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COVID-19's Impact on ASEAN Country Stock Markets

Phouphet Kyophilavong[a] , Phonephet Sitthivong[b], Sengchan Phiakeo[c], Phongsili Soukchalern[d*], Kedtysack Xayxanadasy[e]

[a b c d.] Faculty of Economics and Business Management, National University of Laos, Lao PDR
[e] Faculty of Natural Science, National University of Laos, Lao PDR

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ABSTRACT

In this study, we examine the impact of COVID-19 on ASEAN countries' stock markets. In our examination, we have applied an econometrics model: the GARCH model. We find that the daily number of new cases had a significantly positive impact on IDX (Indonesia Stock Exchange) and MYX (Bursa Malaysia)but a negative impact on PSE Philippine Stock Exchange), SGX (Singapore Exchange), SET (The Stock Exchange of Thailand), and HSX (Ho Chi Minh Stock Exchange). Furthermore, the daily number of new deaths significantly affected the PSE, SGX, SET, and HSX but not the IDX and MYX indices. The results show that COVID-19 had an effect on the stock markets of ASEAN; however, that effect varied.

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1. Introduction

On December 31, 2019, the World Health Organization (WHO) was notified of cases of pneumonia of unknown origin in Wuhan, China. On January 7, 2020, Chinese authorities identified a novel coronavirus as the cause, termed "2019-nCoV" for the time being by the WHO (2020). "On January 30, 2020, WHO designated the new coronavirus epidemic a public health emergency of international concern (PHEIC), the highest level of alarm set by WHO (2020)." At that time, there were 98 cases and no deaths in 18 countries outside of China. COVID-19 had expanded to 220 countries worldwide when this document was written (June 21, 2021). The total number of instances was 179,260,314 and the total number of dead was 3,882,123 on June 21, 2021. The number of cases (4,531486) and the number of deaths (88,133) have increased in ASEAN countries according to the WHO (2021). Indonesia and the Philippines had the largest numbers in ASEAN with Indonesia having 1,989,909 cases and 54,662 deaths, while the Philippines had 1,359,015 cases and 23,621 deaths (WHO 2021). COVID-19 had become a global pandemic and public health emergency that would significantly affect the global economy and financial markets.

According to the Asian Development Bank ADB, (2020), supply chain interruptions, travel restrictions, and lockdowns from COVID-19 have all had severe effects. Many businesses have reduced or closed down operations that has raised concerns about corporate and personal debt defaults. Furthermore, financial markets around the globe, from the United States to Asia and Europe, have been turbulent as investors fear the virus was causing a worldwide economic and financial crisis on a scale not seen since the global financial crisis (Beirne et al. 2020).

There are a number of studies on the impact of COVID-19 on the stocks and financial assets of many countries (Mazur et al., 2021; Le et al., 2021; Bouri et al., 2021; Wei and Han, 2021). Most of the studies have focused on advanced economies (Chong et al., 2021; Izzeldin et al., 2021; Ibrahim et al., 2020). However, there are very few studies on the effects of COVID-19 on the stock markets of ASEAN countries (Kamaludin et al., 2021; Lee et al., 2020; Yiu and Tsang, 2021; Yong et al., 2021). The effect of COVID-19 on stocks might vary between different countries due to the characteristics of stock markets, degrees of financial integration, and the

* Corresponding author: e-mail: phong.soukchalern@gmail.com

economic structure in each country. Therefore, the objective of this study is to investigate the effect of COVID-19 on the stock markets in ASEAN.

There are two contributions that this paper makes to the literature on ASEAN. First, we use relatively new methods. Second, our results could contribute to other studies on developing economies. The remainder of the paper is organized as follows: Section 2 is a literature review, section 3 presents the data and method, section 4 gives the results and a discussion of the study, and the last section is the conclusion.

2. Literature Review

The studies on the effects of COVID-19 on stock and financial assets have gained attention from academia and policymakers. There are a number of studies on this matter. The literature review is summarized in Table 1. However, the studies on the effects of COVID-19 on stocks are mostly concentrated in developed countries. Corbet et al. (2020) for China; Izzeldin et al. (2021) and Yousef (2020) for G7 countries; Onali (2020) and Shehzad et al. (2021) for United States; Yiu and Tsang (2021) for ASEAN-5 economies; Chaudhary et al. (2020) for the US, China, Japan, Germany, India, the United Kingdom, France, Italy, Brazil, and Canada; Liu et al. (2020) for 18 developed and developing countries.

Secondly, the approach of the analysis varies for each study. The vary approaches has been used, for instance, Camba and Camba (2020), Lee et al. (2020), Izzeldin et al. (2021), Onali (2020) and Yiu and Tsang (2021) used traditional linear models, such as VAR, dynamic panel regression, HAR and OLS. Some studies used event-study method (Liu et al., 2020; Mazur et al., 2020; Mishra and Mishra, 2020; Wei and Han, 2020). Many scholars have used vary versions of GARCH model (e.g., Chaudhary et al., 2020; Corbet et al., 2020; Mishra and Mishra, 2020; Onali, 2020; Yiu and Tsang, 2021; Yousef, 2020; Shehzad et al., 2021; Kamaludin et al., 2021; Ibrahim et al., 2020; Czech et al., 2020; Bora and Basistha, 2021). In addition, some scholars have used the quantile cross-spectral and wavelet analysis (Le et al. 2021; Ibrahim et al. 2020). The effect of COVID-19 on stocks has mixed results in developed and developing countries. Most of the findings on the effects of COVID-19 are significant for stock returns and volatility (Onali 2020; Yousef 2020; Chaudhary et al. 2020; Bora and Basistha 2021).

There are few studies on the effects of COVID-19 on ASEAN countries. Yong et al. (2021) have investigated the effect of the COVID-19 pandemic on the volatility of stock market returns by using evidence from Malaysia and Singapore in GARCH, GARCH-M, TGARCH, EGARCH, and PGARCH models. The findings show that both countries' stock market returns are extremely persistent and that persistence declines as the epidemic progresses. Furthermore, before the epidemic, the normal distribution worked well for Malaysian and Singaporean stock markets, but after the pandemic, the normal distribution transformed to a Student's t (skewed normal). For both stock market returns, the standard GARCH (1,1), GARCH-M (1,1), and EGARCH (1,1) performed well, and the EGARCH confirmed the presence of the leverage effect when stock market returns were negatively correlated with volatility.

Sadiq et al. (2021) have developed the COVID-19 Fear and Volatility Index that gives empirical insights into the ASEAN stock markets. In this index, they use a Bayesian posterior model of the ST-HAR type. The empirical findings showed a clear indication of a transition during the COVID-19 pandemic as well as variances in its intensity and timing. Due to the COVID-19 drug race and international travel limitations, health care and consumer services were the most badly hit businesses. Furthermore, they discovered that the COVID-19 pandemic had little possibility of positively affecting stock market performance in all countries, with Indonesia, Singapore, and Thailand being the most affected.

Ibrahim et al. (2020) have investigated COVID-19, the government response, and market volatility with evidence from the Asia-Pacific developed and developing markets. They have used the graphs of the continuous wavelet transformation (CWT) as well as the GJR-GARCH analysis. At various investment horizons, the CWT plots have shown differing levels of market volatility. Except for Japan, all of the countries in the study experienced very low or low volatility across short time frames. On the other hand, Vietnam, Malaysia, and Laos have had moderate volatility over the medium term. Further, China, Japan, South Korea, Malaysia, and the Philippines saw substantial volatility over long-term horizons. The GJR-GARCH results also show that domestic events, such as the intervention measures taken by governments during COVID-19, had an effect on market volatility. The government measures in most of the sample nations significantly reduced the market volatility in local equity markets.

3. Data and Method

To examine our question, we chose the following stock market indices: PSE (Philippine Stock Exchange), IDX (Indonesia Stock Exchange), SGX (Singapore Exchange), MYX (Bursa Malaysia), SET (The Stock Exchange of Thailand), and HSX (Ho Chi Minh Stock Exchange). The data for the daily closing value of these indices come from the period of April 20, 2019, to July 16, 2021. The number of daily cases and the number of daily deaths from COVID-19 in the world come from WHO.

Table 1. The summary of the effect of COVID-19 on stock markets.

Authors	Countries	Time Period	Methodologies	Key Finding
Bora and Basistha (2021)	India	2021	GJR GARCH model	The stock market in India has experienced volatility during the pandemic period, and the return on the indices is higher in the pre-COVID-19 period than during COVID-19.
Camba and CAMBA (2020)	Philippine	January 31 to June 30, 2020	Robust OLS, Vector Autoregression (VAR)	COVID-19 daily infection has negative and statistically significant effect on the Philippine stock exchange index, peso-dollar exchange rate and retail pump price of diesel
Chaudhary et al. (2020)	10 developed countries	1 January 2019 to 30 June 2020	GARCH	Daily negative mean returns for all market indices during the COVID period (January 2020 to June 2020, and The COVID variable is found to be positive and significant for all market indices.
Corbet et al. (2020)	China	1 March 2019 to 10 March 2020	GARCH (1,1)	Considering both the Shanghai and Shenzhen Stock Exchanges, COVID-19 is found to have a strong, significant positive impact on the volatility of each exchange.
Czech et al. (2020)	Czechia, Hungary, Poland, and Slovakia	January 2014 to 7 May 2020	TGARCH,	There is a significant and negative link between the Visegrad stock market indices and the COVID-19 spread
Ibrahim et al. (2020)	11 developed and developing economies	15 February–30 May 202	CWT and GJR-GARCH	The COVID-19 infection cases are increasing market volatility in China and Thailand, while reducing market volatility in Japan, Laos, and Philippines. For the remaining countries, there are no significant relations between COVID-19 infection cases with market volatility
Izzeldin et al (2021)	G7 countries	24/4/2018–24/4/2020.	HAR model	Strong transition evidence to a crisis regime in all countries and sectors, yet crisis intensity and timings vary. Financial markets' response to Covid-19 is akin to response in previous financial crisis rather than previous pandemics.
Kamaludin et al. (2021)	ASEAN-5, and United States	2021	CWT, Granger causality, DCC Bi-GARCH	Overall coherency between the ASEAN-5 equity market and DowJones is relatively larger than the coherence with the number of COVID-19 cases, and from a phase-wise perspective, there are three different scenarios; phase 1 shows slight coherence between Covid-19 cases and domestic equity market movements
Le et al. (2021)	14 countries	January 1, 2019 to April 30, 2020	Quantile cross-spectral	There is an asymmetric impact of the Covid-19 because the left-tail dependencies become stronger and more prevalent than the right-tail dependencies.
Lee et al. (2020)	Malaysia	1 January 2020 to 18 April 2020	OLS	higher numbers of COVID-19 cases in Malaysia tended to adversely affect the performance of the KLCI index and all sectorial indices, except for the Real Estate Investment Fund (REIT) index.
Liu et al. (2020)	18 countries	21 February, 2019 to 19 January, 2020, and 20, January, 2020 to 18 March, 2020	Event-study method	Countries in Asia experienced more negative abnormal returns as compared to other countries, and the adverse effect of COVID-19 confirmed cases on stock indices abnormal returns
Mazur et al. (2020)	US	Mar-20	Event-study method	Natural gas, food, healthcare, and software stocks earn high positive returns, whereas equity values in petroleum, real estate,

				entertainment, and hospitality sectors fall dramatically during the COVID-19 period
Mishra and Mishra (2020)	12 Asian countries	2 July 2019 to 12 June 2020	GARCH, Event-study method, FE	Significant negative effect of the rapid spread of coronavirus on Asian stock markets, and the degrees of volatilities are different across countries based on the severity of the pandemic
Onali (2020)	US	8 April 2019 to 9 April 2020	GARCH, VAR	Based on GARCH, there is no impact of the number of cases and deaths on the US stock market returns, except from China. Based on VAR, the number of reported deaths in Italy and France have a negative impact on stock market returns, and a positive impact on the VIX returns.
Shehzad et al. (2021)	US	1 January 2007 to 23 April 2020	EGARCH	COVID-19 and the accompanying lockdown have adversely impacted both yields , and Dow Jones reached their highest historical levels during the COVID-19 outbreak
Wei and Han (2020)	37 countries	January 1, 2011 and April 30, 2020	Event-study method	The emergence of pandemic has weakened the transmission of monetary policy to financial markets to a more significant degree. The outbreak of pandemic, neither conventional nor unconventional monetary policies have significant effects on all four of the financial markets
Yiu and Tsang (2021)	ASEAN-5	2nd January 2020 to 30th September 2020; nd January	Dynamic panel regression, Ordinary least squares (OLS), GARCH (1,1)	The global COVID-19 development has more
Yong et al. (2021)	Malaysia, Singapore		GARCH, GARCH-M, TGARCH, EGARCH and PGARCH model	impact on the ASEAN-5 stock market daily returns than that of the local COVID-19 situation. However, in general, the COVID-19 development does not increase the volatility of ASEAN-5 stock markets during the pandemic in 2020
Yousef (2020)	G7 countries	2005 to 30th September 2020	GARCH and GJR-GARCH models	

Note: SVAR-DCC-GARCH (Structural Vector Autoregression- Dynamic Conditional Correlation- generalized autoregressive conditional heteroskedasticity), VAR (Vector Autoregression), GJR GARCH (Glosten–Jagannathan–Runkle GARCH), TGARCH (Threshold GARCH), OLS (Ordinary least-squares), HAR model (heterogeneous autoregressive), CWT (Continuous Wavelet Transformation), EGARCH (Exponential GARCH), PGARCH (Power GARCH), and FE (Fixed Effects).

Source: Author's summary

To examine the effect of COVID-19 on the mean return and volatility process, we use a model with a logarithm for the number of cases and one for the number of deaths.

Conditional Mean Equations:

$$y_t = \mu + \beta_1 lncases + t \quad (1)$$

$$y_t = \mu + \lambda_1 lndeaths + t \quad (2)$$

Conditional Variance Equations:

$$h_t = \omega + \sum_{i=1}^{p} \alpha_i \varepsilon_{t-1}^2 + \sum_{i=1}^{p} \beta_i \varepsilon_{t-i}^2 + \beta_1 lncases \quad (3)$$

$$h_t = \omega + \sum_{i=1}^{p} \alpha_i \varepsilon_{t-1}^2 + \sum_{i=1}^{p} \beta_i \varepsilon_{t-i}^2 + \lambda_1 lndeaths \quad (4)$$

A negative and statistically significant coefficient for the COVID-19 variables (lncases and lndeaths) in the conditional mean equation indicates a correlation between COVID-19 and a decrease in market mean returns, while a positive and statistically significant coefficient for the COVID-19 variables indicates a correlation between COVID-19 and an increase in market mean returns. A negative and statistically significant coefficient for the COVID-19 variables in the conditional variance equation indicates a correlation between COVID-19 and a decrease in market volatility, while a positive and statistically significant coefficient for the COVID-19 variables indicates a correlation between COVID-19 and an increase in market volatility. We prefer the GARCH model in most cases (Bollerslev et al. 1994). The sizes of the parameters α_1 and β_1 determine the short-run dynamics of the resulting volatility time series. A large GARCH lag coefficient β_1 indicates that shocks to the conditional variance take a long time to die out, so volatility is "persistent". A large GARCH error coefficient α_1 means that volatility reacts quite intensely to market movements and so if α_1 is relatively high and β_1 is relatively low, then volatility is more "spiky". If $\alpha_1 + \beta_1$ is close to unity, then a "shock" at time t will persist for many future periods. A high value of $\alpha_1 + \beta_1$ therefore, means a "long memory". For $\alpha_1 + \beta_1 = 1$, any shock will lead to permanent change in all future values of h_t: hence the shock to the conditional variance is "persistent".

4. Empirical results

Table 2 presents the descriptive analysis for each index. It shows that the mean, med, max, minimum, and std. dev return values for the PSE, IDX, SGX, MYX, SET, and HSX indices occurred from April 20, 2019, to April 20, 2021, while the values of cases and deaths occurred from January 1, 2020, to April 21, 2021. Moreover, the kurtosis value of all variables is low that means the chances of loss are low; and the MYX is the highest in the group that indicates the chances of loss are high. The Jarque-Ber test denotes that all variables are not normally distributed.

Table 2. Descriptive statistics

Var	PSE	IDX	SGX	MYX	SET	HSX	cases	Dead
Mean	6,929	5,766	2,960	1,562	1,488	1,000	324,065	6,722
Med	6,933	6,027	3,110	1,583	1,547	971	310,000	6,371
Max	8,365	6,463	3,407	1,691	1,741	1,420	895,033	16,727
Min	4,623	3,938	2,233	1,220	1,024	659	0	0
Std. Dev	852	601	294	80	162	157	238,777	4,152
Skew	0	-1	0	-2	-1	1	0	0
Kur	2	2	2	6	2	3	2	2
Jar-Bera	30	78	60	365	42	50	20	8
Pro	0	0	0	0	0	0	0	0
Obs	548	546	572	550	543	562	392	392

Source: Authors' estimation.

We have used the augmented Dickey-Fuller to check for the presence of unit roots before estimating the GARCH model. The results of the unit root test and the heteroskedasticity test are shown in Table 3. The findings show that while the returns of the six markets are non-stationary at level I (0), they are all stationary at the first different or I level (1). At level I, the COVID-19 variables of cases and deaths are stationary I (0). At that level, the ADF's null hypothesis shows that the series has unit roots. The null hypothesis is that there is no unit root that means all initial logarithmic difference series are stationary and can be used to estimate the GARCH model. Furthermore, at a 1% level of significance, the Autoregressive Conditional Heteroskedasticity Lagrange Multiplier (ARCH-LM) shows that all variables' returns have a substantial ARCH effect. As a result, the preconditions for using the GARCH (1,1) model have been accomplished.

We estimated the GARCH (1,1) model with COVID-19 variables. In Tables 4 and 5, we separately use the logarithms of cases and death to measure the effects of COVID-19 on return volatility for the six stock markets. The findings show that the coefficients for the conditional mean equation are positive and significant. In the variance equation, the coefficients are positive and significant, except for the PSE index. The α (ARCH effect) has a more significant value than β(GARCH) in all indices that indicates all stocks are highly persistent to shocks. The sum of α+β equals one indicates a long memory, and any shock may lead to a permanent change in the future value of h_t that indicates the conditional variance is persistent. In other words, COVID-19 increases market volatility in all these indices (Ibrahim 2020). The results also show that the number of COVID-19 cases had a significantly negative relationship with PSE, SGX, and SET, and a positive one with IDX, MYX, and HSX. These findings indicate that an increase in global COVID-19 cases of 1% influenced all indices' volatility. While the number of deaths in the equation has a positive and significant relationship with all indices, the finding also shows that the number of COVID-19 deaths have a negative and significant effect on PSE, SGX, and SET, and a positive and significant one on IDX and MYX,

Table 3. Unit root and ARCH effect test

Variables	Level			First Differences			ARCH effects
	Intercept	Trend& Intercept	None	Intercept	Trend& Intercept	None	LM
PSE	-1.880	-1.936	-0.427	-9.640***	-9.642***	-9.639***	169.047***
	(0.341)	(0.633)	(0.528)	(0.000)	(0.000)	(0.000)	(0.000)
IDX	-1.703	-1.588	-0.152	-11.593***	-11.618***	-11.603***	31.478***
	(0.429)	(0.796)	(0.630)	(0.000)	(0.000)	(0.000)	(0.000)
SGX	-2.021	-1.771	-0.254	-8.257***	-8.327***	-8.261***	112.262***
	(0.277)	(0.717)	(0.594)	(0.000)	(0.000)	(0.000)	(0.000)
MYX	-2.077	-2.073	-0.3069	-24.442***	-24.421***	-24.460***	84.851***
	(0.254)	(0.558)	(0.574)	(0.000)	(0.000)	(0.000)	(0.000)
SET	-1.993	-1.850	-0.148	-7.844***	-7.877***	-7.851***	8.703***
	(0.289)	(0.678)	(0.632)	(0.000)	(0.000)	(0.000)	(0.006)
HSX	-0.187	-1.115	0.971	-21.307***	-21.361***	-21.294***	24.773***
	(0.937)	(0.924)	(0.912)	(0.000)	(0.000)	(0.000)	(0.000)
Case	-6.229***	-4.679***	1.971	-7.361***	-8.503***	-5.812***	36.548***
	(0.000)	(0.000)	(0.769)	(0.000)	(0.000)	(0.000)	(0.000)
Death	-3.280**	-2.691	0.8190	-9.921***	-10.015***	-9.873***	58.005***
	(0.016)	(0.240)	(0.888)	(0.000)	(0.000)	(0.000)	(0.000)

Source: Authors' estimation.

implying that the impact of COVID-19 on stock markets is country-specific, the markets adapted technology seem to benefit from this trend, and the pandemic highlighted the importance of healthcare and pharmaceutical stocks, so these sectors saw increased demand for treatments, and vaccines, leading to stock price gains. It also showed that and increase in global COVID deaths of 1% influenced all indices' volatility.

Table 4. Results of GARCH (1,1) with Cases

GARCH	PSE	IDX	SGX	MYX	SET	HSX
Conditional mean equation						
μ	8.9609***	8.680***	3.512***	7.290***	7.367***	6.768***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Conditional variance equation						
ω	5.52E-05	6.27E-05**	9.38E-05***	3.26E-05***	0.0001***	4.52E-05
	(0.082)	(0.011)	(0.003)	(0.003)	(0.000)	(0.208)
α	0.923***	1.078***	1.288***	1.050***	1.338***	1.101***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
β	0.162	−0.093	-0.248	-0.006	−0.304*	−0.048***
	(0.195)	(0.279)	(0.168)	(0.950)	(0.040)	(0.003)
$\alpha + \beta$	1.086	0.9799	1.039	1.043	1.034	1.053
Case						
Lncase	−0.013***	0.001***	−0.010***	0.005***	−0.004***	0.008***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Like:	513.076	536.349	507.318	872.569	490.235	288.870
SC:	-2.650	-2.796	-2.518	-4.526	-2.556	-1.430
AIC:	-2.702	-2.849	-2.569	-4.578	-2.6087	-1.4823
HQC:	-2.681	-2.828	-2.5492	-4.557	-2.5878	-1.4619

Source: Authors' estimation.

Table 5. Results of GARCH (1,1) with Deaths

GARCH	PSE	IDX	SGX	MYX	SET	HSX
Conditional mean equation						
μ	8.958***	8.685***	8.088***	7.321***	7.362***	6.867***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Conditional variance equation						
ω	4.83E-05	6.35E-05**	4.53E-05***	3.56E-05***	0.000191***	8.29E-05***
	(0.093)	(0.010)	(0.000)	(0.001)	(0.000)	(0.000)
α	0.724***	1.078***	1.009***	1.041***	1.291***	1.154***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
β	0.328***	-0.095	0.040	-0.010	−0.292***	−0.087***
	(0.000)	(0.254)	(0.750)	(0.915)	(0.000)	(0.000)
$\alpha + \beta$	1.053	0.982	1.050	1.0315	0.9999	1.066
Death						
Lndeath	−0.019***	0.002***	−0.014***	0.004***	−0.006***	−0.006***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Like:	517.579	537.385	515.899	864.628	482.200	358.269

SC:	-2.674	-2.802	-2.562	-4.484	-2.512	-1.793
AIC:	-2.726	-2.854	-2.613	-4.536	-2.565	-1.844
HQC:	-2.705	-2.833	-2.593	-4.515	-2.544	-1.824

Source: Authors' estimation.

5. Conclusion

In this paper, we investigate the effect of the COVID-19 pandemic on ASEAN stock markets from April 20, 2019, to July 16, 2021. The result of the GARCH (1,1) shows that α has a more significant value than β in all indices that indicates all stocks are highly persistent to shocks. The sum of α and β of one indicates a long memory, and any shock may lead to a permanent change in the future value of h_t that shows the conditional variance is persistent. In other words, this persistence indicates that COVID-19 increases market volatility in all these indices. The results also show that the number of COVID-19 cases had a significantly negative relationship with PSE, SGX, SET, and a positive one with IDX, MYX, and HSX in which an increase in global COVID-19 cases influences all indices' volatility. While the number of deaths in the equation had a positive and significant relationship with all indices, the finding also showed that the number of COVID-19 deaths had a negative and significant effect on PSE, SGX, SET, and positive and significant one on IDX and MYX. These findings are important for investors in terms of risk management and diversified investment strategies. This suggests encouraging investors to diversify their portfolios across sectors and asset classes because diversification can mitigate risks associated with market volatility and implement risk management practices for investors, especially risk tolerance and long-term investment strategies.

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