ASEAN CAPITAL MARKET INTEGRATION DURING THE COVID-19 PANDEMIC

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Abstract: This research aims to test whether there is a contagion effect on capital markets in ASEAN-5 countries during the COVID-19 pandemic in 2020 and 2022. The research took samples based on the closing prices on the Indonesia Stock Exchange (IHSG), Malaysia Stock Exchange (FTSE), Singapura Stock Exchange (STI), Stock Exchange of Thailand (SET), and Philippine Stock Exchange (PSEI) index for 3 years starting in 2020 and ending in 2022 using the documentation method. This research is quantitative research based on the empirical testing of data. This research uses the contagion effect method, which aims to see the effects of risk transmission that can occur when a shock or crisis occurs in a capital market. The results show that there was a contagion effect on the capital markets in ASEAN-5 countries for 3 years during the COVID-19 pandemic. Apart from that, the contagion effect that occurs in the ASEAN-5 capital market shows that the capital markets in ASEAN are interconnected with each other so that if a problem occurs in one capital market, the effects can be felt and spread to the capital markets of other ASEAN countries. The COVID-19 pandemic spread and had an impact on capital markets in ASEAN-5 due to the relationship or integration between their capital markets.

Keywords: ASEAN-5, capital market, contagion effect, COVID-19

INTRODUCTION

The world has been hit by an outbreak of an infectious disease called coronavirus. Coronavirus, or known as COVID-19, is an infectious disease from a virus that attacks the human respiratory organs. This coronavirus first appeared and was identified in Wuhan, China, at the end of 2019 (Yip & Perasso, 2021). The COVID-19 virus comes from the SARS-CoV-2 virus. Most people infected with the virus will experience mild to moderate

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respiratory illness and can recover without requiring special treatment. However, some will become seriously ill and require medical attention, including death (World Health Organization, 2022).

The COVID-19 pandemic that occurred was felt not only in Indonesia but throughout the world, including in countries in ASEAN-5. The COVID-19 pandemic has caused the world economy to weaken due to restrictions on activities (social distancing). One sector that was directly affected was the stock exchange (Kustodian Sentral Efek Indonesia, 2023), which was marked by a decline in the performance of stock exchanges around the world, including in other ASEAN countries. The pandemic has caused shocks to the global market and markets in developing countries. The negative effects of the pandemic spread rapidly between countries, which ultimately caused various economic shocks (contagion effects).

The contagion effect theory explains the possibility of the spread of economic crises or booms between countries or regions. This phenomenon can occur both domestically and internationally. The World Bank defines contagion effect in three definitions, namely broad, more restrictive, and very restrictive. Broadly, contagion is defined as the general process of shock transmission across countries. This should work during both calm and crisis periods, and contagion is associated not only with negative shocks but also with positive spillover effects. More restrictively, contagion is defined as the transmission of shocks between two countries that exceeds what is expected based on fundamentals and considering the co-movement triggered by common shocks. Very restrictively, contagion is defined as a change in the transmission mechanism that occurs during periods of turmoil and can be inferred based on a significant increase in cross-market correlations.

According to Dornbusch et al. (2000), the contagion effect is a significant increase in cross-market relationships after a shock occurs in a country or group of countries. A good understanding of the contagion effect will make investors more careful in investing so that they can reduce the impact and risks that can arise from the contagion effect that occurs from the capital markets of other countries to the capital markets in their country, which are mutually integrated. The presence of the contagion effect itself has become an attraction for researchers to study, especially during the COVID-19 pandemic.

Shahrier (2022) examined whether the ASEAN-5 markets had cointegration during the COVID-19 pandemic with an emphasis on currency exchange rates. The study showed that the ASEAN-5 exchange rates were cointegrated during this pandemic, and if there was an imbalance, the daily adjustment rates in the Indonesian Rupiah, Malaysian Ringgit, and

Singapore Dollar were 6.58%, 1.47%, and 2.45%, respectively. Indonesia, Malaysia, and Singapore experienced prolonged high exchange rate volatility, Thailand experienced mild volatility in the short term and high volatility in the long term, and only the Philippines experienced mild volatility in the short term, with no long-term increase. The Indonesian Rupiah reacted first to the COVID-19 shock, leading to fundamental-based contagion to Malaysia and Thailand, and purely temporary sentiment-based contagion to the Philippines and Singapore; only the Philippine Peso protected itself from the long-term shock.

Nguyen et al. (2022) studied financial contagion from the United States, Japan, and China markets to Asian markets during the global financial crisis (2007-2008) and the COVID-19 Pandemic. Nguyen et al. (2022) found that the correlation between the United States and Japan markets and emerging Asian markets was quite high, implying interdependence between these markets. In addition, there was a significant contagion effect from the United States' equity market to markets in both developed and emerging countries during the global financial crisis. Le & Tran (2021) found no evidence of contagion from the US stock market to the Philippine stock market during the global financial crisis, while the Vietnamese market was affected by this effect, but both stock markets (Vietnam and the Philippines) were affected by the contagion effect in the COVID-19 pandemic crisis. Fu et al. (2021) examined the contagion effect of the COVID-19 pandemic on four countries from Asia, Europe, Latin America, and North America using an extreme contagion effect test. Fu et al. (2021) reported that the contagion effect was widespread in global equity markets across the four regions in this case. Latin America and North America are highly susceptible to contagion risk, followed by Europe, with Asia being the least susceptible. Based on the time window of the crisis severity index, Fu et al. (2021) found that for countries with more severe epidemics, there is a stronger contagion effect. Looking at the studies that have been conducted previously, this contagion effect phenomenon is very interesting to study, especially to see whether there is a contagion effect that occurs in the ASEAN-5 capital market during the COVID-19 pandemic in the period 2020 to 2022. The countries in ASEAN-5 have relationships between one country and another, both in political relations and economic relations.

Based on previous studies, the contagion effect phenomenon is very interesting to study, especially to see whether there is a contagion effect that occurs in the ASEAN-5 capital market during the COVID-19 pandemic in the period 2020 to 2022. The countries in ASEAN-5 have relationships between one country and another, both in political relations and economic relations. This means that if an event or shock occurs, such as the

COVID-19 pandemic, it can spread among other integrated countries. ASEAN-5 countries, namely Indonesia, Malaysia, Singapore, Thailand, and the Philippines (Association of Southeast Asian Nations, 2023), have large market capitalizations and, consequently, have a greater weighting than other ASEAN countries (MSCI, 2023). Therefore, examining the potential contagion effect on ASEAN-5 is interesting, especially during the pandemic when there are two types of deadly COVID-19 variants. This research aims to test whether there is a contagion effect on capital markets in ASEAN-5 countries during the COVID-19 pandemic in 2020 and 2022.

METHOD

This research is quantitative research based on empirical data testing. The contagion effect model was chosen because the model can analyze the effects of risk contagion that occurs when there is a shock or crisis in a capital market. Data for analysis were obtained from the daily closing prices of the Indonesia Stock Exchange (IHSG), Malaysia Stock Exchange (FTSE), Singapore Stock Exchange (STI), Thailand Stock Exchange (SET), and Philippine Stock Exchange (PSEI) index. The data collection period is for 3 years, namely from 2020 to 2022. Data analysis is based on two analyses. The first is to evaluate the general movement through long-term relationships in the selected stock market, while the second examination is about the causal relationship in the market. The second is a pragmatic analysis of the two stock markets carried out with three analyses, namely the Stationarity test, the Co-Integration test, and the Granger Causality test (Dhiman & Sharma, 2016).

Market return is a picture of the overall market information that can be needed by investors to determine the level of return on investment owned. In this study, the measurement for market return uses data from the ASEAN-5 index consisting of the IHSG index, FTSE index, STI index, SET index, and PSEI index. Market return can be known by the following formula.

$$R_{m,t} = \frac{IP_{i,t} - IP_{i,t-1}}{IP_{i,t-1}}$$

Market index data were collected using the documentation method and obtained from Yahoo Finance. The data collection method was carried out by recording historical data on the daily closing price of the composite stock price index from the five stock exchanges in

ASEAN-5. Data analysis in this quantitative study used statistical analysis using MS Excel and EViews. The data analysis technique used descriptive statistical analysis and Stationarity testing methods, Co-Integration tests, and Granger Causality tests.

RESULTS

The stock price index is used as an object in the study because the stock price index is a composite index and is used to calculate market returns. After the existing data is tested for stationary, testing is carried out using the VAR method if the data is stationary. Furthermore, testing is carried out using the Granger causality test to see the relationship between existing variables.

The results of this market return are obtained by subtracting the return on the current day minus the return on yesterday. This calculation is done using MS Excel. MS Excel processing produces monthly, quarterly, and annual returns. Overall, the monthly return data for 2020 and 2022 are relatively identical. In this case, the majority of market returns are negative. Different results were found in the 2022 data, where the market return was close to zero; even the Indonesian capital market showed a positive spike in July.

The results of the stationary and 1st difference tests indicate that the data is not stationary at the level, as indicated by the probability value of more than 0.05 (Table 1 Panel A). With non-stationary data at the level where the data is, it is necessary to conduct a stationary test again at the 1st difference in the other four countries as can be seen in Table 1 (Panel B) and if the data is still not stationary at the 1st difference level, it is continued with a stationary test at the 2nd difference level.

Table 1 Summary of Stationary Test Results 2020 to 2022

Countries / Description	Indonesia	Malaysia	Singapore	Thailand	Philippines
Panel A: Stationary					
Level	0.7553	0.0716	0.5430	0.4465	0.0528*
t-statistic	-0.9986	-2.7174	-1.4801	-1.6693	-2.8439
Panel B. 1st difference					
Level	0.0000*	0.0000*	0.0000*	0.0000*	0.0528*
t-statistic	-25.7518	-25.2415	-25.1731	-11.8649	-2.8439

The results of the optimal lag test that have been carried out show that the optimal lag is at lag 3, which is shown in Table 2 using the lowest AIC (Akaike Information Criterion)

value of 48.4014. Determination of this optimal lag is carried out to determine the optimal lag value before conducting the VAR test so that when the VAR test is carried out, the lag value is already optimal.

Table 2 Optimal Lag Test Results 2020 to 2022

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-15107.22	NA	8.07e+14	48.5143	48.5499*	48.5282*
1	-15062.84	87.8890	7.59e+14	48.4521	48.6657	48.5351
2	-15043.88	37.2533	7.74e+14	48.4715	48.8630	48.6237
3	-14997.05	91.2605	7.21e+14*	48.4014*	48.9709	48.6227
4	-14975.62	41.4142	7.30e+14	48.4129	49.1603	48.7034
5	-14949.92	49.2474*	7.28e+14	48.4107	49.3360	48.7703

The results of the VAR tests that have been carried out are shown in Table 3, showing that the index return in Indonesia today is influenced by the return of Indonesia -1, the return of Singapore -3, the return of Thailand -1 and the return of Thailand -3, and the return of the Philippines -3. This can be seen from the results of the t-statistic values of each, all of which are greater than 1.96. The test results for Malaysia itself show that the return of Malaysia today is influenced by the return of Indonesia -1, then also influenced by the return of Singapore -3, the return of Thailand -1, and the return of Thailand -3. The test results for Singapore show that the return of Singapore today is influenced by the return of Thailand -3 and the return of the Philippines -1 because the t-statistic value is greater than 1.96. The test results for the return of Thailand today are influenced by the return of Thailand -3. The test results for the return of the Philippines today are influenced by the return of Singapore -1, the return of Thailand -3, and the return of the Philippines -1.

The results of the VAR testing that has been carried out produce a model equation with significant criteria as follows:

Indonesia = -0.1576*Indonesia(-1) - 0.2887*Singapore(-3) + 0.4569*Thailand(-1) + 0.8335*Thailand(-3) + 0.07239*Philippines(-3)

Malaysia = -0.0203*Indonesia(-1) - 0.0758*Singapore(-3) + 0.1155*Thailand(-1) + 0.2845*Thailand(-3)

Singapore = 0.4790*Thailand(-3) + 0.0345*Philippines(-1)

Thailand = 0.1797*Thailand(-3)

Philippines = 0.5374*Singapore(-1) + 1.7051*Thailand(-3) - 0.1224*Philippines(-1)

Table 3 VAR Test Results 2020 to 2022

Variable	Indonesia	Malaysia	Singapore	Thailand	Philippines
Indonesia (-1)	-0.1576	-0.0203	-0.0234	-0.0077	-0.0493
	[-3.1043]*	[-1.9769]*	[-1.0325]	[-0.6072]	[-0.6566]
Indonesia (-2)	-0.0568	-0.0038	-0.0051	0.0179	-0.0489
	[-1.1127]	[-0.3716]	[-0.2223]	[1.4139]	[-0.6481]
Indonesia (-3)	0.0082	-0.0178	-0.0219	0.0046	-0.0019
	[0.1621]	[-1.7303]	[-0.9659]	[0.3661]	[-0.0258]
Malaysia (-1)	-0.0019	-0.0873	-0.0565	-0.0411	0.2470
	[-0.0080]	[-1.7542]	[-0.51423]	[-0.6697]	[0.6784]
Malaysia (-2)	0.3228	-0.0133	0.13852	-0.0447	0.4004
	[1.3074]	[-0.2670]	[1.2557]	[-0.7263]	[1.0960]
Malaysia (-3)	0.2505	-0.0680	-0.0832	-0.0257	-0.0819
	[1.0164]	[-1.3652]	[-0.7555]	[-0.4189]	[-0.2248]
Singapore (-1)	0.08133	0.0175	-0.0515	0.0268	0.5374
	[0.6500]	[0.6919]	[-0.9212]	[0.8596]	[2.9026]*
Singapore (-2)	0.1306	-0.0006	0.0399	-0.0012	-0.1954
	[1.0359]	[-0.0220]	[0.7082]	[-0.0395]	[-1.0471]
Singapore (-3)	-0.2888	-0.0756	-0.0759	-0.0268	-0.2050
	[-2.3018]*	[-2.980]*	[-1.3551]	[-0.8574]	[-1.1044]
Thailand (-1)	0.4569	0.1155	0.0851	-0.0617	0.5359
	[2.0814]*	[2.6014]*	[0.8675]	[-1.1272]	[1.6494]
Thailand (-2)	-0.1498	0.0488	-0.0316	-0.0243	0.13948
	[-0.6779]	[1.0932]	[-0.3198]	[-0.4412]	[0.4265]
Thailand (-3)	0.8335	0.2845	0.4790	0.1797	1.7051
	[3.8059]*	[6.4263]*	[4.8953]*	[3.2901]*	[5.2611]*
Philippines (-1)	0.0569	0.0096	0.0346	0.0049	-0.1224
	[1.6824]	[1.4122]	[2.2896]*	[0.5930]	[-2.4472]*
Philippines (-2)	0.0409	0.0027	0.0096	0.0079	-0.0372
	[1.1943]	[0.3926]	[0.6321]	[0.9310]	[-0.7352]
Philippines (-3)	0.0724	0.0109	0.0248	0.0137	-0.0072
	[2.1732]*	[1.6164]	[1.6644]	[1.6508]	[-0.1452]

* significance at 5%

The results of the Granger causality test are shown in Table 4. It can be seen that Malaysia influences Indonesia ($p < \alpha$), while Indonesia does not influence Malaysia ($p > \alpha$). This influence can be caused by the Malaysian and Indonesian markets, which are emerging markets (MSCI, 2023), so both can influence each other, or one will influence because they are in the same type of market. In addition, Malaysia has a large investment in Indonesia, quite large, with a value of US$ 6.5 million (Kementerian Investasi dan Hilirisasi, 2024). This makes the Indonesian market can be influenced by the Malaysian market.

Table 4 Granger Causality Test Results 2020 to 2022 (n = 626)

Null Hypothesis	F-Statistic	Prob.
Malaysia has no causality towards Indonesia	3.7419	0.0242*
Indonesia has no causality towards Malaysia	0.4649	0.6284
Singapore has no causality towards Indonesia	5.5970	0.0039*
Indonesia has no causality towards Singapore	0.4864	0.6151
Thailand has no causality towards Indonesia	5.7955	0.0032*
Indonesia has no causality towards Thailand	3.4297	0.0330*
Philippines has no causality against Indonesia	5.1125	0.0063
Indonesia has no causality against Philippines	1.51801	0.2199
Singapore has no causality against Malaysia	1.4514	0.2350
Malaysia has no causality against Singapore	1.9476	0.1435
Thailand has no causality against Malaysia	4.1651	0.0160*
Malaysia has no causality against Thailand	0.4518	0.6367
Philippines has no causality against Malaysia	1.8548	0.1573
Malaysia has no causality against Philippines	4.1894	0.0156*
Thailand has no causality against Singapore	0.6307	0.5325
Singapore has no causality against Thailand	1.1603	0.3141
Philippines has no causality against Singapore	2.1814	0.1137
Singapore has no causality against Philippines	12.089	7.E-06*
Philippines has no causality against Thailand	1.8578	0.1569
Thailand has no causality against Philippines	7.4717	0.0006*

* significance at 5%

The Singapore market influences Indonesia as shown (p < α), while Indonesia does not influence Singapore (p > α). This influence arises because Singapore itself is a country with a developed market and has a large market capitalization based on data from MSCI (2023). Therefore, Singapore can influence the Indonesian market. Singapore has a large investment in Indonesia worth US$ 36.7 million (Kementerian Investasi dan Hilirisasi, 2024). In the case of Thailand, the results of the Granger causality test show that Thailand influences Indonesia (p < α). The same thing also happens to Indonesia influencing Thailand (p < α). This can happen because Indonesia and Thailand are included in developing markets, according to MSCI (2023), so the markets of the two countries can influence each other. Thailand has an investment in Indonesia of US$ 807,006. Meanwhile, Indonesia has an investment in Thailand with funds that have been invested reaching US$ 20 billion (Kompas, 2023).

The Philippine market influences Indonesia (p < α), while the Indonesian market does not influence the Philippines (p > α). As developing countries, the Philippines and Indonesia can influence each other (MSCI, 2023). The influence that occurs can be caused

by the Philippines' having capital invested in Indonesia of US$ 111,279 (Kementerian Investasi dan Hilirisasi, 2024). Meanwhile, Singapore was found not to influence Malaysia ($p > \alpha$). Malaysia also influences Singapore ($p > \alpha$). The Thai market was found to influence Malaysia ($p < \alpha$). Conversely, Malaysia does not influence Thailand ($p > \alpha$). As both countries with developing markets, ideally, Thailand and Malaysia influence each other. Thailand has an investment in Malaysia of RM 3.3 million (Department of Statistics Malaysia, 2023), so the Thai market can influence the Malaysian market. The Philippine market does not affect Malaysia ($p > \alpha$). On the other hand, Malaysia affects the Philippines ($p < \alpha$). This can happen because the Philippines and Malaysia are both emerging markets where both can influence each other, or only one will affect the existing market (MSCI, 2023). The influence of the Malaysian market on the Philippine market can be caused by Malaysia's investment worth US$ 108.6 million in 2022 (Bangko Sentral ng Pilipinas, 2024). The Thai market does not affect Singapore ($p > \alpha$). The same thing also happens in the Singapore market, which does not affect Thailand ($p > \alpha$). The absence of this influence could be because as a developing market, Thailand is not strong enough to influence the Singapore market as a developed country market and has a large market capitalization (MSCI, 2023). The Philippine market was found not to affect the Singapore market ($p > \alpha$). However, the Singapore market affects the Philippines ($p < \alpha$). This influence occurs because, as a country with a more developed market and higher market capitalization, Singapore can influence the Philippine market (MSCI, 2023). Singapore's investment value in the Philippines was US$ 491.4 million in 2022 (Bangko Sentral ng Pilipinas, 2024).

The Philippine market does not affect Thailand ($p > \alpha$). However, the Thai market affects the Philippines ($p < \alpha$). Ideally, as countries that are emerging markets, both can influence each other, but it turns out that Thailand influences (MSCI, 2023). Thailand has an investment of US$ 3.7 million in the Philippines based on 2022 data (Bangko Sentral ng Pilipinas, 2024).

Overall, it can be seen that the test of whether there is a contagion effect among countries in ASEAN-5 during the COVID-19 pandemic shows that there is a contagion effect. This means that the COVID-19 pandemic has a contagion effect on countries in ASEAN-5. Malaysia, Singapore, and the Philippines can affect Indonesia but not vice versa, while Thailand itself has a back-and-forth influence with Indonesia. The test results show that Singapore does not affect Malaysia, but Malaysia does not affect Singapore. Thailand affects Malaysia, but Malaysia does not affect Thailand. The Philippines does not affect Malaysia, but Malaysia affects the Philippines. Thailand does not affect Singapore and vice

versa; Singapore does not affect Thailand. The Philippines does not affect Thailand, but Thailand affects the Philippines.

Looking at all the results that exist and have been carried out, it can be concluded that the capital markets of Indonesia and ASEAN-5 countries are related to each other and are integrated. This can happen because the countries in ASEAN-5 have cooperative relationships in various fields such as economics, social, culture, technical, education, and others, and can be influenced by the characteristics of their capital markets, coupled with the COVID-19 pandemic. Therefore, the effects of the risks that occur can easily be spread to other countries because of the integration that occurs between their capital markets. Additional tests have also been carried out for each year. The results of the stationary test at the level and 1st difference levels that have been carried out are presented in Table 5.

Table 5 Summary of Stationary Test Results and 1st Difference 2020-2022

Countries Description	Indonesia	Malaysia	Singapore	Thailand	Philippines
Panel A: Stationary at year 2020					
Level	0.3224	0.5520	0.2862	0.1792	0.3682
t-statistic	-1.9205	-1.4601	-2.001419	-2.2807	-1.8239
Panel B. 1st difference at year 2020					
Level	0.0002*	0.0000*	0.0000*	0.0000*	0.0000*
t-statistic	-4.6337	-14.1493	-14.5903	-6.1118	-14.2061
Panel C: Stationary at year 2021					
Level	0.5764	0.2440	0.0545*	0.1667	0.3629
t-statistic	-1.4111	-2.1026	-2.8394	-2.3190	-1.8349
Panel D. 1st difference at year 2021					
Level	0.0000*	0.0000*	0.0545*	0.0000*	0.0000*
t-statistic	-16.4260	-15.1229	-2.8394	-14.86257	-15.238
Panel E: Stationary at year 2022					
Level	0.0326*	0.5014	0.3032	0.2359	0.4377
t-statistic	-3.0441	-1.5598	-1.9628	-2.1231	-1.6843
Panel F. 1st difference at year 2022					
Level	0.0326*	0.0000*	0.0000*	0.0000*	0.0000*
t-statistic	-3.0441	-14.7488	-8.0709	-13.4570	-14.6489

Table 6 Optimal Lag Test Results 2020-2022

Lag	LogL	LR	FPE	AIC	SC	HQ
Panel A: Year 2020						
0	-4984.974	NA	6.90e+15	50.6596	50.7429*	50.6933*
1	-4949.377	69.0260	6.20e+15	50.5520	51.0520	50.7544
2	-4922.518	50.7178	6.08e+15	50.5331	51.4498	50.9042
3	-4882.337	73.8353*	5.22e+15*	50.3790*	51.7123	50.9187
4	-4867.903	25.7913	5.83e+15	50.4863	52.2362	51.1947
5	-4848.387	33.8803	6.18e+15	50.5420	52.7085	51.4190
Panel B: Year 2021						
0	-4721.190	NA*	9.14e+13*	46.3351*	46.4165*	46.3680*
1	-4705.532	30.3938	1.00e+14	46.4267	46.9147	46.6241
2	-4687.365	34.3752	1.07e+14	46.4937	47.3883	46.8556
3	-4668.647	34.5003	1.14e+14	46.5553	47.8565	47.0817
4	-4651.501	30.7612	1.23e+14	46.6323	48.3402	47.3232
5	-4639.421	21.0804	1.41e+14	46.7590	48.8735	47.6143
6	-4622.566	28.5871	1.53e+14	46.8388	49.3600	47.8587
7	-4600.050	37.0856	1.58e+14	46.8632	49.7909	48.0475
8	-4581.050	30.3625	1.69e+14	46.9220	50.2564	48.2708
Panel C: Year 2022						
0	-4689.959	NA	1.69e+14*	46.9495*	47.0320*	46.9829*
1	-4675.677	27.7067	1.88e+14	47.0567	47.5515	47.2569
2	-4654.391	40.2307*	1.95e+14	47.0939	48.0009	47.4609
3	-4644.582	18.0478	2.27e+14	47.2458	48.5651	47.7797
4	-4631.980	22.5581	2.58e+14	47.3698	49.1014	48.0705
5	-4622.616	16.2928	3.03e+14	47.5261	49.6700	48.3937
6	-4607.449	25.6322	3.36e+14	47.6244	50.1806	48.6589
7	-4590.070	28.5011	3.65e+14	47.7007	50.6691	48.9020
8	-4571.799	29.0515	3.94e+14	47.7679	51.1487	49.1361

* significance at 5%

The results of the 2020 stationary test are shown in Panel A of Table 5. The data were found to be non-stationary ($p > \alpha$). Non-stationary data were found in five countries tested. This means that it is necessary to conduct a stationary test again at the 1st difference in the five countries. The results can be seen in Panel B of Table 5, and if the data is still non-stationary at the 1st difference level, then a stationary test is continued at the 2nd difference level. Panel C of Table 5 shows that in 2021, the data was non-stationary at the level for all countries ($p > \alpha$). Therefore, a stationary test was conducted again at the 1st difference (Panel D of Table 5). The results of the 2022 stationary test (Panel E) show that the data is not stationary at the level ($p > \alpha$). However, only Indonesia passes the stationary

test (p < α). The results of the stationary test return to the 1st difference in the other four countries, which can be seen in Panel F Table 5.

The results of the optimal lag test that have been carried out show that the optimal lag for 2020 is at lag 3 (Panel A Table 6) with an AIC (Akaike Information Criterion) value chosen of 50.3790 because it has the lowest value. The determination of this optimal lag is carried out to find out the optimal lag value before conducting the VAR test so that when the VAR test is carried out, the lag value is optimal. The optimal lag test results were found for 2021 to be at lag 0 (Panel B Table 6) with an AIC value of 46.3351, which was chosen based on the lowest AIC value. The optimal lag test results for 2022 showed results at lag 0 (Panel C Table 6) with an AIC value of 46.9495, which was chosen based on the lowest AIC value. The test results using the VAR method are presented in Table 7.

The results of the VAR test in Table 7 show that the return of the Indonesian index today in 2020 is influenced by the return of Indonesia -2 of -2.6410, the return of Singapore -3 of -1.9955, and the return of Thailand -3 of 3.8972 (p > α). The return of Malaysia today in 2020 is influenced by the return of Singapore -3 of -2.2152, the return of Thailand -3 of 5.0343, and the return of the Philippines -3 of 2.0114. The return of Singapore today in 2020 is influenced by the return of Singapore -3 of -2.9091, the return of Thailand -3 of 5.0343, and the return of the Philippines -3 of 3.0919. The return of Thailand today in 2020 is influenced by the return of Thailand -3 of 2.9078 and the return of the Philippines -3 of 2.2038. The return of the Philippines today in 2020 is influenced by the return of Thailand -3 of 4.9338.

The results of the VAR testing that has been carried out produce a model equation with significant criteria as follows:

$$Indonesia\_2020 = -0.2607*Indonesia\_2020(-2) - 0.5017*Singapore\_2020(-3) + 1.3723*Thailand\_2020(-3)$$
$$Malaysia\_2020 = -0.11753*Singapore\_2020(-3) + 0.4050*Thailand\_2020(-3) + 0.0279*Philippines\_2020(-3)$$
$$Singapore\_2020 = -0.3372*Singapore\_2020(-3) + 0.8172*Thailand\_2020(-3) + 0.0937*Philippines\_2020(-3)$$
$$Thailand\_2020 = 0.2978*Thailand\_2020(-3) + 0.0422*Philippines\_2020(-3) \quad (10)$$
$$Philippines\_2020 = 2.5929*Thailand\_2020(-3)$$

Tabel 7 VAR Test Results 2020

Variable	Indonesia	Malaysia	Singapore	Thailand	Philippines
Indonesia (-1)	-0.0633	-0.0220	-0.0395	-0.0019	-0.0074
	[-0.6305]	[-1.0425]	[-0.8543]	[-0.0682]	[-0.0498]
Indonesia (-2)	-0.2607	-0.0179	-0.0219	0.0389	-0.1739
	[-2.6410]*	[-0.8629]	[-0.4829]	[1.3560]	[-1.1804]
Indonesia (-3)	0.0644	-0.0331	-0.0465	-0.0180	0.0081
	[0.6339]	[-1.5472]	[-0.9937]	[-0.6097]	[0.0538]
Malaysia (-1)	0.1142	-0.1112	-0.0323	0.0184	0.1473
	[0.2532]	[-1.1688]	[-0.1556]	[0.1405]	[0.2188]
Malaysia (-2)	0.6424	-0.1478	0.2046	-0.1575	0.6159
	[1.4373]	[-1.5680]	[0.9935]	[-1.2122]	[0.9234]
Malaysia (-3)	0.3163	-0.0938	-0.12019	-0.0560	-0.1029
	[0.6860]	[-0.9644]	[-0.5653]	[-0.4176]	[-0.1496]
Singapore (-1)	-0.0493	0.0112	-0.1223	0.0311	0.6588
	[-0.1931]	[0.2092]	[-1.0389]	[0.4193]	[1.7278]
Singapore (-2)	0.0276	0.0231	-0.1690	-0.0476	-0.6670
	[0.1075]	[0.4264]	[-1.4282]	[-0.6382]	[-1.7401]
Singapore (-3)	-0.5017	-0.1175	-0.3371	-0.0891	-0.6080
	[-1.9955]*	[-2.2152]*	[-2.9091]*	[-1,2186]	[-1.6203]
Thailand (-1)	0.4092	01469	0.0604	-0.0695	0.4017
	[1.1316]	[1.9252]	[0.3624]	[-0.6614]	[0.7443]
Thailand (-2)	-0.0822	0.0895	0.1625	0.0799	0.4667
	[-0.2275]	[1.1743]	[0.9756]	[0.7606]	[0.8653]
Thailand (-3)	1.3723	0.4050	0.8172	0.29780	2.5929
	[3.8972]*	[5.4516]*	[5.0343]*	[2.9078]*	[4.9338]*
Philippines (-1)	0.05168	0.00969	0.05476	-0.01690	-0.13068
	[0.7810]	[0.6945]	[1.7951]	[-0.8781]	[-1.3231]
Philippines (-2)	0.09511	0.01833	0.06096	0.01130	0.11889
	[1.3804]	[1.2610]	[1.9196]	[0.5643]	[1,1562]
Philippines (-3)	0.10845	0.02791	0.09376	0.04216	0,05072
	[1.6486]	[2.0114]*	[3.0919]*	[2.2038]*	[0,5165]

* significance at 5%

Table 8 Optimal Lag Test Results 2021

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-4721.190	NA*	9.14e+13*	46.3351*	46.4165*	46.3680*
1	-4705.532	30.3938	1.00e+14	46.4267	46.9147	46.6241
2	-4687.365	34.3752	1.07e+14	46.4937	47.3883	46.8556
3	-4668.647	34.5003	1.14e+14	46.5553	47.8565	47.0817
4	-4651.501	30.7612	1.23e+14	46.6323	48.3402	47.3232
5	-4639.421	21.0804	1.41e+14	46.7590	48.8735	47.6143
6	-4622.566	28.5871	1.53e+14	46.8388	49.3600	47.8587
7	-4600.050	37.0856	1.58e+14	46.8632	49.7909	48.0475
8	-4581.050	30.3625	1.69e+14	46.9220	50.2564	48.2708

Table 8 presents a summary of the results of the 2021 optimal lag test. The results of the VAR test can be seen in Table 8, looking at the optimal lag value which has a lag value of 0, then the index returns in Indonesia, Malaysia, Singapore, Thailand, and the Philippines today in 2021 have a direct influence or it can be said that the influence that occurred occurred directly on that day on the five indexes.

Table 9 Optimal Lag Test Results 2022

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-4689.959	NA	1.69e+14*	46.9495*	47.0320*	46.98296*
1	-4675.677	27.7067	1.88e+14	47.0567	47.5515	47.25698
2	-4654.391	40.2307*	1.95e+14	47.0939	48.0009	47.46097
3	-4644.582	18.0478	2.27e+14	47.2458	48.5651	47.77973
4	-4631.980	22.5581	2.58e+14	47.3698	49.1014	48.07056
5	-4622.616	16.2928	3.03e+14	47.5261	49.6700	48.39377
6	-4607.449	25.6322	3.36e+14	47.6244	50.1806	48.65894
7	-4590.070	28.5011	3.65e+14	47.7007	50.6691	48.90200
8	-4571.799	29.0515	3.94e+14	47.7679	51.1487	49.13614

The results of the VAR test can be seen in Table 9. It can be seen that the optimal lag value with a lag value of 0, namely the index return in Indonesia, Malaysia, Singapore, Thailand, and the Philippines today in 2022, has a direct influence. This means that the influence that occurs occurs directly on that day on the five indexes. The results of the Granger quality test are shown in Table 10.

Table 10 Granger Causality Test Results 2020 (n = 206)

Null Hypothesis	F-Statistic	Prob.
Malaysia 2020 has no causality towards Indonesia 2020	3.0617	0.0490*
Indonesia 2020 has no causality towards Malaysia 2020	0.1935	0.8242
Singapore 2020 has no causality towards Indonesia 2020	2.7623	0.0655
Indonesia 2020 has no causality towards Singapore 2020	1.1382	0.3224
Thailand 2020 has no causality against Indonesia 2020	2.1213	0.1226
Indonesia 2020 has no causality against Thailand 2020	2.3888	0.0943
Philippines 2020 has no causality against Indonesia 2020	2.2795	0.1050
Indonesia 2020 has no causality against Philippines 2020	1.8211	0.1645
Singapore 2020 has no causality against Malaysia 2020	1.2911	0.2772
Malaysia 2020 has no causality against Singapore 2020	2.6387	0.0739
Thailand 2020 has no causality against Malaysia 2020	1.9568	0.1440
Malaysia 2020 has no causality against Thailand 2020	0.0508	0.9505
Philippines 2020 has no causality against Malaysia 2020	1.2076	0.3010
Malaysia 2020 has no causality against Philippines 2020	2.1317	0.1213
Thailand 2020 has no causality against Singapore 2020	0.0034	0.9965
Singapore 2020 has no causality against Thailand 2020	0,2543	0.7757
Philippines 2020 has no causality against Singapore 2020	2.2352	0.1096
Singapore 2020 has no causality against Philippines 2020	9.9259	8.E-05*
Philippines 2020 has no causality against Thailand 2020	1.4403	0.2393
Thailand 2020 has no causality against Philippines 2020	4.6012	0.0111*

* significance at 5%

Table 10 shows the results of the Granger causality test for 2020. Malaysia influences Indonesia ($p < \alpha$), while Indonesia does not influence Malaysia ($p > \alpha$). Singapore and Indonesia influence each other ($p > \alpha$). Thailand and Indonesia do not influence each other ($p > \alpha$). The Philippines and Indonesia do not influence each other. Empirical evidence also shows that Singapore and Malaysia do not influence each other ($p > \alpha$). Thailand and Malaysia do not influence each other ($p > \alpha$). The Philippines and Malaysia do not influence each other. Thailand and Singapore do not influence each other. The Philippines does not influence Singapore ($p > \alpha$), but Singapore influences the Philippines ($p < \alpha$). The Philippines does not influence Thailand, but conversely, Thailand influences the Philippines.

Table 11 Granger Causality Test Results 2021 (n = 210)

Null Hypothesis	F-Statistic	Prob.
Malaysia 2021 has no causality towards Indonesia 2021	0.5252	0.5922
Indonesia 2021 has no causality towards Malaysia 2021	0.3719	0.6899
Singapore 2021 has no causality towards Indonesia 2021	2.1350	0.1209
Indonesia 2021 has no causality towards Singapore 2021	1.4985	0.2259
Thailand 2021 has no causality towards Indonesia 2021	0.2282	0.7961
Indonesia 2021 has no causality towards Thailand 2021	0.4031	0.6688
Philippines 2021 has no causality towards Indonesia 2021	1.2480	0.2892
Indonesia 2021 has no causality towards Philippines 2021	0.5965	0.5517
Singapore 2021 has no causality towards Malaysia 2021	0.8331	0.4361
Malaysia 2021 has no causality towards Singapore 2021	0.5282	0.5904
Thailand 2021 has no causality against Malaysia 2021	0.1648	0.8481
Malaysia 2021 has no causality against Thailand 2021	2.0832	0.1272
Philippines 2021 has no causality against Malaysia 2021	1.3967	0.2497
Malaysia 2021 has no causality against Philippines 2021	0.3382	0.7134
Thailand 2021 has no causality against Singapore 2021	1.8349	0.1622
Singapore 2021 has no causality against Thailand 2021	0.2206	0.8022
Philippines 2021 has no causality against Singapore 2021	0.5966	0.5516
Singapore 2021 has no causality against Philippines 2021	3.5296	0.0311*
Philippines 2021 has no causality against Thailand 2021	0.2538	0.7761
Thailand 2021 has no causality against Philippines 2021	2.2511	0.1079

* significance at 5%

Table 11 presents a summary of the results of the Granger causality test for 2021. The results of the 2021 Granger causality test (Table 11) show that Malaysia and Indonesia do not influence each other ($p > \alpha$). Singapore and Indonesia do not influence each other. Thailand and Indonesia do not influence each other. The Philippines and Indonesia do not influence each other. Singapore and Malaysia do not influence each other ($p > \alpha$). Thailand and Malaysia do not influence each other. The Philippines and Malaysia do not influence each other. Thailand and Singapore do not influence each other. The Philippines does not influence Singapore ($p > \alpha$), but Singapore influences the Philippines ($p < \alpha$). The Philippines and Thailand do not influence each other ($p > \alpha$).

Table 12 Granger Causality Test Results 2022 (n = 206)

Null Hypothesis	F-Statistic	Prob.
Malaysia 2022 has no causality towards Indonesia 2022	0.1313	0.8770
Indonesia 2022 has no causality towards Malaysia 2022	0.3179	0.7280
Singapore 2022 has no causality towards Indonesia 2022	1.2504	0.2886
Indonesia 2022 has no causality towards Singapore 2022	0.1692	0.8445
Thailand 2022 has no causality towards Indonesia 2022	1.7376	0.1786
Indonesia 2022 has no causality towards Thailand 2022	2.5822	0.0781
Philippines 2022 has no causality towards Indonesia 2022	1.2219	0.2968
Indonesia 2022 has no causality towards Philippines 2022	0.5885	0.5561
Singapore 2022 has no causality towards Malaysia 2022	0.0418	0.9591
Malaysia 2022 has no causality towards Singapore 2022	0.0594	0.9423
Thailand 2022 has no causality against Malaysia 2022	2.4563	0.0883
Malaysia 2022 has no causality against Thailand 2022	0.3333	0.7169
Philippines 2022 has no causality against Malaysia 2022	1.4409	0.2391
Malaysia 2022 has no causality against Philippines 2022	1.8097	0.1663
Thailand 2022 has no causality against Singapore 2022	1.4884	0.2282
Singapore 2022 has no causality against Thailand 2022	1.8478	0.1602
Philippines 2022 has no causality against Singapore 2022	1.3524	0.2610
Singapore 2022 has no causality against Philippines 2022	0.6718	0.5119
Philippines 2022 has no causality against Thailand 2022	3.0147	0.0513*
Thailand 2022 has no causality against Philippines 2022	1.3277	0.2674

* significance at 5%

The results of the Granger causality test for 2022 are presented in Table 12. The results of the Granger causality test in 2022 (Table 12) show that Malaysia and Indonesia do not influence each other ($p > \alpha$). Singapore and Indonesia do not influence each other. Thailand and Indonesia do not influence each other. The Philippines and Indonesia do not influence each other. Singapore and Malaysia do not influence each other ($p > \alpha$). Thailand and Malaysia do not influence each other. The Philippines and Malaysia do not influence each other. Thailand and Singapore do not influence each other. The Philippines and Singapore do not influence each other. The Philippines and Thailand do not influence each other.

The results of the Granger causality test from 2020 to 2022 show that there is an inconsistent influence that occurs. In 2020, there was an influence of the Malaysian market on Indonesia but not vice versa. Singapore influenced the Philippines but not vice versa. Thailand influenced the Philippines but not vice versa. The 2021 test showed that Singapore influenced the Philippines but not vice versa. The last one occurred in 2022, the Philippines influenced Thailand but not vice versa.

In general, the results of this study are similar to some previous studies, namely that a major event can affect the capital market in a region. For example, Nguyen et al. (2022) found a fairly high correlation between the United States and Japan markets and the emerging Asian market. The United States equity market infected markets in developed and emerging countries during the global financial crisis. Fu et al. (2021) found that the contagion effect was widespread in global equity markets across four regions. Latin American and North American markets were highly susceptible to contagion risk, followed by Europe, with Asia being the least susceptible.

DISCUSSION

This study aims to analyze whether there is a contagion effect in the capital markets between ASEAN-5 countries during the COVID-19 pandemic in the period 2020 and 2022. The test results show several interesting findings. The capital markets of Malaysia, Singapore, and the Philippines affect the Indonesian capital market but not vice versa; there is a reciprocal influence between Thailand and Indonesia. The Singapore capital market and the Malaysian capital market do not influence each other. The Thai capital market affects the Malaysian capital market but not vice versa. The Philippine capital market does not affect the Malaysian capital market, but vice versa, the Malaysian capital market affects the Philippine capital market. The Thai and Singapore capital markets do not affect each other. The Singapore capital market affects the Philippine capital market but not vice versa. The Philippine capital market does not affect the Thai capital market, but the opposite occurs. In the COVID-19 pandemic, the contagion effect that occurred in the ASEAN-5 capital markets shows that the capital markets in ASEAN are interconnected. This means that if a problem occurs in one capital market, the effect can also be felt in other capital markets. The effects of the COVID-19 pandemic that occurred were also spread and had an impact on the capital markets in ASEAN-5 because of the relationship or integration between their capital markets.

The study is also in line with the study conducted by Shahrier (2022), which examines the contagion effect of exchange rates in the ASEAN-5 market during the COVID-19 pandemic by adopting the VECM method in a structural VAR framework and wavelet analysis with a higher time frequency. Similar research was also conducted by Nguyen et al. (2022), which examined financial contagion from the US, Japan, and China markets to the Asian market during the Global Financial Crisis (GFC) and the COVID-19 pandemic

crisis. The results of his research showed that the correlation between the US and Japanese markets with the developing Asian markets was quite high, implying interdependence between these markets. In addition, there was a significant contagion effect from the US equity market to markets in developed and developing countries during the GFC.

Conclusion, Limitations, and Suggestions

This study aims to analyze whether there is a contagion effect in the capital markets between ASEAN-5 countries during the COVID-19 pandemic from 2020 to 2022. There are various interesting results in this research study. The capital markets of Malaysia, Singapore, and the Philippines affect the Indonesian capital market but not vice versa. The Singapore capital market and the Malaysian capital market do not influence each other. The Thai capital market affects the Malaysian capital market but not vice versa. The Philippine capital market does not affect the Malaysian capital market, but vice versa, the Malaysian capital market affects the Philippine capital market. The Thai and Singapore capital markets do not affect each other. The Singapore capital market affects the Philippine capital market but not vice versa. The Philippine capital market does not affect the Thai capital market, but the opposite occurs.

There are limitations in this study in that this study only emphasizes its analysis on the contagion effect that can occur due to an event that occurs from a capital market that does not control other events that exist during the analysis period. This means that by ignoring other events that appear during the analysis period, the results of the study are very likely to be biased. Therefore, in the next study, other methods can be used that are more sensitive to see the contagion effect that occurs. In addition, future research should isolate the potential effects of other events in each country.

The results of this study can be used as reference material and discussion material for investors and other stakeholders to facilitate the decision-making process that must be taken regarding future investments and can obtain optimal results from investments made. The existence of extraordinary events in the short or medium term, such as COVID-19, is a source of foothold for investors to observe the potential effects of contagion that can occur in the ASEAN-5 capital market. However, it should be remembered that not every similar event can also provide the same contagion effect. Therefore, investors need to review again if there are similar events that occur in the future.

REFERENCES

Association of Southeast Asian Nations. (2023). The Founding of ASEAN. Retrieved 25 March, 2024, from: https://asean.org/the-founding-of-asean

Bangko Sentral ng Pilipinas. (2024). Net Foreign Direct Investment Flows. Retrieved 22 August, 2024, from: https://www.bsp.gov.ph/statistics/external/tab10_fdc.aspx

Dhiman, B., & Sharma, H. (2016). Study on Stock Market Integration & Contagion Effect (With Special Reference to India with ASEAN-3). *International Journal of Applied Business and Economic Research, 14*(7), 5277-5289.

Department of Statistics Malaysia. (2023). Statistics Of Foreign Direct Investment In Malaysia 2022. Retrieved 22 August, 2024, from: https://www.dosm.gov.my/uploads/release-content/file_20230615162447.pdf

Dornbusch, R., Park, Y. C., & Claessens, S. (2000). Contagion: Understanding How It Spreads. *The World Bank Research Observer, 15*(2), 177-197. https://doi.org/10.1093/wbro/15.2.177

Fu, S., Liu, C., & Wei, X. (2021). Contagion in Global Stock Markets During the COVID-19 Crisis. *Global Challenges*, *5*(10), 1-10. https://doi.org/10.1002/gch2.202000130

Kementerian Investasi dan Hilirisasi. (2024). Realisasi Penanaman Modal Berdasarkan Negara Periode 2010 - Juni 2024. Retrieved 22 August, 2024, from: https://bkpm.go.id/id/info/realisasi-investasi

Kompas. (2023, July 10). ASEAN-BAC: Thailand Contoh Keberhasilan Manfaatkan Potensi Investasi Asing di ASEAN. Retrieved 25 March, 2024, from: https://www.kompas.id/baca/adv_post/asean-bac-thailand-contoh-keberhasilan-manfaatkan-potensi-investasi-asing-di-asean

Kustodian Sentral Efek Indonesia. (2023). Statistik Pasar Modal Indonesia. Retrieved 25 March, 2024, from: https://www.ksei.co.id/files/Statistik_Publik_-_Februari_2023_v3.pdf

Le, T. P. T. D., & Tran, H. L. M. (2021). The Contagion Effect from US Stock Market to the Vietnamese and the Philippine Stock Markets: The Evidence of DCC-GARCH Model. *Journal of Asian Finance, Economics and Business*, *8*(2), 759-770. https://doi.org/10.13106/JAFEB.2021.VOL8.NO2.0759

MSCI. (2023). MSCI ASEAN Index (USD). Retrieved 22 August, 2024, from: https://www.msci.com/indexes

Nguyen, T. N., Phan, T. K. H., & Nguyen, T. L. (2022). Financial Contagion During

Global Financial Crisis and COVID–19 Pandemic: The Evidence from DCC–GARCH Model. *Cogent Economics & Finance*, *10*(1), 1-20. https://doi.org/10.1080/23322039.2022.2051824

Shahrier, N. A. (2022). Contagion Effects in ASEAN-5 Exchange Rates During the COVID-19 Pandemic. *North American Journal of Economics and Finance*, *62*, 1-17. https://doi.org/10.1016/j.najef.2022.101707

World Health Organization. (2022). Coronavirus Disease (COVID-19). Retrieved 25 March, 2024, from: https://www.who.int/health-topics/coronavirus#tab=tab_1

Yip, B., & Perasso, V. (2021, June 25). Asal COVID-19: Apakah Kita Perlu Tahu Dari Mana Asal Virus Corona ini? Retrieved 25 March, 2024, from: https://www.bbc.com/indonesia/dunia-57590872