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DOES US STOCK MARKET AFFECT MALAYSIA STOCK MARKET DURING COVID-19 PANDEMIC?

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Abstract
The purpose of this study is to explore the possibility of spillovers in return from the US Stock market return to the Malaysia Stock market. VAR models, Granger causality tests, and Generalized Autoregressive Conditional Heteroscedastic (GARCH) models are conducted in this study. This research considers the daily closing price of the Malaysian stock market indexes (FTSE Bursa Malaysia KLCI), spanning from February 4 2020 to 21st Mac 2022. The period of this research allows the empirical analysis during the period of the hike Covid19 cases. The empirical result concludes that return spillover is found to be unidirectional from the US stock market to the Malaysia stock market. The results of this investigation may have important implications regarding international investment, portfolio diversification, and risk management.

Research paper

Keywords: COVID-19, GARCH, Financial Markets, Malaysian Stock Markets

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Introduction

The escalation of global integration of stock markets has surged numerous studies to explain how returns and volatility of different stock markets are connected (Hung, 2019; Lee & Goh, 2016; Malik et al., 2021; Mohammadi & Tan, 2015). The main issue of past studies is usually centered on how stocks return, and volatility in a stock market are impacted by the return of other stock markets. This issue has been receiving extensive attention from all participants of financial markets ever since the series of unanticipated global shocks witnessing strong integration in the price movement of stock markets, both in the developed and emerging markets. From the view of the international investors, strong market movement in returns eliminates the efficiency of capital allocation and the potential benefits of diversification (Joshi, 2016; Nikmanesh et al., 2014). It also believes that when stock markets are strongly integrated, an unanticipated shock in one national stock market will influence volatility in other stock markets.

The analysis of the volatility of stock markets is crucial as it reflects the risk and uncertainty of financial assets. The volatility of stock markets also will harm the health and stability of a country's economic condition (Mala & Reddy, 2007). Thus, understanding the integration of volatility among different stock markets is imperative for investors and governments (Zhou et al., 2012). Despite attempts offered by past studies on stock markets' integration, the focus on emerging stock markets is paradoxically scant. The scarcity also goes unjustifiable to the claim that emerging stock markets are preferable avenues for international portfolio managers eyeing to reaping diversification benefits (Vo & Ellis, 2018). According to Wang et al. (2012),

the Malaysian stock market, through its reforms that promote financial liberalization and facilitate cross-country investment, has not been left aside as one popular avenue for international portfolio investors.

The literature on the effects of COVID-19 on the stock market has started to proliferate (Salisu & Shaik, 2022; Salisu & Vinh, 2020; Zaremba et al., 2020; Salamzadeh & Dana, 2021; Dheer & Salamzadeh, 2021). Past studies show that stock markets respond more quickly to the COVID-19 outbreak and significantly negatively impact stock returns (Al-Qudah & Houcine, 2021; Gherghina et al., 2020). Liu et al. (2020) evaluate the impact of the COVID-19 outbreak on the 21 leading stock market indices in major affected countries. Their results indicate that the stock markets in major affected countries fell quickly after the virus outbreak. Countries in Asia experienced higher negative abnormal returns as compared to other countries. Ashraf (2020) found that stock markets responded negatively to the growth in COVID-19 confirmed cases (Dana et al., 2021, 2022; Pereira et al., 2021; Rahman et al., 2021). That is, stock market returns declined as the number of confirmed cases increased. This is consistent with the study done by Çütcü and Kilic (2020), which reveals that a significant worldwide health problem affects not only social life and real economy, but it also decreases prices in financial markets.

The case of the influence of the infectious disease outbreaks on the Malaysian stock market is of no difference. A study done by Yong et al. (2021) showed that Malaysia's stock market returns decreased during the Covid -19 pandemic. A similar situation can also be seen during the SARS outbreak, where investors overreact to abnormal negative news (Ali et al., 2010; Hameed et al., 2021). During this period, a series of unfavorable news

about a stock have dampened investors' positivity, causing them to undervalue securities highly. Once investors realize undervaluation and take corrective action, stock prices reverse in the subsequent period, particularly in the long term. Stock markets tumbled during the peaks of the SARS outbreak in 2003 but recovered once the outbreak was contained. Therefore, it is essential to review the impact of previous infectious disease outbreaks for some insights into the potential impact of Covid-19 on global stock markets. Thus far, acknowledgment has been given to the presence of infectious disease outbreaks' effect on both the principal stock markets (the US stock market and Japanese stock market) and Malaysia stock market. Nonetheless, less is known on the return spillover effects from the US stock market to the Malaysian stock market, particularly during the peak period of pandemic Covid-19. Past studies investigating return spillover from the US stock markets to the Malaysian stock market generally have focused on the effect during the 1997/1998 financial crisis.

Sidek and Abdul-Rahman (2011) and Wang et al. (2012) notify the US stock market as the principal stock market and influence other stock markets, including those in emerging countries. Examining the effect of returns spillover from the US stock markets to the Malaysian stock market is crucial because the US, in the third quarter of 2020, is reported as the five most prominent countries in terms of investment in Malaysia (Department of Statistics Malaysia, 2020). Therefore, volatility in the US stock market must be of great concern to the Malaysian market.

The primary purpose of the study is to explore the possibility of spillovers in return from the US stock market to the Malaysian stock market,

which this study focuses its examination during the peak period of the pandemic Covid-19. The unusual situation developed by COVID-19 allows us to assess the pandemic's impact on the stock markets of affected nations due to an unforeseen and feared disease. Filling the gap in past studies in terms of the period of examination (during the period of Covid-19) is, thus, the aim of this research.

This paper contributes to the literature in two ways. First, this study highlights the spillover risk between the US stock markets on the Malaysia stock market during the COVID-19 pandemic. Second, this study investigates the existence of the spillover phenomenon in international financial markets and provides empirical evidence on the efficient market hypothesis theory, which argues that no spillover exists in the markets.

Review of Related Literature

The Efficient Market Hypothesis (EMH) is a classical theory that defines the market perfectly with the information provided about the share price. This theory argues that investors will not trade undervalued or sell stocks at inflated prices as the price of assets in an efficient market contains all related information. Hence, asset prices of an efficient market move toward equilibrium quickly if the market experiences a shock. However, researchers found cases of the existence of return spillover phenomenon between stock markets. According to Kyle (1985), different stock markets may reveal the same information but at different speeds due to market imperfections. Meanwhile, Admati and Pfleiderer (1988) added, local investors need time to react with the foreign information because they can access the information only after trading has been done. Moreover, looking from the view of behavioral finance

theory, Fung, Lam & Lam (2010) ascertained that the information and the characteristics of market participants in one stock market will affect individual investment decisions and the stock market's outcomes. Thus, it leads to return and volatility spillover effect to other stock markets.

The empirical evidence regarding the spillover effect among stock markets are provided by several past studies, such as (Floyd, 2005; Hung, 2019; Just & Echaust, 2020; Mohammadi & Tan, 2015; Nikmanesh et al., 2014). Nikmanesh et al. (2014) investigate the return spillover between the US, Japan, and Malaysia stock markets using weekly data concerning the S&P 500, NIKKEI 225, and KLCI composite indices from January 1990 to May 2013. Employing a cross-correlation function method, the results show that a unidirectional causality-in-mean exists from the US and Japan stock markets to the Malaysian stock market. Joshi (2011) examines the return and volatility spillover among Asian stock markets in India, Hong Kong, Japan, China, Jakarta, and Korea using a six-variable GARCH-BEKK model from February 2, 2007, to February 29, 2010. The author finds evidence of bidirectional return, shock, and volatility spillover among most of the stock markets. The magnitude of volatility linkages is low, indicating weak integration of Asian stock markets. The study finds that own volatility spillover is higher than cross-market spillover.

Miyakoshi (2003) also revealed the existence on the spillover effect of return volatility from the Japanese and US stock market to Asian stock markets. Employing the EGARCH model, the study found that the Japanese stock market has a higher impact on the Asian stock market than the US stock market. The global financial crisis (GFC) is one of the factors that influenced market volatility, as mentioned by Allen, McAleer, Powell, K. Singh (2017).

The study explored the impact of GFC on volatility spillover for Australia's major trading partners by applying the spillover Index in Vector Autoregressive (VAR) model developed by Diebold and Yilmaz (2009). Referring to their results, Australian market spillover is influenced by the US and Hong Kong stock markets. The analysis from the GARCH model of the study also demonstrated a strong effect of market spillover on the Australia stock market that comes from the US stock market.

Hu et al. (1997) studied the effect of volatility spillover and its causes, which give effects between the US, Japan, and four stock markets in the South China Growth Triangular. They used two-step procedures of the causality-in-variance test developed by Cheung and Ng (1996). The study results reported that the US stock market volatility is affected by the Japanese stock market volatility. In addition, the level of openness of the markets is also negatively related to the market's volatility to the foreign stock market's volatility, especially after a financial crisis.

The increasing level of financial integration and trade openness have made cross-border capital mobility and volatility spillovers stronger. That is the motivation of the spillover volatility study done by Vo and Tran (2020) in exploring the effects of volatility spillover from the US stock market to six ASEAN stock markets, which also captures the GFC event. They used EGARCH (1,1) models and ascertained that the US stock market directly have a substantial spread of volatility to ASEAN stock markets.

Methodology

We examine the possibility of spillovers in returns from the US market to the Malaysia market during the hike Covid-19 cases using the vector

autoregressive (VAR) model. Vector autoregressive (VAR) models are proposed by Sims (1980) to capture the market's dynamic and investigate the response of each variable to innovations in other variables in the system. It is regarded as a generalization of univariate autoregressive models or a combination between the simultaneous equations' models and the univariate time series models. VAR equations can be written as follow:

$$y_t = \alpha_1 + b_{11}\, y_{t-1} + b_{12}\, x_{t-1} + u_t \quad (1)$$

$$x_t = \alpha_2 + b_{21}\, y_{t-1} + b_{22}\, x_{t-1} + v_t \quad (2)$$

Where y_t and x_t is a daily return of S&P 500 and FTSE Bursa Malaysia KLCI at time *t*; α is the intercept; $b_{11}\, y_{t-1}$, $b_{12}\, x_{t-1}$ is the vector of return lags, u_t and v_t are white noise disturbance.

According to equation (1-2), the return in each market is a linear function of its own past, as well as past return in other markets. In other words, the return on the Malaysia market depends on *p* lags of itself, as well as *p* lags of US stock return.

GARCH Model

We explore the possible return spillover using the GARCH model. The GARCH model was proposed by Bollerslev (1986), an extension of the ARCH model developed by Engel (1982). When modeling using the ARCH model, there might be a need for an enormous value of the lag *p*, hence a large number of parameters, violating the principle of parsimony. Therefore, it can present difficulties when using the model to describe the data adequately.

Also, the more parameters there are in the conditional variance equation, the more likely it is that one or more of them will have a negative estimated value, violating the non-negativity constraints. A GARCH model may be preferred as it may contain fewer parameters than an ARCH model.

The GARCH model of this study can be expressed as:

$$h_t = b_0 + \sum_{k=1}^{q} \theta_k \ h_{t-k} + \sum_{i=1}^{q} b_i \ u_{t-i}^2 \quad (3)$$

If q is the GARCH parameter and p is the ARCH parameter, while σ^2 is the conditional variance, and γ is the regression parameter then GARCH (p,q) function consists of two elements:

a. Conditional mean or mean equation

$$Y_t = X_t\gamma + \varepsilon_t \quad (4)$$

b. Conditional variance

$$\sigma_t^2 = \omega + \sum_{i=1}^{q} \alpha_i \ \varepsilon_{i=1}^2 + \sum_{j=1}^{p} B_j \sigma_{t-j}^2. \quad (5)$$

Data and Preliminary Analysis

The sample of this study comprises the daily closing price of the Malaysian stock market indexes (FTSE Bursa Malaysia KLCI) and the US (S&P 500). The two stock market indices span the period from February 4 2020 to 21 Mac 2022. The period of this study allows the empirical analysis of the return spillover between the US stock markets during the period of the hike Covid-19 cases on the Malaysian Stock Market. February 4 2020, is used as the starting point of this study as the first Covid-19 case was detected in Malaysia on travelers from China arriving via Singapore on January 25 2020 (World Health Organization, 2020). We use daily data to ensure a sufficiently

long-term time series to estimate models. The reason of this study for choosing daily data is to capture more precise information content of changes in stock prices than those in the weekly or monthly data (Hung, 2019; Jebran & Iqbal, 2016; Ebrahimi et al., 2022), and better able to capture the dynamics between variables (Agrawal et al., 2010). Due to holidays, the stock markets in Malaysia and US might be closed on different days. To address this, we omit all observations with missing values. We handle the missing values by replacing them with values from the prior day when the market was open. Following this adjustment, there are a total of 524 daily observations. All the time series data are sourced from the Thomson Reuters Eikon database. Following past studies (Chang et al., 2006; Yuan & Gupta, 2014), daily stock market returns are calculated as the natural logarithm of the closing price relative to the consecutive closing price. i.e., $R_t = l_n \frac{P_i}{P_{i-1}}$

Table I presents the results of the descriptive statistics, unit root test, and ARCH test using daily data of returns concerning FTSE Bursa Malaysia KLCI and S&P 500. As presented in Table 1, during the observation period, Malaysia and US markets have a negative average return of -0.002797 and -0.024341, respectively. Meanwhile, the highest volatility is observed in the US stock market (0.711488), and the Malaysian market is accompanied by volatility (0.427464). This means the US market suffered a greater fluctuation during the observation period compared to Malaysia Market. The Jarque-Bera statistics have been applied to check the normality of the distribution using both skewness and kurtosis. The null hypothesis for the test is that the data is normally distributed. In our sample, the results show that all return series are less than 0.05, which shows rejection of the null hypothesis. Therefore, we conclude that our sample is not normally distributed.

For stationarity of the data, as shown in table 1, the results of augmented Dickey-Fuller (ADF) and Phillips-Perron (PP), both test statistics reject the null hypothesis of a unit root at the l% significance level, implying that the return series are stationary in all samples. The ARCH method was used to investigate the presence of the ARCH effect as proposed by Engle (1982) using the Lagrange Multiplier test. Based upon the results of the ARCH effect test, the null hypothesis suggesting the absence of the ARCH effect on the study variables was rejected. We concluded that there is a presence of ARCH effects and, therefore, the need for the GARCH model.

Figure 1 depicts the visual pattern of the return series concerning the FTSE Bursa Malaysia KLCI and the US stock market during the sample period. As demonstrated in Figure 1, the returns of both markets plummeted in the first quarter of 2020 as the COVID-19 pandemic started. The US stock market appears volatile early as the first case reported in their country is earlier than the first case in Malaysia. It can be seen from Figure 1 that exist a period of high volatility tends to follow a period of high volatility, and the same scenario is for the period of low volatility, which proves the existence of volatility clustering, and ARCH can represent it.

Table 1. Descriptive Statistics

Statistics	BURSA	S&P
Mean	-0.002797	-0.024341
Median	-0.011000	-0.053100
Maximum	2.473808	5.240256
Minimum	-2.936628	-3.928043
Std. Dev	0.427464	0.711488
Skewness	0.441120	0.648624
Kurtosis	11.71355	14.99471
Jarque-Bera	1674.710*	3177.970*
PP test	-22.85753*	-31.47796*
ADF test	-11.46752*	-7.303646*
ARCH test	75.92152*	68.40101*
Observations	524	524

Notes: *Denotes significance at the 1% level. All returns are expected in percentages. ADF and PP test represents the augmented Dickey and Fuller test and Phillips Perron test of stationarity, respectively. The ARCH test is employed to test the presence of the ARCH effect in data sets.

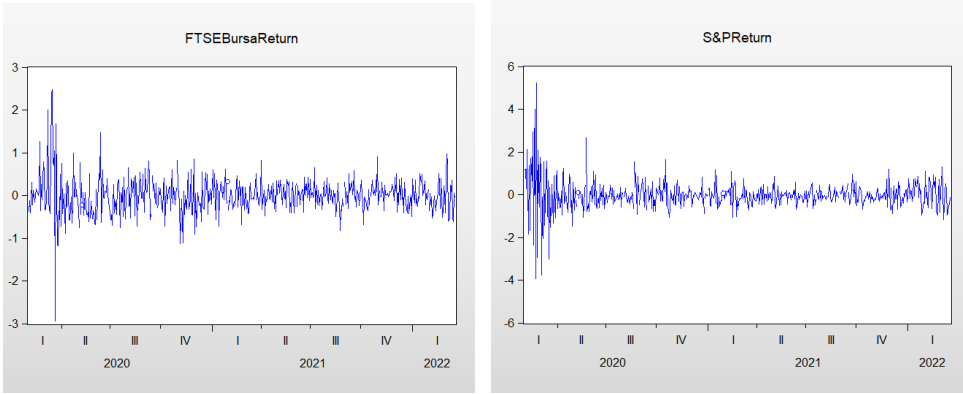

Figure 1. Malaysia and US Stock Market Return

Empirical Results

This section reports the results of estimating the VAR estimation models and GARCH model using the returns of the US on the Malaysian stock market.

VAR Estimation Results

In order to estimate the causal relations between the US on the Malaysian stock market, we applied the VAR model. We use the lag length criteria to identify the optimum lag, where the result gives the best lag order. Using the VAR lag order selection criteria, the Hannan-Quinn information criterion suggests two lags, the Schwarz information criterion (SIC) suggests one lag, and the Akaike information criterion (AIC) suggests four lags. This study uses the two lag specifications, as there is no autocorrelation at lag two, and it is long enough to capture daily data dynamics.

Table 2 reports the results of F-statistics on tests of causality among two markets. Granger causality is the most common way to investigate causality between two variables in a time series. The Granger Causality test results indicate that the null hypothesis that the US stock returns do not Granger-cause Malaysian stock returns is soundly rejected at the 1% significance level. Therefore, it is concluded that the Malaysian stock returns are found to be affected by the stock returns of the US. Meanwhile, for the Malaysian stock return, so we do not have enough evidence to reject the null hypothesis that Malaysian does not Granger-cause US. In other words, it can be concluded that the US stock return is not affected by the Malaysian stock return. The finding implies a unidirectional return spillover from the US stock market to the Malaysia stock market. This finding is consistent with the result

of (Nikmanesh et al., 2014) that no evidence exists of return-causality from the Malaysian stock market to the US. Therefore, a unidirectional causality-in-mean from US stock returns to Malaysian stock returns exists. According to Bala and Premaratne (2009), the spillover effect would be significant from a dominant market to a smaller market.

Table 2. Granger causality between Bursa and S&P.

Null Hypothesis:	F-Statistic	Prob.
S_PRETURN does not Granger Cause FTSEBURSARETURN	8.41940	0.0003
FTSEBURSARETURN does not Granger Cause S_PRETURN	2.08670	0.1251

GARCH Estimation

To examine the return spillover from the US stock market to the Malaysia stock market, GARCH (1,1) models are developed here. The results in Table 3 exhibit the estimated coefficient in equation (3). The mean equation for the Malaysia stock market is positive and insignificant. The coefficient of the constant variance term is positive and statistically significant at the 5 percent level. Meanwhile, the ARCH and GARCH parameters are positive and statistically significant at the 1 percent level. Moreover, the sum of the coefficients of these two parts is less than one, but it is close to 1. The result for US stock return is similar to Malaysia stock return where in the variance equation, both the ARCH part and GARCH part are significant. This result is consistent with the findings of Lee and Goh (2016) reveal that the positive return spillovers from the US market to the Malaysia markets still exist during the covid 19 pandemic.

Table 3. Regression results for the GARCH (1,1) model

		Malaysia	**US**
Mean Equation	ω	0.004780	-0.031015
		0.000416	0.028325
Variance Equation	ω	0.002091**	0.015506***
	α_1	0.079368***	0.236656***
	β_1	0.890971***	0.729064***

Note *, ** and *** represent the level of significance at 10%, 5% and 1% respectively.

Conclusions

This study examines the daily return spillover transmissions between the US markets on the Malaysia market during the Covid 19 by using VAR, Granger causality test, and GARCH models. The significant findings of this study can be summarised as follows: from the Granger causality test, the results show the US stock return does Granger-cause Malaysian stock return. In contrast to the findings for the Malaysian stock return where Malaysian stock return does not Granger-cause US stock return. Therefore, we conclude that return spillover is found to be unidirectional from the US stock market to the Malaysia stock market. The present study's findings provide preliminary insights into the risk elements for investors to understand the existence of the spillover phenomenon in international financial markets, portfolio diversification, and risk management in the stock market to make better investment decisions. The results may draw the attention of policymakers in designing international portfolio diversification strategies and building optimal portfolios during COVID and in the post -COVID world.

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