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TESTING FOR EFFICIENT MARKET HYPOTHESIS ON MALAYSIAN'S STOCK MARKET: DOES CRISIS REGIME MATTER?

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ABSTRACT

In the context of the recent financial crisis, there has been growing questions about improving the efficiency of the stock market through liberalization. Although many researchers have studied the empirical effects of financial liberalization on stock market efficiency, consistent conclusions remain elusive. This paper aims to study the long and short-run relationship between financial liberalization and stock market efficiency before and after the global crisis strike in Malaysia. Specifically, Autoregressive Distributed Lag (ARDL) is the main econometric technique applied to explore this study. This study uses quarterly time series data over the period from 1998Q1 to 2020Q4. The findings revealed that financial openness and trade openness affect the stock market positively in the short and long term. In conclusion, these results indirectly support the efficient market hypothesis in Malaysia. Findings provide some policy implications in which the country should reinforce the prerequisites of openness to avoid the potential of initial crisis by equipping in an appropriate manner to minimize the short-term costs of liberalization to achieve long-term benefits.

Keywords: Financial Liberalization; Stock Market Efficiency Hypothesis; Global Financial Crisis.

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1. INTRODUCTION

The developing country governments were facing difficulties to raise funds for development projects before the 1980s due to the reasons of low savings rates and population growth. The ongoing debt crisis in these regions and the severe financial crisis in industrialized countries have further complicated this problem. As a result, private and public capital flows have declined in developing countries (Kanu, 2011). Therefore, most economists advocate the abolition of capital controls aimed to improve efficiency and expect to shift the economy from price factors to production boundaries to stabilize the development process in these countries. According to Bagehot (1999), the ownership of a large amount of borrowed funds is the source to boost economic progress. The term "financial liberalization" began 30 years ago when several Organization for Economic Co-operation and Development (OECD) countries and some developing countries began to loosen their country's capital account controls, from financial oppression to financial liberalization. Financial impetus is characterized by an interest rate cap, high reserve requirements, fixed exchange rate regime and capital flow controls, all of which were introduced to maintain financial stability. (Abbott, Andersen, & Tarp, 2010).

A lot of research has been done in emerging economies and the authors have studied the effect of stock market liberalization on economic factors. Most of these researchers focus on changes in returns, uncertainties, and economic growth, while only a little effort is put to analyse the impact of financial liberalization on stock market efficiency. The statement that an effective stock market can provide useful input to market regulators has prompted many researchers to examine their investigation by considering the effects of several factors on stock market efficiency. In the context of the recent financial crisis, there has been growing sceptics about improving the efficiency of the stock market through liberalization. Although many researchers have studied the empirical effects of financial liberalization on stock market efficiency, consistent conclusions remain elusive. Now, the main question in this era is to investigate whether the financial liberalization will influence the stock market efficiency. The current financial crisis not only reflects the failure of the economic system, but also the failure of the free market and liberalism. Therefore, this study is mainly to let the empirical test results deviate from the liberalization effect and to investigate which literature reviews represent the visible patterns in the real world. Investigating the authenticity of each chain can also achieve the purpose of the study.

The objective of this study is to examine the relationship between financial liberalization and stock market in Malaysia for the period before and after a global financial crisis. The specific objectives are to examine the relationship between the financial liberalization' namely financial openness, before and after a global financial crisis on stock market in the short and long term. The third objective of this study is to examine whether a legal framework and sufficient institutions which control of corruption, as well as trade openness, are crucial for Malaysia to reap the benefits of financial liberalization. The analysis presented here is based on Autoregressive Distributed Lag (ARDL). The main reason for the focus on Malaysia is that it is an ever-growing economic power with huge potential in the financial sector. Businesses around the world began to realize the economic significance of Malaysia in the global trading network. Malaysia must actively seek to promote better financial integration to cater to the country's growing capital and opportunity needs.

These works contribute a lot to the existing literature. First, it is not enough to examine the impression of liberalization quality and analyze its ability to improve the efficiency of financial

markets. A broad literature review conducted as part of this work shows only a few studies - Kawakatsu and Morey (1999); Li et al. (2004); Basu and Morey (2005); Lim and Kim (2011); and Naghavi and Lau (2016) among others, which clearly study the relationship between financial liberalization and stock market efficiency. Based on these previous studies, this research provides an overview of the effectiveness of liberalization. The findings also help the Malaysian government to decide if financial disclosure is critical in improving stock market efficiency to promote economic growth. Secondly, the focus of the study in the two different economics situations will give more advantage to observe the impact from multiple perspectives.

The rest of the paper is structured as follows: The next section is the literature review followed by the methodology and data sources. The fourth section provides the empirical result and discussions. The conclusions of the study will be included in the final section of the paper.

2. LITERATURE REVIEW

Conceptually, the efficient market hypothesis (EMH) which posits that prices of security quickly and fully reflect all available relevant information was first proposed by Fama (1965). The concept was given an economic argument by Samuelson (1965) in that price changes must be random or unpredictable if they are properly anticipated. Fama (1965) also suggested that the EMH can be operationally defined by identifying the structure of various information sets available to market participants into three categories: weak, semi-strong and strong. The weak form comprises historical prices and volumes information. Fama (1970) was the first person who formalised the "market efficiency" term which has been referred to as the financial market information efficiency in general while it also emphasizes the role of information in stock price. (Lim & Brooks, 2011) Regarding Fama's Efficient Market Hypothesis (EMH), market prices reflect all known information at any time and change quickly in response to any available new information. No market participants can go beyond the market by using the information provided to all investors based on this premise, except pure opportunities (Fama, 1998). Given the strong competitiveness of a stock exchange depending on the effectiveness of the semi-strong share swap, and based on the weakening partly strong stock exchanges, the weak stock exchange efficiency is required. The weak form is first reviewed and verified. As a result, investors do not respond to information that is implied by significant autocorrelation of returns. This interpretation is widely used in existing empirical literature because it has a strong theoretical implication which strongly supports the perception of predicting horizontal short-term gains.

To align this theory with the purpose of this research, it should be noted that the opening of the stock market itself may not be beneficial to the country if the trading market is remained closed. The theory supports the conclusions of Basu and Morey (2005) that financial liberalization per share does not contribute to the stock market efficiency. Countries characterized by less damage than others tend to do better than rules according to economic theory, while deviations inhibit market function. For some time, most of the economists have agreed with the statement that free trade in goods and services does lead to faster growth (Edwards, 2001). In the standard model, the principle of "free trade" covers the situation of securities trading and countries with less restrictions in capital flow. Under the same circumstances, these countries may exceed those countries which are alienated from global financial markets. Rogoff (1999) has been clearly disclosing this point of view.

In the first round of research conducted by Kawakatsu and Morey (1999), Nikiforos (2004) and Hung (2009), the authors followed the local government's announcement of stock price behaviour before and after opening. Due to the growing interest in this field, some broad-spectrum statistical methods are currently growing. There have been many in-depth studies conducted on the topic but there is no agreement to the date whether a country should liberalize the financial system for enhancing the efficiency of stock market. Previous studies in this field include the works of Fuchs-Schundeln and Funke (2003), Galindo et al. (2007), Chinn and Ito (2006), Huang (2008), Chen (2009), Bekaert et al. (2011), and Kose et al. (2011). These authors believe only a well-developed financial system could have the beneficial effect from liberalization. Rodrik (1999) argues in his work on disclosure of openness in particular countries which may not be appropriate for all countries. This is related with Bekaert et al. (2005) which stated that financial liberalization may not have the expected benefits as the strength of domestic institutions also play a role. Bekaert et al. (2005) analysed the effects of financial liberalization's heterogeneity and indicated that the most beneficial countries are those with good financial institutions and investment images which can benefit foreign investors. Gay (2008) examined the effects of the transitional economy system and stated that they have a positive and significant effect on economic performance.

The main theoretical study of this current study was proposed by Basu and Morey (2005), exploring the impact of trade openness on stock market returns in emerging markets and developing a new model. Governments which are in closed economies plan to produce these inputs and provide them to the private sector at low cost. In addition, the private sector in a closed economy faces severe restrictions on such intermediate inputs, resulting in a decline in physical capital gains. Current studies show that the lack of appropriate systems is a major cause of the financial crisis. According to relevant theories, financial liberalization helps to improve the stock market efficiency, which demonstrates that financial openness can serve as an excuse for improving efficiency. This, in turn, affects the liberalization process and creates a feedback loop that gives rise to positive results. The ongoing debate on the relationship between financial liberalization and stock price behaviour contributes to this research. In the next section there will be discussion on the methodology used in this study.

3. METHODOLOGY AND DATA SOURCES

In general, this study adopted the testing procedure employed in Rambeli, Marikan, Hashim, Siti Zubaidah, Hashim & Podivinsky (2021). This study used Augmented Dickey Fuller (ADF), Phillips-Perron (PP) Test, Bound testing, Autoregressive Distributed Lag (ARDL) and diagnostic test such as Breusch-Godfrey LM test for autocorrelation, Jarque-Bera normality test, ARCH test for heteroskedasticity, Ramsey RESET test for omitted variables and also cumulative sum recursive residual test for variable stability for analysing relationships between financial openness, trade openness, institution and stock market efficiency. In addition, the EViews application was used in this study to test each of the variables.

3.1. Model Specification

Inspired by Basu and Morey (2005), the augmented model utilised to investigate the relationship between financial openness and the stock market efficiency is as follows,

$$\text{RETURN}_t = a_i + b_1\text{FO}_t + b_2\text{TO}_t + \text{INST}_t + u_{it} \quad (1)$$

This study used the quarterly time series data over the period from 1998Q1 to 2020Q4; time series data before the global crisis from 1998Q1 to 2006Q4 and after crisis strike from 2010Q1 to 2020Q4. All the variables and their descriptions are presented in Table 1.

Table 1: Variables and Description

Variable	Symbol	Description	Source
Stock market efficiency	RETURN_t	Use weak-form efficient market hypothesis (EMH) method to calculate the excess dollar returns	Monthly stock price indexes are gathered from Thomson data stream
Financial openness	FO_t	De facto measure of financial openness, described as net capital flow as a share of Gross Domestic Product	Lane & Milesti-Ferreti dataset (EWNII)
Trade openness	TO_t	De facto measure of trade openness, defined by the trade volume/ Gross Domestic Product	International Monetary Fund (IMF)
Institution	INST_t	Indicator of Control of corruption	World Bank

3.2. Time Series Analysis

In this section, the method used in the study will be described in detail. Among them, the tests were root test (unit root test), improve Augmented Dickey Fuller (ADF) test, Phillips-Perron (PP) test, bounding test, autoregressive distributed lag (ARDL) and diagnostic test.

3.2.1. Stationary Testing Method

The test populated by Dickey-Fuller (1979) and Phillip and Perron (1988), is a test which is used to determine the degree of integration of each variable. This test is also known as the unit root test. A variable is said to have degree of integration equal to d if it becomes stationary after being distinguished by d times (0 = level, 1 = first level difference, 2 = second level difference). The significance of this test is to prepare for the cointegration test and to prevent the occurrence of false regression. When the mean is zero, it will be said that a set of data is stationary. This indicates that its covariance value and the constant variance between the two time periods are determined only within that time period rather than in real time where the covariance value is calculated. The descriptions are as follows:

Mean : $E(X_t) = \mu$ (2)

Variance : $Var(X_t) = E(X_t - \mu)^2 = \sigma^2$ (3)

Covariance : $[E(X_t - \mu)(X_{t+k} - \mu)] = \gamma k$ (4)

Based on the theory, the root cause of this unit consists of three different assumptions. These assumptions can be summarized as:

i) Unit root test that does not take into account shortcuts and time flows

$$\Delta Yt = \delta Y_{t-1} + \sum_{t=1}^{m} \theta_i \Delta Y_{t-i} + u_t \quad (5)$$

ii) The root cause test that takes into account the shortcut, but it does not take into account the flow of time

$$\Delta Yt = \alpha + \delta Y_{t-1} + \sum_{t=1}^{m} \theta_i \Delta Y_{t-i} + u_t \quad (6)$$

iii) Cause test unit that has short flow fund and random walks (random walk)

$$\Delta Yt = \alpha + \beta_t + \delta Y_{t-1} + \sum_{t=1}^{m} \theta_i \Delta Y_{t-i} + u_t \quad (7)$$

Based on the equations in (5), (6) and (7), the indications for the symbols are as follows:

Y_t = the involved variables such as output
Y_{t-1} = first difference level (Y_t - Y_{t-1})
B = coefficient of time trends
t = duration
Δ = ρ - 1
P = 1-d/2
d = Durbin Watson statistic scores
u_t = white distortion term (white noise)

Theoretically, the Augmented Dickey Fuller action test assumes that the error is not autocorrelated and that the variance is constant. However, in the same test pioneered by Phillip and Perron (1988), other hypothesis is based on the non-parametric method proposed to control the existence of serious autocorrelation problems. Therefore, the Phillip Perron stutter test will be done by changing the t-coefficient of AR (ρ) model to solve this problem. The following is an example of the Phillip Perron test based on the AR (1) model:

$$\Delta Y_t = \alpha + \delta Y_{t-1} + \varepsilon_t \quad (8)$$

Based on the equation in (8), the PP pressure test changes the statistical t-coefficient δ AR model (1) to describe the autocorrelation problem inherent in the model. This correction is based on non-parametric methods. Through spectral analysis, zero frequency shows severe autocorrelation and severe heteroscedasticity in the model. The settlement model is as the following using the Newey-West Heteroskedasticity Autocorrelation Approach (Phillips-Perron, 1998):

$$\omega^2 = \gamma_0 + 2\sum_{j-1}^{q}\left[\frac{1-j}{q+1}\right]\gamma_j \quad (9)$$

and,

$$\gamma_j = \frac{1}{T}\sum_{t=j-1}^{T}\varepsilon_t\varepsilon_{t-j} \quad (10)$$

where,

q = lag length

Therefore, the calculated t-statistic value is based on the formula as follows:

$$T_{pp} = \frac{\gamma_0 1/2 t_b}{W} - \frac{(\omega^2-\gamma_b)T\delta_b}{\partial\omega\sigma} \quad (11)$$

where,

t_b = t-statistics

δ_b = standard deviation of γ

σ = standard deviation for regression

Referring to the optimum latency monitoring period, each equation in the unit root test is essentially determined by the Akaike Information Criterion (AIC) and the Schwarz Information Criterion (SBC). However, the AIC is more popular and frequently adopted by numerous studies. Therefore, in this study the AIC will be used as the best latitude lag benchmark. Basically, the lowest AIC value is synonymous with the optimum latency. The optimum latency calculations based on AIC are as the following:

$$\text{AIC (N)} = Tln\left(\frac{RSS}{T}\right) + 2N \quad (12)$$

3.2.2. Bound Testing Approach

The use of the bounds technique is based on three validations. First, Pesaran et al. (2001) supported the use of the ARDL model to estimate the horizontal relationships as the model shows that as soon as the order of the ARDL has been identified, the relationship can be estimated by OLS. Secondly, the boundary test allows a mixture of I(1) and I(0) variables as the regressors, which means that, the order of integration of appropriate variables does not have be the same. Therefore, the ARDL technique has the advantage of not requiring a specific command to identify the order of the underlying data. Third, this technique can be used for small or limited sample size (Pesaran et al., 2001).

The ARDL method for Co-integration is higher than other conventional Co-integration techniques such as that of Engle and Granger (1987) and Gregory and Hansen (1996). One of the reasons to

choose the ARDL is that it applies regardless of whether the basic regressors are purely I(0), I(1), or mutually co-integrated. In addition, the ARDL method is univariate compared to other methods. The statistical data underlying this procedure is the common Wald or F-statistics in a generalized Dickey-Fuller type regression, which is used to test the significance of the variables' lagged levels considered in a conditional Unrestricted Equilibrium Error Correction Model (UECM) (Pesaran et al., 2001). The model used for the testing the bound testing of the model is as follows:

$$\begin{aligned}\Delta(RETURN)_t = {} & \beta_0 + \beta_1(RETURN)_{t-i} + \beta_2(FO)_{t-i} + \beta_3(TO)_{t-i} \\ & + \beta_4(INST)_{t-i} + \sum_{t=1}^{p}\beta_5\Delta(RETURN)_{t-i} + \sum_{t=1}^{q}\beta_6\Delta(FO)_{t-i} \\ & + \sum_{t=1}^{r}\beta_7\Delta(TO)_{t-i} + \sum_{t=1}^{s}\beta_8\Delta(INST)_{t-i} + \varepsilon_t\end{aligned} \tag{13}$$

In model (13), Δ denotes the first difference operator for the variables and β_0 is the deterministic drift parameter. In order to find that if there is a cointegrating relationship among the variables in the long-run, the null hypothesis is tested. After regression of Equation (13), the Wald test (*F*-statistic) was computed to differentiate the long-run relationship between the concerned variables. The Wald test can be carried out by imposing restrictions on the estimated long-run coefficients. The null and alternative hypotheses are as follows:

$$H_0 = \beta_1 = \beta_2 = \beta_3 = 0 \text{ (no long-run relationship)}$$

Against the alternative hypothesis,

$$H_0 \neq \beta_1 \neq \beta_2 \neq \beta_3 \neq 0 \text{ (a long-run relationship exists)}$$

The calculated *F*-statistic value will be judged with the critical values. The lower bound critical values assumed that the explanatory variables x_t are integrated of order zero, or I(0), while the upper bound critical values assumed that x_t are integrated of order one, or I(1). If the results shows that *F*-statistic value is fall above the upper bound critical value, this means that there is a cointegration relationship between the variables. If the *F*-statistic value falls in between the upper bound and lower bound critical value, this indicates that the cointegration relationship is inconclusive. While the cointegration relationship does not exist if the *F*-statistic value falls below the lower bound.

3.2.3. Testing for Long and Short-run Coefficients

The ARDL can be used for a small sample size that occurs in this study, so the ARDL is being selected. In addition, it can also estimate the short and long-run dynamic relationships in stock market efficiency simultaneously. The ARDL method is exempt from the load to determine the order of integration between variables. Furthermore, it can distinguish between dependent and explanatory variables and enables one to test for the existence of a relationship between the variables. Finally, for ARDL, different variables may have different optimum lag numbers. The long-term coefficient is estimated by the OLS equation given below:

$$RETURN_t = \alpha + \sum_{t=0}^{p} \beta_1 (RETURN)_{t-i} + \sum_{t=0}^{q} \beta_2 (FO)_{t-i} + \sum_{t=0}^{r} \beta_3 (TO)_{t-i} + \sum_{t=0}^{s} \beta_4 (INST)_{t-i} + \mu_t \quad (14)$$

The modified ARDL which is in ECM version is used to examine the short run dynamic relationships. All of this investigation will be conducted using the Error Correction Mechanism (ECM) which is applied through the Ordinary Least Square (OLS) method as follows;

$$RETURN_t = \alpha + \beta_1 (RETURN)_t + \beta_2 (FO)_t + \beta_3 (TO)_t + \beta_4 (INST)_t + ECT_t \quad (15)$$

ECT is the error correction term defined as;

$$ECT_{t-1} = RETURN_t - [\alpha + \beta_1 (RETURN)_t + \beta_2 (FO)_t + \beta_3 (TO)_t + \beta_4 (INST)_t] \quad (16)$$

The lagged value of first difference of return, financial openness, trade openness and institution on lagged values are the explanatory variable of return with the error correction variable at first difference as the following;

$$\Delta (RETURN)_t = \beta_0 + \sum_{t=i}^{p} \beta_1 \Delta (RETURN)_{t-i} + \sum_{t=i}^{q} \beta_2 \Delta (FO)_{t-i} + \sum_{t=i}^{r} \beta_3 \Delta (TO)_{t-i} + \sum_{t=i}^{s} \beta_4 \Delta (INST)_{t-i} + \lambda ECT_{t-i} \quad (17)$$

λ denotes the speed of adjustment parameter while ECT is the residuals from the estimated model of (17). The same equation is also estimated to test the short-run relationship though the VECM from the VAR estimation technique.

3.2.4. Wald Test Short-run Co-integration

When the variables are found with a cointegrating relationship, the short-run dynamics of variables which are influenced by the equilibrium deviation which always exists are also called corresponding error correction representation. As stated by Engle & Granger (1987) it implies that the disequilibrium level of function in the cointegrating relationship involves the changes of dependent variables. As such, the final step is to develop the short run Wald test between financial liberalization and stock market efficiency using the equation (17).

3.2.5. Diagnostic Tests

The model which had been used for testing the long-run relationship and coefficients was further tested with the diagnostic tests such as Breusch-Godfrey LM test serial autocorrelation, Jarque-Bera normality test, ARCH test for heteroskedasticity, Ramsey RESET test for omitted variables or functional problem and Cumulative Sum (CUSUM) recursive residual test for stability while the graphical presentation of the recursive coefficients was used to judge the stability of the coefficients.

4. RESULTS AND DISCUSSION

In this section, there will be in-depth explanations and discussions regarding the output.

4.1. Stationary Test

In this study, we utilized the most popular unit root tests (the details are given in Table 2) the Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests to check if the variables under consideration were integrated of I(0), I(1) or mutually integrated. The, null hypothesis for both the Augmented Dickey-Fuller test (ADF) and the Phillips-Perron tests (PP) is that the series possesses a unit root and hence is not stationary. If the series is stationary at its level, one can conclude that it is integrated of order 0, denoted as I(0). However, if the series is in stationary at its first differenced form, then it is integrated of order 1, denoted as I(1). It is widely known that if any variable in the model is integrated of an order higher than 1, the ARDL technique could not be used to provide reliable estimates of the parameters of the model. The results of the ADF and PP unit root tests, both at the level and first differencing are reported in Table 2, by taking into consideration the interception in the regression. Based on the ADF test results, all variables were I(0), regardless of sub-sample periods, with one exception. In contrast, only "Inst" was I(0) by the PP test results for the sub-sample period before the Global Financial Crisis, while the rest were all I(1). Albeit the inconsistency in the finding on the order of integration, it is obvious that there was no variable that was integrated of order 2 or higher. Hence, the ARDL approach could be applied to estimate the cointegration relationship among the variables.

Table 2: Augmented Dickey Fuller test and Phillips-Perron test for integration order

Data Series	**t-statistic**				**Decision**	
	Level		First difference			
	PP	ADF	PP	ADF	PP	ADF
Malaysia before Global Financial Crisis						
Return	-1.11(20)	-4.73***(3)	-9.25***(2)	-	I(1)	I(0)
Fo	-2.09(20)	-3.37*(1)	-3.87**(2)	-	I(1)	I(0)
To	-1.91(20)	-3.34*(14)	-7.07***(2)	-	I(1)	I(0)
Inst	-6.17***(2)	-	-15.22***(2)	-	I(0)	I(0)
Malaysia after Global Financial Crisis						
Return	-2.27(20)	-3.27*(2)	-5.07***(2)	-	I(1)	I(0)
Fo	-1.59(20)	-3.37*(2)	-4.96***(2)	-	I(1)	I(0)
To	-1.29(20)	-3.34*(14)	-4.66***(2)	-	I(1)	I(0)
Inst	-0.03(20)	-6.57***(15)	-3.38*(2)	-	I(1)	I(0)

Notes: *** statistically significant at the 1% level, ** statistically significant at the 5% level, * statistically significant at the 10% level. "-" indicates the test is not estimated for the first differenced series once the variable is found stationary in the level form. As the o Null hypothesis under ADF and PP test is that the series is non-stationary. If the test statistics is negative and more than the critical value, then the null hypothesis cannot be rejected, otherwise the null hypothesis can be rejected. Figures in () denote the lag order.

4.2. Bound Test for Cointegration

Table 3: F-statistic of cointegration relationship

Test statistic	**Value**	**Significance level**	**Bound critical values (Unrestricted intercept and no trend)**	
			I(0)	I(1)
Before global financial crisis F-statistic	23.9019***	1.0%	2.72	3.77
		2.5%	3.23	4.35
		5.0%	3.69	4.89
		10.0%	4.29	5.61
After global financial crisis F-statistic	8.8689***	1.0%	2.72	3.77
		2.5%	3.23	4.35
		5.0%	3.69	4.89
		10.0%	4.29	5.61

Notes: 1. The critical value for bounds testing are abstracted from Pesaran et al. (2001), Table CI.III: Case III: Unrestricted intercept and no trend: critical value for k=3.
2. * denotes that the F-statistic falls above the 90% upper bound, ** above the 95% upper bound, and *** above the 99% upper bound

The researcher also tested the model by using the Akaike Information Criterion (AIC) to get the parsimonious specification. First, the researcher set the initial lag of 1, and eliminated the insignificant variables except the intercept and the level of the variable. The lag length that minimized AIC was lag 5 for model before the global financial crisis. The calculated F-statistic results are shown in Table 3. The critical values are also displayed in Table 3 which are based on the critical value suggested by Pesaran et al. (2001). As shown in Table 3, the Wald-F test before the global financial crisis (23.9019) from Wald-test showed stronger results which the F-statistic value was higher than the upper bound critical value at all significant levels, using unrestricted intercept and no trend. This implied that the null hypothesis of no cointegration between those variables cannot be accepted at all levels of significance. Hence, the results show that there was a cointegration relationship among the variables. The lag length criterion that minimized AIC was lag 6 for model after the global financial crisis. The null hypothesis of no cointegration for the period after the global financial crisis could also be rejected as the F-statistic value of 8.8689 was higher than the upper bound for all significant level thus indicating that there was a cointegration relationship between those variables. This confirms that there existed a long-term relationship between the variables utilised.

4.3. Long-run ARDL Estimations

Table 4: Long-run ARDL Estimations

Dependent Variable Return					
The Long-run coefficient estimates					
Period	Variable	Coefficient	Std. error	t-statistic	Prob.
Before global financial crisis	Constant	-1.7306	0.3893	-4.4445	0.0002***
	FO_t	0.9799	0.2323	4.2178	0.0003***
	TO_t	0.7484	0.3455	2.1660	0.0409**
	$INST_t$	1.9210	0.6725	2.8561	0.0089***

Table 4: continued

After global financial crisis	Constant	-1.8912	0.1323	-14.2936	0.0000***
	FO_t	0.7472	0.1006	7.4277	0.0000***
	TO_t	-0.3894	0.0844	-4.6090	0.0001***
	$INST_t$	0.9610	0.3210	2.9932	0.0060***

Notes: *** denotes statistically significant at the 1% level, ** statistically significant at the 5% level, * statistically significant at the 10% level.

Based on the bound test cointegration analysis, a long-term equilibrium relationship between financial openness, trade openness, institution and stock market efficiency were already identified. In this section, the estimated long-run and short-run coefficients will be examined. Table 4 reports the results of estimated long-run ARDL cointegration model for the period before the global financial crisis ARDL (2, 1, 4, 3) and after the global financial crisis ARDL (4, 5, 1, 3) in Malaysia which was selected automatically by applying the Akaike Information Criterion (AIC) of lag selection. The AIC criterion automatically determined the optimum lag for the period before global financial crisis as lag 4 and lag 5 for the period after the global financial crisis. As Table 4 showed, the estimated constant term of long-run coefficient for the period before the global financial crisis was negative and highly significant at 10% significance level. The coefficients of the three independent variables of FO_t, TO_t and $INST_t$ were all correctly signed and statistically significant at the level of 10 percent for variables FO_t and $INST_t$ and 5 percent for TO_t respectively. The result indicates that either financial openness, trade openness or institution led to greater stock return in long-run or the variables had a strong influence on stock return. Since the institution coefficient was positive and highly significant, it appears that an increase in institution which is in control of corruption will increase the efficiency of stock market. For the period after the global financial crisis, the estimated constant term of long-run coefficient showed negatively at a value of 1.89 and highly significant at the 10 percent significance level. The coefficient of FO_t and $INST_t$ were positively and statistically significant at the level of 10 percent which was consistent with the theoretical expectation. However, for the variable of TO_t, it was highly significant at 10 percent but it showed a negative sign which was contrasted to the expectations under the efficiency concept. This inconsistent result can be explained probably due to the existence of the global financial crisis in 2007. The result indicates that either financial openness or institution led to greater stock return in long-run except trade openness. According to Table 4, the financial openness elasticity was 0.75 for the period after the global financial crisis, openness elasticity which was highly significant as reflected by a t-statistic of 7.43. The institution was 0.96 and highly significant in supporting the theoretical expectation. Since the trade openness coefficient was negative and highly significant, it appears that an increase in institution which is in control of corruption will decrease the efficiency of stock market.

4.4. Error Correction Model

Table 5: The ARDL cointegrating short-run error-correction model

Before global financial crisis (2,1,4,3)			
Variable	Coefficient	t-statistic	Prob.
$\Delta RETURN_t$ (-1)	0.0429	0.5242	0.6073

Table 5: continued

$\Delta RETURN_t$ (-2)	0.1362	1.8672	0.0803*
ΔFO_t	1.0106	6.0297	0.0000***
ΔFO_t (-1)	-0.6762	-3.8135	0.0015***
ΔTO_t	-0.2388	-0.7367	0.4719
ΔTO_t (-1)	-0.1062	-0.3649	0.7199
ΔTO_t (-2)	-0.0999	-0.3645	0.7202
ΔTO_t (-3)	-0.1387	-0.4652	0.6480
ΔTO_t (-4)	0.7671	2.8270	0.0121**
$\Delta INST_t$	-1.4102	-2.9649	0.0091***
$\Delta INST_t$ (-1)	1.2940	3.1128	0.0067***
$\Delta INST_t$ (-2)	-0.7143	-1.6848	0.1114
$\Delta INST_t$ (-3)	-0.3193	-12.225	0.0000***
Constant	-0.0142	-1.4351	0.1705
ECT(-1)	-0.6654	-2.7789	0.0134**
Adjusted R-squared	0.8928		
S.E. of regression	0.0510		
F-statistic	18.853		
Prob. (F-statistic)	0.0000		
Durbin-Watson statistic	1.4731		
After the global financial crisis (4,5,1,3)			
Variable	Coefficient	t-statistic	Prob.
$\Delta RETURN_t$ (-1)	-0.1873	-0.9377	0.3654
$\Delta RETURN_t$ (-2)	-0.0019	-0.0137	0.9893
$\Delta RETURN_t$ (-3)	0.2948	1.9419	0.0741*
$\Delta RETURN_t$ (-4)	-0.2363	-1.8922	0.0809*
ΔFO_t	0.1021	0.3308	0.7461
ΔFO_t (-1)	0.6551	1.7719	0.0998*
ΔFO_t (-2)	0.1330	0.3602	0.7245
ΔFO_t (-3)	-0.6025	-1.9487	0.0732*
ΔFO_t (-4)	0.0055	0.0201	0.9842
ΔFO_t (-5)	-0.6119	-2.3128	0.0377**
ΔTO_t	-0.0495	-0.1035	0.9191
ΔTO_t (-1)	-1.3823	-2.8089	0.0148**
$\Delta INST_t$	-0.2276	-0.4376	0.6688
$\Delta INST_t$ (-1)	0.8904	1.9580	0.0720*
$\Delta INST_t$ (-2)	0.9815	2.4858	0.0273**
$\Delta INST_t$ (-3)	-1.2974	-3.5058	0.0039***
Constant	-0.0313	-1.8851	0.0820*
ECT(-1)	-0.8710	-2.8329	0.0141**
Adjusted R-squared	0.6296		
S.E. of regression	0.0515		
F-statistic	3.9276		

Table 5: continued

Prob. (F-statistic)	0.0078
Durbin-Watson statistic	1.9825

Notes: 1. *** denotes statistically significant at the 1% level, ** statistically significant at the 5% level, * statistically significant at the 10% level.
2. Δ denotes differenced variable.

Table 5 presents the results of the estimated ARDL short-run error correction model for the period before the global financial crisis and after the global financial crisis. It reports the coefficient estimates of all lagged first differenced variables in the ARDL model. All show the dynamic adjustment of all variables. A negative and significant coefficient of ECT will be an indication of cointegration. As can be seen from Table 5, the ECT for both periods exhibited an expected negative sign, which was highly significant, indicating that, stock market efficiency, financial openness, trade openness and institution were cointegrated in Malaysia for those two periods of before and after the global financial crisis. The absolute value of the coefficient of the error-correction term in the period before global financial crisis indicated that about 67 percent of the disequilibrium in the stock market efficiency in Malaysia was offset by short-run adjustment in each quarterly while for the period after the global financial crisis, the coefficient indicated that the speed of 87 percent of the disequilibrium in the stock market efficiency was adjusted by short-run adjustment to the steady state. The coefficient indicated high rate of convergence to equilibrium. Thus, it is important to reduce the existing disequilibrium over time to maintain long-run equilibrium.

4.5. Wald Test of Cointegration

Table 6: Wald test of cointegration

Endogenous variable: $\Delta RETURN_t$				
Variable	**Before global financial crisis**		**After global financial crisis**	
	F-statistic	Chi-square	F-statistic	Chi-square
$\Delta RETURN_t$	3.3684*	3.3684*	3.8275**	7.6550**
ΔFO_t	26.0967***	52.1933***	2.8911*	5.7823*
ΔTO_t	10.5919***	10.5919***	4.8864**	9.7729***
$\Delta INST_t$	67.2418***	201.7257***	3.6799**	11.0398**
ECT(-1)	9.3511***	9.3511***	19.0465***	19.0465***
Adjusted R-squared	0.8928		0.6296	
S.E. of regression	0.0510		0.0515	
F-statistic	18.8535		3.9276	
Prob. (F-statistic)	0.0000		0.0078	
Durbin-Watson statistic	1.4731		1.9825	

Notes: 1. All variables in each data set denoted by Δ are in first difference.
2. ***, ** and * specify the significant level at 1%, 5% and 10% respectively.

Based on the results showed in Table 6, for the period before the global financial crisis, the financial openness variable showed a highly significant short-run cointegration to the dependent variable of stock return. The difference of trade openness variable also implies that it had a short-run

cointegration to the dependent variable while the institution also showed the same result to stock return. The results indicate that all the three independent variables had cointegrating relationship to stock return in the period before the global financial crisis. For the period after global financial crisis, financial openness showed 1 percent of significance to the dependent variable while the variables of trade openness and institution showed the result of significance at 5 percent significant level. This indicates that all the variables had short-run cointegrating relationship to stock return through the short-run wald test in ARDL approach. Thus, financial openness, trade openness or institutions are important in affecting the stock market efficiency. Hence, the results reported have demonstrated that all variables should be included in the model to get the result.

4.6. Regression Diagnostic and Specification Tests

Table 7: Diagnostic Tests Representations

Test Statistics	**Period**	
	Before global financial crisis	**After global financial crisis**
Breusch-Godfrey LM test for autocorrelation	0.1149 [0.8921]	0.3556 [0.7053]
Jarque-Bear normality test	0.5654 [0.753735]	0.3245 [0.850250]
ARCH test for heteroskedasticity	2.2246 [0.1470]	0.0062 [0.9378]
Ramsey RESET test for omitted variables/ functional	0.8056 [0.3796]	0.4736 [0.4992]

Notes: The values of probability are in the parenthesis.

Figure 1: Plot of Cumulative sum (CUSUM) test of recursive residuals for period before global financial crisis

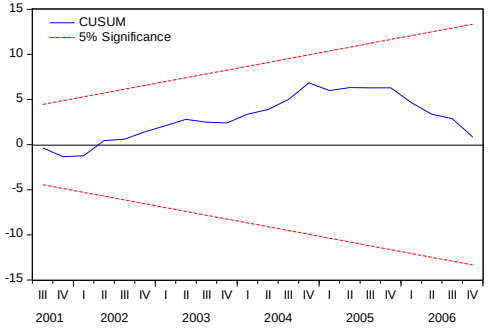
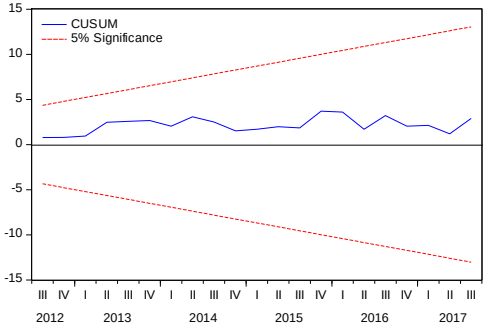


Figure 2: Plot of Cumulative sum (CUSUM) test of recursive residuals for period after global financial crisis



In statistics, the Breusch-Godfrey test, named by Breusch (1978) and Godfrey (1978), was used to evaluate the validity of some modeling hypotheses that existed using models such as regression to view the data series. The result of LM test for the period before the global financial crisis showed a probability of 0.11 indicating that the null hypothesis was accepted, and the residuals were not serially correlated. Besides, for the period after global financial crisis, it also shows a result of not

significant that accept the null hypothesis of the test. The Jarque-Bera test, a type of Lagrange multiplier test, is a test for normality. The null hypothesis in this test is to follow a normal distribution of data. From the results represented in Table 7, the Jarque-Bera test has a probability of 0.75 before the global financial crisis which seems to accept the null hypothesis of data come from a normal distribution. For the period after global financial crisis, the null hypothesis was also accepted. Autoregressive Conditional Heteroskedasticity (ARCH) is a time series statistical model used to analyze the unexplained effects of the economic model. The result from ARCH test reveals that for period before and after global financial crisis, the heteroskedasticity is not existed as both results are not significant and accept the hypothesis. The Ramsey RESET test is the generalised test for those linear regression model specification errors such as missing variables which means that some of the regression explanatory variables are not specified in the model. The null hypothesis of Ramsey REST test states that the functional form is correctly specified. The results from Table 7 imply that the hypothesis of Ramsey RESET test cannot be rejected at both period before and after global financial crisis. This is an indication that there was no specification and functional error in the model. Recursive estimation using CUSUM (cumulative sum) test found that the parameters or coefficients remain stable over the entire study period because generally both recursive lines are in the bound. The plots and test results at the command line indicate that both periods before and after global financial crisis accepted the null hypothesis that coefficients were stable. These indications are clearly illustrated through those CUSUM in Figure 1 and Figure 2.

5. CONCLUSION

According to the results of the study, short-term and long-term estimates indicate that liberalization leads to efficiency relationships depending on whether the dissemination is temporary or permanent (Kim, Hsieh, & Lin, 2021). Temporary shocks do not give enough time for the stock market to adjust to new rules. On the other hand, stock markets can adapt to long-term external shocks, which can result in exposure and adhere to better international governance guidelines. Thus, these results can be explained simultaneously with the work of Baltagi et al. (2009), the author believes that closed economy will be fully benefiting from financial openness as it has enough time to adapt to new circumstances. In other words, the state can adapt to financial openness and better reach information disclosure, thereby promoting economic development in the long run.

The empirical evidence provided in this study confirms the important role of politics in short-term risks and the adverse effects of market liberalization. This increase is supported by key decision of empirical findings section on financial disclosure and the relationship between stock price efficiency and institutional intermediation variables. Therefore, in terms of policy effects, Malaysia should be equipped with sufficient means to minimize the short-term costs of liberalization and thereby obtain long-term benefits of financial disclosure. In other words, they need to strengthen the exposure premises to avoid the possibility of a crisis. The governance threshold plays an important role in assumptions that confirm the relationship between financial liberalization and stock market efficiency. It is believed that the financial liberalization's success or failure depends on the nature of the country. Therefore, with the emergence of more regulation, effective intervention requirements are the key prerequisites for addressing key market failures in the system. State intervention in more forms of institution and governance is a major factor in neoliberalism. The basic component of this open market venture is a more credible country, focusing on providing

individual entrepreneurship, self-government, independence, and accountability. A real challenge for Malaysian policy makers is to strengthen the supervision of Malaysian activities to prevent some investors from monopolizing the rents of other investors as the transactions become more concentrated. Finally, the Malaysian government must continue to provide investment with the right macro and micro economic environment to ensure that investors can improve and continue to access high quality and reliable information without many institutional barriers to trade.

The impact of financial liberalization on the stock market has always been one of the most vulnerable topics, as previous studies have shown contradictory outcomes. Through the findings presented this present study only included the determinants of one of the six dimensions of World Governance Indicator (WGI) which is control of corruption. In particular, it would be interesting if further studies could include all the six dimensions of WGI which are voice and accountability, governance effectiveness, political instability and violence, rule of law, regulatory quality, and control of corruption (Naghavi & Lau, 2016). Second, the stock market volatility has gained considerable attention as evidenced by many of the literature by academics and practitioners. Past volatility can be used to predict future uncertainties and this is an important input for investment decisions and choosing the portfolio. The volatility of local stock market has implications for the financial and economic activities in Malaysia. Volatility can be used as a quantitative risk representative but it should be noted that uncertainty is not equal to risk. Hence, further research needs to consider volatility as a measure of risk that can help investors in planning their resource allocation strategies as measuring volatility is very important in the financial and economic literature. Third, further research is recommended to consider other factors, such as Malaysia's economic cooperation with other countries and the latest information technology, to compare the main factors that lead to efficient stock market in Malaysia. This paper clarifies that evidence of financial liberalization will make the stock market more efficient in the short- and long-run as discussed in previous section. Therefore, future research is expected to provide more insights into whether Malaysia stock prices will become more efficient by issuing other variables.

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