 31, 1998 at the position of 885.26 points. The Straits Times Index is calculated based on the Market Value Weighted of 30 company shares representing companies listed on the Singapore Exchange.

NIKKEI Index 225

The Nikkei 225 is a stock market index on the Tokyo Stock Exchange. This index has been calculated by the daily Nihon Keizai Shimbun (Nikkei) since September 7, 1950. The calculation method uses the calculation of the average price (units in yen), and the components of the company's shares listed in the index will be reviewed once a year.

Shares of companies listed on the Nikkei 225 Index are the most actively traded stocks on the Tokyo stock exchange. Currently, the Nikkei is the index that is most widely used as a guide for investors when it comes to investing. This index was created to reflect stock market conditions, therefore the movement of each industrial sector index is considered equal and there is no more weighting for certain industrial sectors.

Previous Research

Irmalis & Hadi (2020) researched the Cointegration Analysis of the Indonesia, Malaysia and Singapore Stock Exchanges. The results of the analysis showed that the multivariate analysis did not show any cointegration between Indonesia, Malaysia, and the Singapore Stock Exchange. However, there is cointegration between the Malaysian and Singaporean capital markets. **Irmalis & Hadi (2020)** examined the cointegration of the Indonesian, Malaysian and Singapore stock exchanges. The results of her research found that the stock exchanges of Indonesia, Malaysia and Singapore did not show cointegration. **Utami & Novianti (2017)** researched the Cointegration of Stock Exchanges in the Capital Markets of Indonesia, Malaysia, and South Korea. **Malaka and Toar (2015)** conducted a study entitled Capital Market Integration Towards the ASEAN Economic Community. The results show that only the capital market in Indonesia is significantly influenced by the capital market in ASEAN countries such as Malaysia, Singapore, the Philippines, and Thailand. Other capital markets do not affect each other. Thus, the capital market in the ASEAN region is integrated, but not completely. **Subhani et al (2011)** tried to examine the stock markets of countries in South Asia, namely the Karachi Stock Exchange (Pakistan), Bombay Stock Exchange (India), Dhaka Stock Exchange (Bangladesh), Nepal Stock Exchange (Nepal). Using daily data, there is cointegration between KSEI and the Dhaka Stock Exchange, but not with other stock markets.

III. Research Methods

In this study, the unit of analysis is the Composite Stock Price Index (JCI), Kuala Lumpur Composite Index (KLCI), Bombay Stock Exchange Sensitive Index (Bse Sensex), Straits Times Index (STI), and the Nikkei 225 Index. The data used is secondary data sourced from: (1) www.investing.com, (2) www.yahoofinance.com, and (3) www.stooq.com. This study uses daily data where the data has been adjusted to the holidays on each exchange so that the dates used in the research sample are the same in each country. There are 292 trading days starting on January 6, 2020 until April 30, 2021.

Data analysis used is descriptive statistical test, correlation test, unit root test and cointegration test. The analytical tool used in this study is cointegration analysis using the Johansen Cointegration Approach and the Vector Error Correlation Model (VECM) test. The cointegration test with the Johansson approach uses two statistical tests, namely the Trace test and the Maximum Eigenvalue test. The standard approach to the Johansen method is that the maximum likelihood (ML) procedure is first to calculate the Trace and Maximum Eigenvalue statistics, then compare the appropriate critical values. In the cointegration test stage, if there is cointegration between variables or the cointegration rank (r) is more than zero, then the Vector Error Correction Model analysis can be carried out. The whole series of data processing using the program views.

IV. Results And Discussions

Results

The results of the data analysis with *eviews* are presented as follow:

Table 1. Descriptive Statistics

	IHSG	KLCI	SENSEX	STI	NIKKEI
Mean	5476.086	1535.368	40854.13	2796.045	24333.64
Median	5361.000	1564.740	40544.37	2751.500	23474.27
Maximum	6435.000	1684.580	52154.13	3281.030	30467.75
Minimum	3938.000	1219.720	25981.24	2233.480	16552.83
Std. Dev.	632.5225	88.09648	6611.093	269.4655	3437.123
Skewness	-0.134555	0.202730	-0.032281	0.320538	0.113327
Kurtosis	1.745078	2.833879	2.002191	1.719358	2.181503
Jarque-Bera	19.97290	15.74697	12.12248	24.86865	8.745878
Probability	0.145946	0.069810	0.052332	0.166964	0.212614
Sum	1593541.	446792.0	11888551	813649.2	7081088.
Sum Sq. Dev.	1.16E+08	2250687.	1.27E+10	21057383	3.43E+09
Observations	291	291	291	291	291

source : eviews data analysis

Based on the table above, the biggest standard deviation appears in Indian capital market and the smallest is in Malaysian capital market. Based on the *skewness*, it is seen that Indonesian and Indian capital market has negative value which indicates the abnormal data distribution. On the other hand, the capital market in Malaysia, Singapore, and Japan has positive value with indicates normal data distributions. The kurtosis in the capital

market in every country is below 3 which is considered good. *Jarque-Bera* was administered to see whether the data have been normally distributed. The results of the analysis show that all the capital market that will be tested passed the normality tests.

Table 2. Capital Market Correlation

	IHSG	KLCI	SENSEX	STI	NIKKEI
IHSG	1.000000	0.893384	0.814585	0.755982	0.750075
KLCI	0.893384	1.000000	0.800540	0.574154	0.807420
SENSEX	0.814585	0.800540	1.000000	0.680615	0.964467
STI	0.755982	0.574154	0.680615	1.000000	0.628266
NIKKEI	0.750075	0.807420	0.964467	0.628266	1.000000

Sumber : eviews data analysis

The table shows that there is a positive correlation among the capital markets of the countries, which indicates the unidirectional relationship among the capital market of the countries, with the biggest correlation is between the capital market in Indonesia and Malaysia with 0.893384 points. It happens due to some similar economic conditions between Indonesia and Malaysia, for example natural resource based economy, a large amount of foreign owenership in debt securities, and foreign exchange reserves in both countries.

Table 3. Stationary Test (Unit Root Testing)

INDEKS	ADF t-Statistic	Prob.
IHSG	-15.74179	0.0000
KLCI	-17.57919	0.0000
SENSEX	-18.73308	0.0000
STI	-17.12150	0.0000
NIKKEI	-16.94756	0.0000

Source : eviews data analysis

Based on the stationary tests, the index probability is more than 0.05, which indicates that the data are not stationary, while to proceed to the cointegration tests, the data need to be stationary, therefore, data differencing is needed. After conducting the data differencing on each index, the results of the analysis can be seen as presented on table 3. On data differencing level 1, the probability is < 0,05, which shows that the data are stationary on differencing level 1, and the further analysis could be proceed. The next process is cointegration test which is conducted to analyze the stock exchange index which has the order of integrated process and also to assess if there is a balance in the variables during the same period.

Table 4. The Result of Cointegration Test in Several Stock Markets

Indeks	ADF t-Statistic			Conclusion
	Trace Statistic	0.05 Critical Value	Prob.	
IHSG, KLCI, SENSEX, STI, NIKKEI	69.72097	68.81889	0.0409	Cointegrated
IHSG and KLCI	18.19898	15.49471	0.0191	Cointegrated
IHSG and SENSEX	12.07360	15.49471	0.1534	Not-Cointegrated
IHSG and STI	9.702472	15.49471	0.3043	Not-Cointegrated
IHSG and NIKKEI	11.47207	15.49471	0.1841	Not-Cointegrated

Sumber : pengolahan data eviews

Based on table 4, it can be seen that the stock market in Indonesia has the cointegration with Malaysia, India, Singapore, and Japan. However, when it is seen separately, Indonesian stock market is only integrated with Malaysian's, and not with the other countries.

Discussion

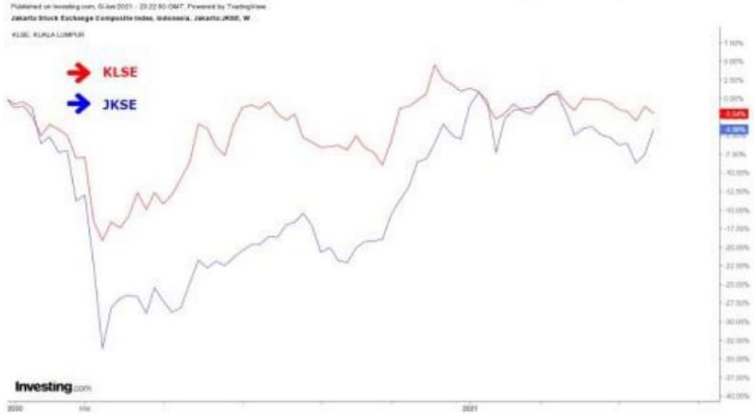
Based on the data analysis, there is a cointegration between the capital market in Indonesia and Malaysia, India, Singapore, also Japan during the Covid-19 Pandemic. This is in line with the research conducted by **Oktavia dan Wijaya (2020), Sundoro & Theovardo (2019), Toar (2015)** and **Yang et al., (2003)**. Foreign investors invest their money on stock exchange including the stock exchange in Asian countries. As the results, there is connection in the stock market globally. Even though there are many foreign stockholders who withdraw their funds from Indonesian capital market, there are a lot of them who chose to invest their money in Indonesia that

now the lockdown restrictions have been lifted. The dynamic of stock price in the stock exchange will affect the stock market in every country **(Mansur : 2005)**. Globalization in the capital market also affects the capital market in our country. It is see when there is and increase and decrease in the index of the global market which affects the index increase and decrease in Indonesian capital market. As the emerging market, Indonesia often indirectly affected by the economic conditions in some countries in the world. Indonesian economic is now more integrated with the global economy **(Syarofi : 2014)**. In addition to that, in nowadays technological era, it is very easy for the investors to get information and to conduct transactions in capital market through online trading, international broker community, and the information sharing platform about the stock exchange in a country. Globalization also open the opportunity for the lawmaker to welcome foreign investors in their country. This makes the stock exchange even more integrated **(Madyan, et al : 2019)**.

Based on the partial results, it is found that Indonesian capital market is cointegrated with Malaysian capital market as stated in **Sundoro & Theovardo (2019), Utami & Novianti (2017)** and **Click & Plummer (2005)** research stating that there is a long or short term correlations between Indonesian and Malaysian stock market. It is due to the fact that both Indonesia and Malaysia are developing countries with the majority of Muslim people.

Indonesia and Malaysia both have the same cultural roots as geographically located close to each other. By looking at the *benchmark movement patterns,* the capital market in Indonesia and Malaysia, which represented by IHSG and KLCL, both of the index have the same movement patterns during January 2020 to April 2021. This similar movement pattern is possible to happen as there are same variables such as global macro economy and covid-19 pandemic which results the cointegration between the stock index. The movement pattern of the stock price in both countries can be seen in the following chart:

Picture 2. Trading Graph of JKSE and KLSE During January 2020 – April 2021



Source : Investing.com

Cointegration test administered in the capital market in India, Singapore, and Japan show different results. The results show that there is cointegration between the capital market in the capital market in Indonesia and India and the capital market in Indonesia and Singapore, and the capital market in Indonesia and japan. This is in line with the research conducted by **William (2015**) and **Madyan, et al (2019)** stating that in the long term there is no cointegration between the stock exchange in Indonesia and in developed countries including Singapore.

Hendrawan & Gustyana (2011) show the same result, when there is no cointregation between the stock exchange in Indonesia and in japan. This condition is due to the fact that each country is now focusing on recovering their own economic situation with the recession. A lot of international economic activities such as the export and the import are postpone due to the lockdown restrictions in each country. The capital market wal also not affected in each country.

Conclusion And Suggestion

Conclusion

The results of the research show that there is contegration between the stock markets in developing and developed countries in Asia, which include the stock market in Indonesia, Malaysia, India, Singapore, and Japan. The stock exchange in every countries is more connected that ever. It is even more obvious during the crisis caused by the pandemic, especially the economic crisis. The correlation between the stock exchange is also supported by the contagion *effect* which is the effect of the globalization. This research identified the correlation between the stock exchange in developing countries and stock exchange in developed countries during the covid 19 pandemic. Based on the analysis in each stock market, it can be seen that the cointegration only exist in Indonesian and Malaysian's stock market, this is due to the similarities between this two

developing countries in terms of geographical location, cultural roots, and stock trade pattern. Whereas there is no cointegration in the stock market in Indonesia, India, Singapore, and Japan. It is because a lot of global economic activities that are postponed due to the pandemic as each country are still focusing to stabilize their own economic conditions.

Suggestion

Based on the results of the study and the effect of limitations, the researcher would like to provide some suggestions and recommendations that might be carried out for further research so that the research results can be more accurate. These suggestions include; (1) The next research is expected to divide the period before the covid and after the covid so that it can be seen clearly whether these results occur due to government policies during a pandemic or not; (2) The next research is expected to add indexes from other international exchanges, especially the China Stock Exchange as the main source of the pandemic and increase the stock exchanges in Europe and America as the economic base of developing countries; (3) At the time of the pandemic, the stock exchanges that have similar characteristics that are cointegrated with our country's stock exchange, so that stocks based in that country can be considered.

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