

EXCHANGE RATE, GOLD PRICE, AND STOCK PRICE CORRELATION IN ASEAN-5: EVIDENCE FROM COVID-19 ERA

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Abstract

ASEAN-5 (Indonesia, Singapore, Malaysia, Philippines, and Thailand) were the pillars of economies in the Southeast Asia. This study aimed to examine the dynamic correlation of exchange rate and gold price on stock price in ASEAN-5 countries during COVID-19 pandemic. This study used Asymmetric DCC-GARCH model and employed daily data from March 2020 to August 2021. For all cases, the findings showed the degree of correlations were similar to each other. Furthermore, the result revealed that exchange rate and gold price had weak correlations on stock price. During the pandemic, negative correlation confirmed the exchange rate was a better alternative asset than gold which was positively correlated with stock prices. The ASEAN-5 market participants should hereby evaluated their investment risk and strategy.

Keywords: Exchange rate, gold price, stock price, ASEAN-5, ADCC-GARCH, COVID-19.

Introduction

A virus, the new coronavirus or COVID-19, is wreaking havoc on the world. It was declared a global pandemic by the World Health Organization on March 11th, 2020 (World Health Organization, 2020). The world is having an unprecedented impact from this virus. All sectors without exception are affected, including the public health system, society and economy (United Nations, 2020). Furthermore, this pandemic leads to an intense slowdown in economic growth (Ding, Levine, Lin, & Xie 2020). Simultaneously, the economy's uncertainty during the pandemic causes stock markets to be very volatile (Zhang, Hu, & Ji 2020). In addition, Baker *et al.* (2020) implied that stock markets have an unprecedented reaction to the outbreak of COVID-19. This incident has a significant impact on stock price changes. Global financial markets are plummeting as a result of the COVID-19 pronouncement, according to Phan and Narayan (2020). The markets overreact, resulting in a market correction.

Previous research have looked into the influence of the COVID-19 pandemic on financial markets around the world. Cao, Li, Liu, and Woo (2020), Ali, Alam, and Rizvi (2020), and Al-Awadhi, Al-Saifi, Al-Awadhi, and Alhamadi (2020) confirmed that the increase in confirmed cases and deaths, followed by substantial equity market volatility, had a major negative impact on global stock markets. Aside from that, a variety of things might affect stock market volatility. The

exchange rate is one of the macroeconomic factors that affect the stock market (Surbakti, Achسانی, & Maulana, 2016). It has been proven that there is a causal relationship between exchange rates and stock prices. Empirical studies by Barakat, Elgazzar, and Hanafy (2015), Chandrashekar, Sakthivel, Sampath, and Chitredi (2018), Robiyanto, Santoso, Atahau, and Harijono (2019) validated that the exchange rate has a significant relationship with stock prices. In any case, the study of the correlation of exchange rates and stock prices aims to predict future movements in stock prices.

Apart from the exchange rate, gold is another macroeconomic variable that influence the prices of stock. During the financial crisis, gold was seen as a safe haven asset in comparison to the stock market (Junttila, Pesonen, & Raatikainen, 2018). The empirical study conducted by Ji, Zhang, and Zhao (2020) proved that gold had remained strong as a safe-haven investment throughout the pandemic. Besides, Chkili (2016) also suggested that gold can be an optimal hedging instrument for stock market investors in extreme market conditions. Hedging aims to reduce or balance the portfolio risk in investment activities (Robiyanto, Wahyudi, & Pangestuti, 2017b). Investors select gold as a safe-haven asset in a steady market and shun riskier investments. As a result, the market price of equity falls under this circumstance (Kocaarslan, Sari, Gormus, & Soytaş, 2017).

Works of literature have empirically examined the dynamic correlation between exchange rates, gold prices, and stock markets. Syahri and Robiyanto (2020)

used the Dynamic Conditional Correlation Generalized Autoregressive Conditional Heteroskedasticity (DCC-GARCH) approach to investigate the correlation between gold, exchange rate, and stock during the COVID-19 pandemic in Indonesia. Siddiqui and Roy (2019) utilized the same method to look at the dynamic connection between the Indian stock index and the currency rate. These researches revealed that stock markets and currency rates have a conditional relationship over time. In addition, Akram, Malik, Imtiaz, and Aftab (2020) exhibited that China's and ASEAN's stock exchanges and foreign exchange market had a significant relationship.

Wen and Cheng (2018) used the Generalized Autoregressive Score (GAS) Copula model to show that the US dollar and gold may both function as safe-haven assets in emerging stock markets. Furthermore, Joy (2011) and Jain and Biswal (2016) employed the DCC-GARCH to investigate into the stock market's link between US dollar and gold. They advised investors to avoid high-risk assets and instead invest in safer asset such as gold during times of crises. These researches supported the case that exchange rates and gold price follow a predictable trend that has an effect on financial markets. Therefore, re-examining the correlation between exchange rates, gold prices, and stock markets can thus assist investors and investment managers during a pandemic.

In the context of the COVID-19 pandemic, it is still rare to find the studies of the dynamic correlation between exchange rate, price of gold, and stock markets, especially with asymmetric approaches. According to Chkili (2016), Asymmetric Dynamic Conditional Correlation (ADCC) model is appropriate for estimating the conditional correlation, co-variances and variances. It reflects not only the dynamic correlation but also an asymmetric feature of the stock market time series. Hence, this study adopts the ADCC-GARCH model to examine the dynamic correlation between the three variables in ASEAN-5 countries of Indonesia, Singapore, Malaysia, Philippines, and Thailand in time of COVID-19 pandemic. Conforming to Vinayak, Thompson, and Tonby (2014), the ASEAN economies is one of the largest economies in the world. Kang, Uddin, Troster, and Yoon (2019) claimed that ASEAN's stock markets are attractive to investors due to the region's rapid economic expansion. They went on to say that ASEAN markets are good for investing, diversity, and portfolio allocation. As a result, these traits make a good basis for looking into the impact of macroeconomic factors. These researches can add to the body of knowledge for investors in the event of a pandemic, particularly in the Southeast Asian market.

In financial markets, the relationship between macroeconomic indicators and stock prices has become a hot issue of discussion. The impact of macroeconomic conditions on global and regional stock indices has been studied extensively in empirical research. Surbakti *et al.* (2016) categorized macroeconomic factors influencing stock return into two categories, they are domestic and global factors. Domestic macroeconomic factors consist of the exchange rate, interest rate, and inflation rate. During the pandemic, the ASEAN-5 had a long-term cooperation that demonstrated their exchange rate policies were coordinated (Shahrier, Subramaniam, & Ariff, 2020). Additionally, currency markets are used as a key proxy for studying financial market integration. Whereas, the gold price is an example of global macroeconomic factors.

The Correlation between Exchange Rate and Stock Price

An exchange rate refers to the price of one currency in comparison to another. The exchange rate is one of the variables that is most widely used for determining stock market price. A nation's international trade influences a change in an exchange rate. Therefore, the change is determined by the relative dominance of the economy's import and export sectors (Mohapatra & Rath, 2015). The price of foreign money is affected by changes in the exchange rate, which affects a company's competitiveness. This circumstance produces changes in a company's profitability and share price, causing stock market price fluctuations. As a result, a change in the exchange rate can have a positive or negative impact on the stock market. Based on the portfolio adjustment strategy, the change in share price results in the flow of foreign capital. It means that when the share price rises, it will attract foreign capital, and when the price falls, it will be less attractive to foreign investors, which results in a decrease in a company and subsequently state wealth (Vejjagic & Zarafat, 2013).

Qamruzzaman, Mehta, Khalid, Serfraz, and Saleem (2021) argued that the function of FDI inflows in subsidizing erratic exchange rate movements is critical. They stated that currency depreciation stimulates foreign investors' ingenuity, resulting in FID inflows, but more considerable exchange volatility reduces the volume of FDI in the long run. The constant infusion of FDI into the economy stimulates the buildup of local capital while also lead to the foreign exchange market stability. In ASEAN, especially in 2019, they receive the biggest amount of foreign capital inflow, totaling

\$182 billion. They suffered a 25% decline to \$137 billion in the next year as a result of the pandemic crisis. However, as of April 2021, ASEAN had signed 508 investment treaties, including both Bilateral Investment Treaties (BITs) and Treaties with Investment Provisions (TIPs) (ASEAN Secretariat & UNCTAD Division on Investment and Enterprise, 2021).

Business and economic operations are severely harmed during the pandemic (Donthu & Gustafsson, 2020). The financial market, especially the foreign currency market, is in a state of panic as a result of this situation. COVID-19-related negative feelings, such as infection rates and fatalities, have a major influence on exchange rate volatility (Iyke, 2020). At the same time, Narayan, Devpura, and Wang (2020) revealed that the role of the exchange rate becomes more decisive in determining stock market return during the COVID-19 pandemic. Rai and Garg (2021) enhanced significant risk transfers between the two variables that lead to the decline in the domestic stock market, heightening the capital outflow, which leads to the increase of the exchange rates during the pandemic. In compliance with these findings, studies from Syahri and Robiyanto (2020) and Zhafira, Evana, and Septiyanti (2021) also implied that exchange rate negatively correlates with the stock market during the COVID-19 pandemic.

The Correlation between Gold Price and Stock Price

Gold is the most popular commodity for investment among other precious metals. O'Connor, Lucey, Batten, and Baur (2015) stated that the gold investment demand is the second highest in the overall gold industry, with jewelry demand being the first most important demand for gold. The majority of the causes for a big rise in the gold price, as Baur and McDermott (2010) stated, is an increase in the gold investment demand. As a result of this circumstance, gold is a low-risk asset that can influence the stock price movement (Syahri & Robiyanto, 2020).

In the report of Baur and Lucey (2010), gold can act as a hedge or safe haven against the stock market. They describe a hedge as an asset that, on average, is uncorrelated or negatively associated with other assets. Meanwhile, in time of financial uncertainty, a commodity that is uncorrelated or adversely associated with other assets is defined as safe-haven. According to Baruník, Kočenda, and Vácha (2016) about an economic tradeoff, gold acts as an essential financial variable for investors in the stock market so that it can produce a negative correlation. The negative correlation is rooted in the fact that gold is perceived as a wealth store during periods of political and economic uncertainty.

Previous research was done by Chkili (2016) and Kocaarslan *et al.* (2017) examined the dynamic correlation between gold and the stock market in BRICS (Brazil, Russia, India, China, and South Africa). Their findings showed the value of using gold as a hedging technique in portfolios. This strategy aimed to reduce the portfolio's vulnerability without reducing its projected return. In addition, research by Robiyanto, Wahyudi, and Pangestuti (2017a) investigated the hedging effectiveness of precious metals on Indonesia and Malaysia stock indices. They revealed that gold was the most effective hedging commodity compared to silver, platinum, and palladium.

Iqbal (2017), using a quantile regression model, identified the correlation between gold and the stock market, and revealed that gold acts as a safe-haven against the stock market in India and the US. This result is in line with Chkili (2016), Iqbal (2017), and Wen and Cheng (2018), who also stated that gold can perform as a safe haven in times of extreme market condition. Ji *et al.* (2020) and Morema and Bonga-Bonga (2020) investigated safe-haven properties during the COVID-19 pandemic. The financial crisis during this pandemic was not an ordinary financial crisis like known before. They suggested the investors be obliged to consider the characteristics of the underlying drivers of market turmoil. At the end of the study, they concluded that gold remains robust as a safe-haven asset or a store of value during the COVID-19 pandemic and financial crisis.

Asymmetric Dynamic Conditional Correlation - Generalized Autoregressive Conditional Heteroskedasticity (ADCC-GARCH)

Often researchers use the multivariate GARCH method to examine the co-movement of two or more commodities. Also, the study of the conditional co-variances and variances is critical in order to examine the conditional Value at Risk (VaR) in each class of entity. The Dynamic Conditional Correlation (DCC) model proposed by Engle (2002) is one among many multivariate GARCH models. This model can discover the possibilities for change in conditional correlations over time, which traces the investor behavior's dynamic response to the news and innovations (Rajwani & Kumar, 2016). The DCC-GARCH endlessly synchronizes the correlation of time-varying volatility. Therefore, the time-varying correlation doesn't have a volatility bias.

Cappiello, Engle, and Sheppard (2006) discovered the critical constraint of DCC-GARCH. They mention

that it doesn't examine the dynamic asymmetric effects of conditional correlation. The asymmetric findings discriminate between the negative and positive effects of shock. Hence, they introduced the Asymmetric Dynamic Conditional Correlation (ADCC) approach to overcome that issue. This model makes it possible to examine volatility due to the asymmetric effects of negative and positive shocks.

Research Methods

Variables and Data Collection

This paper aims to construct a time-varying conditional correlation among variables paired that reflect the co-movement of stock price indices across ASEAN-5 countries during the COVID-19 pandemic. The daily closing prices of the exchange rates, gold, and stocks are taken in this study. The exchange rates and the stock prices data are collected from finance.yahoo.com. Whilst, the data of the gold price (in the USD) is collected from kitco.com. The stock indices of the ASEAN-5 consist of JCI (Jakarta Composite Index), STI (Straits Times Index), KLSE (Kuala Lumpur Stock Exchange), PSEi (Philippines Stock Exchange) and SET (Stock Exchange of Thailand). While, the exchange rates are taken from each country that is USD/IDR (Indonesia), USD/SGD (Singapore), USD/MYR (Malaysia), USD/PHP (Philippine), and USD/THB (Thailand).

1. The stock returns of each SPI ($R_{SPI,a(t)}$) are calculated as follows:

$$R_{SPI,a(t)} = \left[\frac{SPI_{a(t)} - SPI_{a(t-1)}}{SPI_{a(t-1)}} \right]$$

Where, the $SPI_{a(t)}$ is the daily closing price index in country a on day t . The $SPI_{a(t-1)}$ is the closing price index on day $t - 1$ in country a .

2. The exchange rate return ($\Delta ER_{a(t)}$) of each country is calculated as follows:

$$\Delta ER_{a(t)} = \left[\frac{ER_{a(t)} - ER_{a(t-1)}}{ER_{a(t-1)}} \right]$$

Where, the $ER_{a(t)}$ represents the daily closing price of a currency exchange rate to USD in country a on day t . The $ER_{a(t-1)}$ represents the daily closing price of a currency exchange rate to USD in country a on day $t - 1$.

3. The gold price return ($\Delta GP_{(t)}$) is calculated as follows:

$$\Delta GP_{(t)} = \left[\frac{GP_{(t)} - GP_{(t-1)}}{GP_{(t-1)}} \right]$$

Where, the $GP_{(t)}$ represents the daily closing price of gold on day t . The $GP_{(t-1)}$ represents the daily closing price of gold on day $t - 1$.

ADCC-GARCH Model

The Asymmetric Dynamic Conditional Correlation Generalized Autoregressive Conditional Heteroskedasticity technique is used to test the results in this analysis. This technique provides an estimation of the asymmetric response in a conditional correlation during the turmoil. This model's estimation is performed in two stages. The first stage is to estimate the conditional variances as well as conditional co-variances, and the second stage is to analyze the conditional correlations. It is assumed that all conditional variance and co-variances are lagging functions. The current rate of return is influenced by the lag rate of other returns. Therefore, the optimal lag length test can help eliminate autocorrelation. Thus, autocorrelation is not expected to be a problem. In this model, the optimal lag of the endogenous variable is the independent variable. This study adopts the GJR-GARCH model by Glosten, Jagannathan, and Runkle (1993) to investigate the asymmetric dynamic volatility effect. The GJR-GARCH is specified as:

$$\begin{aligned} r_t &= \mu + \varphi r_{t-1} + \varepsilon_t \\ \varepsilon_t &= e_t \sqrt{h_t} \\ h_t &= \omega + \alpha \varepsilon_{t-1}^2 + \beta h_{t-1} + \gamma I[\varepsilon_{t-1} < 0] \varepsilon_{t-1}^2 \end{aligned}$$

Where, e_t represents the standardized residual. The DCC-GARCH model's conditional variance and co-variance matrix (H_t) by Engle (2002) is defined as follows:

$$\begin{aligned} H_t &= D_t P_t D_t \\ D_t &= \text{diag}(\sqrt{h_{nt}}, \sqrt{h_{mt}}) \\ P_t &= (\text{diag}(Q_t)^{-\frac{1}{2}}) Q_t (\text{diag}(Q_t)^{-\frac{1}{2}}) \\ h_t &= \omega + \alpha \varepsilon_{t-1}^2 + \beta h_{t-1} \\ Q_t &= (1 + A + B) \bar{Q} + A Z_{t-1} Z'_{t-1} + B Q_{t-1} \end{aligned}$$

Where, D_t represents a diagonal matrix of the volatility of return series, and P_t represents the conditional correlation matrix. Based on the standardized residual, Q_t represents the conditional co-variance matrix and \bar{Q} represents the unconditional co-variance matrix. By the process on DCC and GJR model, Cappiello *et al.* (2006) suggested the following correlation evolution for ADCC model:

$$Q_t = (\bar{P} - A' \bar{P} A - B' \bar{P} B - G' \bar{N} G) + A' \varepsilon_{t-1} \varepsilon'_{t-1} A + B' Q_{t-1} B + G' n_{t-1} n'_{t-1} G$$

Where, A, B, and G are the matrices with $k \times k$ parameter, $\bar{P} = [\varepsilon_t \varepsilon_t']$, $\bar{N} = [n_t n_t']$. The $n_t = I[\varepsilon_t < 0] \circ \varepsilon_t$, where $I[\cdot]$ refers to $k \times 1$ indicator function that has the value 1 for true and 0 for false argument, and “ \circ ” refers to the Hadamard product. Cappiello *et al.* (2006) stated that Q_t 's acceptable condition to be positive definite for all possible realizations is that Q_0 (initial co-variance matrix) have to be matrix of positive definite, and the intercept $(\bar{P} - A'\bar{P}A - B'\bar{P}B - G'\bar{N}G)$ is positive semi-definite.

Results and Discussion

Descriptive Statistics Analysis

Table 1 provides the descriptive statistics summary of ASEAN-5 indices, exchange rates, and the gold. It demonstrates that, with the exception of the exchange rates of Singapore, Malaysia, and the Philippines, all of the market's average returns are positive. The degree of dependence on foreign debts exacerbates the risk of currency movements. During the period, all series distributions are leptokurtic that exhibit significant kurtosis (excess kurtosis), indicating the distributions are peaked and have thick tails. In this case, the SET has the highest peak and thickest tail. Then, the market returns series display the low volatility and

the majority are negatively skewed and approximately symmetric, especially the gold series. Among the series of exchange rates, Indonesia has the most volatile exchange rate compared to the others. Because it has 1.0357% of standard deviation while the others are less than 1%. Whereas, PSEi (1.8571%) is the most volatile index compared to other indices in ASEAN-5.

Unit Root Test

Table 2 shows the result of unit root test by Augmented Dickey-Fuller Test (ADF) to test the stationarity of a data series. This test is employed to determine whether or not the variables are stationary. The variables must be stationary in order to rule out the potential of a fictional relationship between variables affecting the results. The Table 2 indicates that all variables are significant at level, implying that all the variables are stationary.

Empirical Results

Figure 1 and Figure 2 illustrate the charts of the time-varying asymmetric dynamic conditional correlation between variables, involving ASEAN-5 stock indices, exchange rates, and price of gold. Figure 1 reveals that all asymmetric dynamic correlation

Table 1
Descriptive Statistics of Market Returns (From March 2020 –August 2021)

	Mean	Std. Dev.	Minimum	Maximum	Skewness	Kurtosis
Indonesia						
JCI	0.0006	0.0144	-0.0520	0.1019	0.5505	11.5391
USD/IDR	0.0001	0.0104	-0.0400	0.0468	0.3834	5.9692
Gold	0.0003	0.0121	-0.0513	0.0527	-0.3813	6.5131
Singapore						
STI	0.0004	0.0125	-0.0735	0.0607	-0.2001	10.5408
USD/SGD	-0.0001	0.0029	-0.0128	0.0100	0.3606	4.7394
Gold	0.0003	0.0118	-0.0502	0.0527	-0.4179	6.4167
Malaysia						
KLSE	0.0003	0.0107	-0.0526	0.0685	0.1481	9.9329
USD/MYR	-0.0000	0.0029	-0.0131	0.0112	0.1478	6.2807
Gold	0.0003	0.0121	-0.0513	0.0527	-0.4736	6.5053
Philippines						
PSEi	0.0004	0.0186	-0.1334	0.0744	-1.3199	14.1445
USD/PHP	-0.0000	0.0045	-0.0308	0.0210	-0.6531	10.8934
Gold	0.0003	0.0120	-0.0513	0.0571	-0.2654	7.5341
Thailand						
SET	0.0009	0.0153	-0.1080	0.0795	-1.2734	17.7344
USD/THB	0.0001	0.0035	-0.0115	0.0175	0.1981	5.8672
Gold	0.0003	0.0122	-0.0551	0.0527	-0.4758	6.6973

Note: Std. Dev. represents standard deviation

Source: finance.yahoo.com; kitco.com

Table 2
Augmented Dickey-Fuller Unit Root Test

		Augmented Dickey-Fuller (Intercept and no trends)	Test Critical Values			Prob.
			1%	5%	10%	
Indonesia	JCI	-14.0448	-3.4493	-2.8698	-2.5712	0.0000
	USD/IDR	-17.6772	-3.4493	-2.8698	-2.5712	0.0000
	Gold	-18.4090	-3.4493	-2.8698	-2.5712	0.0000
Singapore	STI	-20.5994	-3.4484	-2.8694	-2.5710	0.0000
	USD/SGD	-18.9872	-3.4484	-2.8694	-2.5710	0.0000
	Gold	-18.8181	-3.4484	-2.8694	-2.5710	0.0000
Malaysia	KLSE	-19.1538	-3.4489	-2.8696	-2.5711	0.0000
	USD/MYR	-17.1629	-3.4489	-2.8696	-2.5711	0.0000
	Gold	-19.3701	-3.4489	-2.8696	-2.5711	0.0000
Philippines	PSEi	-19.2739	-3.4488	-2.8696	-2.5711	0.0000
	USD/PHP	-24.9657	-3.4488	-2.8696	-2.5711	0.0000
	Gold	-18.8625	-3.4488	-2.8696	-2.5711	0.0000
Thailand	SET	-22.9015	-3.4494	-2.8698	-2.5713	0.0000
	USD/THB	-18.2862	-3.4494	-2.8698	-2.5713	0.0000
	Gold	-18.4681	-3.4494	-2.8698	-2.5713	0.0000

Note: The result of ADF test is significant at 1% level. Prob. represents probability

Source: finance.yahoo.com; kitco.com

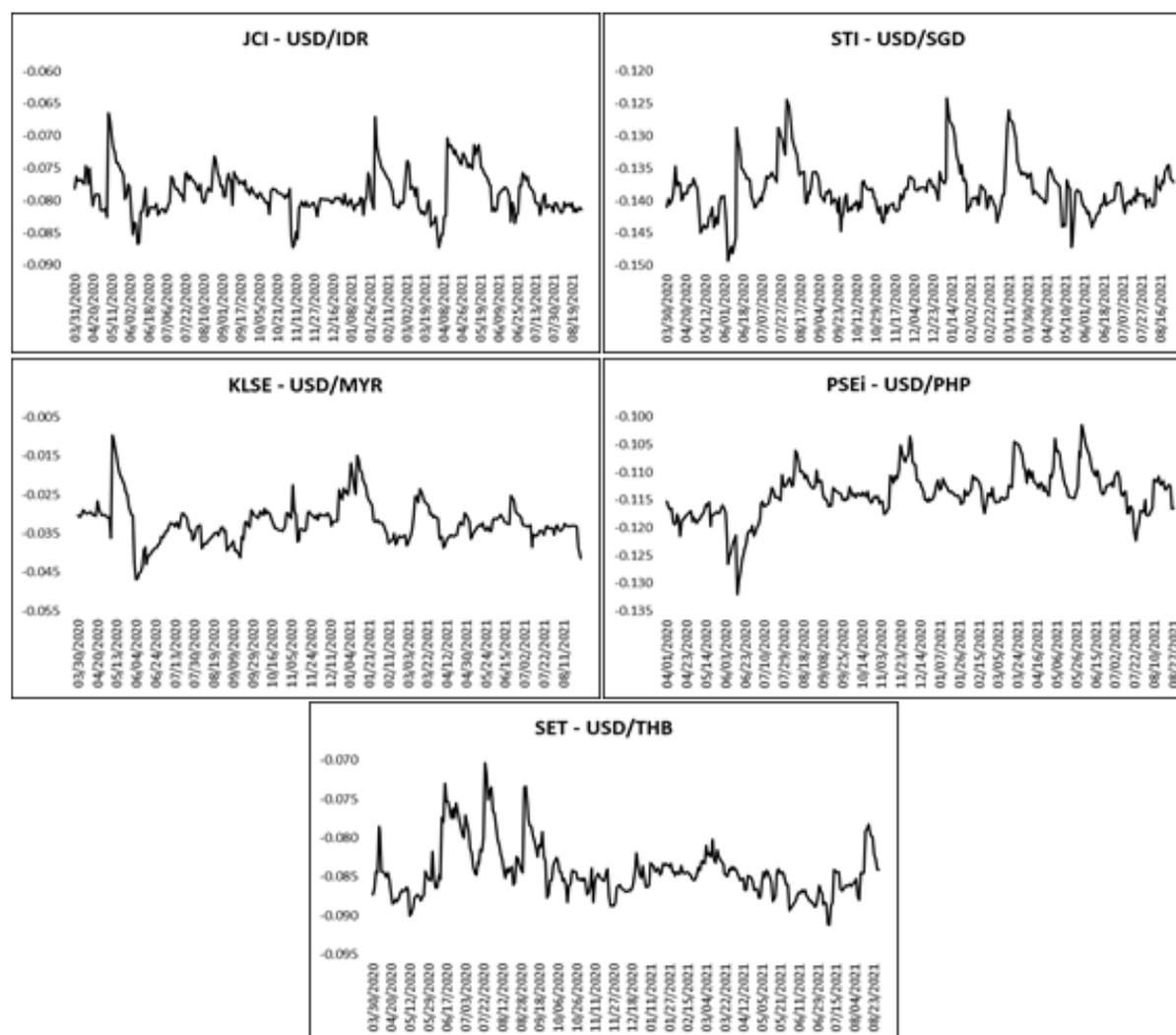


Figure 1. ADCC-GARCH analysis of ASEAN-5 exchange rates and stock indices

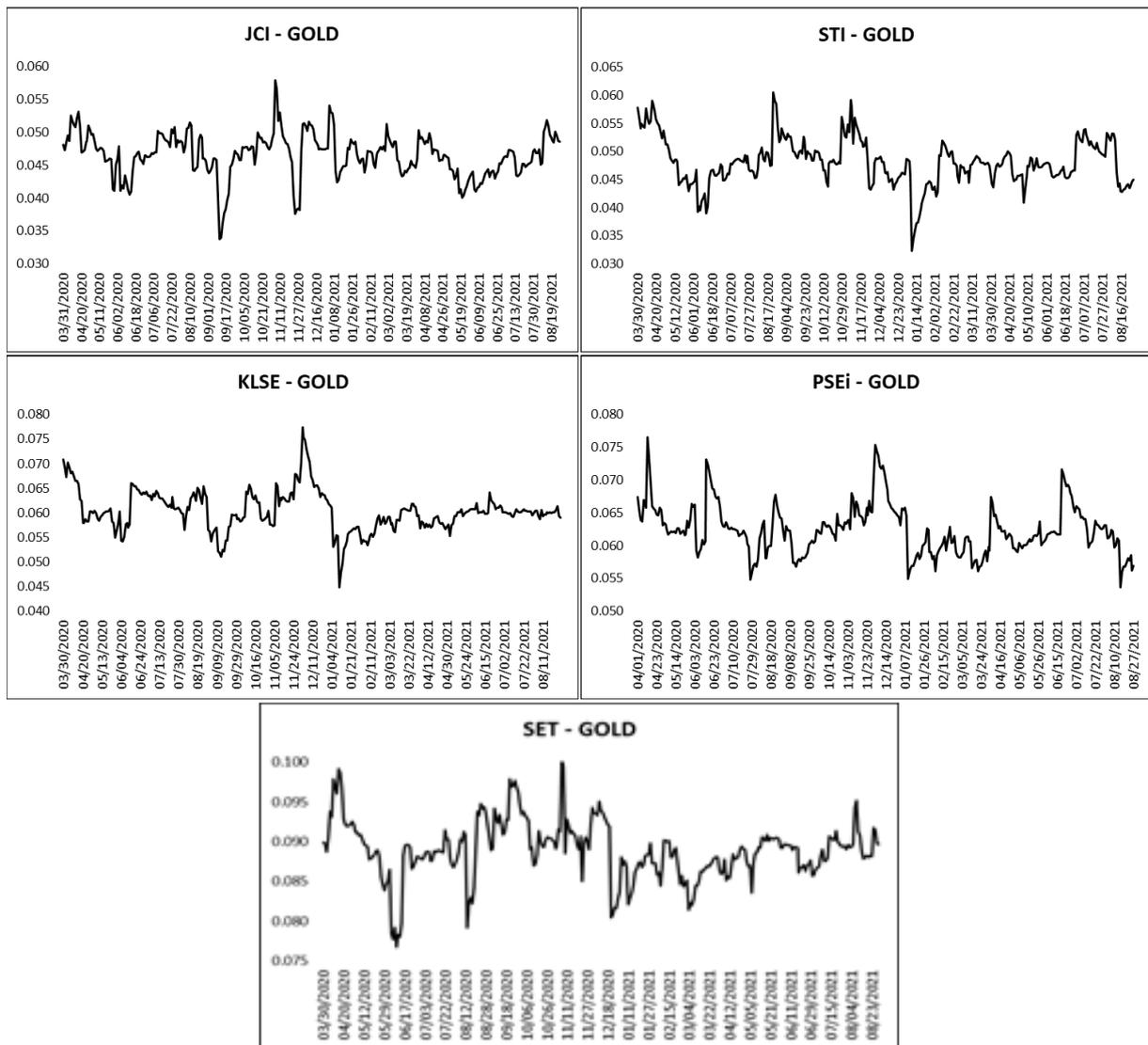


Figure 2. ADCC-GARCH analysis of price of gold and ASEAN-5 stock indices

between ASEAN-5 exchange rates and stock indices have negative correlation and are weak. Malaysia has the greatest average correlation at -1.3837, while Singapore has the lowest average correlation at -0.0470 in June 2020 to -0.0098 in May 2020. Singapore, on the other hand, ranges from -0.1493 in June 2020 to -0.1242 in January 2021. In Indonesia, the lowest and greatest ADCC values are -0.0873 in November 2020 and -0.0664 in May 2020. Philippines has a lowest ADCC value of -0.1320 in the middle of June 2020 and a highest value of -0.1014 in early June 2021. Thailand's low point is -0.0912 in early July 2021, and its high point is -0.0703 in July 2020. According to the findings, Indonesia has a greater average correlation than Thailand, followed by the Philippines.

The results of asymmetric dynamic conditional correlation between price of gold and ASEAN-5 indices shown in Figure 2. Unlike the exchange rate correlation, gold displays a positive correlation with the ASEAN-5 indices but remains modest over the research period. Thailand and Indonesia have the greatest and lowest mean values, respectively. Thailand's average value is 0.0889, with a range of 0.0768 in July 2020 to 0.1006 in November 2020. Meanwhile, Indonesia's average value is 0.0465, ranging from 0.0338 in September 2020 to 0.0580 in November 2020. The lowest values of ADCC of Singapore, Malaysia, and Philippines, are 0.0324 in January 2021, 0.0449 in January 2021, and 0.0536 in the mid of August 2021 respectively. Meanwhile, the greatest values are 0.0605 in August 2020, 0.0773 in December 2020, and 0.0765 in April 2020 respectively. Singapore has the lowest

mean while Malaysia has the highest mean, with just a little difference with the Philippines.

Table 3 summarizes the analysis results, which demonstrate a varied state of the market's correlation.

Table 3
Time-Varying Asymmetric Dynamic Conditional Correlation

	Mean	Min	Max
JCI – USD/IDR	-0.0789	-0.0873	-0.0664
JCI – GOLD	0.0465	0.0338	0.0580
STI – USD/SGD	-0.1384	-0.1493	-0.1242
STI – GOLD	0.0481	0.0324	0.0605
KLSE – USD/MYR	-0.0321	-0.0470	-0.0098
KLSE – GOLD	0.0604	0.0449	0.0773
PSEi – USD/PHP	-0.1139	-0.1320	-0.1014
PSEi – GOLD	0.0624	0.0536	0.0765
SET – USD/THB	-0.0842	-0.0912	-0.0703
SET – GOLD	0.0889	0.0768	0.1006

The results imply that the exchange rate negatively correlates with ASEAN-5 indices, while the gold is positive. Indonesia and Thailand have the smallest range of exchange rate and stock price correlations. This low volatility stems from the fact that their exchange rate depreciated during the research period. And there are no substantial asymmetric shocks in any of the variables. Relatively, the mean of the connectedness of each variable is less than +/- 10%, which shows that there is a low degree of integration between the volatility of the markets in the short time.

The fact that currency rates and gold have weak correlations with stock prices during the COVID-19 turbulence suggests that it may be used as a safe-haven during the instability. As a result, in the short term, they are the ideal mix for diversification. Furthermore, as compared to gold, the exchange rate provides a superior potential for portfolio diversification. For all locations, the correlations show a negative and negligible relationship between the exchange rate and the stock market. For example, when USD/IDR and JCI have a negative interaction at particular moments on the scale, the price of USD/IDR tends to increase while the stock market is bearish. As there are apparent diversification opportunities, such insights can be successfully used for risk mitigation. Singapore's currency rate has the lowest degree of correlation with stock values, making it a viable choice.

Ideally, the correlation of exchange rate and stock market is negative. Figure 1 depicts this aspect of nature. With the decline in the index value in ASEAN-5 particularly during the pandemic reduces the interest of investors to invest in the stock market decreasing the demand of local currency leading to the appreciation of exchange rate. This finding is in line with Asaad (2021)

and Nwosa (2021) who reveal a non-significant relationship between the markets during COVID-19. Although the global spread of the coronavirus pandemic has impacted import-export operations and caused some volatility in currency exchange rates at first, exchange rates are not substantial carriers of pandemic's uncertainty in Asian nations (Mishra & Mishra, 2020). In addition, the fact that the results show an insignificant relationship is the result of the success of the policies set by the relevant government to control exchange rate fluctuations (Asaad, 2021; Thaker & Sakaran, 2021).

The correlation of JCI-, STI-, KLSE-, PSEi- and SET-GOLD are positive and weak. They are positive because the value of equities and gold are in the same direction. As a result, linking gold with stock might raise risk somewhat in the short term. Nevertheless, the correlation slightly declines from the beginning until the end of the study period revealing that investors prefer to acquire gold as an alternative safe-haven and a diversification strategy to safeguard their stock portfolios. The indication of a weak safe-haven is exhibited as the relationship doesn't strengthen on successive days of market fall. It implies that this diversification is more ideal for high-risk investors at its time. These results are in line with the findings of Ibrahim (2012), Chkili (2016), and Al-Ameer, Hammad, Ismail, and Hamdan (2018) that explain the positive yet weak relationship between gold and stock market during the crisis. However, the findings suggest that gold is less effective as a safe-haven, as investors seek out other options such as cryptocurrencies. As a result, for risk-averse investors, using the exchange rate as a safe-haven is preferable.

Conclusion and Implication

A COVID-19 pandemic that has emerged around the world has caused countries to experience financial crises. It generates major concerns about investing in the stock market and is enticing to observe the alternatives of investment assets. With the model of ADCC-GARCH, this study examines the asymmetric dynamic correlation of exchange rates and gold toward stock markets in ASEAN-5 including Indonesia, Singapore, Malaysia, Philippines, and Thailand during the pandemic. It is found that the correlation results between variables are similar across countries under the study.

The study finds evidence of weak correlation between exchange rates and gold price on the stock market. There is a weak and negative correlation between exchange rate and stock market as an alternative of investment asset during the pandemic. This shows the

success of ASEAN-5 countries in managing their currency exchange rates, and creating a better alternative than gold. Similarly, gold has a weak correlation with the stock market but positive. Singapore, Malaysia, and the Philippines, which have had exchange rate appreciation, are more volatile than Indonesia and Thailand, which have experienced depreciation. During the COVID-19 uncertainty, gold is still preferred to protect the portfolio investments although the risk is completely unavoidable. The presence of cryptocurrencies, on the other hand, makes gold less appealing to market players. This issue has a greater impact on Indonesia and Singapore, with a lower correlation level than the rest.

Extending to our result, the investing and risk management strategies need to be reconsidered by market participants to reduce the new increased degree of risk during this volatile time. Investor behavior may change as a result of the pandemic. If the cryptocurrency is generally recognized by market players, gold is expected to be weakly correlated with stock prices. On the other side, if the crypto currency's uncertainty is significant, gold may revert to its original function as a pure safe-haven, increasing the correlation with stocks. Unfortunately, the correlation between stock prices and cryptocurrency is not examined in this study. Because of this constraint, the research is insufficient to describe the market in its entirety. Furthermore, more research is needed to examine the correlation between cryptocurrencies and stock markets as a new safe haven option. The research time could be extended in the future to be able to characterize market conditions in general during a pandemic.

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