THE CO-INTEGRATION AND CAUSALITY EFFECT BETWEEN GLOBAL COVID-19 PANDEMIC AND THE STOCK MARKET RETURN IN MALAYSIA: AN EXPLORATORY SEQUENTIAL MIXED METHODS APPROACH

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ABSTRACT

The COVID-19 pandemic is one of the most unparalleled disasters the world has ever seen. Previously, the global community has faced the Middle East Respiratory Syndrome (MERS), Ebola Virus Disease (EVD), and Severe Acute Respiratory (SARS). However, the tremendous rate of infection created by the global COVID-19 pandemic is unmatchable with its rapid spread all over the world.

Therefore, it is considered as a Black Swan event as created previously by the 2008 financial crisis, SARS, and 9/11 terrorist attack. All these events have triggered panic selling that affected the confidence of investors and businesses. Subsequently, stock market performance has affected the choice of investment decisions that translated into stock return. Therefore, this paper was undertaken to investigate the co-integration and causality relationship among global COVID-19 daily infected cases, COVID-19 recoveries rate, COVID-19 death rate, investor sentiment, government policy, foreign exchange rate, Malaysia gold price, and crude oil price towards the KLCI stock market return. This study employed an exploratory sequential mixed methods approach along with Johansen and Julius Co-Integration and Granger Causality in explaining the Malaysia stock market return. The empirical analysis concluded that COVID-19 daily cases, COVID-19 recoveries rate, government policy and foreign exchange have had a long-term effect in explaining the Malaysia stock return. On the other hand, all the study variables, except for government policy indicated a short-term effect on the Malaysia stock return. This study will contribute significantly to the body of finance literature on the impact of a disease outbreak, with highlights on the considerations of investors on the global COVID-19 pandemic in illuminating the variation of Malaysia stock market returns.

Keywords: Global COVID-19 pandemic, stock market, Malaysia.

INTRODUCTION

Covid-19, which refers to novel coronavirus, is a deadly infectious disease that directly affects the respiratory tract of birds and mammals. The COVID-19 outbreak in year 2020 has brought many negative consequences and traps to people, the community and the world economy (Morgan et al., 2020). The first COVID-19 case was reported in December 2019 at a seafood market situated in Wuhan, China. Various symptoms were identified as the indicators of the disease, namely fever, dry cough, loss of sense of taste and smell, flu and other respiratory symptoms. The exact medium of the virus transmission was via droplets of patients (Shereen et al., 2020). The intensified transmission of the disease had then affected the whole wide world. On 9 May 2020, as the deadly disease touched more than 2 million confirmed cases and more than 200,000 deaths, the World Health Organization (WHO) officially declared Covid-19 a pandemic

worldwide (Lin et al., 2020). The world has endured severe economic downturns, since the Great Depression of 1930, with the most recent being the COVID-19 pandemic, where the rapid spread of the virus quickly spiraled out of control. Thousands of companies filed for bankruptcy, most firms' performance deteriorated and the world stock markets were highly impacted (Shen et al., 2020).

In Malaysia, COVID-19 in 2020 posted the most severe outbreak other than SARS in 2003. Approximately 11,100 lives have been claimed by COVID-19 alone, reaching 1.36 million daily infected cases in May 2020. Malaysia recorded its first wave of epidemic outbreak from 25th January to 15th February 2020 with 22 confirmed cases. Meanwhile, the second wave of the epidemic outbreak was recorded on 27 February 2020 with several clusters and large Sri Petaling Tabligh's religious gathering attended by 14,500 locals and 1,500 foreigners. By March 2020, the number of daily infected cases increased from 41 to 190, not surprisingly, coming mostly from the gathering in the Sri Petaling Tabligh event. As the daily confirmed cases touched 100, Malaysia's Ministry of Health promptly announced immediate precautions to take effect in order to curb the widespread transmission of the disease.

According to Hajilee et al. (2021), in order to set a stock market performance benchmark, the stock market index is regarded as the most crucial aspect. The capital market's overall trend can be anticipated from the stock market (Teams, 2019). Besides, the stock market also indicates the economic trends while providing clues for future trends (Teams, 2019). A stock market index that analyses the performance of publicly listed corporations, for instance, might indicate future economic development. During the COVID-19 pandemic, the KLCI dropped more than 68 points in only a few minutes of trading time. This was the lowest level since October 2009, as investors responded to the government news of issuing Movement Control Order (MCO) throughout the nation (Ahmed, 2020). Due to the drop in predictability of stock market performance, the investors faced huge losses; therefore, our research aimed to provide a complete examination of the relationship between COVID-19 and the stock market index, which benefits investors when making investment decisions in tough circumstances. Besides economic factors, major events such as war, terrorism, and natural disasters would also impact the stock market performance (Havel, 2021) as the stock market is sensitive to world events. Based on previous records from the history

of epidemics, the returns of the global stock market have fluctuated due to contagious infectious illnesses, such as the EVD epidemic and the SARS epidemic (Al-Awadhi et al., 2020).

To facilitate further understanding, a previous scholarly article has used COVID-19 daily cases to study their association with US Standard & Poor (S&P)'s 500 Index (Yilmazkuday, 2023). The study revealed an increase of 1 cumulative daily COVID-19 case to subside the S&P 500 Index after 1 day and after a month by 0.01 percent and by 0.03 percent respectively. Similarly, a study by Chowdhury and Abedin (2020) had clearly shown the effect of COVID-19 towards the US stock market incorporating VAR, Event Study methods and GARCH (1,1) whereby a negative relationship was found between confirmed cases of and deaths due to COVID-19 and the US stock market. Furthermore, in the study of Chowdhury and Abedin (2020) also stated the number of deaths exaggerating stock market volatility significantly due to the COVID-19. In another study which focused on six countries with the highest cumulative cases, it was demonstrated that the reaction of stock market returns was more sensitive to the number of COVID-19 cases compared to cumulative indicators of the coronavirus and death cases (Alber, 2020). The returns of the stock markets in France, China, Spain and Germany associated negatively with COVID-19 spread upon the robustness check. However, there was no definite effect on the stock markets in United States and Italy. The rapid spread of this pandemic has thus caused panic around the world.

In terms of well-acceptance of the public, specifically on the government's response in fighting against the COVID-19 pandemic, Malaysia has been ranked as one of the four topmost countries (Keh & Tan, 2021). However, the impact of government policy on the performance of stock markets are still questionable. During the COVID-19 pandemic, most of the economic activities have ceased in Malaysia. The KLCI then faced a drastic drop on the second day of the MCO, reaching its lowest point at 1,219.71. It later took a longer period for the KLCI to overcome the strain in order to reach the 1,400-point level (Lee et al., 2020). Thus, intrigued by this phenomenon, the present study wanted to look into the knowledge gap on the global pandemic literature by incorporating the effect of government policy on the stock market.

On the other hand, studies have asserted the correlation between the exchange rate and stock market performance (Kwofie & Ansah,

2018). Increases in the stock prices are associated with an increase or decrease in the exchange rate. For instance, a national currency would show significant correlation between the stock prices and the value of currencies as the stock market rose (Abdullah et al., 2023; Reboredo et al., 2016). Studies also found that the exchange rate would adversely affect stock returns (Ouma & Muriu, 2014). Likewise, the link between gold and stock prices was spurious. In the short term, there was a relative weak and negative effect of gold price on stock indexes among European and Japanese markets (Shahzad et al., 2020). This result was further enhanced by the study conducted on the relationship between four gold prices and six stock market indexes in the U.S stock market (Shahzad et al., 2020). Elsewhere, most of the previous scholarly articles found a strong relationship between gold price and stock market performance in the long term (Bhuyan & Dash, 2018).

Besides, crude oil prices were found to have a strong influence on stock indexes (Dawar et al., 2021). Stock prices increased due to the rise in oil prices. Furthermore, a study on the correlation between crude oil prices and stock market performance in developing countries has shown a significant correlation (Aloui et al., 2012). However, there was no significant statistic to prove the correlation between prices of crude oil and market activity (Nordin et al., 2014). Therefore, the present comprehensive study was designed to consider investors' feedback to support empirical findings in addressing the following pivotal objectives:

1. to investigate the co-integration relationship between global COVID-19 daily infected cases, COVID-19 recoveries rate, COVID-19 death rate, investor sentiment, government policy, foreign exchange rate, Malaysia gold price, and crude oil price towards the FTSE Bursa Malaysia KLCI Stock Market Return.
2. to assess the causality relationship between global COVID-19 daily infected cases, Covid recoveries rate, COVID-19 death rate, investor sentiment, government policy, foreign exchange rate, Malaysia gold price, and crude oil price towards the FTSE Bursa Malaysia KLCI Stock Market Return.
3. to study the investors' considerations and ideas on global COVID-19 pandemic in illuminating the variation of FTSE Bursa Malaysia KLCI Stock Market Return.

AN UNDERLYING THEORY

Random Walk Theory is a well-known mathematical model of a stock market linked to random walk hypothesis. This theory indicated that the stock prices follow a random walk-in stock market. Thus, the movement of the stock market is assumed to be unforeseen (Teams, 2019). Based on this theory, the future stock price is totally independent, regardless of other stock prices and the past stock price movements. Therefore, forecasting the future price of any stock tends to be inaccurate, even if fundamental and technical analyses are applied.

Because of the difficulty in foreseeing stock prices movement, Random Walk Theory encourages investors to tackle the market in the long run, since it is difficult to outperform in the short run (Teams, 2019). A certain amount of additional risk for every investor is deemed crucial in order to outperform in the stock market. The investors can consider investing in market portfolios that cover the total stock market in which stock prices can reflect the overall stock prices movement in the market. As has been reported, the stock market performance of Malaysia has shown a tremendous fluctuation followed by a decline since January 2020 due to the global COVID-19 pandemic. It touched below the 1,600-point threshold. The uncontrolled performance confirmed that most of the investors might outperform the entire stock market consistently by taking short term profit with short position. This scenario resulted in a high trading volume.

LITERATURE REVIEW

The COVID-19 Daily Confirmed Cases, Recoveries Rate and Death Rate

On 31 December 2019, the first COVID-19 case was detected in Wuhan, China. In a short period, the disease had overwhelmed the entire world (Abuzayed & Al-Fayoumi, 2021). COVID-19 spread so rapidly that it had caused 60,000 deaths and the infection rate was over 1 million (WorldOMeter, 2021). The intense impact of the rapid widespread of COVID-19 infections compelled the WHO to regard the spread of COVID-19 as a global pandemic in the year 2020.

In Malaysia, the first confirmed COVID-19 case was reported on 25 January 2020 (Asita, 2020). By the end of February 2020, the number

of COVID-19 cases had rocketed, primarily due to the massive crowd at a religious event (Tang, 2020). Initially, to manage the situation, the Malaysian government had implemented two key strategies, namely quarantine and travel restrictions. However, as the COVID-19 cases continued to rise rapidly, the government initiated the MCO (Movement Control Order) on 18 March 2020. This MCO led to the closure of many businesses, except those businesses providing essential goods and services. Following the inevitable restrictions on human movement, the MCO also significantly affected the profitability of companies, consequently causing a substantial effect on stock prices (Chia et al., 2020).

Arguments have earlier been made that the performance of the stock markets were largely affected in the short run during a global crisis, namely COVID-19 (Yan et al., 2020). Past empirical evidence too affirmed that the stocks prices of solar energy sources were significantly influenced by COVID-19 (Wan et al., 2021). Observations have also claimed that investors became traumatic about the stock market performance during COVID-19, specifically in the short run (Giglio et al., 2021). Subsequently, the stock prices have been negatively impacted in the short run upon the announcement of the first COVID-19 case.

The empirical finding has demonstrated that the stock market would react negatively to the increasing number of daily COVID-19 cases (Ashraf, 2020a). Additionally, empirical evidence indicated that all selected indexes in the Malaysian equity market exhibited a negative association with COVID-19 cases, except for real estate investment funds (Lee et al., 2020). This was in contrast to the findings in studies conducted by Ahmed (2020) and Chia et al. (2020) which found that there was an insignificant relationship between COVID-19 cases and the stock markets in both Pakistan and Malaysia.

The increasing cases of deaths due to COVID-19 caused job losses and economic turmoil, and had become a critical issue in Malaysia (Phan & Narayan, 2020). To curb this, the government imposed lockdown policies, banned travelling, as well as stimulus packages to curb job losses issues (Anuar & Raharjo, 2022; Phan & Narayan, 2020). Past studies found a negative relationship between daily COVID-19 deaths and the volatility of market in the United States (Baek et al., 2020). Additionally, another study revealed a negative and statistically insignificant relationship between daily COVID-19 deaths and the

Malaysian stock market, which was analyzed using sectoral indices (Chia et al., 2020).

In addition, a number of past studies have revealed significant relationships between COVID-19 recoveries rate and the performance of stock markets. In Pakistan, a significant association between stock market performance and COVID-19 recoveries rate was found (Ahmed, 2020). In addition, the stock market volatility was highly impacted by negative news, instead of the positive news on recoveries rate (Baek et al., 2020). Previous research has generally argued that the severity of COVID-19 has a huge impact on the recoveries rate as the increase in the number of recoveries rate was parallel with the increase in virus spread (Aslam, 2020). In line with this, another past study has also affirmed that there was a reduction in stock market volatility alongside the improved   COVID-19 recoveries rate (Yağli, 2020).

Investor Sentiment

In the Malaysian context, the benchmark of setting stock market performance is the index of the stock market (Hajilee et al., 2021). Serving as evidence of economic trends and indicators of future performance, the stock market often provides a detailed illustration of capital market trends (Teams, 2019). Due to COVID-19, most of the investors reacted negatively to the government's decision on the implementation of MCO, which had dragged the Bursa Malaysia index to its lowest since October 2009 (Leong et al., 2020). Researchers have tried to address the market concerns related to the many deadly infectious illnesses like the EVD epidemic and SARS epidemic, since the stock market movement has caused huge losses among investors in the past. As such, a comprehensive analysis is crucial for the understanding of the connection between the stock market index and COVID-19, as it would significantly influence investors' decisions during uncertain times.

Similar to SARS and Ebola, COVID-19 has affected the stock market volatility during lockdowns imposed across the world to prevent the spread of COVID-19. In order to control the daily-affirmed cases of COVID-19, the Malaysian government has announced the implementation of the MCO from 18 March 2020 onwards. However, this decision led to an economic slowdown, as the corporate operations and businesses affected investors' behavior and investment strategy which finally caused a serious problem of stock market volatility.

Despite the numerous vaccination programmes which had been carried out systematically across the nation, there was at a certain point when a new challenge had arisen; the virus had mutated and now there were variants of the COVID-19 virus. This had dealt a serious blow not only to Malaysia but the whole world. The government had no choice but to re-imposed lockdowns (Lee et al., 2020). Consequently, businesses and investors have lost confidence in making decisions to invest in the country. In addition, the sales revenue and operational costs of companies have been impacted largely due to the COVID-19 pandemic. As such, the company's stock price and stock market return were being affected indirectly. This scenario heightened caution among investors, leading them to reevaluate various factors before investing, particularly if the stock market's returns would continue to fall below expectations. It is common knowledge that certain good news such as the launch of new products, good earnings reports, and corporate acquisitions can be a favorable sign for the economy. Therefore, during the pandemic, COVID-19 recoveries rate tends to be the good news for the investors to advance their investment. In defining a country's ability to curb COVID-19, the recoveries rate plays a significant role as an indicator for the Malaysian government when deciding to reopen certain economic operations during the MCO. This would certainly send a positive signal to potential investors.

Government Policy

The Malaysian government had announced social distancing measures (Ashraf, 2020a; Sohrabi et al., 2020) and enforced the imposition of the Movement Control Order (MCO) (Shah et al., 2020) for a greater control over the COVID-19 spread. However, these steps had caused negative impacts on stock market returns due to their unfavorable effects on economic activities (Ashraf, 2020b; Ozili & Arun, 2020). The non-pharmaceutical interventions such as workplace closure, international restrictions, and the shutdown of public transport were largely linked to higher stock market volatility (Zaremba et al., 2020). The implementation of monetary policies, on the other hand, could bring disappointment in long-term expectations (Gormsen & Koijen, 2020), even though it would enhance investors' confidence in the short term (Zhang et al., 2020). Therefore, arguments have been raised to emphasize a government policy which incorporates income support packages and community awareness campaigns that would be beneficial to market returns (Ashraf, 2020b). Similarly, studies have asserted that the impacts of COVID-19 could have been lessened if

the government had reacted on time with a comprehensive financial package for companies and individuals, as well as liquidity assurance to boost domestic markets (Hasan et al., 2021; Topcu & Gulal, 2020).

From the Islamic perspective, waqf, a well-known Islamic endowment held in trust for charitable purposes has been able to tackle issues of poverty brought about by the shutdown in economic activities during the pandemic. Therefore, suggestions have been put forward to accelerate economic stimulation activities by utilizing waqf assets for education and infrastructure enhancement purposes (Faturohman et al., 2021; Hassan et al., 2021). In line with this, many countries focused on expansionary fiscal policies. Such adoption has minimized the negative impacts of COVID-19 on the national economy (Ozili & Arun, 2020). Moreover, studies confirmed the positive signal from the fiscal stimulus policy among US investors since the government has been able to assist the affected businesses (Sharif et al., 2020). Thus, the present study has hypothesized that an appropriate government policy regarding the COVID-19 pandemic would significantly affect stock prices.

Foreign Exchange Rate

The connection between exchange rate risk and stock prices can be explained based on two models, namely "Stock-Oriented" (Branson, 1981) and "Flow-Oriented" (Dornbusch & Fischer, 1980; Gavin, 1989). The "Flow-Oriented" model proposes that the liquidity of companies and wealth of investors would be negatively affected by declining stock prices. Consequently, the interest rate would fall as a result of liquidity declining (Acharya & Rajan, 2021). Eventually, currency depreciation would occur as a result of capital outflows (Adjasi, 2009; Badwan, 2021). On the other hand, the "Stock-Oriented" model discusses the primary role of the exchange rate as a balancing factor between demand and supply of stocks and bonds. Thus, the financially held assets' value would be significantly impacted by the changes in the currency value. For instance, the value of foreign currency would appreciate as the local currency falls against the foreign currency. This scenario would encourage investors to focus more on foreign assets (stocks) as compared to local assets. Therefore, the prices of stock would be depressed.

Empirical evidence has shown the spillover of volatility towards stock prices as compared with the exchange rate in the USA market

(Abbas & Wang, 2020). In another study conducted in Sri Lanka, a long-term causal relationship was found between the exchange rate and the share market (Wickremasinghe, 2011). There was also a short-run bidirectional causality between the S&P 500 index performance and the exchange rate. Surprisingly, no causality was found in the long run.

Gold Prices

"Safe haven investment" is well known for gold investment in the context of the financial market. Gold is used to hedge against inflation, besides it being acknowledged as the oldest form of money. There would be no correlation of other types of assets with gold (Disli et al., 2021), making it a prominent asset in investment Most of the assets might have a significant association with one another, but under extreme stock market condition, gold would remain the safest platform for investment (Baur & Lucey, 2010; Triki & Maatoug, 2021).

A positive and significant relationship between gold prices and stock prices has been claimed in the study by Shabbir et al. (2020). In another study, empirical evidence with a nonlinear ARDL approach showed that the emerging stock prices of BRKS had a positive association with gold prices. However, in some other countries, namely Chile, Indonesia, Malaysia, Thailand and Mexico, there was a negative impact in the stock market. Similarly, in the Ghana market, studies confirmed a negative volatility between gold prices and stock prices (Adjasi, 2009). A previous study by Gilmore et al. (2009) also found a short-term unidirectional causality of gold prices in the S&D 500 index's large capitalization companies. It also identified that a long-term relationship can be restored by the gold prices and large-gap stock prices that adjusting to the COVID-19 disturbance towards the stock market volatility.

Crude Oil Prices

Among the numerous sources of energy, oil is considered one of the most crucial resources and similarly, crude oil is well-known for it being in the largest commodity market in the world (Shabbir et al., 2020). Past literature has shown that the stock prices in Malaysian companies were significantly impacted by Brent oil prices in the Norway Market (Gjerde & Saettem, 1999). Furthermore, the volatility in stock prices, as compared to oil prices has been found to be negative (Adjasi, 2009). In contrast, a study by Ahmed (2020) conducted in

Pakistan that applied autoregressive distributed lag test documented a significant and positive influence of oil prices on Pakistan's stock prices. However, the study by Andersen and Subbaraman (1996) which has been conducted in the Australian market resulted in an inconsistent output of an insignificant relationship between oil prices and stock prices. Due to the fluctuations in the previous trends of oil prices, some experts predicted that the world might face even greater fluctuations in oil prices. In the Nigerian market, the oil prices improved in the short run immediately after oil price shocks. However, in the long run, such returns turned out to be negative.

Based on the literature review exploring the interconnections among the identified study variables within the FTSE Bursa Malaysia KLCI stock returns, the present study has adopted the conceptual framework as depicted in Figure 1.

Figure 1

Conceptual Framework for the Study
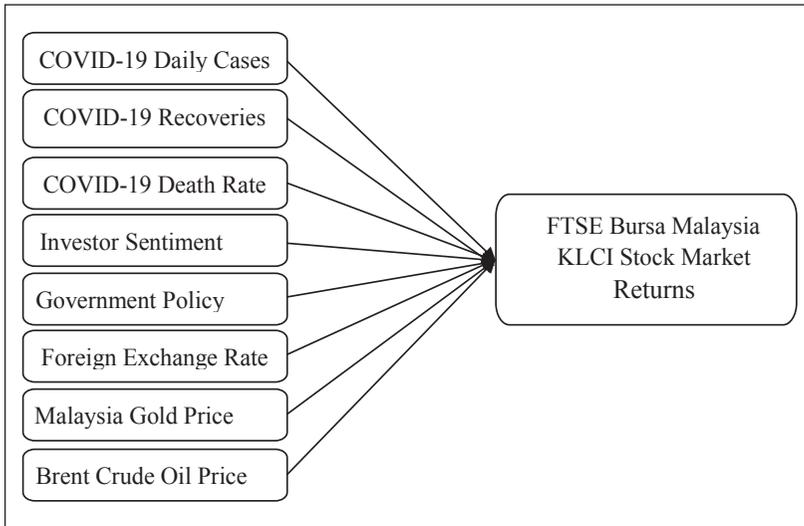
METHODOLOGY

Research Design and Data Quantification

This study obtained quantitative and secondary data from two primary sources, namely Bloomberg Terminal and the Ministry of Health

Malaysia (Kementerian Kesihatan Malaysia). The objective was to examine the dynamic relationship among several key factors including daily COVID-19 cases, COVID-19 recoveries rates, COVID-19 death rates, foreign exchange rates, Malaysia's gold prices, and world crude oil prices, in relation to their co-movements with the FTSE Bursa Malaysia KLCI index. The data set transformation process to convert time series data into numerical format, as well as statistical analyses conducted to generate descriptive outcomes contributed valuable insights to contemporary finance literature, particularly in the context of the global pandemic disease period. The dataset of the present study comprised daily secondary data from 18 March 2020 to 31 March 2022, coinciding with the imposition of the Movement Control Order by the Malaysian government during the COVID-19 pandemic in the country. The dataset included 501 data points and these were meticulously quantified as the independent and dependent variables for the study. These data have been outlined in Table 1, to ensure clarity and precision in the study's research approach. Furthermore, an exploratory sequential mixed methods approach through group focus interviews with stock market traders was undertaken to better comprehend the quantitative analysis and to provide statistical insights into the relationships between variables, as well as to offer a general overview of the research topic.

Table 1

The Quantification of the Study Variables

Variables	Quantification	Unit of Measurement	Source
FTSE Bursa Malaysia KLCI	Top 30 companies' market capitalization listed on the Bursa Malaysia Main Board	Index	Bloomberg Terminal
Malaysia COVID-19 daily cases, recoveries rate and death rate	Statistical data by Ministry of Health Malaysia	Number of Cases	Ministry of Health Malaysia portal
Investor sentiment	Bursa Malaysia market turnover rate	Rate	Bloomberg Terminal
Government policy	Malaysia government policy announcement related to Covid-19 on day t = 1 otherwise 0	Dummy variable	News

(continued)

Variables	Quantification	Unit of Measurement	Source
Foreign exchange rate	The market quotation price of USD / MYR	Rate	
Malaysia gold price	The force of demand and supply of Malaysia gold price	Per ounce (MYR)	Bloomberg Terminal
Brent crude oil price	The force of demand and supply of physical world crude oil price	Per barrel (USD)	

Inferential Statistics

In ensuring the validity of the secondary data collected from various sources for the statistical analysis, this study conducted unit root tests by employing the Augmented Dickey-Fuller (ADF) test on each study variable as presented in Table 1. According to Gujarati and Porter (2009), the constancy of mean, variance, and covariance of the series throughout the study periods suggests that the study variables exhibit a stationary trend. This stationary trend is essential for deriving accurate results, as non-stationary variables can lead to invalid conclusions. Moreover, economists commonly argue that macroeconomic time series tend to contain unit roots, resulting in fluctuations over time that imply non-stationary trends. The ADF test was depicted as in the Equations 1, 2, and 3.

$$\text{Intercept only} = \Delta R_t = \beta_1 + \Delta R_{t-1} + \lambda_t + R_t \qquad \text{Equation (1)}$$
$$\text{Intercept and slope} = \Delta R_t = \beta_1 + \beta_{2t} + \Delta R_{t-1} + \lambda_t + \varepsilon_t \qquad \text{Equation (2)}$$
$$\text{No intercept and slope} = \Delta R_t = \Delta R_{t-s} + \lambda_t + \varepsilon_t \qquad \text{Equation (3)}$$

The Johansen and Julius co-integration test was employed in this study to assess co-integration to explore the long-term co-movements between Covid-19 daily cases, COVID-19 recoveries rates, COVID-19 death rates, foreign exchange rates, Malaysia's gold prices, and world crude oil prices in relation to the FTSE Bursa Malaysia KLCI in the post global COVID-19 pandemic. The co-integration relationship derived the long-run equilibrium of independent and dependent variables, and this study has utilized the trace test and maximum eigenvalue test to determine the presence of co-integration vectors. Furthermore, the determination of the optimal lag length is crucial for ensuring the accuracy and reliability of the present study's model, following

the guidelines of Gujarati (2021). This determination is essential to maintain the dependability of the study model and to ensure its robustness. Specifically, the trace test and maximum eigenvalue test were as described in Equation 4 and Equation 5 respectively.

Trace Test = $\lambda_{trance}(r) = -T\sum_{i=r+1}^{g}\ln(1-\lambda_i)$ Equation (4)

Maximum Eigenvalue test = $\lambda_{max}(r, r+1) = -T\ln(1-\lambda_{r+1})$

Equation (5)

In conjunction with the Johansen and Julius Co-integration model in this study, we have Equation 6.

$$KLCI_t = \alpha + \beta_1 CDC_t + \beta_2 CRR_t + \beta_3 CDR_t + \beta_4 IS_t + \beta_5 GP_t + \beta_6 FX_t + \beta_7 MGP_t + \beta_8 BCOP_t + \varepsilon_t$$

Equation (6)

Where,

$KLCI_t$	=	FTSE Bursa Malaysia KLCI index at time t
α	=	Constant
$\beta_1 CDC_t$	=	COVID-19 daily cases at time t
$\beta_2 CRR_t$	=	COVID-19 recoveries rate at time t
$\beta_3 CDR_t$	=	COVID-19 death rate at time t
$\beta_4 CDR_t$	=	Investor sentiment
$\beta_5 CDR_t$	=	Government policy
$\beta_5 FX_t$	=	Foreign exchange at time t
$\beta_6 MGP_t$	=	Malaysia Gold Price at time t
$\beta_7 BCOP_t$	=	Brent Crude Oil Price at time t
ε_t	=	Error term

In the present study, the Granger Causality approach was used to explore the causal relationship among measurable variables. This method assesses whether past values of one variable can effectively forecast future values of another variable. However, it is imperative to clarify that Granger causality does not infer a genuine causal relationship in the traditional sense of causation. Instead, it is primarily used to identify statistical dependencies or predictive relationships. As Kathpalia and Nagaraj (2023) has pointed out, whether conducted in the time domain or the frequency domain, Granger causality relies on a linear interaction framework established by the autoregressive model. The equations pertaining to Granger causality analysis were presented as Equation 7 to analyse the global COVID-19 pandemic variables and economic factors in relation to the FTSE Bursa Malaysia KLCI stock returns.

$$\Delta Y_t = \sum_{j=1}^{n} b_j \Delta X_{t-j} + \sum_{j=1}^{n} c_j \Delta Y_{t-j} + \varphi e_{t-1} + w_t \quad \text{Equation (7)}$$

RESULTS

This research has investigated the comprehensive examination of the enduring relationship between the global COVID-19 pandemic variables and economic factors, in relation to the FTSE Bursa Malaysia KLCI stock returns. The study spanned the period from 18 March 2020 to 31 March 2022, incorporating a robust dataset comprising 501 data points. To fortify the model against potential econometric issues, the unit root analysis employed the ADF unit root Test. Recognizing the inefficiency and invalidity of the ordinary least squares method for capturing long-term effects, alternative methodologies were sought. Consequently, the study turned to the Johansen and Julius co-integration approach, alongside the vector error correction model. This combination of techniques was tailored to discern the linear interdependencies among multiple time series. Table 2 below presents the results of the ADF unit root test, illustrating the t-statistics for the key factors under investigation.

Table 2

Augmented Dickey-Fuller Unit Root Test

Variables	At Level		First Difference	
	Intercept	**Trend and intercept**	**Intercept**	**Trend and intercept**
FTSE Bursa Malaysia KLCI	-4.270685***	-3.991798***	-25.14651***	-25.26749***
COVID-19 daily cases	-3.825643***	-3.825643***	-3.735525***	-3.688594***
COVID-19 recoveries rate	-3.544935***	-4.701778***	-3.483456***	-3.397191*
COVID-19 death rate	-2.001979	-2.105724	-23.62740***	-23.60729***
Investor sentiment	-9.970794***	-9.961125***	-19.42891***	-19.41278***
Government policy	-4.830653***	-4.878663***	-16.43266***	-16.41603***
Foreign exchange rate	2.797329*	-2.399140	-21.64292***	-21.75593***
Malaysia gold price	-3.483982***	-3.446655**	-22.41411***	-22.40372***
Brent crude oil price	-0.937007	-3.909088**	-21.12114***	-21.10188***

*Note. *, **, **** indicates the rejection of the null hypothesis at 10%, 5%, 1% significance levels. Lag lengths for the Augmented Dickey–Fuller unit root is based on the schwarz information criterion.

Table 2 provides a comprehensive overview of the Augmented Dickey-Fuller (ADF) unit root test results. The data showcased the time series attributes of global COVID-19 pandemic variables, economic factors, and FTSE Bursa Malaysia KLCI stock returns. Notably, these variables exhibited stationarity and demonstrated an absence of unit root problems at the first difference. Consequently, compelling evidence emerged, supporting the assertion that all study variables attained stationarity at the first difference level. This critical finding bolstered the foundation for subsequent analyses. Moreover, within the framework of the ADF test, Bhargava and Sargan (1983) presented an array of optimal finite sample tests for assessing unit roots in various time series scenarios. Specifically, these statistics scrutinized the null hypothesis of a unit root against one-sided alternatives, taking into account first order autoregressive models. This examination helped ascertain whether the process in question skewed towards explosiveness or maintained stability under the alternative hypothesis.

Table 3

Johansen and Julius Co-integration Rank Test

Rank	Trace Statistic	Critical Value	Max-Eigen Statistic	Critical Value
r = 0	509.3570***	197.3709	229.3812***	158.43354
r <= 1	279.9759***	159.5297	87.53130***	152.36261
r <= 2	192.4446***	125.6154	79.41926***	95.23142
r <= 3	113.0253***	95.75366	55.87685***	40.07757
r <= 4	57.14845	69.81889	24.80831	33.87687
r <= 5	32.34014	47.85613	18.32953	27.58434
r <= 6	14.01061	29.79707	9.876550	21.13162
r <= 7	4.134060	15.49471	3.759669	14.26460
r <= 8	0.374391	3.841466	0.374391	3.841466

Note. *, **, *** indicates the rejection of the null hypothesis at 10%, 5%, 1% significance levels. The Johansen and Julius Co-integration test is based on the MacKinnon-Haug-Michelis (1999) p-values.

Table 3 displays the empirical findings of the Johansen and Julius Co-integration test, focusing on the rank determined through both the trace test statistic and maximum eigenvalue statistic. These tests aimed to ascertain the number of integrating vectors (Γ) pertinent to global

COVID-19 pandemic variables, economic factors, and FTSE Bursa Malaysia KLCI stock returns that leveraged the Johansen and Julius maximum likelihood methodology. The trace test statistics revealed the presence of three co-integrating equations, with significance levels below one percent. Moreover, the critical value for rank 0 stood at 197.3709, surpassing the 95 percent level critical value. Simultaneously, the max-eigen statistic mirrored the findings of the trace test, indicating the existence of three co-integrating equations with significance levels below one percent. The critical value for rank 0 was calculated at 158.43354, further exceeding the 95 percent level critical value. These empirical analyses collectively underscored the establishment of a long-term relationship among the variables under scrutiny. This robust evidence too supported the continuation towards employing a VECM for long-term estimations concerning each independent factor towards the FTSE Bursa Malaysia KLCI stock returns.

Table 4

Normalized Co-integration Coefficient

Variables	Coefficient	Std. Error	t-Statistic	Prob.
Dependent: FTSE Bursa Malaysia KLCI stock return				
COVID-19 daily cases	0.207029	0.01377	15.0320	0.0001***
COVID-19 recoveries rate	-0.217202	0.01431	-15.1811	0.0001***
COVID-19 death rate	0.265103	0.49808	0.53225	0.5948
Investor sentiment	-6.18E-07	4.5E-07	-1.36198	0.1738
Government policy	-115.8221	59.5744	-1.94416	0.0524*
Foreign exchange rate	-690.0368	332.730	-2.07387	0.0386**
Malaysia gold price	-0.113316	0.08036	-1.41013	0.1591
Brent crude oil price	2.095231	1.88700	1.11035	0.2674
C	5294.660			

*Note. *, **, **** indicates the rejection of the null hypothesis at 10%, 5%, 1% significance levels. The normalized co-integrating coefficients and probability value is based on the MacKinnon-Haug-Michelis (1999) p-values.

The empirical findings in Table 4 provides an in-depth exposition of the linear combination of normalized co-integration coefficients pertaining to global COVID-19 pandemic variables and economic factors on a compelling long-term relationship with respect to the FTSE Bursa Malaysia KLCI stock returns. Specifically, the daily

reported cases of COVID-19 exhibited a noteworthy positive impact on the FTSE Bursa Malaysia KLCI stock returns, signifying a co-integrated positive long-run association. A change in COVID-19 cases, characterized by a coefficient of 0.207029, demonstrated statistical significance at the one percent level, underscoring its influential role in shaping the stock returns. Conversely, the empirical scrutiny of the COVID-19 recoveries rate revealed a significant negative correlation within the co-integrated long-run framework. This was evidenced by a coefficient of -0.217202, also deemed significant at the one percent level. Moving on to government policy and foreign exchange rates, the analysis uncovered a substantial negative impact on the FTSE Bursa Malaysia KLCI stock returns and implied a co-integrated positive long-term relationship. Notably, the VECM estimated an increase in government policy and foreign exchange rates, characterized by coefficients of -115.8221 and -690.0368 respectively, further accentuating their influential roles in shaping stock returns with a 10 percent and five percent significant level, respectively.

Table 5

Granger Causality

Variables	F-Statistic	Prob.
COVID-19 daily cases does not Granger Cause FTSE Bursa Malaysia KLCI stock returns	0.89397	0.4673
COVID-19 recoveries rate does not Granger Cause FTSE Bursa Malaysia KLCI stock returns	0.44281	0.7777
COVID-19 death rate does not Granger Cause FTSE Bursa Malaysia KLCI stock returns	0.82532	0.5094
Investor sentiment does not Granger Cause FTSE Bursa Malaysia KLCI stock returns	1.10204	0.3549
Government policy does not Granger Cause FTSE Bursa Malaysia KLCI stock returns	2.43596	0.0464**
Foreign exchange rate does not Granger Cause FTSE Bursa Malaysia KLCI stock returns	1.03261	0.3898
Malaysia gold price does not Granger Cause FTSE Bursa Malaysia KLCI stock returns	1.38687	0.2373
Brent crude oil price does not Granger Cause FTSE Bursa Malaysia KLCI stock returns	1.88449	0.1119

*Note. *, **, *** indicates the rejection of the null hypothesis at 10%, 5%, 1% significance levels.

Table 5 shows the empirical findings on causal relationships between COVID-19 variables and economic factors in relation to the FTSE Bursa Malaysia KLCI stock returns. The results shed light on several noteworthy observations with all the study variables, except for government policy, that exhibited a significant causal relationship with the FTSE Bursa Malaysia KLCI stock returns. This was confirmed by the rejection of the null hypothesis at a one percent significance level. Furthermore, the analysis revealed that COVID-19 daily cases, COVID-19 recoveries rate, and foreign exchange rate were influential factors with both short and long-term implications for explaining the FTSE Bursa Malaysia KLCI stock returns. Conversely, government policy did not demonstrate a significant Granger causality with the FTSE Bursa Malaysia KLCI stock returns at the five percent level. The F-Statistic of 2.43596 supported this observation, indicating that government policy predominantly exerted an impact on the long-term relationship with the FTSE Bursa Malaysia KLCI stock returns.

In the exploratory sequential mixed methods approach, thirty respondents participated in a focus group interview to engage in discussions and debates regarding the empirical findings on Table 4 and Table 5 concerning the long-term and short-term relationships between global pandemic COVID-19 variables and economic factors in relation to the FTSE Bursa Malaysia KLCI stock returns. The responses collected during the group interview, as detailed in Table 6, provided valuable insights into the behavioral aspects underlying the empirical findings. This qualitative data offered a deeper understanding of the patterns and trends observed in the research and a more nuanced perspective on the dynamics at play within the finance literature.

Table 6

Focus Group Interview Responses on the Empirical Analysis

Variables	Empirical Finding		Stock Market Trader Responses
	Long-term Relationship	Short-term Relationship	
COVID-19 daily cases	✓ Positive coefficient	✓	Supported: High daily COVID-19 cases led to increased uncertainty and fear among investors. This brought positive effect in both the short term and long term, as investor sentiment and confidence caused investors to be more risk-averse. As a result, investors were more inclined to sell stocks leading to a decrease in stock prices.
COVID-19 recoveries rate	✓ Negative coefficient	✓	Not supported on long term coefficient: A higher recovery rate would boost investor confidence and sentiment. It signaled the government is managing the pandemic, potentially leading to increased optimism about the economic recovery and consequently, positive effects on stock prices.
COVID-19 death rate	×	✓	Supported: A high death rate led to changes in consumer behavior. Consumers became more cautious and conservative in their spending habits, particularly on essential goods and services (evident during the pandemic period). This could directly impact on companies' revenues and, subsequently, their stock prices over the short term. The respondents responded that there would only be a short-term impact as the Malaysian government ceased announcing the death rate thereafter.

(continued)

Variables	Empirical Finding		Stock Market Trader Responses
	Long-term Relationship	Short-term Relationship	
Investor sentiment	×	✓	Supported: Investor sentiment led to rapid and extreme fluctuations in stock prices during the COVID-19 pandemic. Negative sentiment resulted in sharp declines over short periods given the panic selling and uncertainty. Furthermore, the fundamental analysis readjusted the equity prices to reflect the book value when the storm has settled down.
Government policy	✓ Negative coefficient	×	Supported: Government policies on COVID-19, such as stimulus packages and monetary policies have had a substantial impact on the stock market's reaction. Stimulus measures could inject liquidity into the economy, potentially leading to an increase in stock prices, which took a longer duration to yield results compared to its short-term impact. However, the political instability during the lockdown had a detrimental effect on government policies, which in turn had a negative and prolonged impact on the economy.
Foreign exchange rate	✓ Negative coefficient	✓	Not supported on long term coefficient: Exchange rate movements directly affected Malaysia as it is one of the export-oriented countries. On the short term, the world purchasing power reduced due to the Movement Control Order.

(continued)

Variables	Empirical Finding		Stock Market Trader Responses
	Long-term Relationship	Short-term Relationship	
			The respondents argued that in the long term, exchange rate trends could impact a company's competitiveness in the global market, that re-correction the stock market return into long-term positive coefficient. Supported:
Malaysia gold price	×	✓	Investment in gold has often been considered a safe-haven asset key that explained investors' switch from equity investment, its short-term impact on stock prices due to the market dynamics and return to equity investment after a price storm. Not supported:
Brent crude oil price	×	✓	The stock market trader dismissed the empirical findings regarding the long-term relationship. The justification was that Malaysia being a significant oil exporter that is heavily reliant on oil revenues, would experience a prolonged impact on its economy. This, in turn, was reflected in the equity market that gauge Malaysian economy over the long term positive coefficient.

CONCLUSION

The statistical results from the Johansen and Julius Co-integration Rank Test showed the presence of three co-integrating equations, shedding light on the long-term relationship in Malaysia's stock returns. Furthermore, with the normalized co-integration coefficient, COVID-19 daily cases, COVID-19 recoveries rate, government policy, and foreign exchange rates have inextricably had a long-term relationship in the stock returns of Malaysia. In contrast, all study variables exhibited short-term relationships, with the exception of government policy influence on Malaysia's stock market returns. The

global stock market has no doubt faced a lot of uncertainties due to the Covid-19 pandemic.

To augment the empirical analysis, a focus group interview was conducted to achieve several objectives, namely garner additional insights into the stock market responses, to provide a valuable context, and to enhance the empirical findings. The responses from the focus group interview supported the empirical analysis of COVID-19 daily cases, COVID-19 recoveries rate, COVID-19 death rate, investor sentiment, government policy and the gold price in Malaysia. All these were aligned with the empirical findings and the reasoning behind the observed patterns that elucidated the underlying factors driving the phenomenon in question. On the other hand, the focus group respondents contended that over the long term, the exchange rates could exert a substantial influence on a company's competitiveness in the global market that will result in a positive translation of benefits. This appears to be a deviation from the finding of the empirical analysis, warranting a need for further exploration to gain valuable insights into the underlying reasons. Furthermore, regarding the Brent crude oil price, the focus group respondents dismissed the empirical findings regarding the long-term relationship, justifying the fact that Malaysia being a significant oil exporter that was heavily reliant on oil revenues and had already experienced a prolonged impact on its economy.

Due to the government's MCO imposition, the stock market performance has been impacted significantly. Numerous restrictions have been made specifically on movement and travel in order to control the spread of the COVID-19 pandemic. This then led to the temporary closure of business operations. As a result, some firms faced insolvency and bankruptcies that threatened the entire financial system. This was in line with the empirical finding in Zhang et al. (2022) which showed that the COVID-19 pandemic had significantly affected the indices of selected stock markets both in the short run and the long run. Moreover, a previous scholarly article has also highlighted a significant co-integration among all selected stock market indices due to the COVID-19 pandemic (David et al., 2021).

Overall, COVID-19 has largely affected the growth of the economy in Malaysia, including the performance of Bursa Malaysia. Both the short-run and long-run associations among numerous COVID-19 indicators and the performance of Bursa Malaysia ought to be addressed

in detail to ensure Malaysia stock market stability and improvement. The objectives and the empirical findings of this study are not only important to businesses and investors, but also to respective agencies and policy makers to develop a complete method for stability assurance of the stock market. Furthermore, this study would have provided the knowledge of the considerations of investors considerations and ideas on the global COVID-19 pandemic in illuminating the variation in the stock market performance of Malaysia.

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