

Co-movements between Islamic and Conventional Stock Markets: An Empirical Evidence

(Pergerakan bersama antara Pasaran Saham Islamik dan Konvensional: Bukti Empirikal)

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ABSTRACT

This paper examines the co-movement between the Islamic (Shariah compliant) and conventional stock indices. Using data from Bangladesh and Malaysia from 25 January, 2011 to 31 May, 2018, the study employs the co-integration approach and Vector Error Correction Model (VECM). The results reveal that there is a significant co-integration relationship among the variables. The analysis of the Variance Decomposition indicates that there are weak (strong) influences for predating the forecast errors of the respective indexes in the short run and long run while the impulse response function (IRF) shows negatively (positively) to the shocks with each other in the Islamic and conventional stock indexes. These findings provide useful insights to investors and policy makers in reducing risks and achieving the optimum level of return.

Keywords: Co-movement; Islamic; conventional; stock markets; Bangladesh and Malaysia.

ABSTRAK

Makalah ini mengkaji pergerakan bersama antara indeks saham Islam (patuh syariah) dan konvensional. Menggunakan data dari Bangladesh dan Malaysia daripada 25 Januari 2011 hingga 31 Mei 2018, kajian ini menggunakan pendekatan co-integration dan Vector Error Correction Model (VECM). Hasil kajian menunjukkan terdapat hubungan gabungan yang signifikan antara pemboleh ubah. Analisis Penguraian Varians menunjukkan terdapat pengaruh lemah (kuat) untuk mendahului ralat ramalan indeks masing-masing dalam jangka pendek dan jangka panjang sementara fungsi tindak balas impuls (IRF) menunjukkan hubungan negatif (positif) terhadap kejutan antara satu sama lain dalam indeks saham Islam dan konvensional. Penemuan ini memberikan pandangan berguna kepada pelabur dan pembuat dasar dalam mengurangkan risiko dan mencapai tahap pulangan yang optimum.

Kata kunci: Pergerakan bersama; Islamik; konvensional; pasaran saham; Bangladesh dan Malaysia.

INTRODUCTION

The 2007-2008 Global Financial Crisis (GFC) has sparked the discussion of financial market stability. The onset crisis has not only caused the volatility spillover but also triggered the prime catalyst in cross-countries stock market outcomes (Devereux & Yu 2020). Though GFC is over, the modern world has witnessed drastic changes in financial markets. They have seen an optimistic trend of Islamic finance during the GFC period. After GFC, Islamic Capital Market (ICM) has shed on the light in the mainstream market. ICM is fundamentally different from the conventional

capital market. Riba (interest), Gharar (uncertainty) and Maysir (gambling) are strongly prohibited in Islamic capital markets, whereas in conventional capital, these are the common practices (Majid & Shabri 2018). However, due to the rapid growth of the world financial system sector, ICM has shown positive momentum and rapid development rate. According to Islamic Finance Development Report (IFDI 2018) the size of IF industry has grown up to \$2.438 trillion in 2017. Besides, the phenomenal growth and consistent development of Islamic finance, have not only attract Muslim investors, but has become a viable alternative investment instrument to non-Muslim investors (Khavarinezhad &



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Biancone 2019). Particularly, Islamic equity market has the ability to prevent financial markets instability and spillover effects through the effort of the government, regulators and stakeholders (Hassan et al. 2019; Erfani & Vasigh 2018; Trabelsi & Naifar 2017). Moreover, it tends to reduce the probability of reoccurrence of financial crises (Majid & Shabri 2018; Shahzad et al. 2017). Therefore, the Islamic stock market is parallel in many developed and developing countries (Lahsasna, Hassan & Ahmad 2018).

This study discusses the issue of co-movement between Islamic (Shariah compliant) and conventional (non-Shariah compliant) stock markets across countries in terms of asset allocation and risk transmission from the long run and short run perspectives. The main motive of this study is to examine the interdependence of domestic and international asset linkages and to add to the literature on the Islamic and conventional stock markets integration and portfolio diversification. Integrated equity markets not only create enough room for portfolio diversification benefits but also observe a financial contagion effect to the investors which is consistent with the issue of stock market co-movement (Devereux & Yu 2020; Gkillas et al. 2019). Stock markets co-movement refers to the tendency of two or more stock market movement in the same direction, which leads to a loss or gain of any potential opportunity to diversify (Jebran et al. 2017).

However, as a central theme of international finance, stock market co-movement drives a direction to the investor in making investment decisions in different portfolio horizons. In theoretical perspectives, it suggests that high-level co-movement supports the evidence of the co-integration relationship in the long run which diminishes the portfolio diversification benefits. On the other hand, low-level co-movement leads to better portfolio benefits. It also indicates the absence of a long run association among the variables (Rua & Nunes 2009). These evidences are consistent to the modern portfolio theory. Markowitz (1952) states that portfolio diversification benefit is possible at a low level of correlation in domestic markets. From the seminal work and empirical evidence of Tobin (1958) and Grubel (1968), it has been acknowledged that international portfolio diversification mitigates the total risk of portfolio diversifications.

Moreover, stock market integration plays an essential role in developing the domestic market through the process of liberalization in emerging economies. Financial market liberalization is a significant way of equity market segmentation that enables to remove the initial barrier of cross-country transactions (Yao et al. 2018). Interestingly, investors can purchase both domestic and foreign equity stocks and enjoy the same level of opportunity to access any market due to the openness and financial market fusion (Moshirian et al. 2019).

Therefore, this study is an evolving effort to examine the co-movement between Islamic and conventional stock markets in Bangladesh and Malaysia perspectives. Moreover, the examination of co-movement among the stock markets would increase the interest of investors, policymakers and academicians in emerging countries such as Bangladesh and Malaysia in a comparative context. Although, there are plenty of empirical studies which have been conducted on the topic of stock market co-movement in developed countries as well as composite stock markets perspectives (Huang 2020; Hitoi & Pochea 2019; Das & Manoharan 2019; Das et al. 2018; surprisingly, there is no empirical study on the topic of co-movement between Islamic and conventional stock markets especially in the comparative perspectives (Hasan 2019; Chowdhury et al. 2017).

The current body of literature does not provide a conclusive finding between the Islamic and conventional stock markets in Bangladesh in comparison to other developed and developing countries. Some researchers (Chowdhury et al. 2017) found that the stock returns of Dhaka Stock Exchange, Bangladesh has co-integration relationship which restricts the portfolio diversification benefits with other countries. On the other hand, some researchers (Kumar & Dhankar 2017; Sehgal et al. 2018) show evidence that the stock return of Bangladesh has no long-run relationship which confirms the presence of portfolio diversification benefits across countries. However, to date, no studies have been conducted on the Islamic and conventional stock markets in Bangladesh and Malaysia, and this gives credence to the idea of conducting a study on both countries which may serve as a catalyst to fuel their continued growth.

The main objective of this study is to examine the co-movement between the Islamic and conventional stock markets in Bangladesh and Malaysia, and this is the first study involving the two countries. The justifications behind the motives of conducting this study are presented in the following. Firstly, it provides an identification of the nature of the Islamic stock market co-movement which furnishes opportunities for international investors to diversify their investment.

Secondly, most of the previous studies have covered conventional stock markets co-movement in developed countries perspectives (Huang 2020; Hitoi & Pochea 2019; Das & Manoharan 2019; Das et al. 2018), and very few studies have focused on the co-movement between the Islamic and conventional stock market in the context of emerging economies such as in Bangladesh and Malaysia (Sehgal et al. 2018; Kumar & Dhankar 2017; Chowdhury et al. 2017).

Thirdly, the study of co-movement between the Islamic and conventional stock indexes in Bangladesh and Malaysia need further research in order to determine their recent position since most of the previous studies have been conducted before and during the financial crises, but less attention has been given on this topic

after the financial crisis period (Das, Kannadhasan et al. 2018).

Moreover, the risk-return trade-off in Shariah compliant stock market could also be different from the non-Shariah compliant stock markets (Zhu et al. 2019; Ng et al. 2017). Shariah screening criteria and different risk-return structure could lead to different patterns of portfolio benefits and affect the extent of co-movement between the Islamic and conventional stock indexes (Saiti et al. 2016). Therefore, it gives ample space for this study to fill in the gap on the co-movement of the Shariah and non-Shariah compliant stock indexes in Bangladesh and Malaysia.

The study has several contributions. Firstly, the study extends the extant literature in the dynamics of co-movement between the Islamic and conventional stock markets in Bangladesh and Malaysia. As stated earlier, this is the first study that explores the dynamic of co-movement between the Islamic and conventional stock markets in the context of Bangladesh and Malaysia. Secondly, this study uses dataset gathered since the beginning of the formation of the Shariah compliant stock index in Bangladesh, and this will provide comprehensive insights on the Shariah-based stock markets. Thirdly, the findings are expected to provide significant information on portfolio diversification for domestic and international investors. Finally, the study applies several econometric methods that examine the co-movement among the indexes to get robust results. Following the Section on introduction; Section 2 of this paper presents the literature review; Section 3 describes the dataset and econometric specifications; Section 4 reports the empirical results and Section 5 provides the conclusion of the findings.

LITERATURE REVIEW

Globalization is the process of integration which increases the financial market interdependency around the world. Interdependency among financial markets may provide a proponent and opponent experiences to investors with regard to profitability. Due to the global stock market uncertainties and changes in geo-political situation and financial policy-making decision; researchers, investors and policy makers are highly attentive on the issue of market movement. In recent years, the issues on financial markets stability and how stock markets move together have been discussed extensively (Hassan et al. 2019; Erfani & Vasigh 2018; Trabelsi & Naifar 2017).

However, during the past financial crises, there has been a massive failure of financial institutions as well as a staggering collapsed in the price of assets around the world. The crashing of the US stock markets' crises has created uncertainty around the world and increased the co-movement of stocks prices across countries (Jiang

& Hashmi 2017). This indicates that world financial markets are highly integrated, and investors may allow moving the shares prices and shift their investment decisions across the world (Buriev et al. 2018). Stock market integration depends on the correlation structure and perfectness in different stock markets. However, all attempts would be worthless, if portfolio managers or investors fail to identify the nature of investments and the level of co-movement of stock price indexes across countries (Aamir & Shah 2018). Therefore, it gives further insights to investors, fund managers and policymakers in determining the significant level of co-movement from the different stock markets. Furthermore, stock market co-movement is the key term of international finance literature that provides an important consequence for risk and return trade off using assets allocation and portfolio diversification strategies (Chuluun 2017).

The empirical evidences have suggested that both national and foreign investors to look forward at low levels of co-movement of stock prices for attaining portfolio diversification benefits. Investors are continually ready to take the opportunity to adverse the risk and increase their expected returns by allocating their assets in different countries and different line of assets. Therefore, many investors like to segregate their investment strategies and invest some of their capitals in foreign markets as well as to purchase the shares in foreign firms (Panda & Nanda 2017). For example, the issue of stock market co-movement is still arguable and crucial in cross countries' perspectives not only for portfolio diversification but also for an alternative investment horizon. A robust co-movement among the assets class would lead to attaining the gain and affect the risk pattern in a particular portfolio, which are associated with assets allocation and diversifications. The practical insinuations for configuring portfolio diversifications and risk management strategies have made the evaluation of stock market co-movement behavior in the international avenue an important deal in the finance literature (Mensi et al. 2018; Mensi et al. 2017).

Chowdhury et al. (2017) examine the contagion effects of Dhaka Stock Exchange Shariah (DSES) with stock markets of the six Gulfs and developed countries. To restate, the aim of this research is to find the dynamic relationship between Shariah compliant stock market in Bangladesh and the other six global Islamic stock markets. Standard time series techniques such as the Johansen co-integration test, Vector Error Correction model (VECM) and Impulse Response Function (IRF) are applied as the methods of analyses. It has been discovered that Dhaka Shariah compliant stock index (DSES) shows a long run co-integration relationship among the Islamic stock indexes, but contagion effect varies from market to market. The researchers found that Shariah compliant stock market

TABLE 1. Summary of related literatures

Study	Market	Methodology	Findings
Hasan (2019)	Bangladesh	ARDL, EGARCH and BEEKGARCH test	The present study examines the co-movement and volatility transmission between conventional and Islamic stock indexes in Dhaka Stock Exchange, Bangladesh. The evidence reveals that there are short-run and long-run relationship between the two indexes. It is also discovered that the significant volatility transmission mechanism is prominent in Islamic stock indexes as compared to conventional indexes. The portfolio diversification benefits are not measurable between the two series. Therefore, policymakers, investors and fund managers, should add and find other faith-based categories of assets in their risk-return portfolios.
Sehgal, Pandey & Deisting (2018)	SAARC countries (Bangladesh, India, Maldives, Nepal, Pakistan and Sri Lanka)	Copula GARCH test	Empirical evidence shows that the sample countries of the region exhibit very little or no levels of integration among the variables. Furthermore, trend analysis of the fundamental determinants of financial integration for the SAARC countries is performed, and the same result is compared with its neighbouring regional economic bloc in Asia.
Majdoub & Sassi (2017)	China, Malaysia, Indonesia, Korea, Thailand and India	VARMA-BEKK-AGARCH test	The study examines the volatility and return spillover among six countries Islamic stock indexes. The findings show that there are negative and positive return spillover between China and the other selected Asian countries in Islamic stock indexes but bidirectional volatility spillover exists among China, Korea and Thailand Islamic stock markets.
Kumar & Dhankar (2017)	Four emerging South Asian markets. (India, Pakistan, Sri Lanka, Bagladesh)	GARCH ARCH LM test Granger causality test	This study found that the stock markets of India, Pakistan and Sri Lanka are strongly integrated.
Chowdhury, Haque & Islam (2017)	Bangladesh, Saudi Arabia, UAE, Kuwait, Europe, UK and Japan	Johansen co-integration test, VECM and Impulse Response Function (IRF) analyses	Bangladeshi Islamic stock market is found to be marginally affecting other stock markets but not as strong as Kuwait. Global Islamic stock market seems to have very little impact on Bangladesh Islamic stock market.

in Bangladesh slightly affects the other stock markets except the Kuwait Islamic stock market. At the same time, Global Islamic stock markets are found to have a little influence on Bangladesh Shariah compliant stock market. In a similar way, Sahabuddin et al. (2018) examine the co-movement between Shariah and Sectorial stock price indexes in Bursa Malaysia. Their study reveals a co-integration relationship among the variables. Consequently, empirical evidence shows that Shariah compliant stock index moves together with the composite and ten sectorial indexes in the long run, but in the short run, the speed of adjustment varies among the variables.

In addition, Hamidi et al. (2018) found that in the long run equilibrium, the speed of adjustment for negative deviation is faster than the positive movement, and this finding suggests that investors are more interested to invest their money during the rising stock price movement. In addition, this study proves an asymmetric adjustment with the partial adjustment model which suggests that good news prolongs positive

return, and bad news provides negative return. However, good news is less influential than the bad news.

Recently, Hasan (2019) shows conventional and Islamic stock index co-movement and volatility transmission use ARDL bound to test the co-integration model and EGARCH and GARCHBEEK estimations respectively. The evidence reveals that there are short-run and the long-run linkages between the two indexes. It also indicates a remarkable volatility transmission mechanism in Islamic as compared to conventional stock indexes. Therefore, portfolio diversification benefits are not applicable between the two series. However, policymakers, investors and fund managers, should add and find other faith-based categories of assets in their risk-return portfolios.

This study is the pioneering endeavour that investigates the co-movement between the Islamic and conventional stock markets in Dhaka Stock Exchange, Bangladesh and Bursa Malaysia. The implication of this study contributes in numerous ways to the existing literature.

First, from the perspective of Bangladeshi and Malaysian capital market, this is the first study that investigates the dynamic co-movement of Shariah and non-Shariah compliant stock indexes. Second, this study uses data gathered from the beginning of the formation of the Shariah compliant stock index in Bangladesh, which provide valuable insights regarding the market dynamics. Third, the findings of the study are expected to offer notable understanding and insights to domestic and international investors who are keen on portfolio diversification. Fourth, this study adds valuable knowledge to the current body of literature from the perspective of an emerging economy in both countries, Bangladesh and Malaysia. Lastly, the application of several econometric methods to explore the inter-dependence of the indexes is believed to provide robust results and help in understanding the market comprehensively.

METHODOLOGY AND DATA ANALYSIS

This paper examines the co-movement between the Shariah and non-Shariah compliant stock indexes in Bangladesh and Malaysia using several econometric tests such as the Unit Root Test, Johansen Co-integration, and Vector Error Correction Model (VECM), to address the issue of co-movement between the series. Furthermore, to determine the robustness, the paper employs Variance Decomposition as well as Impulse Response Function (IRF).

An unrestricted vector autoregression (VAR) is usually used when the stationarity of variables at level are confirmed. The VAR model can be written as follows:

$$Y_t = \beta_0 + \sum_{i=1}^p \phi_i Y_{t-i} + \varepsilon_t \tag{1}$$

where Y_t is a vector of $n \times 1$, β_0 is an $n \times 1$ vector of intercepts, ϕ_i is an $n \times n$ coefficient matrix, P is lag numbers and ε_t is a vector of $n \times 1$ error terms.

If the variables are not stationary, the cointegration tests are to be applied to ensure whether there is cointegration or not. VAR model in differences is suitable in the case where the evidence shows no cointegration. Nonetheless, vector error correction model (VECM) estimator is usually conducted if there is cointegration. The VECM can be specified as follows:

$$\Delta Y_t = \delta Y_{t-1} + \sum_{i=1}^p \lambda_i \Delta Y_{t-i} + \theta D_t + \varepsilon_t \tag{2}$$

where Δ is the difference operator, λ_i is an $n \times n$ matrix of coefficient parameters which provide information regarding short-run associations among variables. δ denotes $n \times n$ coefficient matrix which is derived from cointegration and adjustment matrices. D represents intercepts and trends and θ denotes coefficient matrix.

It is worth noting that this paper particularly applies a co-integration test developed by Johansen and Juselius, (1988) to examine the long run relationship between series as it is a better technique to investigate the association between the series in the case of large number of observations. In addition, VAR model is used to choose a suitable lag number because estimating the co-integration requires a selection of lags as a prelude. There are two measures to test Co-integration, namely Trace test and Maximum Eigen value test. The specifications of the tests are written as follows:

$$\phi Trace = -T \Sigma \ln(1 - \phi) \tag{3}$$

The trace postulates a null hypothesis which states that there is no co-integration while the alternative hypothesis states that there is co-integration, and the rejection of null hypothesis implies significance which suggests that most Shariah and non-Shariah stock returns have long-run relationships. On the other hand, the Maximum Eigen value test hypothesizes that there are no long run relationships between Shariah and non-Shariah stock returns in Bangladesh as a null hypothesis while the alternative hypothesis states that there are long run relationships between Shariah and non-Shariah stock returns. The Maximum Eigen test is specified as follows:

$$\phi Max = -T \ln(1 - \phi) + 1 \tag{4}$$

$$\begin{aligned} \Delta DSES_t = & \sigma + \sum_{i=1}^{k-1} \Delta DSES_{t-i} + \sum_{j=1}^{k-1} \phi \Delta DSEX_{t-i} \\ & + \sum_{j=1}^{k-1} \phi \Delta FBMHJSI_{t-i} + \sum_{j=1}^{k-1} \phi \Delta FBMKLCI_{t-i} \\ & + \lambda ECT_{t-1} + u_t \end{aligned} \tag{5}$$

A co-integration approach only focuses on the long run relationships among the variables, and it does not cover the short run property of the model. Instead, a standard time series modelling should explain both the long run and short run movement simultaneously.

DATA

The aim of this study is to examine the co-movement between Islamic and conventional Stock markets in Bangladesh and Malaysia using the official website of Dhaka Stock Exchange and Data Stream as the source of the data. The study used a day-to-day data from the period of 25 January, 2011 to 31 May, 2018, taking into account 5 trading days with a total of 1771 observations. The Dhaka Stock Exchange Shariah (DSES) and FTSE Bursa Malaysia Hijarah Shariah indexes are based on Shariah compliant principles which are taken as a proxy for Islamic index. It complies the Shariah standards strictly in the selection of companies under the Index. The Dhaka Stock Exchange DSEX and FTSE Bursa Malaysia KLCI indexes are designated as a proxy of conventional index.

The first Islamic stock index in Bangladesh known as DSEX Shariah index (DSES) has been introduced in 2014 by Dhaka Stock Exchange (DSE). The inception date of index is January 24, 2011 with the starting value (base value) of 1000. The introduction has been made with a view to enable investors' participation in equity investments that are attuned with Shariah principles. It is expected to oblige as a Shariah-compliant broad market benchmark in evaluating the Bangladesh equity market performance. In designing DSES; S&P and Dow Jones Indices served as consultants to DSE. The Index is constructed as a subset of DSEX, that is the broad market index of DSE. Thus, DSES comprises of those stocks which are incorporated in the parent index and passes the Shariah compliance standard screening system. The screening consists of two broad parameters, namely sector based screen and accounting based screen.

Malaysian economy is one of the emerging economies in the world. Due to dual structured capital markets (Islamic and Conventional), Malaysia has shown an exemplary development in the south Asian regional economy. Islamic stock market has gained a positive momentum and tremendous growth rate in

Malaysia. In 1963, Malaysia started an Islamic finance with a small Islamic saving sector pilgrim fund. Now it has become the third largest Islamic finance industry in the world (Islamic BMB 2011). According to the Security Commission (SC) of Malaysia, Shariah compliant stocks make up 77% of the total stocks, and they comprise 693 counters listed on Bursa Malaysia (Bursa Malaysia 24 May 2018).

Figures 1 and 2 display the stock price performance between Islamic (Shariah compliant) and conventional (non-Shariah compliant) stock indexes in Bangladesh and Malaysia, respectively. The graphical examination shows that all the Shariah and non-Shariah indexes stock price move together, but the volatility clustering varies in the span of time. Precisely, the indexes track the same upward and downward trends and specify co-movement between the two series. Generally, the price movement of Dhaka Stock Exchange of Shariah compliant stock index in Figure 1, shows less volatility than its non-Shariah counterpart; whereas, in Malaysia, the movement of both indexes in Figure 2 is almost the same for price performance and volatility clustering context.

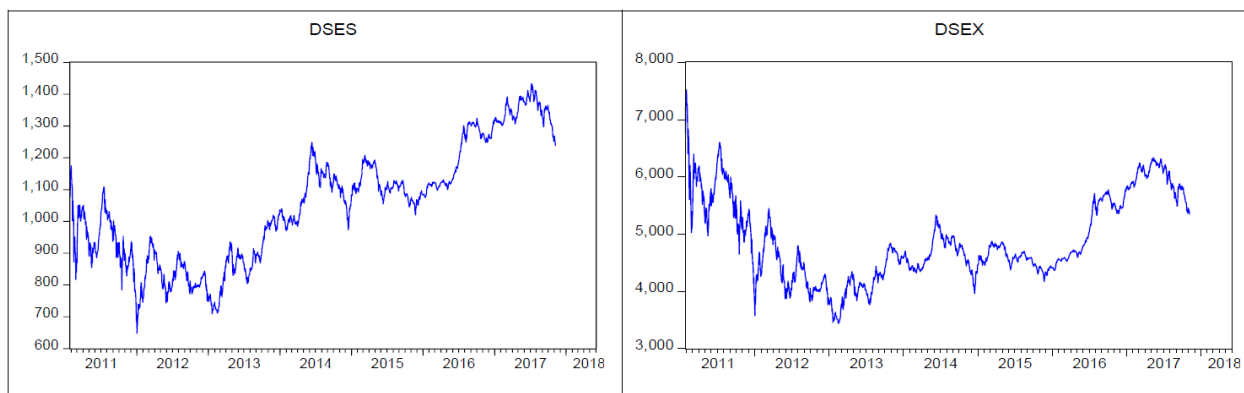


FIGURE 1. Stock price performance between Dhaka Stock Exchange Shariah (DSES) index and Composite (DSEX) index

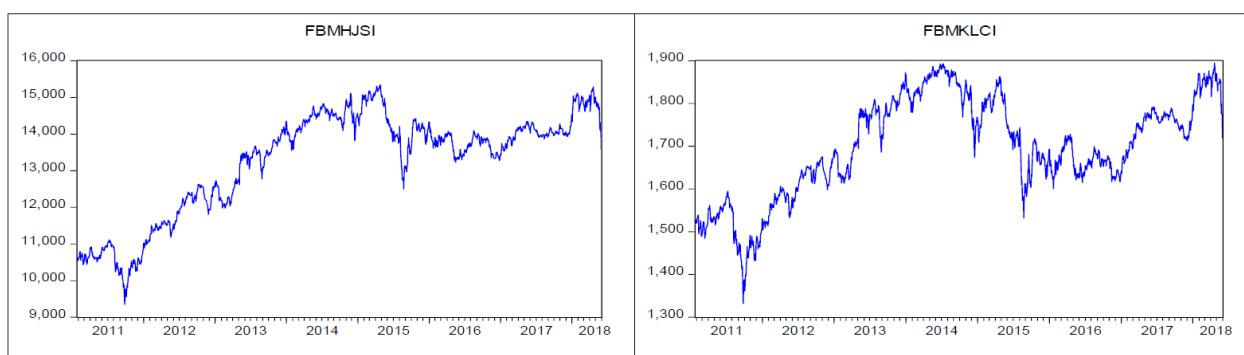


FIGURE 2. Stock price performance between FTSE Bursa Malaysia Hijarah Shariah Index (FBMHJSI) and FTSE Bursa Malaysia Kuala Lumpur Composite (FBMKLCI) index

TABLE 2. Summary of statistics

	DSES	DSEX	FBMHJSI	FBMKLCI
Mean	0.0034	-0.0058	0.0070	0.0034
Std. Dev.	0.5958	0.6118	0.2422	0.2371
Skewness	-0.8441	-0.0872	-0.1047	-0.2712
Kurtosis	19.2500	9.4000	6.6600	6.3400
Jarque-Bera	19689.1300	3027.1900	989.2700	842.4300
Observations	1771	1771	1771	1771

Note: DSES= Dhaka Stock Exchange Shariah Index, DSEX= Dhaka Stock Exchange Composite Index, FBMHJSI= FTSE Bursa Malaysia Hijrah Shariah Index, FBMKLCI= FTSE Bursa Malaysia Kuala Lumpur Composite Index.

RESULTS AND DISCUSSION

SUMMARY STATISTICS

Table 2 represents the summary of statistics among Islamic and conventional stock indexes return data set. The results indicate that the Shariah compliant stock indexes in both Dhaka Stock Exchange, Bangladesh and Bursa Malaysia have the maximum mean returns (0.0034 and 0.0070) compared to their non-Shariah counterparts. This result points to the fact that the investors can earn more by investing in Islamic stocks in both countries instead of investing in conventional stocks. A higher standard deviation of the conventional index in Dhaka stock exchange when compared to Islamic stock index; signifies a higher volatility in the former than in the latter. In the context of Malaysia, Islamic stock index signifies a higher return and higher volatility (risk). However, the kurtosis statistics are positive and higher than 3 for both indexes, reflecting a leptokurtic distribution. The results also show that the data sets of the three indexes are negatively skewed. They indicate left skewed index distribution.

UNIT ROOT TEST

The results of the Unit Root Test are shown in Table 3. To confirm the stationarity of the datasets, this study employs two frequently used techniques: Phillips and Perron (1988) and Dickey-Fuller (1979) tests. The results indicate that the indexes for both Islamic and conventional are non-stationary in levels but stationary in the first difference. Hence, the significance level has been taken at 5% of p-value. This result authenticates the assumption of the co-integration test, which is pertinent to the datasets stationary of identical order.

CO-INTEGRATION TEST

Before establishing the co-integration estimation, it is essential to select the optimal lag length criteria. Without setting an appropriate lag length criteria, the results could be biased which may lead to a wrong decision (Ogunade 2018). Therefore, an unrestricted error correction model

is employed to determine the maximum lag length by applying the following - LR: sequential modified LR test statistic (each test at 5% level), FPE: Final Prediction Error, AIC: Akaike Information Criterion, SC: Schwarz information Criterion and HQ: Hannan-Quinn information criterion. According to the standard criteria and norms, the lower the value, the better the model; thus, the lag length of 3 has been chosen for the co-integration approach. The results are shown in the Table 4.

TABLE 3. Stationarity test

Indexes	P-VALUE	
	ADF	PP
Level and Intercept		
DSES	0.6363	0.5829
DSEX	0.0549	0.0430
FBMHJSI	0.2914	0.3171
FBMKLCI	0.2097	0.2339
First difference and Intercept		
DSES	0.0001**	0.0001**
DSEX	0.0000**	0.0000**
FBMHJSI	0.0000**	0.0000**
FBMKLCI	0.0000**	0.0000**

Note: ** indicate a 5% significance level

TABLE 4. Optimum lag criteria

Lag	LogL	LR	AIC	SC	HQ
0	-47640.29	NA	53.93	53.93	53.93
1	-30974.50	33237.27	35.09	35.14	35.10
2	-30818.26	310.90	34.92	35.03*	34.97
3	-30768.62	98.54	34.89*	35.05	34.94*
4	-30753.50	29.95*	34.89	35.10	34.96

* indicates lag order selected by the criterion, LR: sequential modified LR test statistic (each test at 5% level), AIC: Akaike information criterion, SC: Schwarz information criterion and HQ: Hannan-Quinn information criterion.

TABLE 5. Co-integration test

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistics	0.05 Critical Value	Prob.**
None *	0.0162	51.3708	47.8561	0.0225
At most 1	0.0071	22.4700	29.7970	0.2731
At most 2	0.0032	9.8275	15.4947	0.2942
At most 3 *	0.0024	4.1741	3.8415	0.0410

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

** MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistics	0.05 Critical Value	Prob.**
None *	0.0162	28.9008	27.5843	0.0337
At most 1	0.0071	12.6426	21.1316	0.4856
At most 2	0.0032	5.6534	14.2646	0.6580
At most 3 *	0.0024	4.1741	3.84147	0.0410

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

** MacKinnon-Haug-Michelis (1999) p-values

The results of the co-integration approach is tabulated and it shows the existence of a co-integration among the variables. This indicates that there is a long run relationship between Shariah and non-Shariah compliant stock indexes in Bangladesh and Malaysia. The results show the values of both tests, Trace and Maximum Eigen, which indicate that at least one variable shows the co-integrating equation at 5% level of significance. Therefore, the empirical evidence suggests that a long-run co-integration relationship increases the correlation among the variables, suggesting diminishing portfolio diversification benefits to the investors in Bangladesh and Malaysian stock markets.

VECTOR ERROR CORRECTION MODEL (VECM) ANALYSIS

Table 6 shows the empirical results of VECM Model. VECM is often used to explain the possible short-run causality among the variables which is consistent with the theoretical underpinning of time series data sets. This paper uses VECM to examine the co-movement between Shariah and non-Shariah stock indexes in Dhaka Stock Exchange and Bursa Malaysia. There is a co-integrating association between Shariah and non-Shariah compliant stock markets in Bangladesh and Malaysia. After establishing the co-integrating relationship among the variables, this study has estimated error correction model based on the Vector Autoregression (VAR) approach. The coefficient of VECM is 1.364891, which is negative and highly significant at 1% level. This implies that the previous period of deviation for long run equilibrium is correct as the speed of adjustment is at 1.36% in the

short-run. On the other hand, a percentage change in DSEX is associated with an average of 6.29% decrease in FBMHJSI among the variables in the short-run.

These findings confirm that there is a stable long-run causality among the variables. Furthermore, Dhaka Stock Exchange Shariah (DSES) index shows $(1.364891/0.12549=10.88)$ as an endogenous (dependent) variable, whereas other variables indicate exogenous (independent) variables. This trend indicates that the DSES is the follower, and the rest of the variables are the drivers.

VARIANCE DECOMPOSITION (VDC) TEST

The Variance Decomposition test is applicable to discover the forecast error. It gives the percentage of unexpected variation in each variable that is produced by shocks from the variables. The results of Variance Decomposition (VDC) test are shown in Table 7. The findings show that the variance of decomposition of DSES explains itself and 100% of forecast error variance in period 1 and 86% of forecast error variance in period 8 which is not much affected by DSEX, FBMHJSI and FBMKLCI. The contributions of DSEX, FBMHJSI and FBMKLCI are strongly exogenous. It implies that they have a very weak influence on predicting DSES in the future. On the other hand, the variance of decomposition of DSEX explains 28.23% of forecast error variance for one day and 22.46% of forecast error variance for ten days of its own shocks. The contributions of FBMHJSI and FBMKLCI are strongly exogenous, but DSES is strongly endogenous. It implies that FBMHJSI and

TABLE 6. VECM test

Error Correction:	D(DSES)	D(DSEX)	D(FBMHJSI)	D(FBMKLCI)
CointEq1	-1.3649 (0.1255) [-10.8765]	0.5228 (0.1377) [3.7965]	0.0042 (0.0555) [0.0752]	-0.0640 (0.0545) [-1.1745]
D(DSES(-1))	-0.1095 (0.1047) [-1.0453]	-0.5163 (0.1149) [-4.4923]	-0.0006 (0.0463) [-0.0130]	0.0496 (0.0455) [1.0910]
D(DSES(-2))	-0.2305 (0.0761) [-3.0269]	-0.4259 (0.0836) [-5.0981]	-0.0234 (0.0337) [-0.6939]	0.0108 (0.0331) [0.3281]
D(DSES(-3))	-0.1711 (0.0428) [-4.0009]	-0.2456 (0.0469) [-5.2202]	-0.0407 (0.0189) [-2.1490]	-0.0248 (0.0186) [-1.3365]
D(DSEX(-1))	-0.6293 (0.0999) [-6.2988]	-0.2992 (0.1096) [-2.7290]	-0.0025 (0.0442) [-0.0563]	-0.0496 (0.0434) [-1.1427]
D(DSEX(-2))	-0.2262 (0.0745) [-3.0344]	-0.1018 (0.0818) [-1.2449]	-0.0080 (0.0330) [-0.2425]	-0.0439 (0.0324) [-1.3560]
D(DSEX(-3))	-0.0659 (0.0433) [-1.5208]	-0.0203 (0.0475) [-0.4276]	0.0232 (0.0192) [1.2090]	0.0044 (0.0188) [0.2315]
D(FBMHJSI(-1))	-0.3141 (0.1369) [-2.2949]	0.1671 (0.1502) [1.1129]	-0.7669 (0.0606) [-12.6653]	-0.0298 (0.0594) [-0.5021]
D(FBMHJSI(-2))	0.0098 (0.1562) [0.0625]	0.2859 (0.1715) [1.6678]	-0.4043 (0.0691) [-5.8492]	0.0734 (0.0678) [1.0819]
D(FBMHJSI(-3))	0.0948 (0.1329) [0.7135]	0.3549 (0.1458) [2.4336]	-0.2612 (0.0588) [-4.4420]	-0.0186 (0.0577) [-0.3230]
D(FBMKLCI(-1))	0.4257 (0.1376) [3.0933]	-0.0092 (0.1510) [-0.0609]	0.1202 (0.0609) [1.9743]	-0.6254 (0.0598) [-10.4661]
D(FBMKLCI(-2))	0.1247 (0.1568) [0.7953]	-0.1700 (0.1721) [-0.9877]	0.0198 (0.0694) [0.2850]	-0.4724 (0.0681) [-6.9377]
D(FBMKLCI(-3))	-0.0698 (0.1350) [-0.5171]	-0.3314 (0.1482) [-2.2372]	0.0352 (0.0597) [0.5894]	-0.2231 (0.0586) [-3.8058]
C	-0.0015 (0.0144) [-0.1007]	-0.0019 (0.0159) [-0.1227]	-1.6E-05 (0.0064) [-0.0025]	9.1E-05 (0.0063) [0.0145]

FBMKLCI have a very weak influence, but DSES has a very strong influence on predicting DSEX in the future. Consequently, FTSE Bursa Malaysia Hijrah Shariah (FBMHJSI) index explains approximately 99% variations by itself for period 1 and almost similar variation for period 10 which implies that there is no fluctuation of its own shocks for predicting forecast error in the future. However, the contribution of other variables (DSES, DSEX and FBMKLCI) is strongly exogenous which shows that they have a weak influence

on predicting FBMHJSI in the future. These findings suggest that Islamic stock indexes absorb less fluctuations or variation of their own shocks on predicting forecast error in the future than conventional stock indexes in both countries, Bangladesh and Malaysia.

IMPULSE RESPONSE FUNCTION (IRF) ANALYSIS

The current study employs the 'impulse response function' analysis to see how the Shariah and non-

TABLE 6. Variance Decomposition (VDC) test

Period	S.E.	DSES	DSEX	FBMHJSI	FBMKLCI
1	0.6071	100.0000	0.0000	0.0000	0.0000
2	0.6526	87.6942	11.9203	0.3855	1.2E-05
3	0.6886	87.1941	12.1870	0.5424	0.0765
4	0.7196	87.1586	12.2182	0.4972	0.1260
5	0.7748	87.4998	11.9094	0.4722	0.1187
6	0.8049	86.6729	12.6889	0.5280	0.1102
7	0.8392	86.4231	12.9029	0.5441	0.1299
8	0.8710	86.2023	13.1312	0.5263	0.1402
Period	S.E.	DSES	DSEX	FBMHJSI	FBMKLCI
1	0.6662	71.7716	28.2284	0.0000	0.0000
2	0.6833	71.5807	28.1118	0.2525	0.0550
3	0.7157	72.5345	27.1431	0.26077	0.0616
4	0.7558	74.1243	25.5437	0.2359	0.0961
5	0.8161	76.2424	23.3729	0.2044	0.1802
6	0.8499	75.8882	23.6917	0.2535	0.1665
7	0.8865	76.6073	22.9878	0.2513	0.1536
8	0.9220	77.1566	22.4642	0.2372	0.1420
Period	S.E.	DSES	DSEX	FBMHJSI	FBMKLCI
1	0.2686	0.0471	0.0024	99.9505	0.0000
2	0.2841	0.0577	0.0046	99.7412	0.1965
3	0.3034	0.5042	0.0059	99.3069	0.1830
4	0.3200	0.4773	0.0243	99.3077	0.1905
5	0.3488	0.4028	0.1135	99.3195	0.1642
6	0.3670	0.4323	0.1105	99.2791	0.1782
7	0.3852	0.4623	0.1030	99.2723	0.1624
8	0.4020	0.4516	0.0953	99.2909	0.1622
Period	S.E.	DSES	DSEX	FBMHJSI	FBMKLCI
1	0.2636	0.0588	0.0278	84.4584	15.4550
2	0.2791	0.0905	0.0569	84.3351	15.5175
3	0.2967	0.7126	0.0554	84.5507	14.6813
4	0.3130	0.7039	0.1687	84.0129	15.1146
5	0.3415	0.5950	0.1470	84.2360	15.0220
6	0.3593	0.6436	0.1690	84.1975	14.9900
7	0.3766	0.7083	0.1622	84.3605	14.7690
8	0.3930	0.6980	0.1638	84.2505	14.8877

Note: Cholesky Ordering: DSES DSEX FBMHJSI FBMKLCI respectively.

Shariah compliant stock indexes react to the short run temporary shocks. The analysis is derived from the estimation of VAR model. Figure 2a represents the impulse response function between DSES index to DSEX, FBMHJSI and FBMKLCI. The results of Impulse Response Function suggest that Dhaka Stock Exchange Shariah (DSES) Index responds positively to the shock produced by the Dhaka Stock Exchange Shariah (DSES) and non-Shariah stock (DSEX) index. From the early stage of period 1 to 2, the response sharply decreases but interestingly, after period 2, Dhaka Stock Exchange Shariah (DSES) Index positively and

steadily responds to the shock produced by the Dhaka Stock Exchange Shariah (DSES) and Non-Shariah stock (DSEX) indexes. Surprisingly, Dhaka Stock Exchange Shariah (DSES) index responds negatively to the shock produced by FBMHJSI and FBMKLCI indexes. From the early stage of period 1 to 2, the response is negative for FBMHJSI and positive for FBMKLCI. After period 2, shocks remain stable up to period 10. Figure 2b represents the impulse response function between DSEX index to DSES, FBMHJSI and FBMKLCI. The results of Impulse Response Function indicate that Dhaka Stock Exchange composite (DSEX) index

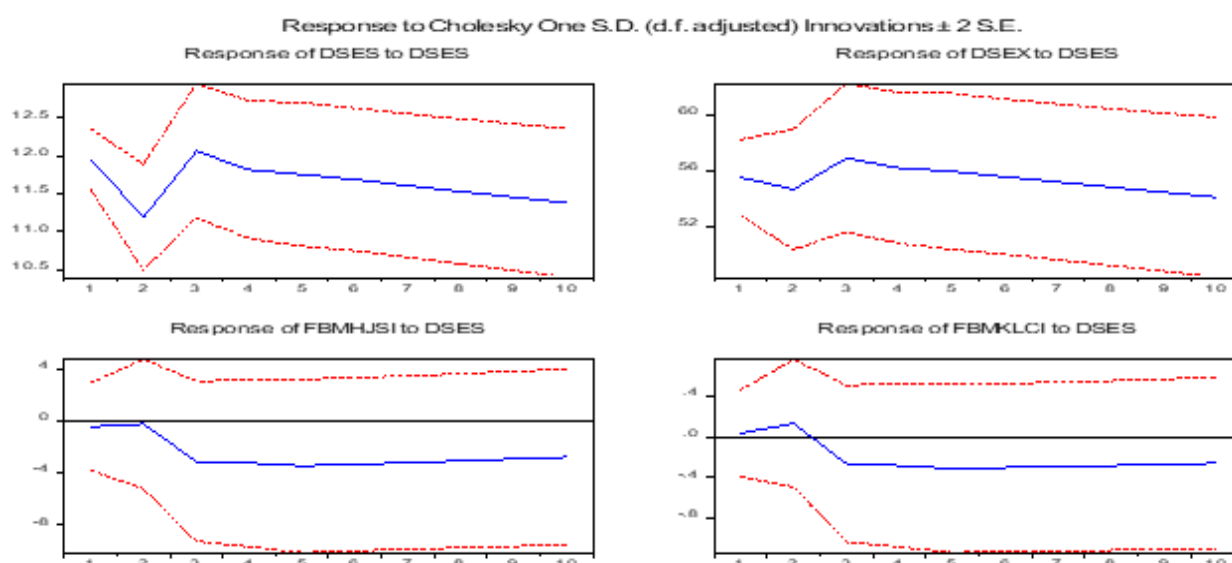


FIGURE 2a: Impulse response function: DSES TO DSES, DSES TO DSEX, FBMHJSI TO DSES and FBMKLCI TO DSES

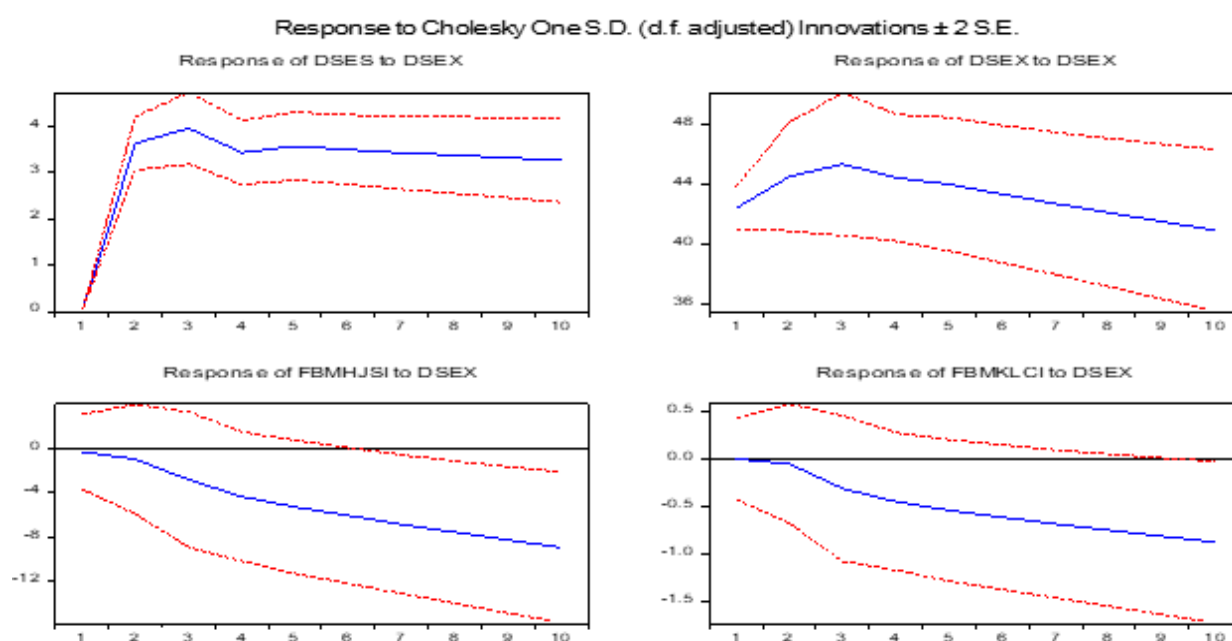


FIGURE 2b. Impulse response function: DSES TO DSEX TO DSEX, FBMHJSI TO DSEX and FBMKLCI TO DSEX

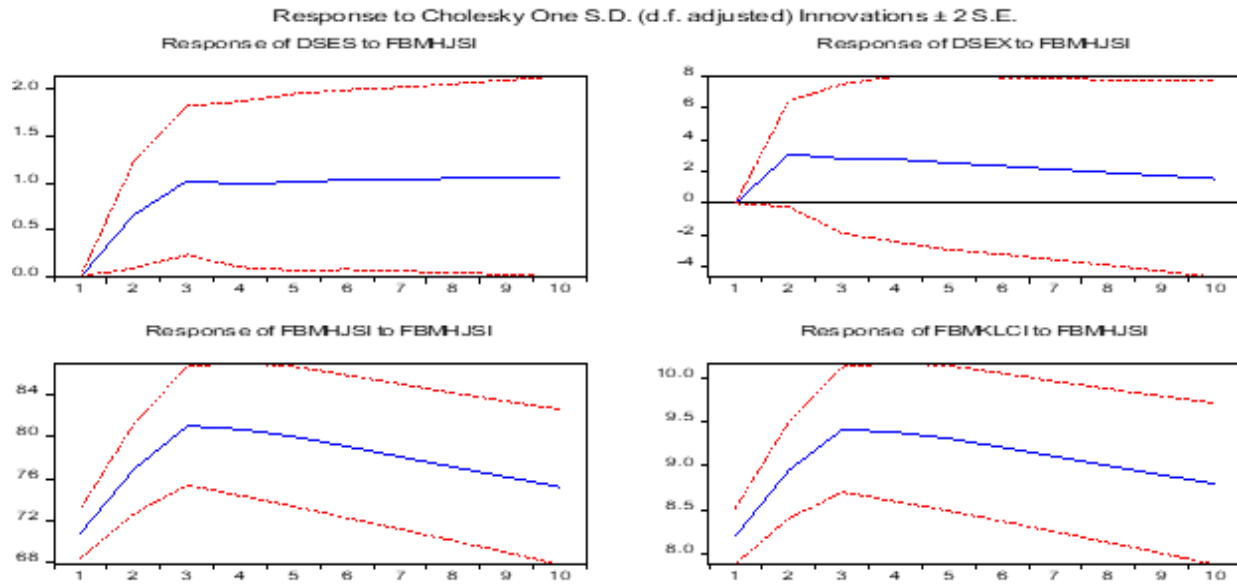


FIGURE 2c. Impulse Response Function: DSES TO FBMHJSI, DSEX TO FBMHJSI, FBMHJSI TO FBMHJSI and FBMKLCI to FBMKLCI

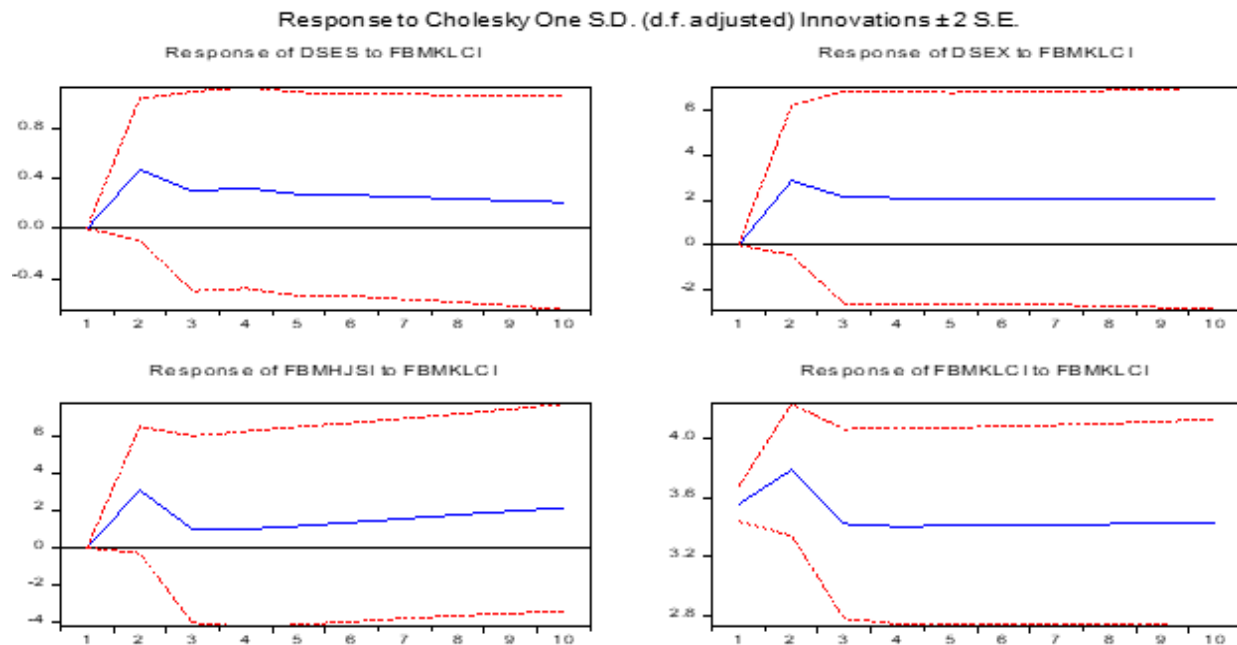


FIGURE 2d. Impulse response function: DSES TO FBMKLCI, DSEX TO FBMKLCI, FBMHJSI TO FBMKLCI and FBMKLCI TO FBMKLCI

responds positively to the shock produced by the DSES, but from the early stages of the period, DSEX responses negatively to the shocks produced by FBMHJSI and FBMKLCI up to period 10. Figure 2c represents the Impulse Response Function between FBMHJSI index to DSES, DSEX and FBMKLCI. The results of Impulse Response Function show that FBMHJSI index responds positively to the shock produced by DSES, DSEX and

FBMKLCI during the full sample period. Figure 2d represents the Impulse Response Function between FBMKLCI index to DSES, DSEX and FBMHJSI. The results of the Impulse Response show that FBMKLCI index responds positively to the shock produced by the DSES, DSEX and FBMHJSI during the full sample period. When one unit shock rises to DSES, the impulse response of DSEX, FBMHJSI and FBMKLCI presents

different facts. DSES affects DSEX positively, but DSES affects FBMHJSI and FBMKLCI negatively for all the days.

CONCLUSION AND IMPLICATIONS

This study examines the co-movement between the Islamic and conventional stock indexes in Bangladesh and Malaysia. This study has made use of daily data which covers the span of time from 25 January, 2011 to 31 May, 2018. Co-integration and VECM are two important standard time series econometric techniques that have been applied to meet the main objective of this study. Unit root tests, namely Dickey and Fuller (ADF) and Phillips and Perron (PP) have been used to test the stationarity among variables. Co-integration VECM test has been employed to test the long run and short run relationships among the variables. In addition, the Variance Decomposition method (VDC) and Impulse Response Function (IRF) approaches have been used to check the robustness among the variables. The empirical results highlight interesting findings. First, there is a significant long run relationship among the variables which restricts the diversification benefits for investors in Bangladesh and Malaysia. Second, the coefficient of VECM is 1.364891 which is negative and is highly significant at 1% level. This implies that the previous period of deviation for a long run equilibrium is correct as the speed of adjustment is at 1.36% in the short-run. Furthermore, the movement indicates that the DSES is the follower, and the rest of the variables are the drivers. As for the robustness, the empirical result of Variance Decomposition shows that there are weak (strong) influences for pre-dating the forecast error of the respective indexes in the short run and long run. Furthermore, the Impulse Response Function shows that the Islamic and conventional stock indexes respond negatively (positively) to the shocks of each other. Hence, the empirical findings suggests that the individual and institutional investors should modify their assets allocations strategy and investment decision in response to the co-integration and shocks effect. In a nutshell, the stakeholders should observe the trend of co-movement in both countries. Further researchers may include others south Asian emerging countries focussing on examining the stock markets co-movement and shocks effect.

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