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AN IMPLICATION OF QUANTILE REGRESSION MODEL ON STOCK MARKET ISSUES IN MALAYSIA

NURIN ALEEYA AHMAD NIZAM, FAUZIAH CHE LEH & NORIMAH RAMBELI

[1*] Department of Economics, Faculty of Management and Economics, Universiti Pendidikan Sultan Idris 35900, Tanjong Malim Perak. E-Mail: n.aleeya2703@gmail.com; norimah@fpe.upsi.edu.my
2 Department of Geography and Environment, Faculty of Human Sciences, Universiti Pendidikan Sultan Idris 35900, Tanjong Malim Perak. E-Mail: fauziah@fsk.upsi.edu.my

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Abstract: The economic instability caused by the presence of Covid-19 is a challenge for every nation to generate a source of income, especially when the stock market crisis occurs. Then, the purpose of this research is to examine the impact of various variables, including gold price, crude oil price, exchange rate, gross domestic product (GDP) and Covid-19 dummy on the stock market. To overcome the flaws, this study uses the Quantile Regression approach to understand how certain independent variables can affect stock prices based on each quantile distribution. It can provide an overview of potential risks and rewards for the stock market when the health crisis occurs in Malaysia. Next, this research data is conducted monthly from January 2010 to December 2022. Interestingly, the results of the study show that the price of gold has a long- term relationship effect on the issues of Malaysian stock markets for the 25th, 50th, 75th and 95th quantile regression models. However, the impact on the 10th, 20th, 30th and 40th quantile regression levels for the Malaysian stock market is influenced by oil prices and exchange rates. The research findings suggest that when faced with economic uncertainty, investors' confidence can be expanded by their dependence on low-risk assets. Therefore, this research helps investors, governments, and stakeholders consider any changes in macroeconomic factors before making decisions on the effectiveness of domestic stock market performance.

Keywords: Stock Market, Gold Price, Quantile Regression, Linear Regression.

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INTRODUCTION

The stock market serves as a place for businesses and investors to find long-term profit and provides an opportunity for the community to engage in investment activities, while being able to generate more income. Stock market is a crucial tool for assessing the economic state and acts as a financial intermediary in the acquisition and disposition of assets. Moreover, the stock market error was incorporated in the research to strengthen its validity concerning economic growth. Due to that, the stock market plays a significant role in the country's finances and has the potential to enhance stability and economic growth. However, starting from January 2019 the presence of Covid-19 began to have a negative impact on economic activity, especially for developing countries such as Malaysia. This crisis affected several sectors of the country's economy, causing a severe slowdown in economic growth, and

an impact on the stock market (Ding, Levine, Lin, & Xie 2020). Hence, the community will indirectly receive a negative impact from investment income activities in the stock market during that time.

This crisis has an effect of instability on the national economy and encourages people to take alternatives in low-risk asset investments such as gold and crude oil (Yousaf, Bouri, Ali & Azoury, 2021). The aim is to enhance the source of income, while covering the higher cost of living. In response to society and investors that are so profit-obsessed, it is possible for them to make profit without realizing how other economic factors affect the stock market. Then, the major of research studies has mostly neglected how the Covid-19 crisis has affected the stock market. This is due to the value of stock market progress and speculative activities in contributing to the determination of shares in ASEAN countries which is the primary factor that attracting all investors in the financial market (Mohd Hussin 2003). As we know, the stock market is a sensitive variable to any crisis that happens to the national economy. Thus, Gamal, Al-Qadasi, Mohd Noor, Rambeli, and Viswanathan (2021), found that the impact of the stock market can be influenced by the response to disasters, where it can impact on the entire economic environment, whether in international or local scale.

The existence of Covid-19 is one of the unexpected elements that indirectly contributes to the nation's financial crisis and may influence stock price fluctuations. This is the evident that the crisis has the potential impact not only on macroeconomic variable but also the stock market variable performance. Furthermore, Nor, Kogid, Abdul Karim and Isa (2012) stated that the developed and developing countries experience different impacts from each variable. Therefore, when a stock market crisis occurs in certain developing countries, the acceptance of its impact is not considered in the same way as it is in developed nations due to the disparity of crisis impact.

The objective of this study will look at how distinct variables, which are the gold price, crude oil price, exchange rates, gross domestic product (GDP) and Covid-19 dummy could influence the stock market issue crisis. It is essential to do research about the effects of stock market crises because failure to do so will increase the likelihood of encountering another crisis with unresolved difficulties. Furthermore, the findings of this study may help scholars, policymakers, and stakeholders in controlling the crisis effects on the Malaysia stock markets. This is because developing nations are prone to incur greater risk because of their size growth and different economic strategies (Tay & Gan, 2016). Therefore, if developed countries receive a severe economic crisis, where they can survive, then for developing countries like Malaysia maybe do not have a concrete study on the significant status of their stock market.

The rest of the paper is structured as follows: Section 2 is the literature review, Section 3 is data and methodology, followed by Section 4 present the empirical result and discussions and the conclusions of the study will be included in the final section of the paper.

LITERATURE REVIEW

Many previous researchers have studied the effect of variables on the stock market, either at the international or local levels. However, this research was carried out in a different way in terms of observation, country analysis, period time, selected variables and method approach used. This study was conducted using monthly time series data, which outperforms the study using cross-sectional data. Therefore, previous studies on each relevant variable are reviewed in this section. This section will discuss briefly on the issue by previous literature.

The Relationship between Stock Market and Gold Price

The increased demand for gold has caused a slight decrease in the correlation of gold and exposed its value as being unstable in the stock market. A study in German by Al-Ameer, Hammad, Ismail, and Hamdan (2018) explains that the relationship between stock market and gold price variables is positive but weak in some circumstances. According to the study's findings, found that gold is less effective in being the safest asset in investment activities during a crisis because now investors have other options to protect value, which is through cryptocurrencies. However, Bayram, Abdullah, and Mydin Meera (2017) found that the lack of a correlation between the stock market and the gold market caused the return on gold in Turkey to be less volatile than the market return. Overall, though, they believe that through the inclusion of gold assets in the portfolio can shield investors from the Turkish economy's stock market risk.

The Relationship between Stock Market and Crude Oil Prices

Researchers Zeinedini, Karimi and Khanzadi (2022) have carried out a study for both variables through the quantile regression method for the country of Iran. They also used daily data starting from the period 20 February 2020 to 30 January 2021. The dependence structure for the stock market and oil price variables was determined based on various market conditions. The results found that the effect of oil prices on the stock market price return index was significantly negative throughout crisis period. They claimed that because the government carried out its budget by incurring debt to the central bank, the decline in crude oil prices caused a budget deficit. The effect of that can lower the purchasing power of the government which can increase the value of the monetary base and the liquidity volume thus increasing the amount of capital in the stock market to maintain assets. The results of the study are consistent by Bani and Ramlia (2019), who discovered that the crude oil price coefficient is negatively and significantly related to the stock market because rising crude oil prices cause a decline in Malaysia's stock price index.

The Relationship between Stock Market and Exchange Rate

According to a previous study conducted by Arisandhi and Robiyanto (2022), there is a relative causal relationship between the stock market and the exchange rate. They explained that the changes of exchange rate can be influenced by the export and import sectors in international trade. This is because fluctuations in the value of foreign exchange rates have the potential to upset the stock market, which in turn can affect stock values and profit margins. Changes in stock prices can determine the flow of foreign capital and this is supported by Vejzagic and Zarafat (2013), where the results of their study found that when stock prices increase, their value becomes more appealing to foreign investors and will increase the quantity of foreign capital inflows. However, the decline in stock prices may reduce the flow of profits to the company and country due to the lack of demand for local currency and company revenue.

The Impact of Stock Market on Gross Domestic Product (GDP)

The interaction of the relationship between stock market movements in economic activity has become an issue studied by most economic studies with the aim of seeing the development of the country's economic growth. A well-functioning stock market can help a country achieve economic development in the long term. Therefore, according to Haruna Issahaku (2019), the stock market has a positive relationship with the country's economic growth as measured by using the country's gross domestic

product (GDP) as a proxy. His analysis also points out that a rise in bilateral stock market transactions, whether at the international or local level, can result in a rise in the total demand for currency value. Therefore, it can contribute to improving the quality of the country's economic growth.

METHODOLOGY

In general, this study adopted the testing procedure employed in Adil (2022) and Hairuddin et al. (2022). This study used Augmented Dickey Fuller (ADF), Phillips-Perron (PP) Test, Kwiatkowski-Phillips-Schmidt-Shin (KPSS), Bound testing, Vector Autogression (VAR), Johansen-Juselius (JJ), Quantile Regression, Robustness of Ordinary Least Square (OLS), Dynamic Ordinary Least Square (DOLS) and Fully Modified Ordinary Least Square (FMOLS). Finally, to ensure the stability of the model, the diagnostic test of Jarque-Bera normality test will be applied. Therefore, the research of this study uses EViews 10 and 12 as software to perform the data analysis process of each variable.

Model Specification

Based on modelling from the literature of Zeinedini et al. (2022) and Hairuddin et al. (2022), where gold prices, crude oil prices, exchange rates and economic growth are factors that influence the stock market. Therefore, the following equation specifications were used:

$$\ln SMt = \alpha 0 + \beta 1\ \ln GPt + \beta 2\ \ln WTIt + \beta 3\ \ln EXCHt + \beta 4\ \ln IPIt + \beta 5\ \ln WCt + \varepsilon t \quad (1)$$

This study used the monthly time series data over the period from January 2010 to December 2022: time series data before the world crisis from January 2010 to December 2019 and after crisis strike from January 2020 to December 2022. All the variables and their sources are presented in Table 1.

Table 1: Variables and Sources

Data	Symbol	Sources	Link
Stock Market	SM	Trading Economics	https://tradingeconomics.com/malaysia/stock-market
Gold Price	GP	Index Mundi	https://www.indexmundi.com/commodities/?commodity=gold&months=180&currency=myr
Oil Price	WTI	Index Mundi	https://www.indexmundi.com/commodities/?commodity=crude-oil&months=120&currency=myr
Exchange rate	EXCH	Census Economic Information Centre (CEIC)	https://www.ceicdata.com/en/indicator/malaysia/exchange-rate- against-usd
Industrial Production Index	IPI	Trading Economics	https://tradingeconomics.com/malaysia/industrial-production

Time Series Analysis

In this section, the method used in the study will be explained. The tests included the following: unit root test that consist of ADF, PP and KPSS, bound test, quantile regression and diagnostic test

Stationary Testing Method

The test suggested by Dickey and Fuller (1979) and Phillips and Perron (1988), is used to examine the stationarity of time series data. The test is important before performing the regression analysis, to obtain confirmation of the stationarity of each variable studied and to avoid false regression. In this case, if variable becomes stationary after being separated by three (3) level which is level, first level difference and second level difference, it will be said to have a degree of integration. A set of data is deemed stationary when the mean is zero. This suggests that, as opposed to being calculated in real time, the covariance value is only determined within that time, along with the constant variance between the two time periods. Therefore, equation (2) below is done empirically.

$$\Delta Yt = \alpha 0 + \alpha 2\ t + \delta Yt{-}1 + \sum p\ \beta i\ \Delta Yt{-}1 + \varepsilon t \quad (2)$$

The Dickey-Fuller Standard Model has been added $\Delta Yt{-}1$. In this case the regression model and the t-test is referred as the unit root test. ΔYt is a set of variables that being observed in equation (2) above, including the stock market, gold price, crude oil price, exchange rate and economic growth. Additionally, Δ is a differential operator, t displays time series data, and εt is white noise residual with a constant variance and zero mean. For α, β and δ is the parameters to be estimated. Furthermore, p lag differences are added, to eliminate serial correlation in the residuals. Here are the null and alternative hypotheses:

Hypothesis null: $H0$: $\delta = 0$ (failed to reject $H0$, Yt is non-stationary) Hypothesis alternative: $H1$: $\delta \neq 0$ (reject $H0$, Yt is stationary)

According to the ADF and PP test hypothesis above, the unit root test variable is stationary when t-statistic value is lower than 0.05 (5%) and negative than the critical value, then the unit root hypothesis can be rejected and shows that the unit root test variable is stationary. This is because when the probability is greater than 0.05, the data will not be stationary. Moreover, Gujarati and Porter (2009), state non-stationary data in the first difference can result in regression falsities that cause the acquisition of results to be deceptive.

After that, the concept KPSS is same as ADF and PP, but it is different in terms of test results, because statistical properties of the time series such as variance and mean do not change over time. This is the generated equation that has been formed:

$xt = rt + \beta t + \varepsilon 1 \quad (3)$

The KPSS test equation is formed based on linear regression which is divided into three (3) parts, which is rt indicates random walk, βt means the determining trend and $\varepsilon 1$ is the stationary error. After that, to analyse the stationary of the data series using this method, the hypothesis is as follows included:

Hypothesis null: $H0$: $\delta = 0$ (failed to reject $H0$, Yt is stationary) Hypothesis alternative: $H1$: $\delta \neq 0$ (reject $H0$, Yt is non-stationary)

The variable has a unit root test and is not stationary when the probability value is less than 0.05, accepting the null hypothesis. Conversely, when the probability value is higher than 0.05, the variable has a unit root test but is stationary, rejecting the null hypothesis. The hypothesis is contrast with ADF test where from the result, when the t-statistic is less than critical value, it will be accepting the null hypothesis and data is stationary. Conversely, if t-statistic more than critical value that means

the data is not stationary. Therefore, the analysis of this test is split into two (2) parts, the level and the first difference, and is tabulated under conditions constants and with constants and trends.

Bound Test Cointegration

After determining the appropriate lag, the cointegration of exogenous and endogenous variables is examined. At this point, the bound test will be employed to ensure the presence of absence of a long-term relationship between variables. When the estimated F-statistic exceeds the upper critical boundary value, it indicates the existence of a long-term cointegrating relationship between the variables. Therefore, the subsequent hypothesis is examined:

Hypothesis null: $H0$: $\mu 1 = \mu 2 = 0$ (failed to reject $H0$, long run relationship does not exist) Hypothesis alternative: $H1$: $\mu 1 \neq 0 \cup \mu 2 \neq 0$ (reject $H0$, long run relationship does exist)

For this study, the bound test cointegration equation was inspired by Kuang Hsu (2017), Through his research the equation can be used as below:

$$\Delta \ln SM_t = \delta_0 + \sum_{i=1}^{p} \alpha_1 \Delta InSI + \sum_{i=0}^{q} \alpha_3 \Delta InW + \sum_{i=0}^{q} \alpha_4 \Delta InE + \sum_{i=0}^{q} \alpha_5 \Delta \ln IF + \sum_{i=0}^{q} \alpha_6 \Delta InWC_{t-i} + \varepsilon_t \quad (4)$$

The quantile model application of the ARDL bounds test estimation approach allows for the long-term consideration of alterations in the equilibrium distribution structure. It considers regressor endogeneity and serial correlation (Kuriyama, 2016). However, when the F-statistic value is between the upper and lower critical boundary, then the boundary test cannot be concluded. Based on Nkoro and Uko (2016), stated that the variables with different optimal lags can estimate the long-term relationship using the ARDL bounds test. Then, it also has the advantage of overcoming the limitations of previous approaches by combining I(0) and I(1) variables for each regressor.

Quantile Regression

Quantile regression is a non-linear data model and was introduced by Koenker and Bassett in 1978. The ability to estimate the relationship between the independent variable and the percentile of a particular quantile against the biassed conditional median compared to the biassed conditional mean makes this method an effective tool in economics (Hairuddin & Firyal, 2022). Furthermore, the quantile regression method differs from multiple regression and linear regression, which compute the target conditional mean across various characteristic regression values using the least squares method.

Then, quantile regression is an extension of linear regression. It is a useful model when the assumptions of linear regression conditions are not appropriate and are met by linearity, normality, and homoscedasticity. Through the estimation of the quantile process, there are several potential nonlinear relationships that can be obtained between the dependent variables. Therefore, the quantile regression model as below has been built:

$$QT\ (yi) = \beta 0\ (T) + \beta 1\ (T)xi1 + \beta 2\ (T)xi2\ \ldots. + \beta p\ (T)xip + \varepsilon T \quad (5)$$

To determine a 95% confidence interval for the predicted value or dependent variable, the regression method equation (5) is created. Where T is the estimated percentage of quantile level, ε is

error of the quantile and βp is parameter to be estimated. Following determination of the variables for the quantile regression, the model equation was then developed as follows:

$$SM = \alpha 0 + \alpha 1\ GP + \alpha 2\ WTI + \alpha 3\ EXCH + \alpha 4\ IPI + \alpha 5\ WC + \varepsilon t \quad (6)$$

The equation shows that SM is the value of stock market. GP represents the gold prices value, WTI is refer to the oil prices, EXCH is the exchange rate value, IPI is the industrial production index value and WC refer to the dummy of world crisis. Coefficient α is a determinant variable ε is error term or better known as white nose, while t represents monthly data from January 2010 to December 2022.

Based on this study, the quantile values selected are divided by two types, higher quantile, and lower quantile. The chosen values are used to examine the level of variables that can impact the stock market using various quantiles. The quantile values were selected for a reason; among them, quantile 10th, 20th, 30th and 40th is used to analyse results of the lower quantile, whereas quantiles 95th are useful for measuring the data and provide an accurate picture of the maximum traffic generated by the interface due to its higher value. After that, 25th, 50th and 75th represent the lower (25), median (50), and upper (75) quantile values, respectively. Therefore, to analyse the quantile regression method, the following hypotheses are included:

Hypothesis null: $H0$: $\delta = 0$ (failed to reject $H0$, Yt, no significant impact on Y)
Hypothesis alternative: $H1$: $\delta \neq 0$ (reject $H0$, Yt, there is significant impact on Y)

Based on the hypothesis above, acceptance of the null hypothesis occurs when the probability value is higher than 0.05 where there is no significant effect of dependent variable on the independent variable.

Diagnostic Test

When the estimated model is to be used, diagnostic tests can be run to assess the residuals' suitability as a model. Briefly, this test is carried out to determine the model's stability and normality. Therefore, in this study will be implemented the Jarque-Bera Test to provide more stability of regression model results and linear unbiased estimates (BLUE).

RESULTS AND DISCUSSION

There will be in-depth analysis and discussions about the outcomes in this section

Stationary Unit Root Test

In general, ADF test results analysis typically shows a variables mixture that are stationary at the level and first difference (Maddala & Wu, 1999). As discussed in the previous chapter, to enable a study of QR method, during stationarity testing, each data series used must be stationary at the I(0) level or at the first different level I(1) only. If there is a variable that is stationary at the second different level or I(2), then the QR method is not suitable to use (Bahmani, Chang, Chen & Tzeng, 2017). Usually, financial data or high-frequency data such as uncertainty data or volatility data are stationary at the second different level (Rambeli, et al, 2021). Therefore, all the under-observation variables are stationary at the level or at the first difference level only. In this study, there are 6 variables including the stock market as a dependent variable, while Gold Price (GP), Oil Price (WTI), Exchange Rate (EXCH), Industrial Production Index (IPI) and World Crisis (WC) are independent variables.

Table 2: Augmented Dickey Fuller (ADF) Unit Root Test for Malaysia

		ADF		
Variable	Unit Root Test	None	Intercept	Trend and intercept
Stock Market (SM)	Level	0.51 [12]	-2.86 [12]	-2.81 [12]
	1st Difference	-8.84 [12]***	-8.82 [12]***	-8.09[12]***
Gold Price (GP)	Level	1.54 [12]	-0.96 [12]	-1.99 [12]
	1st Difference	-10.27 [12]***	-10.43 [12]***	-10.40 [12]***
Oil Price (WTI)	Level	0.04 [12]	-2.23 [12]	-2.19 [12]
	1st Difference	-9.34 [12]***	-9.31 [12]***	-9.29 [12]***
Exchange Rate (EXCH)	Level	0.50 [12]	-1.11 [12]	-2.73 [12]
	1st Difference	-7.96 [12]***	-7.96 [12]***	-7.93 [12]***
Industrial Production Index (IPI)	Level	0.52 [12]	-3.06 [12]	-2.99 [12]
	1st Difference	-8.81 [12]***	-8.79 [12]***	-8.09 [12]***
World Crisis (WC)	Level	0.00 [12]	-0.55 [12]	-1.80 [12]
	1st Difference	-12.37 [11]***	-12.41 [12]***	-12.44 [12]***

Source: calculated by using software Eviews12

Note: Numbers in [] are numbers of lag that follow Akaike Info Criterion (AIC). The () are numbers of prob.* of Augmented Dickey Fuller Test Statistic. The sign '***', '**', and '*' specify significance at 99%, 95%, and 90% significance levels respectively.

Table 2 indicates that the data series of all variables are non-stationary at the level form and stationery at the first difference. However, the data series of IPI at intercept is stationary at a level where the probability value is less than a significant value of 5% at -3.06 and tends to reject the null hypothesis. Other than that, the result found that each variable in ADF test is stationary at the first difference level. According to the significant level in the three models for first difference of each variable data series were significantly at values of 0.00. Therefore, the result suggests rejecting the null hypothesis and accept alternative hypothesis. Overall, the Malaysia time series data is stationary at first difference by using ADF test as the data is cointegrated with the order I(1).

Next, Table 3 presents the results of unit root test using PP test for the variables in Malaysia. The cases used the scenario of without constant (none), with a constant (intercept), and with a constant and trend (intercept and trend). To evaluate the likelihood of the series and decide whether to accept or reject the null hypothesis, the significance of the probability value is attained from MacKinnon (1996).

Table 3: Phillip Perron Test (PP) Unit Root Test for Malaysia

		PP		
Variable	Unit Root Test	None	Intercept	Trend and intercept
Stock Market (SM)	Level	0.26 [16]	-2.77 [10]	-2.65 [14]
	1st Difference	-13.98 [14] ***	-13.96 [14]***	-15.03 [22]***
Gold Price (GP)	Level	1.69 [7]	-0.79 [6]	-1.81 [5]
	1st Difference	-10.26 [9]***	-10.37 [11]***	-10.33 [11]***
Oil Price (WTI)	Level	0.09 [12]	-2.24 [8]	-2.21 [8]

	1st Difference	-8.46 [21]***	-8.42 [21]***	-8.37 [21]***
Exchange Rate (EXCH)	Level	0.88 [2]	-0.79 [3]	-2.32 [3]
	1st Difference	-7.84 [4]***	-7.79 [5]***	-7.75 [5]***
Industrial Production Index (IPI)	Level	0.52 [16]	-2.98 [10]*	-2.83 [15]
	1st Difference	-14.08 [13]***	-14.07 [13]***	-15.31 [22]***
World Crisis (WC)	Level	0.00 [4]	-0.54 [4]	-1.81 [1]
	1st Difference	-12.36 [12]***	-12.41 [1]***	-12.44 [2]***

Source: calculated by using software Eviews12

Note: The value in [] for PP represent the bandwidth that follow Newey-West Bandwidth. The value in [] represent the Mackinnon (1996) p-value. The sign '***, '**', and '*' specify significance at 99%, 95%, and 90% significance levels respectively.

The result reported that SM, GP, WTI, EXCH and WC are not stationary at the level form where the probability value is higher than 0.05 (5%) significance level, which accepting the null hypothesis of unit root test. However, the data series of IPI at intercept is stationary at level where the probability value is less than a significant value of 5% at -2.98 and tends to reject the null hypothesis at 95% significance level. Besides, the result found that each variable in the PP test is stationary at the first difference level. According to the significant level in the three models for first difference of each variable data series were significantly at values of 0.00. Therefore, the result suggests rejecting the null hypothesis and accept alternative hypothesis. Overall, indicates that the time series data are stationary at first difference and the data is cointegrated with the order one 1(1).

Since the time series variable are cointegrated of order one I(1). The next step in analysis is to estimate the optimal lag selection. This step is important because the lag chosen will be applied to the next analysis which are Johansen Juselius Cointegration test. The result show that the stationary data for Malaysia are recommended by system at Lag 5 with values of - 14.76657.

Bound Test Cointegration

Table 4: Cointegration Relationship of F-statistic

Countries	**Value**	**Significant level**	**Boundary critical value**	
			I(0)	I(1)
Malaysia	4.2576405	10%	2.08	3
		5.0%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15

Source: calculated by using software Eviews12

The display of Table 4 indicates the results of the F-statistics for the cointegration relationship for Malaysia. The bound critical values of I(0) are 2.08 at 10%, 2.39 at 5.0%, 2.7 at 2.5%, and 3.06 at 1.0% while the bound critical values of I(1) are 3.0 at 10%, 3.38 at 5.0%, 3.73 at 2.5% and 4.15 at 1.0%. The results of the Malaysian results show that the F-statistic value of 4.2576405 is higher than all the critical values bound I(1).

Johansen-Juselius (JJ)

Johansen Juselius Cointegration test is a function to identify the long run relationship in the variables number with long-run characteristics. The trace statistics and maximum eigenvalue were used to estimate the existence of co-integration between variables. This test is important as presence of long relationships will help to proceed with the next analysis which are Dynamic Ordinary Least Square (DOLS) and Fully Modified Ordinary Least Square (FMOLS).

Table 5: Johansen Juselius Cointegration for Malaysia

Data period: Jan 2010 to Dec 2022		Cointegration system: F (SM, GP, WTI, EXCH, IPI, WC)					
Hypothesis		Trace Statistic	5% critical value	1% critical value	Max Eigenvalue	5% critical value	1% critical value
H0	H1						
r = 0	r > 0	125.8201**	94.15	103.18	61.01509**	39.37	45.10
r ≤ 1	r > 1	64.80505	68.52	76.07	25.09219	33.46	38.77
r ≤ 2	r > 2	39.71286	47.21	54.46	18.56112	27.07	32.24
r ≤ 3	r > 3	21.15174	29.68	35.65	12.48048	20.97	25.52
r ≤ 4	r > 4	8.671258	15.41	20.04	8.375491	14.07	18.63
r ≤ 5	r > 5	0.295767	3.76	6.65	0.295767	3.76	6.65

Source: calculated by using software Eviews12

Note: Max-eigenvalue test indicates 2 cointegrating equation(s) at both 5% and 1% level where '*'at 5%, '**' at 1% critical value

Based on Table 5, Malaysia's trace statistic and Maximum Eigenvalue exceed the critical value at 5% and 1% significance which are 125.8201 and 61.01509. Therefore, reject the null hypothesis and accept alternative hypothesis. From that, it means there at least one cointegration vector. Then, the result specified there is at least one long run relationship for Malaysia.

Quantile Regression

This study implements several quantiles to determine the relationship between the dependent and independent variables across the quantiles. The quantiles use for this study is 25th, 50th, 75th and 95th. The higher quantile shows more accurate picture of the results. Due to that, this study added quantile 10th, 20th, 30th and 40th to provide more comprehensive understanding of how dependent variable affects the different parts of the distribution (Clarke, Llorca & Palinavir, 2023). Then multiple regression is applied in Malaysia and Singapore used the linear quantile regression. The result from quantile regression is being interpreted for every quantile. Therefore, the findings of quantile regression from Malaysia will be shown in Table 6.

Table 6: Quantile Regression Test for Malaysia (25th, 50th, 75th and 95th)

Variables	Quantile Regression							
	0.25		0.50		0.75		0.95	
	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
GP	-35.51	0.02**	-86.29	0.00***	-132.72	0.00***	-121.68	0.00***
WTI	4.23	0.39	7.69	0.19	3.83	0.45	0.04	0.99
EXCH	0.77	0.59	4.09	0.05	6.55	0.00***	12.81	0.13
IPI	3750.23	0.00***	3705.77	0.00***	3650.58	0.00***	3603.12	0.00***
WC	5.49	0.01**	11.01	0.00***	14.06	0.00***	-2.11	0.84
C	-10318.25	0.00***	-10037.23	0.00***	-9716.83	0.00***	-9601.39	0.00***
Pseudo R-Squared		0.97	0.96		0.95		0.94	
Adjusted R-squared		0.97	0.95		0.94		0.94	
Quasi-LR		7386.13	5217.82		3908.17		1636.35	

Source: calculated by using software Eviews12

Note: *, ** and *** indicates the significant level at 10%, 5% and 1%

Table 6 shows the result of multiple quantile regression for 25th, 50th, 75th and 95th. The results that have been obtained aim to analyses the relationship between the study variables based on the selected quantile values along with the Pseudo R-Squared and Quasi-LR statistical attached in the appendix. The result of WTI, EXCH and WC show inverse relationship with SM while GP and IPI have positive relationship. However, only GP and IPI is statistically significant as the probability value is lower than 0.05. Furthermore, the Pseudo R-squared is 96 percent while the adjusted R-squared is 95 percent. Then, 95 percent in the conditional 25th quantile in SM is due to GP, IPI and WC. Besides, Quasi-LR statistic value is 7386.13 and p- value is less than 0.05 which indicates that the model is stable.

Next, at the 50th and 75th quantile GP, EXCH, IPI and WC have positive relationship and are statistically significant at 99% significant level, however, only WTI has negative relationship with SM, but they are not significant. After that, at the 95th quantile only GP, IPI and WC have positive relationship and are statistically significant at 99% significant level since the p-value is lower than 0.05, but WTI and EXCH has negative relationship but they are not significant. On the other hand, the coefficient on the GP variable is negative and significant at all quantile level of 25th, 50th, 75th and 95th. This negative effect being more pronounced at higher level of quantile and the coefficient becoming higher as the one move along with quantile. Concerning the WTI, EXCH and IPI, it notes a positive coefficient across all the estimated quantiles which are statistically significant at all critical value with the marginal positive effect on stock market increasing as one moves up to different quantile levels. Then, the coefficient of WC shows a positive effect and significant at all levels except for 95th level. From the result of factors influence stock market, the effect of quantile regression suggested that GP, IPI and WC are the factor that most influence stock market in Malaysia. This finding is consistent with previous study by Edward and Ramayah (2016). However, WTI is not significant in this study.

Table 7: Quantile Regression Test for Malaysia (10th, 20th, 30th and 40th)

	Quantile Regression							
	0.10		0.20		0.30		0.40	
Variables	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
GP	-27.60	0.02**	-35.71	0.02**	-44.25	0.01***	-56.61	0.001***
WTI	2.74	0.48	4.32	0.35	4.84	0.38	3.35	0.54
EXCH	0.43	0.69	0.73	0.58	1.03	0.51	1.63	0.33
IPI	3749.57	0.00***	3752.14	0.00***	3748.02	0.00***	3735.68	0.00***
WC	4.34	0.02**	5.93	0.01**	6.92	0.01***	8.67	0.01***
C	-10336.83	0.00***	-10324.15	0.00***	-10286.58	0.00***	-10208.44	0.00***
Pseudo R-Squared		0.98		0.97		0.96		0.96
Adjusted R-squared		0.97		0.96		0.95		0.95
Quasi-LR		8053.95		7480.81		6660.83		6304.04

Source: calculated by using software Eviews12

Note: *, ** and *** indicates the significant level at 10%, 5% and 1%

Table 7 shows the result of multiple quantile regression for 10th, 20th, 30th and 40th. The results that have been obtained aim to analyses the relationship between the study variables based on the selected quantile values along with the Pseudo R-Squared and Quasi-LR statistical attached.

Based on the quantile regression result at 10th, GP, IPI and WC show inverse relationship with SM while WTI and EXCH have positive relationship. However, in this quantile, only GP, IPI and WC is statistically significant as the p-value is lower than 0.05. The positive effect of the stock market being more pronounced at higher quantile and the coefficient decline as one move along the quantile levels. Hence, it is signifying a diminishing positive effect of stock market on gold price, industrial production index and world crisis across the estimated quantile.

Next, there is a positive relationship between GP, IPI, and WC at the 20th quantile with 99% significant level since the p-value is lower than 0.05. However, WTI and EXCH has negative relationship with SM and they are not significant. The Pseudo R-squared is 97 percent while the adjusted R-squared is 96 percent in the conditional 20th quantile in SM, that is due to GP, IPI, and WC. Besides, Quasi-LR statistics value is 7480.81 with p-value is less than 0.05 which indicates that the model is stable. Similar with 30th and 40th quantile level, where GP, IPI, and WC have positive relationship while WTI and EXCH have negative relationship, and they are not significant. Besides, Quasi-LR statistics value is 6660.83 and 6304.04 respectively with p- value is less than 0.05 which indicates that the model is stable.

Robustness of OLS, DOLS and FMOLS analysis

Table 8: Robustness Model for Malaysia

Method	OLS			DOLS			FMOLS		
Variables	Coefficient	t-Statistic	Prob.	Coefficient	t-Statistic	Prob.	Coefficient	t-Statistic	Prob.
Constant	-9805.16	-164.72	0.00***	-9934.36	-91.43	0.00***	-9829.30	-100.53	0.00***
GP	-110.58	-8.61	0.00***	-115.60	-5.18	0.0000***	-125.40	-6.18	0.00***

WTI	7.72	1.59	0.11	14.37	1.74	0.0835	12.16	1.61	0.11
EXCH	4.99	3.04	0.00***	5.89	2.17	0.0316**	6.40	2.48	0.01***
IPI	3655.83	236.78	0.00***	3696.00	136.33	0.0000***	3673.29	147.12	0.00***
WC	13.09	5.12	0.00***	16.40	3.90	0.0001***	16.54	4.16	0.00***
R-squared			0.99	R-squared		0.99	R-squared		0.99
Adjusted R-squared			0.99	Adjusted R-squared		0.99	Adjusted R-squared		0.99
S.E Regression			6.53	S.E Regression		5.64	S.E Regression		6.41

Source: calculated by using software Eviews12

Note: *, ** and *** indicates the significant level at 10%, 5% and 1%

Table 8 shows the 3 robustness methods used on analysis in Malaysia which is OLS, DOLS and FMOLS. This study was conducted to investigate the effect of gold and oil prices on stock market returns following the health crisis, which will have an impact on economic growth in Malaysia from January 2010 to December 2022. The result of multiple regression model through OLS suggests that the GP, EXCH, IPI and WC are the most significant variable affecting the SM at 99% significant level. This is due to the p-value of each variable is lower than 0.05, which rejects the null hypothesis. Furthermore, the result suggests that the Malaysian SM is positively affected by WTI, EXCH, IPI and WC, while GP affected negatively. Next, the result of DOLS stated that Malaysian SM is positively affected by WTI, EXCH, IPI and WC, while the GP negatively affected. The analysis of the multiple regression model using FMOLS also showed the same results with OLS and DOLS, where it suggests that the GP, EXCH, IPI and WC are the most significant variable affecting the SM at 99% significant level. Then, the result indicates SM is positively affected by WTI, EXCH, IPI and WC, while the GP is negatively affected.

Finally for R-squared and adjusted R-square in all three methods of multiple regression indicate the different regressor model in explaining the stock market movement. This analysis aims to see the robustness of all three models. Therefore, Table 8 shows that the Adjusted R- squared for the OLS, DOLS and FMOLS is 0.99% for each. This demonstrates that all methods have a standard error of less than 5%. Consequently, these 3 methods provide similar results from each other signs and magnitude. Therefore, it can be said that the result is robust and GP, EXCH, IPI and WC are significant factors that could affect the Malaysian stock market.

Wald Test

In the context of regression analysis, the Wald test is used as statistical parameter to evaluate the validity of specific constraints or hypotheses regarding the model. This test uses the weighted distance between the unrestricted estimate and its predicted value under the null hypothesis where the weight is the precision of the estimate. Therefore, Table 9 until Table 11 below show the results for the Wald test against the quantile model.

Tables 9: Wald Test for Malaysia (25th, 50th, 75th and 95th)

Quantile	Test Statistic	Value	df	Probability
	F-statistic	3088.615	(5, 150)	0.0000***
0.25	Chi-Square	15443.08	5	0.0000***
	F-statistic	4415.949	(5, 150)	0.0000***
0.5	Chi-Square	22079.74	5	0.0000***
	F-statistic	9448.237	(5, 150)	0.0000***

0.75	Chi-Square	47241.18	5	0.0000***
	F-statistic	24101.87	(5, 150)	0.0000***
0.95	Chi-Square	120509.4	5	0.0000***

Source: calculated by using software Eviews12

Note: the null hypothesis: c(1) =c(2)=c(3)=c(4)=c(5)=0. Then *, ** and *** indicate the significant level at 10%, 5% and 1%.

Table 9 shows the result of Wald Test for Malaysia. The quantile applied in this analysis is 25th, 50th, 75th and 95th. The results that have been obtained aim to evaluate the significance of coefficients related to predictor variables based on the selected quantile values. According to the quantile regression result indicate that all equation systems fit at least 95% significance level at quantile 25th 50th, 75th and 95th. This result is consistent with the analysis of Alam (2020), where the results of the study found that the probability is less than 0.05 indicate that the Wald test has enough evidence to reject the null hypothesis.

In the sense of the Wald test consistent is related to the increasing sample size, where it converges to the correct inferences approaches of 1. In other words, increasing the amount of data collected, will improve the consistency of the test to correctly reject or not reject a false null hypothesis (Engle, 1984). Then Wald test context in each quantile shows that the estimated parameter is considered statistically significant at 99% significant level. Therefore, the consistency of the Wald test shows that the estimation of dependent variables (GP, WTI, EXCH, IPI and WC) have a statistically significant effect on the stock market. This can be used by traders and investors to inform their trading strategy predictions. Therefore, it is statistically considered more reliable to predict stock movements to make more informed and reliable decisions.

Table 10: Wald Test for Malaysia (10th, 20th, 30th and 40th)

Quantile	Test Statistic	Value	df	Probability
	F-statistic	4546.545	(5, 150)	0.0000***
0.10	Chi-Square	22732.72	5	0.0000***
	F-statistic	3336.160	(5, 150)	0.0000***
0.20	Chi-Square	16680.80	5	0.0000***
	F-statistic	2742.621	(5, 150)	0.0000***
0.30	Chi-Square	13713.11	5	0.0000***
	F-statistic	3240.892	(5, 150)	0.0000***
0.40	Chi-Square	16204.46	5	0.0000***

Source: calculated by using software Eviews12

Note: the null hypothesis: c(1)=c(2)=c(3)=c(4)=c(5)=0. Then *, ** and *** indicates the significant level at 10%, 5% and 1%.

Table 10 shows the result of Wald Test for Malaysia and the quantile applied in this analysis is 10th, 20th, 30th and 40th. According to the quantile regression result, indicate that all equation system is fitted at least 95% significance level at quantile 10th, 20th, 30th and 40th. The result of this study found that the probability all level of quantile is less than 0.05, reveal that the Malaysia Wald test has enough evidence to reject the null hypothesis at 99% significance level. Therefore, the consistency

shows that the estimation of dependent variables (GP, WTI, EXCH, IPI and WC) have a statistically significant effect on the Malaysian stock market.

Tables 11: Wald Test for Robustness Model of Malaysia and Singapore

Method	OLS		DOLS		FMOLS	
Country	F-statistic	Probability	F-statistic	Probability	F-statistic	Probability
Malaysia	14707.18	0.0000	5376.440	0.0000	5833.545	0.0000***

Source: calculated by using software Eviews12

Note: the null hypothesis: c(1)=c(2)=c(3)=c(4)=c(5)=0. Then *, ** and *** indicates the significant level at 10%, 5% and 1%.

Table 11 reveals the OLS, DOLS, and FMOLS analysis methods that are applied in Malaysia. This study was conducted to investigate the significant effect of gold and oil prices on stock market returns following the health crisis, which will have an impact on economic growth in both countries from January 2010 to December 2022. The result of multiple regression model through OLS suggests that the estimation of dependent variables (GP, WTI, EXCH, IPI and WC) have a statistically significant effect on the Malaysia stock market at 99% significant level. This is due to the p-value of each lower than 0.05, which rejects the null hypothesis. Next, the result of DOLS stated that the estimated parameter is statistically significant at 99% significant level, while the analysis of FMOLS also showed the same results with OLS and DOLS, where p-value of each is lower than 0.05 and F-statistic value for Malaysia which is 5833.545. This indicates that the estimation of dependent variables has statistically significant effect on their stock market at 99% significant level. Overall, this study shows that the models are reliable and well-fitted for further analysis.

Regression Diagnostic: Jarque Bera Test

The robustness of Quantile model will then be examined in this research using Jarque Bera (JB) Test. According to Shabbir, Kousar and Batool (2020) stated the diagnostic test was conducted, to see the stability and normality of the model. Therefore, the diagnostic test result will show in Table 12 below:

Tables 12: Jarque Bera Test

Quantile	F-statistic	Probability	Quantile	F-statistic	Probability
0.25	590.9197	0.0000***	0.10	0.910893	0.6341
0.50	176.5345	0.0000***	0.20	1.365772	0.5051
0.75	4.660300	0.0972	0.30	5.049525	0.0800
0.95	5.573793	0.0616	0.40	2.221113	0.3293

Table 12 shows the Jarque Bera Test results for Malaysia. The results found that quantile levels of 25th, 50th, 75th and 95th model is not normally distributed in terms of error since the p- value is less than the significance level of 0.05 which is at 0.0000 for the quantile levels of 0.25 and 0.50. However, the model is normally distributed in error terms for the quantile levels of 0.75 and 0.95 because the p-value exceeds 0.05 at 0.0972 and 0.0616 respectively. On the other hand, at quantile levels of 10th, 20th,

30th and 40th, the results found that the model is not normally distributed in terms of error at all quantile levels since the p-value is less than the significance level of 0.05 which is at 0.0000 each.

CONCLUSION

Gold and oil prices are always significant factors in the stock market, especially when there is economic uncertainty. The purpose of this research was to examine the impact of various factors on the stock market issues in Malaysia, including the gold price, crude oil price, exchange rates, gross domestic product (GDP) and dummy world crisis. According to the result of this study, the quantile regression for the 25th, 50th, 75th and 95th in Malaysia indicate that the gold price and industrial production index have a long-term relationship effect on the stock market. Here it can be seen, although all the variables influence the stock market, but the gold price has the highest effect that can impact the stock price in the long term, especially when the economic crisis issue occurs (Gokmenoglu & Fazlollahi, 2015). It is important implications for investors, because of the opportunity cost characteristic of the gold price that gives investors the opportunity to enhance their stock market performance. Investors can then respond to changes in the gold price by assuming that gold is a good replacement for stocks due to its value that can hedge against economic crisis that could affect the stock market price. This demonstrates clearly that a higher quantile can offer a more realistic representation of the variable's performance on the stock market.

Then, the different findings under the second quantile regression model, which is 10th, 20th, 30th and 40th, reveals that crude oil prices and exchange rates are the only factors affecting Malaysian stock market in the long term. This is because Malaysia is an important exporter of oil and natural gas, which is the energy sector that is the biggest contributor to the country's economy (Nordin & Ismail, 2014). Therefore, when the Covid-19 crisis issue occurs, it should have an impact on the fluctuation of crude oil prices, which directly affects the income of Malaysian oil companies. Low oil prices have the potential to lower stock market prices as well as the profitability of oil companies' operations. Hence, it is noticeable that the lower quantile provides a thorough understanding of how the dependent variable affects the stock market at each different distribution.

The impact of variables on the stock market has always been one of the most vulnerable topics, as previous studies have shown conflicting results. Through the findings presented, the study only included the world crisis dummy, which is a crisis issue that has an impact on the Malaysian stock market. It would be interesting if further studies could include stock market issues using a more transparent and effective method approach other than Ordinary Least Square (OLS), Dynamic Ordinary Least Square (DOLS) and Fully Modified Ordinary Least Square (FMOLS). To develop the statistical findings of the study, researchers also can include additional control variables such as inflation and other assets in influencing the stock market efficiency. However, an excessive number of functional control variables will lead to complex study results. Therefore, future studies are expected to provide more insight into whether Malaysian stock prices will be more efficient by removing other variables.

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