The Impact of the 3rd Wave of COVID19 on the Stock Market of Thailand

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Abstract

This paper examines the impact of the outbreaks of the coronavirus disease (COVID19) pandemic on the trading volume of the Stock Exchange of Thailand (SET). The outbreak of the COVID19 pandemic is considered at both domestic and global levels, which are captured by the number of daily new cases and deaths in Thailand and across the globe, respectively. We focus on the third wave of the COVID19 pandemic in Thailand (April 2021 onward), when new cases and deaths increased significantly. Using daily time-series data from 01/04/2021 to 31/10/2021, we employ the Autoregressive Distributed Lag Bound Test Approach to Cointegration to investigate the long-run and short-run relationship between the trading volume of the SET and explanatory variables in the model. We find that the number of domestic daily new deaths from COVID19 negatively impacts the trading volume of the SET in the short run only. However, we find that global daily new cases have a significant positive impact on the trading volume of SET.

Keywords: COVID19, Stock Exchange of Thailand, stock market, ARDL, Short-run, Long-run, Time series

Introduction

Commencing in December 2019, the Coronavirus Disease (COVID19) has substantially impacted social and economic life worldwide. The financial sector, including stock markets, is among the most hit sectors by COVID19 due to the reduced demand for stock market products and services, stock market volatility, and the fluctuations in stock prices (see Corbet et al., 2021; Fernandez-Perez et al., 2021; Gil-Alana & Claudio-Quiroga, 2020; He et al., 2020; Liu et al., 2020; Rahman et al., 2021; Topcu & Gulal, 2020; Van Hung et al., 2021; Yiu & Tsang, 2021).

The possible mechanisms by which the COVID19 pandemic affects the performance of stock markets are partially justified by the theory of the psychology of investing, which explains the effect of psychology on investors' behaviour (Nofsinger, 2018). Nofsinger (2018) states that investors' feelings or moods are important determinants of their investment decisions. This effect is labelled as the misattribution bias, i.e., individuals tend to misattribute their mood to the concurrent financial decision. Therefore, individuals with good moods are more likely to be optimistic in evaluating an investment. As such, good (bad) moods will increase (decrease) the probability of risky investments, such as in stocks. Applying this notion to the case of the COVID19 pandemic, the daily reports of the new cases and new deaths from COVID19 by the WHO and public health officials and the stringencies imposed by the governments could shape investors' sentiments towards the disease. In turn, investors' sentiments would influence the stock markets through their investment decision. Negative updates relating to COVID19 make investors pessimistic, resulting in delayed reentrance to the market until a recovery is observed. On the other hand, when there are positive updates relating to COVID19, investors behave more optimistically and are likely to take more risks. Thus, new information regarding COVID19 leads to short-term investor overreaction. The impacts of disease outbreak on stock markets due to investors' sentiments towards the uncertainty in financial markets were also observed during the times of previous pandemics, such as SARs - 2003, MERs - 2012, and Ebola -2014 (see Chen et al., 2007; Donadelli et al., 2017; Ichev & Marinč, 2018; Loh, 2006; Wang et al., 2013).

Like financial markets around the globe, the Stock Exchange of Thailand (SET) has also been negatively affected by the COVID19. To the best of our knowledge, only two previous studies investigated the relationship between COVID19 and SET. Using the data of 46 stocks listed in SET from 03/01/2019 to 01/04/2020, Panyagometh (2020) utilizes a GARCH(1,1) model to measure abnormal volatilities and returns in SET in the early stages of COVID19 in Thailand. The study finds that stocks in the finance and security, banking, energy and utility, transportation and logistics, and food and beverage sectors have experienced an abnormal negative return during the event window of COVID19. Over the sample period from 12/01/2020 to 11/05/2021, Gongkhonkwa (2021) applies multiple linear regression to examine the connectedness between the number of new, confirmed and death COVID19 cases in Thailand and trading value among investors in SET. The finding reveals that (1) the effects of COVID19 on trading value in Thailand are observed only during the first and second waves[1], but not in the third wave; (2) COVID19 new cases and deaths have a negative effect while confirmed cases have a positive impact on the trading value. Although these studies significantly contribute to our understanding of the relation of COVID19 to the stock market in Thailand, they have some limitations. First, they do not control variables that may confound the relationship between COVID19 and the stock market, such as exchange rate and interest rate. This may lead to biased estimates due to endogeneity. Second, they only consider the instantaneous relationship and ignore the short-term dynamics of the time-series data; thus, they may lose the information over time, leading to biased estimation. Third, since these studies were conducted before the prevalence of the COVID19 pandemic became more pronounced in Thailand (from May to August 2021), their finding on the impacts of COVID19 on SET may be underestimated.

To address these limitations, our paper studies the effect of the COVID19 outbreak on the trading volume of SET with the following considerations:

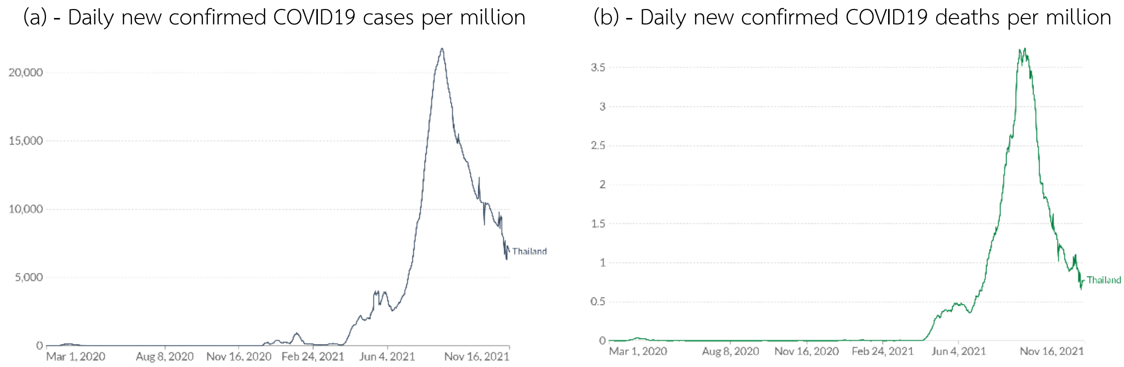
First, to isolate the impact of the COVID19 outbreak on SET, we control for variables that may confound the relationship between COVID19 and the stock market, including exchange rate, interest rate, stock market volatility, and bid-ask spread. Moreover, Thailand has begun vaccinations since February 28, 2021. Since this is considered the most effective solution to prevent the spread of COVID19 and drive economic recovery, we control for the COVID19 vaccination status, measured by the number of daily new doses, in Thailand (VAC). As far as we have researched, the previous studies have not considered this variable, including those outside Thailand.

Second, we estimate our model using the Autoregressive Distribution Lag (ARDL) Bound Test Approach to Cointegration proposed by Pesaran et al. (2001). This approach determines a dynamic Unrestricted Error Correction Model (UECM), where the short-run dynamics are integrated with the long-run equilibrium so that no information is lost over time.

Third, we focus on the third wave of the COVID19 pandemic in Thailand, April 2021

[1] Thailand's Ministry of Public Health divides the COVID19 pandemic in Thailand into three waves by: first wave spans from January to November 2020, the second wave from December 2020 to March 2021, and the third wave from April 2021 onwards (as of November 15, 2021).

onwards, which marks a significant increase in COVID19 cases and deaths. The third wave, which is still ongoing, also captures the peak in the number of new cases and deaths in Thailand in August 2021, as observed in Figure 1.



Source: Johns Hopkins University CSSE COVID19 Data

Figure 1. Daily New Cases and New Deaths of COVID19 in Thailand

Another interesting feature of this paper is that, in addition to the domestic outbreak of COVID19, we also consider the impact of the global outbreak of COVID19, captured by the number of daily new cases and new deaths around the globe. This is motivated by the increased linkage of world economies and the global financial markets interdependence (Siddiqui, 2009).

Research Objectives

This paper examines the impact of the third wave of outbreaks (domestic and global) of the COVID19 pandemic on the trading volume of the SET. First, we focus on the third wave of COVID19 because the number of new cases and deaths from COVID19 became prevalent in Thailand from the third wave onwards. Second, besides the domestic, we also pay attention to the global prevalence of COVID19 to capture globalization and the interdependence of the global financial markets. Third, we investigate this relationship in both the long-run and short-run.

Literature Review

The literature on the impact of COVID19 on the stock markets of both developing and developed countries has quickly emerged in 2020 and 2021 (Basuony et al., 2021). Most of the studies show that bad news (i.e., higher prevalence (new cases) and mortality (deaths)) related to COVID19 reduces the return and trading volume of stocks and increase their volatility.

Albulescu (2021) examines the impact of official announcements regarding COVID19 new cases and deaths on the United States (US) financial markets volatility. Using OLS regression and a stepwise procedure, the study finds that new cases of COVID19 are related to higher financial volatility in the US. Baek et al. (2020) study the relationship between COVID19 and the regime change from lower to higher volatility of the US stock market. Using the Two-regime Markov switching model, the study observes that news about the number of deaths impact the stock market's volatility twice as much as news about recovered cases. Baig et al. (2021) investigate the effect of COVID19 on the US equity markets illiquidity and volatility. With a GARCH (1,1) model specification, the study finds that increases in confirmed cases and deaths due to COVID19 were linked with a significant increase in volatility and market illiquidity. Bissoondoyal-Bheenick et al. (2021) investigate the impact of COVID-19 on stock return and volatility connectedness in the Group of Twenty countries (including Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Republic of Korea, Mexico, Russia, Saudi Arabia, South Africa, Turkey, the United Kingdom, the United States, and the European Union). Using a bivariate fractionally integrated vector autoregressive model, the study observes increased volatility and connectedness between stock returns during the COVID19 pandemic. Chaudhary et al. (2020) studied the volatility in Stock Markets of the United States, Canada, United Kingdom, Germany, France, China, Japan, India, Italy, and Brazil from 01/2019 to 06/2020. Using a GARCH (1,1) model specification, the study observed more negative mean returns for all market indices and higher volatility during the COVID19 period. Jelilov et al. (2020) investigated the impact of COVID19 on Nigeria's stock market from 27/02/2020 to 30/04/2020. Using standard GARCH and the GJR-GARCH model, the study found that COVID19 is associated with higher volatility and negative market returns. Waheed et al. (2020) investigate the impact of COVID19 on the Pakistani Stock Market from 26/02/2020 to 17/04/2020. Using the autoregressive integrated moving average and exponential smoothing (ES) approach, the study found that COVID19 positively affects the KSE-100 index, which positively relates to the stock market. Zaremba et al. (2020) examines the impact of COVID19 on the stock markets of Argentina, Australia, Austria, Bahrain, Belgium, Brazil, Bulgaria, Canada, Chile, China, Colombia, Croatia, Cyprus, Czechia, Denmark, Egypt, and Estonia from 01/01/2020 to 03/04/2020, and find that COVID-19 is associated with higher volatility in the stock markets of these countries.

Specific to the impacts of Covid-19 on the stock markets of ASEAN countries, Yiu and Tsang (2021), applying the Arellano–Bond estimator for dynamic panel regression models, found that the global COVID-19 development has more impact on the ASEAN5 (including Indonesia, Malaysia, the Philippines, Thailand, and Vietnam) daily returns of stock market than that of the local COVID-19 situation. However, in general, the COVID19 development did not increase ASEAN5 stock markets volatility in 2020. Ngu Chuan Yong et al. (2021) estimated a standard GARCH, GARCH-M, TGARCH, EGARCH and PGARCH model for each subsample of daily closing prices of the indices of Bursa Malaysia and Singapore Exchange from 01/07/2019 to 31/08/2020. They found that both stock market returns are persistent, and the persistence decreases for both stock market returns during the pandemic. Gamal et al. (2021), using daily time-series data of the Malaysian stock market from 27/01/2020 to 12/05/2020 and employing the autoregressive distributed lag (ARDL), found that daily new domestic and global cases of COVID-19 has significant negative effects on the daily trading size of the stock market in Malaysia. Hung et al. (2021), using a random-effect model on panel data of stock returns of 733 listed companies on the Vietnamese Stock Market from 02/01/2020 to 13/12/2020, found that daily confirmed cases of COVID19 in Vietnam negatively impact stock returns of listed companies in the market and the impacts were more severe for the pre-lockdown and second-wave period, compared to impact for the lockdown period. Relating to Thailand, two previous studies are investigating the relationship between COVID19 and SET to the best of our knowledge. Using the data of 46 stocks listed in SET from 03/01/2019 to 01/04/2020, Panyagometh (2020) utilizes a GARCH(1,1) model to measure abnormal volatilities and returns in SET in the early stages of COVID19 in Thailand. The study finds that stocks in the finance and security, banking, energy and utility, transportation and logistics, and food and beverage sectors have experienced an abnormal negative return during the event window of COVID19. Over the sample period from 12/01/2020 to 11/05/2021, Gongkhonkwa (2021) applies multiple linear regression to examine the connectedness between the number of new, confirmed and death COVID19 cases in Thailand and trading value among investors in SET. The finding reveals that (1) the effects of COVID19 on trading value in Thailand are observed only during the first and second waves, but not in the third wave; (2) COVID19 new cases and deaths have a negative effect while confirmed cases have a positive impact on the trading value.

Research Hypothesis

The possible mechanisms by which the COVID19 pandemic affects the performance of stock markets are partially justified by the theory of the psychology of investing, which explains the effect of psychology on investors' behaviour (Nofsinger, 2018). Nofsinger (2018) states that investors' feelings or moods are important determinants of their investment decisions. This effect is labelled as the misattribution bias, i.e., individuals tend to misattribute their mood to the concurrent financial decision. Therefore, individuals with good moods are more likely to be optimistic in evaluating an investment. Good (bad) moods will increase (decrease) the probability of risky investments, such as in stocks. Applying this notion to the case of the COVID19 pandemic, the daily reports of the new cases and new deaths from COVID19 by the WHO and public health officials and the stringencies imposed by the governments could shape investors' sentiments towards the disease. In turn, investors' sentiments would influence the stock markets through their investment decision.

In view of the discussion above and the literature review, the COVID-19 outbreak has resulted in uncertainty, exaggerated fear, and pressure on stock markets (Chatjuthamard et al., 2021). Investors link the COVID19 news, especially confirmed cases/deaths, to their valuation of the stocks (Al-Awadhi et al., 2020; Ashraf, 2020; Erdem, 2020; Ramelli and Wagner, 2020), and the stock market appear highly sensitive to such news, which results in higher short-run volatility and jumps in the stock market (Ashraf, 2020; Baker et al., 2020; Okorie and Lin, 2020).

Thus, our first hypothesis is that:

H1: The increase in the number of COVID-19 confirmed cases/deaths in Thailand is negatively related to the trading volume of the SET.

Moreover, globalization has linked global economies and increased the interdependence of global financial markets (Chatjuthamard et al., 2021). Therefore, we expect the SET to be affected by news about COVID-19 at the global level. For instance, Gamal et al. (2021) found that the daily growth in the active global cases of COVID19 has significant negative effects on the daily trading size of the stock market in Malaysia.

Thus, our second hypothesis is that:

H2: The increase in the number of COVID-19 global confirmed cases/deaths is negatively associated with the trading volume of the SET.

Empirical Model and Methodology

To investigate the impact of COVID19 on the trading volume of SET, we use the following model:

$$SET_t = \alpha_0 + COV19_t\beta + X_t\gamma + \varepsilon_t \tag{1}$$

where SET_t represent the trading volume of the SET at time t; $COV19_t$ is the domestic and global outbreaks of COVID19 at time t; X_t is the vector of control variables at time t; and ε_t is the error term.

This paper captures the domestic and global outbreaks of COVID19 by the number of daily new cases and deaths in Thailand and worldwide, respectively. Therefore, $COV19_t = \{COV19_t^{TNC},\ COV19_t^{TND}, COV19_t^{GNC},\ COV19_t^{GND}\}$, where $COV19_t^{TNC}$ and $COV19_t^{TND}$ represent new cases and deaths in Thailand at time t; and $COV19_t^{GNC}$ and $COV19_t^{GND}$ represent new cases and deaths around the world at time t. Following Yiu and Tsang (Yiu & Tsang, 2021) and Gamal et al. (2021), our control variables include foreign exchange rates (EX), interest rates (IR), the spread of bid-ask prices (BA), and stock market volatility ((VOL). Moreover, since Thailand has begun the vaccination process for its citizens in February 2021, which is considered the most effective solution to bring COVID19 under control and positive economic recovery, we also control the COVID19 vaccination in Thailand (VAC). Then, equation (1), in the logarithm form[2], can be rewritten as:

[2] Since the spread of bid-ask prices (BA) and stock market volatility (VOL) are computed in percentage, we do not take logarithm for these two variables.

$$lnSET_t = \alpha_0 + \beta_1 lnCOV19_t^{TNC} + \beta_2 lnCOV19_t^{TND} + \beta_3 lnCOV19_t^{GNC} + \beta_4 lnCOV19_t^{GND} + \gamma_1 lnEX_t + \gamma_2 lnIR_t + \gamma_3 BA_t + \gamma_4 VOL_t + \gamma_5 lnVAC_t + \varepsilon_t \quad (2)$$

We apply the Autoregressive Distribution Lag (ARDL) Bound Test Approach to Cointegration, proposed by Pesaran et al. (2001a), to investigate the short-run and long-run relationship between COVID19 and the trading volume of SET. Pesaran et al. (Pesaran et al., 2001b) found this method more efficient than other methods. Several relative advantages of the ARDL approach include: First, the ARDL allows for the inclusion of variables without consideration to their order (i.e., stationary at I(0) or I(1)). Secondly, while OLS estimation results are biased in finite samples as they do not consider short-term dynamics (Banerjee et al., 1986), the ARDL determines a dynamic Unrestricted Error Correction Model (UECM) where the short-run dynamics are integrated with the long-run equilibrium so that no information is lost over-time. The UECM of ARDL approach takes the following form:

$$\begin{aligned}\Delta lnSET_t = {} & \delta_0 + \delta_1 lnSET_{t-1} + \delta_2 lnCOV19_{t-1}^{TNC} + \delta_3 lnCOV19_{t-1}^{TND} \\ & + \delta_4 lnCOV19_{t-1}^{GNC} + \delta_5 lnCOV19_{t-1}^{GND} + \delta_6 lnEX_{t-1} \\ & + \delta_7 lnIR_{t-1} + \delta_8 BA_{t-1} + \delta_9 VOL_{t-1} + \delta_{10} lnVAC_{t-1} \\ & + \sum_{i=1}^{q_1} \omega_{1i} \Delta lnSET_{t-i} + \sum_{i=1}^{q_2} \omega_{2i} \Delta lnCOV19_{t-i}^{TNC} \\ & + \sum_{i=1}^{q_3} \omega_{3i} \Delta lnCOV19_{t-i}^{TND} + \sum_{i=1}^{q_4} \omega_{4i} \Delta lnCOV19_{t-i}^{GNC} \\ & + \sum_{i=1}^{q_5} \omega_{5i} \Delta lnCOV19_{t-i}^{GND} + \sum_{i=1}^{q_6} \omega_{6i} \Delta lnEX_{t-i} \\ & + \sum_{i=1}^{q_7} \omega_{7i} \Delta lnIR_{t-i} + \sum_{i=1}^{q_8} \omega_{8i} \Delta BA_{t-i} \\ & + \sum_{i=1}^{q_9} \omega_{9i} \Delta VOL_{t-i} + \sum_{i=1}^{q_9} \omega_{10i} \Delta lnVAC_{t-i} + \epsilon_t \end{aligned} \quad (3)$$

The first part of the equation (3), with parameters $\delta_1, \delta_2, \delta_3, \delta_4, \delta_5, \delta_6, \delta_7, \delta_8, \delta_9, \delta_{10}$ refers to the long-run dynamic relationship coefficients and the second part, with parameters $\omega_1, \omega_2, \omega_3, \omega_4, \omega_5, \omega_6, \omega_7, \omega_8, \omega_9$, ω_{10} refers to the short-run dynamic relationship.

Two steps are involved in implementing the ARDL Bound Test Approach to Co-integration.

First, to test the existence of a long-run cointegrating relationship, we test the null hypothesis (H0) of no cointegration against the alternative hypothesis (H1).

$$\text{H0: } \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = \delta_7 = \delta_8 = \delta_9 = \delta_{10} = 0$$
$$\text{H1: } \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \delta_5 \neq \delta_6 \neq \delta_7 \neq \delta_8 \neq \delta_9 \neq \delta_{10} \neq 0$$

ARDL bound test, based on F-test, is used to test the null hypothesis (H0) against the alternative hypothesis (H1). For the computed F-statistic greater than the critical value of the upper bound, the null hypothesis (H0) is rejected, indicating that there is cointegration between the variables. For the computed F-statistic smaller than the critical value of the lower bound, the null hypothesis (H0) is accepted, indicating that the variables are not cointegrated. The result is inconclusive for the computed F-statistic between the lower and upper bound critical values. This study utilizes the Wald test to determine the F-statistic value.

Second, after confirming the existence of a cointegrating relationship, we use Akaike Information Criteria (AIC) to determine the lag length of the variables. After that, the long-run ARDL model for the stock trading volume is estimated as follow:

$$\begin{aligned} lnSET_t = \delta_0 + \delta_1 lnSET_{t-1} + \delta_2 lnCOV19_{t-1}^{TNC} + \delta_3 lnCOV19_{t-1}^{TND} \\ + \delta_4 lnCOV19_{t-1}^{GNC} + \delta_5 lnCOV19_{t-1}^{GND} + \delta_6 lnEX_{t-1} \\ + \delta_7 lnIR_{t-1} + \delta_8 BA_{t-1} + \delta_9 VOL_{t-1} + \delta_{10} lnVAC_{t-1} \\ + u_t \end{aligned} \quad (4)$$

The residual series estimated from equation (4) is the error correction term (ECT). Next, the associated error correction model is estimated with one-lagged ECT to obtain the short-run dynamic parameters. The error correction model is as follows:

$$\Delta lnSET_t = \omega_0 + \sum_{i=1}^{q_1} \omega_{1i} \Delta lnSET_{t-i} + \sum_{i=1}^{q_2} \omega_{2i} \Delta lnCOV19_{t-i}^{TNC} + \sum_{i=1}^{q_3} \omega_{3i} \Delta lnCOV19_{t-i}^{TND} + \sum_{i=1}^{q_4} \omega_{4i} \Delta lnCOV19_{t-i}^{GNC} + \sum_{i=1}^{q_5} \omega_{5i} \Delta lnCOV19_{t-i}^{GND} + \sum_{i=1}^{q_6} \omega_{6i} \Delta lnEX_{t-i} + \sum_{i=1}^{q_7} \omega_{7i} \Delta lnIR_{t-i} + \sum_{i=1}^{q_8} \omega_{8i} \Delta BA_{t-i} + \sum_{i=1}^{q_9} \omega_{9i} \Delta VOL_{t-i} + \sum_{i=1}^{q_9} \omega_{10i} \Delta lnVAC_{t-i} + \lambda ECM_{t-1} + V_t \quad (5)$$

The presence of cointegration is verified by the negatively significant coefficient estimate obtained from the one lagged ECT, which also indicates the speed of adjustment to the long-run equilibrium.

Data and Variable Measurement

We utilize the time-series data of the daily trading volume of SET from April 1 to October 29, 2021, which is obtained from the page Investing.com – Stock Market Quotes & Financial News (n.d.).

In this paper, the trading volume of SET is specified as a function of domestic and global outbreaks of COVID19, foreign exchange rates, interest rates, the spread of bid-ask prices, stock market volatility, and the COVID19 vaccination. The domestic and global outbreaks of COVID19 are measured by the number of daily new cases and deaths in Thailand and worldwide, respectively. These data are obtained from COVID19 reports published by the World Health Organization (n.d.). The foreign exchange rate is measured as the relative value of the Domestic Currency per US Dollar (THB/USD) and obtained from Investing.com – Stock Market Quotes & Financial News (n.d.). The interest rate is captured by the one-year tenure interbank offered rate and obtained from the page of Bank of Thailand (Bank of Thailand, n.d.). Finally, the spread of bid-ask prices and stock market volatility are constructed as follows:

$$BA_t = \frac{highprice_t - lowprice_t}{midpoint_t} \times 100$$

$$VOL_t = 0.5[ln(highprice_t) - \ln(lowprice_t)]^2 - [2ln2 - 1][ln(closeprice_t) - \ln(openprice_t)]^2$$

where highprice, lowprice, closeprice, and openprice are obtained from Investing.com - Stock Market Quotes & Financial News (n.d.).

The COVID19 vaccination in Thailand is captured by the number of daily new doses administered, obtained from Our World in Data (n.d.).

Results

1. Stationarity and Cointegration Tests

First, to accommodate the ARDL approach, we need to confirm that all the variables are integrated of order zero or order one. We employ the Augmented Dickey-Fuller unit root with break test to detect each variable's integration order and structural break. We conducted the tests on the logarithmic forms of the variables, except for the stock market volatility and the bid-ask spread. The test results reported in Table 1 show that all our variables are integrated of order zero or one.

Then we investigate the existence of a long-run cointegrating relationship between the trade volume of SET and its determinants. Table 2 reports the results from the F-Bounds Tests. The computed F-statistic value is higher than the upper bound values at a 1% significance level, indicating the existence of a long-run cointegration in our model.

We also test the stationarity of the residuals for our ARDL model. Table 3 indicate that the residuals are stationary at level (integrated of order 0). This confirms the long-term cointegrating relationship in the ARDL model.

Table 1: Augmented Dickey-Fuller Unit Root with Break Test in Level and First Difference

Variables	t-statistic in Level	Break Date	t-statistic in First Difference	Break Date	Order of Integration
$lnSET$	-8.565 (1) ***	28/09/2021			*I(0)*
$lnCOV19^{TNC}$	-5.346 (1) **	25/06/2021			*I(0)*
$lnCOV19^{TND}$	-2.979 (7)	09/09/2021	-4.652 (5) *	30/06/2021	*I(1)*
$lnCOV19^{GNC}$	-3.015 (7)	06/05/2021	-6.129 (4) ***	23/06/2021	*I(1)*
$lnCOV19^{GND}$	-4.727 (4) *	20/07/2021			*I(0)*
$lnEX$	-4.208 (7)	05/07/2021	-10.891 (0) ***	04/10/2021	*I(1)*
$lnIR$	-3.982 (1)	04/08/2021	-9.726 (0) ***	05/08/2021	*I(1)*
BA	-12.558 (0) ***	13/05/2021			*I(0)*
VOL	-19.598 (2) ***	13/05/2021			*I(0)*
$lnVOC$	-9.064 (0) ***	06/02/2021			*I(0)*

Note: *, **, *** denotes 10%, 5%, and 1% significance levels, respectively. The tests were conducted with Trend and Intercept specifications. The optimal numbers of lags are selected based on Akaike Information Criterion. Lag lengths are reported in the brackets next to the t-statistic.

Table 2: Bounds Co-integration Tests

Model	F-statistic	
$lnSET = f(lnCOV19^{TNC}, lnCOV19^{TND}, lnCOV19^{GNC}, lnCOV19^{GND}, lnEX, lnIR, BA, VOL, lnVAC)$	8.702***	
	K=9, N = 136	
Critical value for bound test - Case 5: Unrestricted Constant and Unrestricted Trend	Lower Bound	Upper Bound
10%	1.80	2.80
5%	2.04	2.08
1%	2.50	3.68

Note: *, **, *** denotes 10%, 5%, and 1% significance levels, respectively. K is the number of determinants, and N is the number of observations.

Table 3: Residuals Stationarity Test

Variable	ADFT t-Statistics	Order of Integration
Residual (ε)	-9.071***	*I(0)*

Note: *, **, *** denotes 10%, 5%, and 1% significance levels, respectively. The tests were conducted with Trend and Intercept specifications.

2. Long-run and Short-run Estimates

The estimates of ARDL in the long run and short run are presented in Table 4. The results suggest that in the long run, the domestic and global outbreak of COVID19 do not affect the trading volume of SET; only exchange rates and interest rates have significant impacts on the trading volume with correct signs and at p-values <0.1.

In the short run, the one-lagged domestic daily deaths from COVID19 has a significant negative impact on the trading volume of SET at p-value <0.05. Therefore, we do not reject our first research hypothesis (H1). This is mainly due to the depreciated market sentiment related to COVID-19 and halted economic activities due policy responses to COVID19 such as social distancing, quarantine and market shutdown (Panyagometh, 2020). The one-lagged global daily new cases also appear to have a significant impact on the trading volume of SET at p-value <0.01, but with an unexpected sign; thus, rejecting our second research hypothesis (H2). The one-lagged ECM has a negative value and is significant at p-value <0.01, which provides evidence of cointegration and implies that 80.5% adjustment speed is observed towards the equilibrium of the trading volume of SET.

Table 4: Long-run and Short-run Estimates - ARDL (1, 0, 2, 2, 0, 0, 0, 0, 0)

Long-run Coefficient Estimates		Short-run Coefficient Estimates	
	Coefficient		Coefficient
$lnCOV19^{TNC}$	0.898 (0.670)	$\Delta lnCOV19^{TND}$	-0.414 (0.467)
$lnCOV19^{TND}$	-0.372 (0.469)	$\Delta lnCOV19^{TND}(-1)$	-1.021** (0.466)
$lnCOV19^{GNC}$	-1.420 (1.473)	$\Delta lnCOV19^{GNC}$	0.291 (0.859)
$lnCOV19^{GND}$	0.041 (1.476)	$\Delta lnCOV19^{GNC}(-1)$	2.930*** (0.812)
$lnEX$	0.916* (0.716)	$@Trend$	0.002 (0.003)
$lnIR$	-2886.837* (4120.763)	$Constant$	92.415*** (9.159)
BA	29.693 (16.257)	$ECM(-1)$	-0.810*** (0.080)
VOL	-473.007 (241.001)		

Table 4: (Continue)

Long-run Coefficient Estimates		Short-run Coefficient Estimates	
	Coefficient		Coefficient
$lnVAC$	-0.003 (0.427)		

Note: *, **, *** denotes 10%, 5%, and 1% significance levels, respectively. Standard errors in the brackets under the coefficient estimates. The regression is estimated with Trend and Intercept specifications. The optimal numbers of lags are selected based on Akaike Information Criterion.

3. Diagnostic Tests

The stability and validity of the short-run SET model are diagnosed using heteroskedasticity, residual correlation, and stability tests, respectively. The results reported in **Table 5** shows that our residuals are not heteroscedastic and are not serially correlated. However, the CUSUM and CUSUMQS tests, reported in **Figure 1,** indicate some instability over the study period (i.e., the plots of the test statistics lie out the critical bound lines at the 5% significance level).

Table 5: Residual Heteroscedasticity and Serial Correlation Tests

Test	Hypothesis	χ^2	$p-value$
Heteroskedasticity: White Test	H0: Errors are homoscedastic H1: Errors are not homoscedastic	124.159	0.530
Correlation: Breusch Godfrey Test	H0: No serial correlation at up to 12 lags H1: Serially correlated at up to 12 lags	10.099	0.607

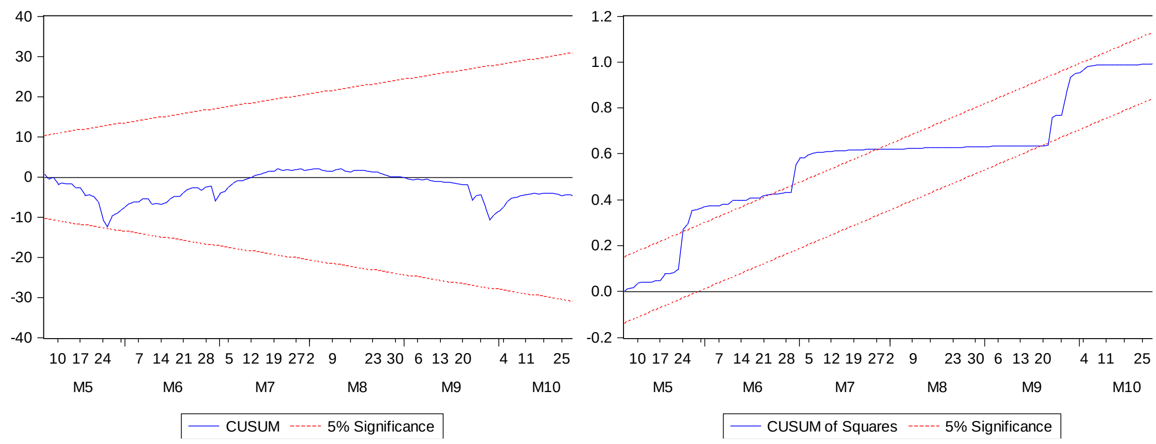


Figure 1: Plot of CUSUM and CUSUMSQ Statistics

Conclusion and Discussion

This paper examines the impact of the 3rd wave of outbreaks of the coronavirus disease (COVID19) pandemic on the trading volume of the SET. The outbreak of the COVID19 pandemic is considered at both domestic and global levels, which are captured by the number of daily new cases and deaths in Thailand and across the globe, respectively. We focus on the third wave of the COVID19 pandemic in Thailand (April 2021 onward), when substantial increases in the number of new cases and deaths are observed. Using daily time-series data from 01/04/2021 to 31/10/2021, we employ the Autoregressive Distributed Lag Bound Test Approach to Cointegration to investigate the long-run and short-run relationship between the SET's trading volume and explanatory variables in the model. By addressing the limitations of previous studies on the relation of the COVID19 pandemic to the stock market in Thailand, this paper provides reliable evidence on this relation in the case of Thailand.

Our finding reveals that the number of domestic daily new deaths from COVID19 significantly negatively impact the trading volume of the SET in the short run only. This significant negative impact can be explained by the fact that the increase in deaths from COVID19 generates anxiety among investors. In turn, anxiety promotes a negative sentiment that can influence investment decisions. Particularly, when the number of deaths due to COVID19 increases, investors become more pessimistic towards the stock returns and tend to reduce trading. Furthermore, the short-term impact of COVID19 on the trading volume of SET reflects the quick response of the stock market to the daily updated COVID19 information, which the efficient market hypothesis can explain.

The main concern in this paper is that the global daily new cases appear to have a significant impact on the trading volume of SET, but with a positive sign. This finding contradicts with previous research of Gamal et al. (2021), who found that the daily growth in the active global cases of COVID19 has significant negative effects on the daily trading size of the stock market in Malaysia. This may be because, holding the COVID19 status in Thailand constant, the global investors turn to investment in Thailand's stock market when an increase in new cases of COVID19 is observed outside Thailand. A similar relationship is also observed by Yiu and Tsang (2021), who found that the number of new deaths in the US due to COVID19 has a positive impact on the returns of the ASEAN5 (including Indonesia, Malaysia, the Philippines, Thailand, and Vietnam) stock markets. Our explanation of this phenomenon may be insufficient. This is a limitation of our paper.

Our findings on the impact of COVID19 on the SET in the short term are in line with previous literature. He et al. (2020) explored the direct effects and spillovers of COVID19 on the daily return of stock markets in the US, Italy, France, Germany, Spain, Japan, South Korea, and China and found a more significant negative short-term than long-term impact. Liu et al. (2020) found a short-term impact of the COVID19 outbreak on 21 leading stock market indices in the US, the UK, Italy, Germany, Japan, Korea, and Singapore. Gil-Alana and Claudio-Quiroga (2020) examined the impact of the COVID19 outbreak on three Asian stock market indices, including the Japanese Nikkei 225, the Korean SE Kospi Index, and the Chinese Shanghai Shenzhen CSI 300 Index. The study a transitory effect of the shock in the Nikkei 225 index.

Our results contribute to understanding the psychology of investing, such that the number of deaths than the number of new cases from COVID19 drives the investment decisions in SET. This reflects investors' psychology of being more anxious about the pandemic's drastic result (death) than its spread. Our findings also have some policy implications for the Government of Thailand, such that the government should make decisions on imposing/relaxing stringencies due to COVID19 based on the number of deaths than the number of new cases to encourage investors to re-invest in the stock market and subsequently obtain the recovery of the stock market.

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