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Composite Stock Price Index and Currency Exchange Rates of 4 Countries in Southeast Asia after Covid-19

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Abstract

The Covid-19 pandemic has caused a social and economic crisis in every country, leading to economic shocks that can be observed through the movement of the Composite Stock Price Index (CSPI) and Exchange Rate (ER). To determine the economic conditions of four Southeast Asian countries, this study aims to examine their exchange rates and CSPI. However, the pandemic has made economic factors unpredictable since every country has responded differently to it. The research focuses on Indonesia, Malaysia, Singapore, and Thailand from 2013 to 2022, using Vector Autoregression Model (VAR) modeling to analyze the relationship between the variables and their movements. The study found that exchange rate changes in the previous two periods significantly influence exchange rate changes in the four countries, and changes in exchange rates and JCI in Indonesia and Thailand affect subsequent changes with a longer time horizon. The study's results emphasize the importance of tailoring economic management based on each country's unique economic characteristics and taking measures to stabilize the exchange rate and CSPI movement. Policymakers and investors should consider the findings of this study to make informed economic decisions, especially in anticipating the impact of sudden exchange rate fluctuations and their potential long-term consequences.

Keywords : Composite Stock Price Index; Exchange Rate; VAR
JEL Classification : F47, C58

1. INTRODUCTION

The Covid-19 pandemic has infected millions of people in the world with relatively rapid transmission. Covid-19 as a deadly virus has made the government enforce policies related to social interactions and human habits. Pandemic conditions like this have a huge impact on various sectors, especially the economic sector as a result of shocks stemming from human conditions and poor health. The Covid-19 pandemic has caused various bad conditions, such as a health crisis, social crisis, and economic crisis. The pandemic also allows inequality and poverty to widen globally, which has an impact on economic conditions in each country (Asare Vitenu-Sackey & Barfi, 2021).

One indicator that illustrates the development and growth of a country's economy is the capital market, which plays an important role in sustaining economic growth (Pan & Mishra, 2018; Yang, 2019). The capital market is one of the media for capital investment by buying securities or bonds (Abina & Lemea, 2019). However, the political situation in a country and investor psychology can affect investment decision-making. Likewise, the Covid-19 pandemic can affect capital market conditions as a result of disturbed investor psychology. In addition, political turmoil can also affect economic stability. In other words, political stability will create economic stability, resulting in a positive response from investors (Stefhani, 2020). Therefore, the government, central bank, and industrial sector continue to watch the development of the stock market to maintain the good condition of the stock market in the future, especially when there is world turmoil such as the Covid-19 pandemic.

Goodell & Huynh (2020) present literature on the Covid-19 pandemic which has caused an economic slowdown seen in several countries experiencing recession. The recession can be seen through the negative GDP growth rate in the second quarter of 2020. This condition worsened when the relationship between the world's two largest economies worsened, namely the United States and China. In Southeast Asia, the decline in economic conditions occurred in several countries, such as Singapore, Indonesia, Malaysia, and Thailand. Zulhelmy & Hidayat (2020) stated that in the second quarter, Singapore's economy experienced a recession when the Gross Domestic Product (GDP) fell rapidly by 41.2 percent. A recession also occurred in Malaysia when GDP fell 16.5 percent in the second quarter. Similarly, the economies in Thailand and Indonesia experienced a decline in economic conditions in 2020 as a result of the pandemic. World Bank data also shows that the outlook for the East Asia and Pacific (EAP) region in 2020 is only 0.9 percent overall.

An indicator of a country's economy is also seen from the movement of the capital market. If a country's capital market conditions are good and stable, it will be attractive to both local and international investors. Thus, it can increase economic growth for a country. This is why the stock market is very important in terms of industry and investors. The development of stocks as an instrument that is in high demand by investors will always be considered because it has a higher risk of price fluctuations compared to other instruments. Fluctuations in stock market prices must be taken seriously by investors. Likewise, the stock price index is the beginning of consideration for making an investment because the stock price index is a form of summary of a simultaneous and complex impact (Astuti et al., 2013). CSPI is an index that shows general stock price movements. CSPI can be presented as a reference for capital market activities in a country. CSPI has three main benefits, namely as an identifier of market direction, a measure of profitability, and as a benchmark for portfolio performance (Astuti et al., 2013).

The movement of capital market indicators fluctuates in line with changes in market conditions and existing macroeconomic assumptions. Macroeconomic factors as external factors of the company have an impact on increasing or decreasing company performance, either directly or indirectly. Hidayat et al., (2021) concluded that there is a strong relationship between stock prices and variables in the macro economy. Capital market performance will respond to macroeconomic changes such as changes in exchange rates, economic growth, inflation and interest rates (Fahlevi, 2019).

According to Amir et al. (2020), CSPI, as an investment reference, experiences fluctuations driven by three main factors: domestic, foreign, and capital flow. The domestic factors that impact CSPI include exchange rates, GDP, inflation, and money supply. For instance, exchange rates represent the value of one currency when exchanged for another,

and variations in these rates can be attributed to foreign investors withdrawing their funds, as noted by Nwosa (2021). Previous research has indicated that most macroeconomic indicators, including currency exchange rates, have an impact on CSPI, as mentioned by Dewi (2020). Additionally, Yusuf et al., (2021) found that the rupiah exchange rate against the US dollar has a negative influence on CSPI, both in the short and long term. Therefore, the exchange rate is inversely related to CSPI movements. It is worth noting that the movement of foreign capital flow also plays a crucial role in determining CSPI changes. Foreign investment can affect the supply and demand of stocks, leading to changes in stock prices, which can ultimately impact CSPI movements. In summary, domestic and foreign factors, including capital flow, are significant drivers of CSPI movements, and investors should take these factors into account when making investment decisions. However, the Covid-19 pandemic makes the movement of economic factors in each country experience uncertainty because each country has a different response to the Covid-19 pandemic. Therefore, this research can provide information about economic conditions in Indonesia, Malaysia, Singapore, and Thailand that can be used as a basis for investors.

This research aims to identify the causality relationship between CSPI and currency exchange rates in 4 Southeast Asian countries, namely Indonesia, Malaysia, Singapore, and Thailand with VAR modeling. In addition, this study also aims to determine the economic conditions of these countries after the Covid-19 pandemic in terms of exchange rates and CSPI. Southeast Asia's economic research focuses on Indonesia, Malaysia, Thailand, and Singapore due to various reasons. These four countries have sizable and significant economies in the region and are considered as leading countries due to their relatively high GDP size and economic development level (Basri & Hill, 2020). Moreover, these countries have the potential for higher economic growth through technological innovation and investment, leading to economic diversification. They also play a vital role in Southeast Asia's regional economic integration (Ishikawa, 2021; Maneejuk & Yamaka, 2021). Therefore, comprehending the economies of these countries is crucial in understanding the dynamics of economic integration in the region, particularly after the Covid-19 Pandemic.

2. HYPOTHESES DEVELOPMENT

Many studies have been conducted to evaluate the effects of macroeconomic factors on capital market development in emerging economies, such factors include GDP, cash supply, interest rate, and others. For example, (John, 2019) used a VAR model to examine the relationship between macroeconomic factors and stock prices in the Nigerian stock market. The results showed a strong relationship between stock prices and these factors. Another study conducted by Saleem et al (2020) discussed the impact of FDI, EG, and TO in several South Asian countries, such as Pakistan, India, Sri Lanka, Bangladesh, and Nepal. In their research also found a long-term relationship between FDI, GDP, and openness with the capital market in these countries. The causality relationship between macroeconomic variables and capital markets in several developing countries such as Nigeria and Pakistan shows different results. Research conducted (Aremo et al., 2020) in Nigeria shows that some macroeconomic variables have a two-way relationship with the capital market where these variables consist of GDP per capita, FDI, and money supply. Research conducted by Acikalin et al (2008) concluded that four macroeconomic variables, namely GDP, exchange rates, interest rates, and CAB, have a unidirectional relationship with macro indicators and the Istanbul Stock Exchange (ISE) index. The difference in the results of previous research on the causal relationship between macroeconomic variables and the capital market has led to ambiguous theories. Therefore, an accurate understanding of this causal relationship is crucial for appropriate modeling of economic data. This knowledge can be used as a

reference in making investment and policy decisions, especially during the Covid-19 pandemic which has a huge impact on the economy.

Based on the Covid-19 pandemic events that occurred around the world, the Composite Stock Price Index (CSPI) and currency exchange rates are two aspects of the economy that experienced significant fluctuations. In this study, we hypothesize that there is a significant relationship between the CSPI and the currency exchange rates of four countries after the Covid-19 pandemic. We argue that the impact of the Covid-19 pandemic is different in each country and this may affect the relationship between CSPI and currency exchange rates. In addition, we also consider other factors such as interest rates, inflation, and political conditions in each country that may affect the relationship between the two variables. Therefore, this study is expected to provide a better understanding of the relationship between CSPI and currency exchange rates after the Covid-19 pandemic in the four focus countries.

Knowledge of this causal relationship is important in modeling appropriate economic data. In a study by Rahman et al (2022) CSPI can be modeled through ARIMAX modeling. However, this method requires that the independent and dependent variables show a unidirectional relationship. Thus, the direction of the relationship between two variables needs to be known before conducting the analysis. In economic data, economic variables are often found that have no known direction of relationship. Therefore, VAR modeling is needed that can be applied to continuous data where the direction of the relationship is unknown. The VAR model is a very useful analytical tool in understanding the relationship between variables Erlando et al (2020). This VAR modeling has been carried out by several economic researchers in identifying the relationship between variables, such as those conducted by.

3. METHOD, DATA, AND ANALYSIS

Vector Autoregressive Model

Christopher Sims created the VAR model in 1980 to understand how variables are related (McCALLUM, 1983). It is widely used in economics and finance to analyze how economic variables such as interest rates, inflation, economic growth, and unemployment rates are connected (Lenza & Primiceri, 2020). One benefit of the VAR model is that it recognizes the relationship between economic variables. This happens because the model equation has endogenous variables on both sides that activate the VAR model. Additionally, the VAR model is simple to use, and it applies the Ordinary Least Square (OLS) method on each equation separately. The VAR model is also helpful in developing more complex economic models by showing the relationship between economic variables. Equations (1) and (2) below show simultaneous VAR models with a reciprocal relationship, where two variables influence each other.

$$r_{1t} = \phi_{10} + \Phi_{11} r_{1,t-1} + \Phi_{12} r_{2,t-1} + a_{1t}, \quad (1)$$

$$r_{2t} = \phi_{20} + \Phi_{21} r_{1,t-1} + \Phi_{22} r_{2,t-1} + a_{2t} \quad (2)$$

The VAR model is one of the models used in time series data analysis, and in this modeling it is important to determine the optimum lag. This is done to ensure that the reaction of a variable to other variables can be optimally analyzed. Determining the optimum lag is also important to overcome the autocorrelation problem in the VAR system and helps in choosing the combination of time variables that best fits the assumptions of linearity and stationarity. In addition, there is an optimum lag test in the VAR modeling process. The lag optimum test performed on the VAR model is very important to ensure the accuracy and validity of the model. Therefore, this test should be carried out

periodically and can be updated according to changes in the observed data or variables. Optimum lag tests can be performed using various criteria such as Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC), and Hannan-Quinn Criterion (HQ). Lag selection is done by selecting the model that has the smallest AIC and SIC values and the largest HQ value(Alfian & Mustafa, 2019).

Data Resources

The study employs data from CSPI and currency exchange rates in several Southeast Asian countries between 2013 and 2022. The data is in the form of CSPI time series data and currency exchange rates of each country, which include Indonesia, Malaysia, Singapore, and Thailand. The CSPI is a composite index that tracks the stock market performance of a country. These countries have their own stock price indices, such as Indonesia's JCI, Malaysia's KLCI, Singapore's STI, and Thailand's SET Index. These indices amalgamate the share prices of major companies and are calculated using various methods, serving as a benchmark for investors and analysts to evaluate the country's stock market and make investment decisions. The CSPI is influenced by various factors, including: macroeconomic factors (national and global economic conditions, inflation rates, interest rates, and currency stability), company performance factors (profits, revenues, and business prospects), political and regulatory factors, market sentiment, and key events. These factors can affect individual stock prices and, therefore, also affect the overall performance of the CSPI. Therefore, the CSPI is an important indicator for investors and stock market analysts to understand the condition and prospects of a country's stock market. Based on the historical data obtained, information is obtained that the CSPI which describes the economy in these four countries is considered to have decreased due to the Covid-19 pandemic as shown in Figure 1.

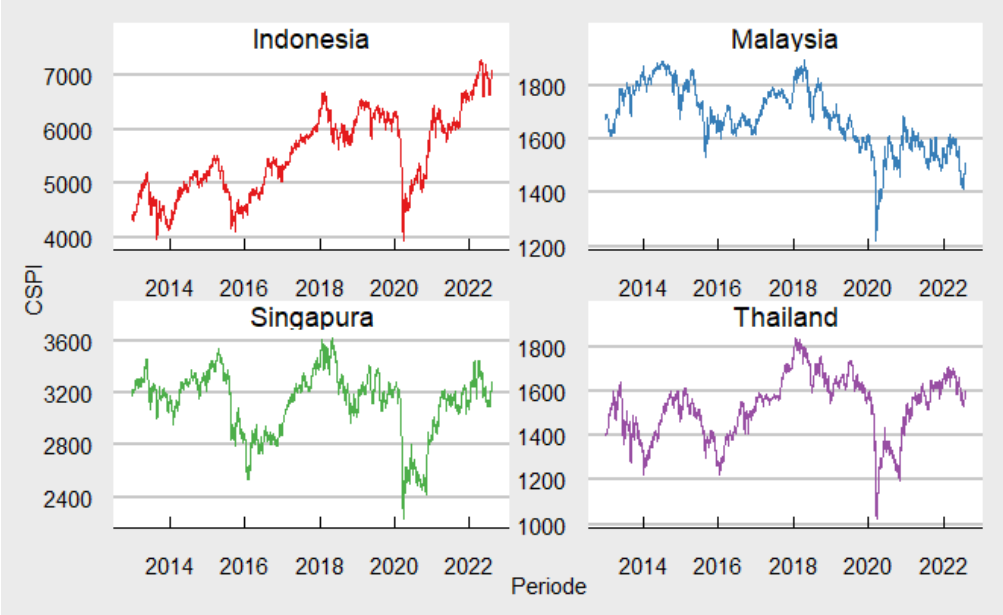


Figure 1. CSPI of Indonesia, Malaysia, Singapore, and Thailand

Before COVID-19, the JCI was steadily increasing due to political stability, positive economic development, and supportive government policies. However, the pandemic caused a sharp decline. Similarly, the KLCI saw a stable increase from 2013-2019, but also suffered a drastic decline due to COVID-19, with a downward trend since the end of 2022.

The STI experienced significant changes, rising in early 2013, declining in mid-2015 due to global economic uncertainty, then increasing in 2016-2017 due to government policies and improving global economic conditions. However, the trade war between the US and China and other political instability caused a decline in 2019, exacerbated by COVID-19 in 2020. The SET index in Thailand saw diverse fluctuations due to economic, political, and social factors, with a stable surge in 2017-2018 from successful economic policies (Rujirarangsan & Chancharat, 2019). However, it dropped again in 2019 due to global economic uncertainty and the trade dispute. COVID-19 caused a significant decline in 2020 In summary, the CSPI is influenced by various internal and external factors in each country, resulting in different changes in CSPI for each country. Nevertheless, the COVID-19 pandemic had a significant impact on CSPI in all countries, causing a sharp drop to its lowest level in the 2013-2019 period. This demonstrates the destabilizing effect of the pandemic on the economic conditions of each country.

The currency exchange rate is the price of a currency against another currency. It shows how many units of one country's currency must be paid to buy one unit of another currency. Currency exchange rates affect the price of goods and services between countries and can affect the flow of capital and investment between countries. Currency exchange rates are influenced by various economic, political, and monetary policy factors. Therefore, changes in currency exchange rates can affect exports, imports, and investments between countries. Currency exchange rates are also an important factor for investors and businesses conducting international transaction activities. The movement of currency exchange rates in Indonesia, Malaysia, Singapore, and Thailand shown in Figure 2.

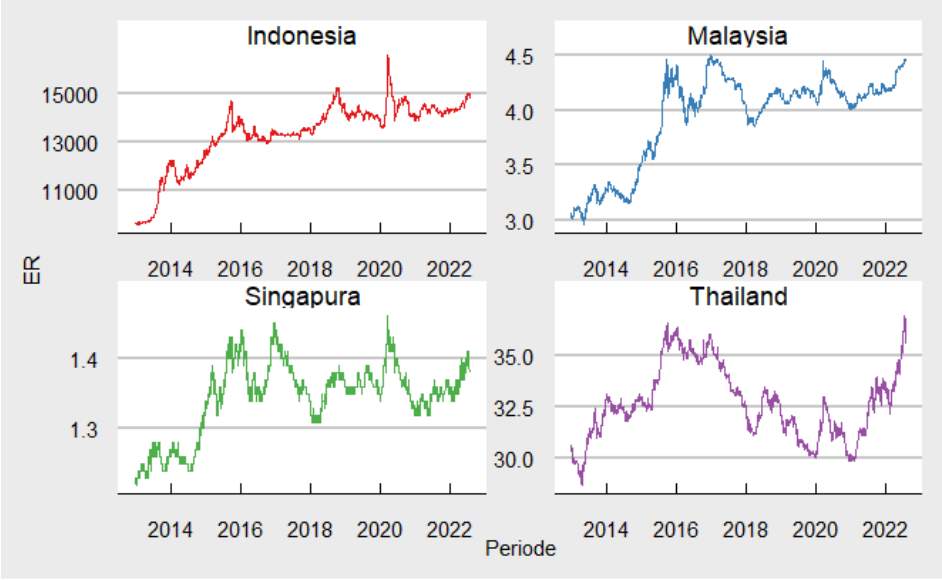


Figure 2. *Exchange Rate* of Indonesia, Malaysia, Singapore, and Thailand

Currency exchange rates or often referred to as exchange rates are the price of foreign currency against domestic currency and vice versa. Changes in currency exchange rates will affect companies engaged in export and import as well as companies that import raw materials. From a macroeconomic perspective, changes in exchange rates will cause changes in the portfolio value of multinational companies. The appreciation of the domestic exchange rate will lead to a decrease in corporate profits, in this case the stock price. In addition, that the appreciation of the domestic currency in a flexible exchange rate will lead to a decrease in the competitiveness of a country's products, and will lower its stock price.

From these two views, exchange rate movements are seen as leading the movement of stock values (Alfian & Mustafa, 2019)

Each country has a different exchange rate. Based on Figure 2 which shows the plot of currency exchange rates in Indonesia, Malaysia, Singapore, and Thailand are different. Likewise, the different fluctuations indicate that there are internal factors that affect the movement of currency exchange rates. In early 2020, the Rupiah exchange rate against the US Dollar weakened offset by the weakening CSPI value. However, the Rupiah exchange rate against the USD can return to normal with about 3 months. Different things happened to the other three countries which showed a weakening of the Singapore Dollar, Malaysia Ringgit, and Thailand Bath against the US Dollar with a longer subsiding time than Indonesia. The different characteristics of the four countries in Southeast Asia are of interest to researchers to find out the economic conditions of these countries in terms of exchange rates and CSPI and identify the causal relationship between CSPI and currency exchange rates in 4 Southeast Asian countries, namely Indonesia, Malaysia, Singapore, and Thailand with VAR modeling.

4. RESULTS

VAR modeling was conducted on each of the observed countries, namely Indonesia, Malaysia, Sngapore, and Thailand to determine the causal relationship between CSPI and exchange rate. In addition, differences in economic characteristics in the four countries can be seen. The first step in VAR modeling is stationarity testing which aims to determine whether the research data is stationary or not. If the data has been stationary, then the data has avoided regression. Data stationarity testing can be done with the Augmented Dickey Fuller Test (ADF-Test). The results of the ADF test on each data are shown in Table 1.

Table 1. Stationarity Augmented Dickey Fuller Test

Country	***P-value of ADF-Test***	
	ΔCSPI	**Δ Exchange Rate**
Indonesia	0.01	0.01
Malaysia	0.01	0.01
Singapore	0.01	0.01
Thailand	0.01	0.01

The unit root test results as shown in Table 1 indicate that all variables in each country to be estimated are stationary on average after the first differencing. This can be seen through the p-value (0.01) which is less than the 5% significance level. The first differentiation process makes the data to be modeled not the actual CSPI and exchange rate values, but the data on changes in CSPI (ΔCSPI) and changes in currency exchange rates (Δ Exchange Rate). After the first differentiation process, causality testing between variables is carried out to determine the direction of the CSPI and exchange rate relationship for each country. The results of Granger causality testing are shown in Table 2. Furthermore, the optimum lag selection is done to determine how long the reaction of a variable to other variables. Determination of the optimum lag is based on the smallest AIC value. The selected optimum lag for each country is shown in Table 3.

Table 2. Granger Causallity Test

Country	Variables	*P-value*	Relationship Direction
Indonesia	ΔCSPI → Δ Exchange Rates	<0.001	Two-way Relationship
	Δ Exchange Rates → ΔCSPI	0.013	
Malaysia	ΔCSPI → Δ Exchange Rates	0.185	One-Way Relationship ΔExchange Rates → ΔCSPI
	Δ Exchange Rates → ΔCSPI	0.012	
Singapura	ΔCSPI → Δ Exchange Rates	<0.001	Two-way Relationship
	Δ Exchange Rates → ΔCSPI	<0.001	
Thailand	ΔCSPI → Δ Exchange Rates	<0.001	One-way Relationship ΔCSPI → Δ Exchange Rates
	Δ Exchange Rates → ΔCSPI	0.229	

The difference in the optimum lag in VAR modeling for each country shows the difference in data characteristics in each country. The results of VAR modeling related to CSPI and the Exchange Rate (ER) of the Indonesian Rupiah against the US Dollar are as follows.

$$\Delta CSPI = 1.22 + 0.02\Delta CSPI^{*}_{t-1} - 0.07\Delta ER^{**}_{t-1} - 0.04\Delta CSPI^{*}_{t-2} - 0.03\Delta ER_{t-2} + 0.003\Delta CSPI_{t-3} + 0.03\Delta ER_{t-3} - 0.04\Delta CSPI_{t-4} + 0.002\Delta ER_{t-4} + 0.02\Delta CSPI_{t-5} + 0.00\Delta ER_{t-5} + 0.004\Delta CSPI_{t-6} + 0.002\Delta ER_{t-6} \quad (3)$$

$$\Delta ER = 2.012 - 0.04\Delta CSPI_{t-1} + 0.11\Delta ER^{***}_{t-1} - 0.04\Delta CSPI_{t-2} + 0.09\Delta ER^{***}_{t-2} - 0.09\Delta CSPI^{***}_{t-3} - 0.06\Delta ER^{**}_{t-3} + 0.00\Delta CSPI_{t-4} + 0.06\Delta ER^{**}_{t-4} - 0.08\Delta CSPI^{***}_{t-5} - 0.01\Delta ER_{t-5} - 0.03\Delta CSPI_{t-6} - 0.01\Delta ER_{t-6} \quad (4)$$

Table 3. Optimum Lag Selection

Country	Optimum Lag
Indonesia	6
Malaysia	2
Singapore	2
Thailand	6

In equation 3, the coefficient of 0.02 on the variable $\Delta CSPI_{t-1}$ indicates that each 1 unit increase in the variable ΔCSPI in 1 lag before will cause an increase of 0.02 units in the current ΔCSPI. Meanwhile, the coefficient -0.07 on the variable ΔER_{t-1} indicates that each decrease of 1 unit in the ΔER variable in the previous 1 period will cause a decrease of 0.07 units in the current ΔCSPI. In equation 4, the coefficient -0.04 on the variable $\Delta CSPI_{t-2}$

indicates that each decrease of 1 unit in the variable ΔCSPI in the 2 previous perod will cause a decrease of 0.04 units in the current ΔER. Meanwhile, the coefficient of 0.11 on the variable ΔER_{t-1} indicates that each 1 unit increase in the variable ΔER in 1 previous period will cause an increase of 0.11 units in the vcurrent ΔER.

From these interpretation results, it can be concluded that changes in the ΔCSPI (lag 1 and lag 2) and ΔER (lag 1) variables affect changes in the current ΔCSPI significantly. While the change of Rupiah ER provides a 4-period long-run effect on the current change in ER. This can be seen based on the significance value less than the real level of 0.05 which is marked with the symbol (*). Rupiah ER also significantly affected by CSPI changes at lags 3 and 5. Thus, changes in CSPI are influenced by changes in Rupiah ER and CSPI in the previous period. Likewise, changes in ER are also influenced by changes in Rupiah ER and CSPI in the previous period. this shows that there is a two-way relationship between changes in CSPI and Rupiah ER in Indonesia during the Covid-19 pandemic. These results are in line with research by (Mulyadi, 2020) which also explains the causal relationship between JCI and the Rupiah exchange rate against the USD.

The optimum lag in VAR modeling for Malaysia is 2 lags. This indicates that the CSPI and the Malaysian Ringgit exchange rate against the US Dollar are mostly influenced by the previous 2 periods. The VAR model for Malaysia is as follows.

$$\Delta CSPI = -0.05 + 0.01\Delta CSPI_{t-1} - 42.74\Delta ER^{**}_{t-1} + 0.04\Delta CSPI^{*}_{t-2} - 2.96\Delta ER_{t-2} \quad (5)$$

$$\Delta ER = 0.0005 - 0.00004\Delta CSPI_{t-1} + 0.03\Delta ER_{t-1} - 0.00004\Delta CSPI_{t-2} + 0.003\Delta ER_{t-2} \quad (6)$$

In equation 5, the current change in CSPI is significantly affected by yesterday's ER change and the CSPI change two days ago. The coefficient of -42.74 indicates that every 1 Ringgit change in the exchange rate against USD yesterday will decrease the current CSPI change by 42.74. While the coefficient of 0.04 indicates that every 1 unit increase in CSPI two days ago, it will increase the current CSPI change by 0.04. Equation 6 shows that Malaysia Ringgit ER are not affected by changes in CSPI or changes in ER in the previous period. This condition shows that CSPI and Malaysia Ringgit ER have a one-way relationship, namely ER affects CSPI in Malaysia. These results are in line with research by (Thakolsri, 2021) which also explains the effect of ER to CSPI in Malaysia.

VAR modeling for Singapore results in an optimum lag of 2 which indicates the maximum previous period that affects changes in CSPI and the Singapore Dollar Exchange Rate against the US Dollar. The VAR model equation for CSPI and Singapore Exchange Rate is as follows.

$$\Delta CSPI = 0.08 - 0.01\Delta CSPI_{t-1} - 631.38\Delta ER^{***}_{t-1} + 0.06\Delta CSPI^{**}_{t-2} - 237.92\Delta ER^{**}_{t-2} \quad (7)$$

$$\Delta ER = 0.00008 - 0.00001\Delta CSPI^{**}_{t-1} - 0.27\Delta ER^{***}_{t-1} - 0.00002\Delta CSPI^{***}_{t-2} - 0.1\Delta ER^{***}_{t-2} \quad (8)$$

In equation 7, the current change in CSPI is significantly affected by the change in CSPI (lag 2) and the change in ER (lag 1 and 2). If the change in ER increases by 1 SGD in the past 1 day, it can reduce the current CSPI change by 631.38 and if the change in ER increases by 1 SGD in the past 2 days, it can reduce the CSPI by 23.92. In addition, the current change in CSPI will increase by 0.06 if the change in CSPI two days ago increases by 0.06. In equation 8, it can be seen that the current change in ER is significantly influenced by changes in CSPI and ER in the previous 1 and 2 days. Based on this information, it can

be seen that CSPI changes and ER changes in Singapore affect each other. In other words, there is a two-way relationship between CSPI and ER in Singapore (Firmansyah & Oktavilia, 2017).

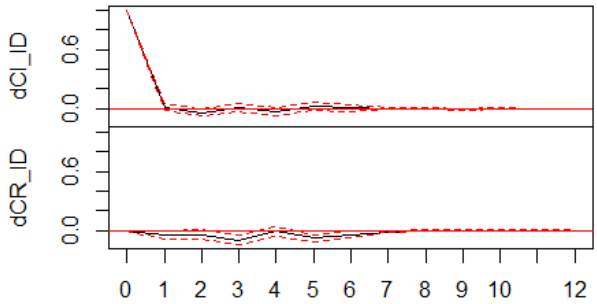
Moreover, the macroeconomic constituents of Thailand were modeled with the optimal six lags. Consequently, the current CSPI and exchange rate in Thailand Bath are shaped by the changes in the previous six periods of CSPI and exchange rate. The results of the VAR modeling are outlined below.

$$\Delta CSPI = 0.093 - 0.01\Delta CSPI_{t-1} - 5.03\Delta ER_{t-1} + 0.01\Delta CSPI_{t-2} - 1.15\Delta ER_{t-2} + 0.03\Delta CSPI_{t-3} + 2.79\Delta ER_{t-3} - 0.001\Delta CSPI_{t-4} - 4.61\Delta ER_{t-4} + 0.07\Delta CSPI^{**}_{t-5} + 0.2\Delta ER_{t-5} + 0.07\Delta CSPI^{**}_{t-6} - 2.96\Delta ER_{t-6} \quad (9)$$

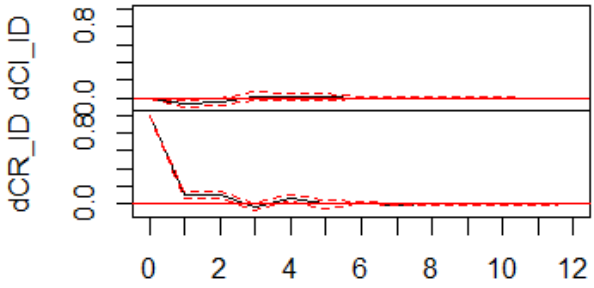
$$\Delta ER = 0.002 - 0.0002\Delta CSPI_{t-1} + 0.07\Delta ER^{**}_{t-1} - 0.0007\Delta CSPI^{***}_{t-2} - 0.05\Delta ER^{*}_{t-2} - 0.0001\Delta CSPI_{t-3} + 0.05\Delta ER^{*}_{t-3} - 0.0002\Delta CSPI_{t-4} + 0.05\Delta ER^{*}_{t-4} - 0.0001\Delta CSPI_{t-5} + 0.007\Delta ER_{t-5} - 0.0002\Delta CSPI_{t-6} - 0.004\Delta ER_{t-6} \quad (10)$$

In equation 9, the change in CSPI is only influenced by the change in CSPI also significantly at lag 5 and lag 6. That is, the change in ER does not significantly affect the change in the current CSPI. In equation 10, information is obtained that current ER changes are influenced by previous ER changes (lags 1, 2, and 3) and CSPI changes in the previous period (lag 2). This condition shows that CSPI and ER have a one-way relationship, namely CSPI affects ER in Thailand. These results are in line with research by (Hersugondo & Laksana, 2020) which also explains the effect of CSPI to ER in Thailand.

VAR modeling related to CSPI and exchange rates in each country shows different results. CSPI and exchange rates of each country are not necessarily influenced by factors with the same time in each country. Thus the modeling of CSPI data and currency exchange rates is very dynamic according to the characteristics of the data and the country. Of course, this will make every economic policy in each country different. Based on each VAR model obtained, the IRF form explains the effect when there is a shock on CSPI changes and changes in currency exchange rates. The IRF graphs of CSPI and currency exchange rate changes in Indonesia, Malaysia, Singapore, and Thailand are shown in figure 3.



IRF from CSPI in Indonesia



IRF from Exchange Rate in Indonesia

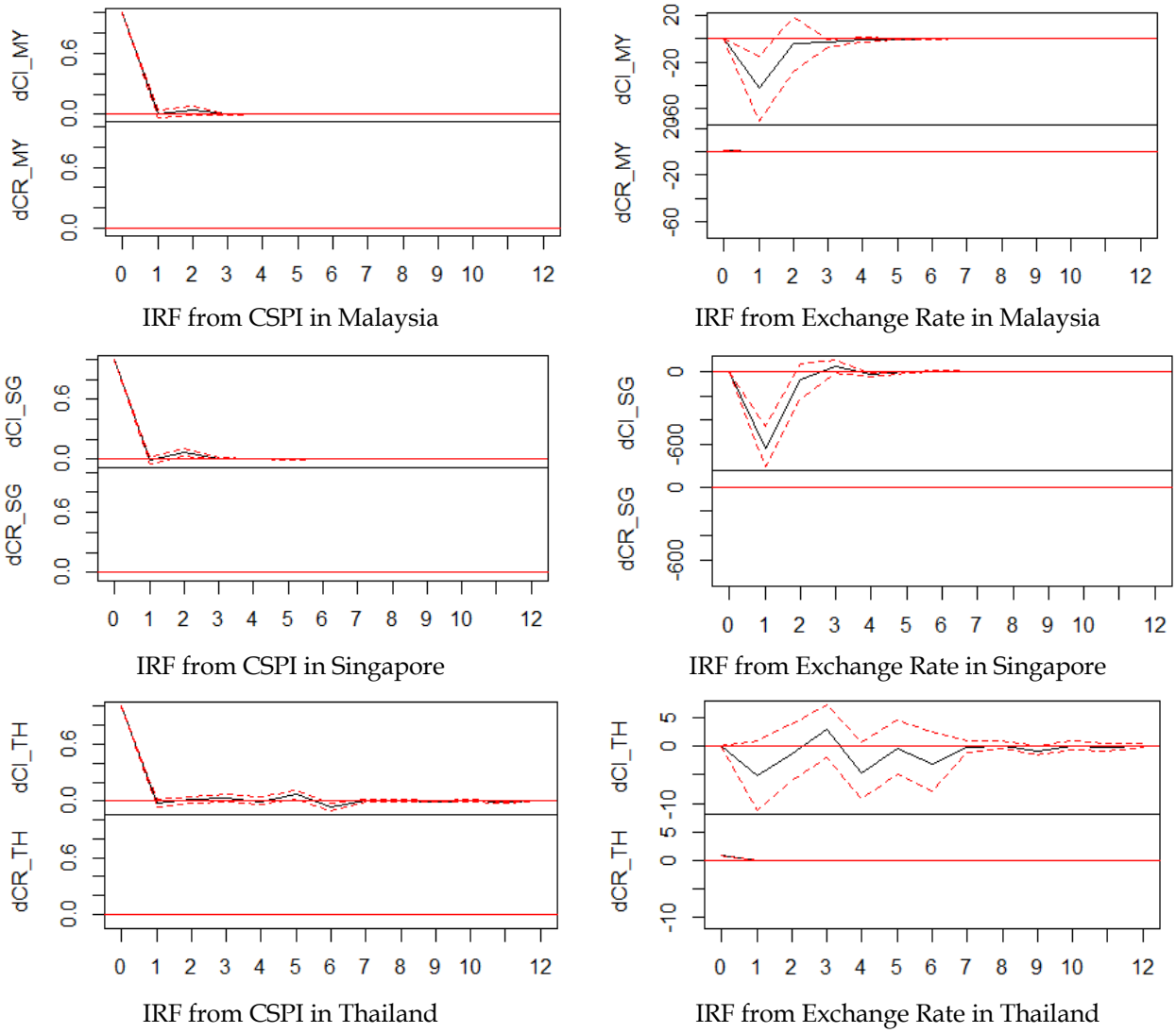


Figure 3. *IRF Graph*

The shock effects of changes in CSPI and exchange rates in each country exhibit distinct characteristics, as observed in Figure 3. In Indonesia, changes in CSPI and exchange rates demonstrate a two-way relationship. A shock or drastic change in the CSPI in Indonesia affects the changes in the exchange rate in Indonesia for up to six periods, while still remaining around the average area. Similarly, a sudden shock in Rupiah exchange rate changes affects the changes in the CSPI up to lag 6. In contrast, Malaysia and Singapore exhibit a different pattern, where the shock effect of exchange rate changes results in a drastically decreasing pattern in the next period, followed by a return to normal in the second period. The impact of sudden changes in economic variables in Thailand persists for a longer period of time, as evident from the IRF, which shows that the shock of changes in the exchange rate of the Thai Baht against the USD leads to unstable movement in CSPI changes in Thailand for up to seven periods.

5. DISCUSSION

This study examines the movement of CSPI changes and currency exchange rates in the four top economies in Southeast Asia, which include Indonesia, Malaysia, Singapore and Thailand. Although geographically close in region, it does not reflect the same

economic conditions. Each country has its own economic characteristics according to local government policies, market conditions, and the behavior of its people. However, when the world experienced the Covid-19 pandemic, the economic conditions in these four countries experienced shocks. In this case, what is interesting is the different responses in each country when experiencing the Covid-19 pandemic.

Some of the Indonesian government's policies when facing the Covid-19 pandemic include mobility restrictions that cause changes in people's behavior, such as a decrease in consumption levels and purchasing power due to economic concerns (Olivia et al., 2020). The Malaysian government's response to the pandemic played a significant role in this recovery. To combat the spread of Covid-19, the government implemented a policy known as the Movement Control Order (MCO), which mandated citizens to stay home and restricted non-essential movements outside. This policy was in effect for several months and hindered economic and social activities within the country (Mizan et al., 2021). In response to the Covid-19 pandemic in early 2020, the Singaporean government has adopted several distinctive policies. Among these policies is the implementation of an aggressive and proactive approach to track and isolate individuals who have been in close contact with Covid-19 patients. Furthermore, the government has also enforced mass testing and tightened quarantine measures for individuals arriving from foreign countries (Yuen et al., 2021). Thailand's existing programs in response to the COVID-19 pandemic include vaccination programs, COVID-19 testing, health education, social assistance, development of contact tracing applications, and social distancing. The Thai government continues to develop new programs and strengthen existing ones to ensure public health and safety (Marome & Shaw, 2021).

The movement of CSPI and currency exchange rates in Indonesia, Malaysia, Singapore, and Thailand has different patterns and characteristics in accordance with Wahyudi et al (2017) which explains that each country has its own economic characteristics. JCI, KLCI, SET Index, and STI are affected by different factors that influence their stock index performance. The first factor is macroeconomic factors such as economic growth, inflation, interest rates, and political stability, which affect stock index performance in all countries, but the impact may differ due to differences in economic and political conditions (Arisandhi & Robiyanto, 2022; Siregar & ., 2019). The second factor is commodity prices, which greatly influence the JCI, KLCI, and SET Index since these countries are commodity producers, while the STI is not significantly affected by this factor due to Singapore's lack of a significant commodity sector. The third factor is government policies that influence stock index performance in all countries, but the types of policies and their impact on stock indexes can vary (Imran et al., 2020). Lastly, external factors such as the global stock market situation, bilateral relations between countries, and global economic uncertainty also affect stock index performance in all countries, but the impact may differ depending on each country's dependence on the global market and bilateral relations (Paramati et al., 2018).

Exchange rate movements in each country can be influenced by various factors. Additionally, government policies and interventions such as interest rate policies, fiscal policies, and foreign exchange reserves also affect exchange rates in all four countries. However, the specific policies implemented and their effectiveness in influencing exchange rates can vary between countries (Feng et al., 2021). In contrast, Singapore's exchange rate is more influenced by its financial and service sectors rather than commodities. Finally, investor sentiment and market speculation can also have a significant impact on exchange rates in all four countries.

6. CONCLUSION, LIMITATIONS, AND SUGGESTIONS

Conclusion

The exchange rate and CSPI of a country can be considered as economic indicators of that country. Based on the analysis and VAR modeling results, it can be inferred that each country has its unique economic characteristics, and the factors that affect the exchange rate and CSPI movement vary among countries. Thus, the management of the economy in the event of an economic shock will also differ from country to country. Nevertheless, this study highlights a fascinating finding, indicating that the changes in CSPI for Indonesia, Malaysia, and Singapore are significantly influenced by the exchange rate fluctuations from the previous two periods. Meanwhile, the changes in Thailand's CSPI are affected by the changes in the previous five periods. Furthermore, it was observed that the changes in the exchange rate and CSPI of Indonesia and Thailand have a more prolonged effect, lasting up to six periods later. In other words, if a sudden fluctuation occurs in the exchange rate, it will result in the instability of the CSPI movement for up to six periods later.

This study's findings are significant as they emphasize the importance of understanding the interrelationship between the exchange rate and CSPI in each country. The study's results indicate that each country's economic management should be tailored based on its unique economic characteristics, and measures should be taken to stabilize the exchange rate and CSPI movement. The study's results also emphasize the significance of anticipating the impact of a sudden exchange rate fluctuation and its potential long-term consequences. Thus, policymakers and investors should consider the findings of this study when making informed economic decisions.

Limitation and suggestions

This study only focuses on two economic variables, namely exchange rates and CSPI in the four countries with the highest economic growth in Southeast Asia. In this case, the researcher suggests for future research to involve other economic variables such as Gross Domestic Product (GDP). In addition, to describe the characteristics of exchange rates and CSPI more generally, information on exchange rates and CSPI in various countries on other continents is needed.

REFERENCES

Abina, A. P., & Lemea, G. M. (2019). Capital Market and Performance of Nigeria Economy. *International Journal of Innovative Finance and Economics Research*, *7*(2), 51–66.

Acikalin, S., Aktas, R., & Unal, S. (2008). Relationships between stock markets and macroeconomic variables: An empirical analysis of the Istanbul Stock Exchange. *Investment Management and Financial Innovations*, *5*(1), 8–16.

Alfian, A., & Mustafa, M. (2019). Analysis of Behavior Relationship Between Exchange Rate (USD / IDR), Interest Rate, Inflation, Growth of GDP and Indonesian Composite Index (IHSG) in Indonesia Stock Exchange Period 2008-2018. *Saudi Journal of Business and Management Studies*, *04*(12), 860–867. https://doi.org/10.36348/sjbms.2019.v04i12.001

Aremo, A. G., Olabisi, O. E., & Adeboye, O. O. (2020). Effects of Selected Macroeconomic Variables on Stock Market Returns in Nigeria. *Asian Journal of Economics, Business and Accounting*, *16*(3), 56–70. https://doi.org/10.9734/ajeba/2020/v16i330242

Arisandhi, V. D., & Robiyanto, R. (2022). Exchange Rate, Gold Price, and Stock Price Correlation in Asean-5: Evidence From Covid-19 Era. *Jurnal Manajemen Dan Kewirausahaan*, *24*(1), 22–32. https://doi.org/10.9744/jmk.24.1.22-32

Asare Vitenu-Sackey, P., & Barfi, R. (2021). The Impact of Covid-19 Pandemic on the Global Economy: Emphasis on Poverty Alleviation and Economic Growth. *The Economics and Finance Letters*, *8*(1), 32–43. https://doi.org/10.18488/journal.29.2021.81.32.43

Astuti, R., Apriatni, E. ., & Susanta, H. (2013). Analisis Pengaruh Tingkat Suku Bunga (Sbi), Nilai Tukar (Kurs) Rupiah, Inflasi, Dan Indeks Bursa Internasional Terhadap Ihsg (Studi Pada Ihsg Di Bei Periode 2008-2012). *Diponegoro Journal of Social and Politic of Science*, 1–8.

Basri, M. C., & Hill, H. (2020). The Southeast Asian Economies in the Age of Discontent. *Asian Economic Policy Review*, *15*(2), 185–209. https://doi.org/10.1111/aepr.12305

Erlando, A., Riyanto, F. D., & Masakazu, S. (2020). Financial inclusion, economic growth, and poverty alleviation: evidence from eastern Indonesia. *Heliyon*, *6*(10), e05235. https://doi.org/10.1016/j.heliyon.2020.e05235

Fahlevi, M. (2019). *The Influence of Exchange Rate, Interest Rate and Inflation on Stock Price of LQ45 Index in Indonesia*. *343*(Icas), 157–163. https://doi.org/10.2991/icas-19.2019.34

Feng, G. F., Yang, H. C., Gong, Q., & Chang, C. P. (2021). What is the exchange rate volatility response to COVID-19 and government interventions? *Economic Analysis and Policy*, *69*, 705–719. https://doi.org/10.1016/j.eap.2021.01.018

Firmansyah, F., & Oktavilia, S. (2017). The Stock Market and Exchange Rates in Five South Asian Countries. *Jurnal Ekonomi Pembangunan: Kajian Masalah Ekonomi Dan Pembangunan*, *18*(1), 102. https://doi.org/10.23917/jep.v18i1.4293

Goodell, J. W., & Huynh, T. L. D. (2020). Did Congress trade ahead? Considering the reaction of US industries to COVID-19. *Finance Research Letters*, *36*(May), 101578. https://doi.org/10.1016/j.frl.2020.101578

Hersugondo, H., & Laksana, R. D. (2020). The Effect of Crude Oil Price and Macro Economic Variables on Aggregate Stock Index in Emerging Capital Markets Southeast Asia ' s. *International Journal of Environmental Science*, *5*, 185–191.

Hidayat, F. F., Rotinsulu, T. O., & Mandeij, D. (2021). Analisis Pengaruh Variabel-Variabel Ekonomi Makro Terhadap Indeks Harga Saham Gabungan Di Bursa Efek Indonesia Periode 2016 : Q1-2020 : Q4. *Jurnal Berkala Ilmiah Efisiensi*, *21*(06), 92–101.

Imran, Z. A., Ejaz, A., Spulbar, C., Birau, R., & Nethravathi, P. S. R. (2020). Measuring the impact of governance quality on stock market performance in developed countries. *Economic Research-Ekonomska Istrazivanja* , *33*(1), 3406–3426. https://doi.org/10.1080/1331677X.2020.1774789

Ishikawa, K. (2021). The ASEAN Economic Community and ASEAN economic integration. *Journal of Contemporary East Asia Studies*, *10*(1), 24–41. https://doi.org/10.1080/24761028.2021.1891702

John, E. I. (2019). Effect of Macroeconomic Variables on Stock Market Performance in Nigeria. *Journal of Economics, Management and Trade*, *April*, 1–14. https://doi.org/10.9734/jemt/2019/v22i630110

Lenza, M., & Primiceri, G. E. (2020). How To Estimate a VAR After March 2020. *NBER WORKING PAPER SERIES HOW*, 1–23.

Maneejuk, P., & Yamaka, W. (2021). The impact of higher education on economic growth in asean-5 countries. *Sustainability (Switzerland)*, *13*(2), 1–28. https://doi.org/10.3390/su13020520

Marome, W., & Shaw, R. (2021). COVID-19 response in Thailand and its implications on future preparedness. *International Journal of Environmental Research and Public Health*, *18*(3), 1–11. https://doi.org/10.3390/ijerph18031089

McCALLUM, B. T. (1983). A Reconsideration of Sims' Evidence Monetarism. *Economics Letters*, *13*, 167–171.

Mizan, M. Z., Lada, S., Hamzah, A. A., Noor, N. A. M., Razali, K., Esam, A., & Nordin, M. N. (2021). Movement Control Order (MCO): An Syar'iyyah Political Approach. *Review of International Geographical Education Online*, *11*(7), 1225–1230. https://doi.org/10.48047/rigeo.11.07.114

Mulyadi, M. (2020). Effect of Exchange Rate and Global Index in Five Countries Against CSPI. *Journal of Accounting and Finance Management*, *1*(1), 44–58. https://doi.org/10.38035/jafm.v1i1.11

Olivia, S., Gibson, J., & Nasrudin, R. (2020). Indonesia in the Time of Covid-19. *Bulletin of Indonesian Economic Studies*, *56*(2), 143–174. https://doi.org/10.1080/00074918.2020.1798581

Pan, L., & Mishra, V. (2018). Stock market development and economic growth: Empirical evidence from China. *Economic Modelling*, *68*(July 2016), 661–673. https://doi.org/10.1016/j.econmod.2017.07.005

Paramati, S. R., Zakari, A., Jalle, M., Kale, S., & Begari, P. (2018). The dynamic impact of bilateral trade linkages on stock market correlations of Australia and China. *Applied Economics Letters*, *25*(3), 141–145. https://doi.org/10.1080/13504851.2017.1305067

Rahman, M. M., Guotai, C., Das Gupta, A., Hossain, M., & Abedin, M. Z. (2022). Impact of early COVID-19 pandemic on the US and European stock markets and volatility forecasting. *Economic Research-Ekonomska Istrazivanja* , *35*(1), 3591–3608. https://doi.org/10.1080/1331677X.2021.1997626

Rujirarangsan, K., & Chancharat, S. (2019). The Impact of Coup d'états on the Relationship between Stock Market and Exchange Rate: Evidence from Thailand. *Academic Journal of Interdisciplinary Studies*, *8*(3), 113–122. https://doi.org/10.36941/ajis-2019-0010

Saleem, H., Shabbir, M. S., & Bilal khan, M. (2020). The short-run and long-run dynamics among FDI, trade openness and economic growth: using a bootstrap ARDL test for co-integration in selected South Asian countries. *South Asian Journal of Business Studies*, *9*(2), 279–295. https://doi.org/10.1108/SAJBS-07-2019-0124

Siregar, E. I., & . D. (2019). The Impact of Political Risk and Macro Economics on Stock Return at Indonesia Stock Exchange (An Approach of Arbritage Pricing Theory (APT)). *KnE Social Sciences*, 744–772. https://doi.org/10.18502/kss.v3i26.5412

Stefhani, Y. (2020). Reaksi Pasar Modal Indonesia Terhadap Peristiwa Politik. *Jurnal Manajemen*, *4*(2), 1–12. https://doi.org/10.54964/manajemen.v4i2.129

Thakolsri, S. (2021). Modeling the relationships among gold price, oil price, foreign exchange, and the stock market index in Thailand. *Investment Management and Financial Innovations*, *18*(2), 261–272. https://doi.org/10.21511/imfi.18(2).2021.21

Wahyudi, S., Hersugondo, H., Laksana, R. D., & Rudy, R. (2017). International Journal of Economics and Financial Issues Macroeconomic Fundamental and Stock Price Index in Southeast Asia Countries: A Comparative Study. *International Journal of Economics and Financial Issues*, *7*(2), 182–187. http:www.econjournals.com

Yang, F. (2019). The impact of financial development on economic growth in middle-income countries. *Journal of International Financial Markets, Institutions and Money*, *59*(July 2017), 74–89. https://doi.org/10.1016/j.intfin.2018.11.008

Yuen, S., Cheng, E. W., Or, N. H. K., Grépin, K. A., Fu, K. W., Yung, K. C., & Yue, R. P. H. (2021). A tale of two city-states: A comparison of the state-led vs civil society-led responses to COVID-19 in Singapore and Hong Kong. *Global Public Health*, *16*(8–9), 1283–1303. https://doi.org/10.1080/17441692.2021.1877769

Zulhelmy, & Hidayat. (2020). The Impact of Covid- 19 to Capitalism Economic System : An Islamic Economic and Financial Perspective. *Jurnal Kajian Peradaban Islam*, *3*(2), 40-44