

Are Islamic Stock Markets Integrated Globally? Evidence From Time Series Techniques

¹Sarkar Humayun Kabir, ²Ginanjar Dewandaru and ³Mansur Masih

¹Assistant Professor of Finance, Faculty of Business Administration, American International University – Bangladesh (AIUB). Currently, he is pursuing PhD in Islamic Finance at INCEIF, Kuala Lumpur, Malaysia. Contact Address: The Global University of Islamic Finance (INCEIF), LorongUniversiti A, 59100 Kuala Lumpur, Malaysia.

²Research assistant and a teaching assistant at INCEIF. Currently, he is pursuing a PhD in Islamic Finance at INCEIF, LorongUniversiti A, 59100 Kuala Lumpur, Malaysia.

³Professor of Finance and Econometrics, The Global University of Islamic Finance (INCEIF), LorongUniversiti A, 59100 Kuala Lumpur, Malaysia.

Abstract: This study attempts to investigate the issue of integration of Islamic equity markets (i) not only whether these markets are moving together or not (ii) but also whether the permanent and temporary components of these markets are moving together or not. Our evidence tends to indicate that these selected Islamic markets are bound together by one cointegrating relationship with the Euro zone Islamic equity market being the most leading one and the U.K. Islamic equity market being the follower. Beveridge-Nelson (BN) time series decomposition analysis reinforces the integration by indicating that both the permanent and transitory components of all these Islamic equity indices tend to move almost together leading to further integration of the Islamic equity markets. Finally, the study tends to suggest that the financial crises did affect the investments in Islamic Equity markets. The findings of this study are also consistent with the Shariah views of economic and financial integration and have strong policy implications.

Key words: Tawhid; Shariah screening; Islamic stock market integration, Johansen cointegration; Vector Error Correction Model; Variance Decompositions; Impulse Response functions; Persistence Profile; Beveridge-Nelson time series decomposition.

INTRODUCTION

Integration of financial markets, the central locus of International finance, is one of the important phenomena of open market economic system. In an open market system, nations are free to move with their businesses and investments across the borders without minimum trade barriers in general and in a specific region in particular. Glaring example is the creation of European Monetary Union (EMU) with euro as the common currency introduced on January 1st, 1999, which is the resultant of the initial creation of European Monetary System (Kim, Moshirian, and Wu, 2005). Not only currency, even commodity such as oil could play an important role in economic and financial market integration. Study by Chaudhury and Boldin (2012) found that there is evidence of cointegration between the equity indices of Gulf Cooperation Council (GCC) countries, which could be due to some of the common factors that link these markets. For instance, these markets are heavily dependent on oil and other energy related commodities. Besides, these nations are attempting to have a common currency to create a greater integration in terms of trade, commerce, and money supply.

Apart from conventional economic system, the concept of integration in general and financial integration in particular has been engraved in the principles and thoughts of Islamic economic system as well. The concept of integration has been instilled in the solidarity and brotherhood advocated by Islam. Allah the almighty emphasized on brotherhood and cooperation among human being. Allah said that indeed, this brotherhood (religion of Islam) of men is one brotherhood, which is based on one basic foundation. The men who are deviating from the one brotherhood of Islam will be trialed as all their deeds (activities) will be recorded (al Quran, 21: 92, 21: 93 and 21: 94). According to the meaning of Tawhid, if Allah the almighty is one, then Allah's best creation human being with their mankind should be one. Chapra (2001) asserted that the apparent disparities in terms of nationality, race, creed, and color are artificial and have no place in Islam. The holy Quran clearly points out that human beings were created as one nation (ummah) but became divided because of their differences (al Quran, 10:19). Conflicts of interest, prejudices, exploitation and misuse of power have taken their toll in dividing mankind. However, the ultimate objective of Islam is to reunite all of them (al Quran, 11:118 and 11:119). Here Allah the almighty is also conveying the message that those who are receiving mercy from Allah, will not diverge and they will be in the right path. And those who are deviating from the right path

Corresponding Author: Mansur Masih, Professor of Finance and Econometrics, The Global University of Islamic Finance (INCEIF), LorongUniversiti A, 59100 Kuala Lumpur, Malaysia.

Ph: +60173841464 E-mail: mansurmasih@gmail.com

(both Jinn and men) will be sent to the hell all together. Allah the almighty also stressed that increased interaction and cooperation among people would reduce the prevailing gap, misunderstandings and conflicts. Analyzing all the Quranic Ayets (statements), we can easily realize the importance of unity, brotherhood, and cooperation in Islam. Here Allah the almighty in the holy Quran provides proper guidelines of maintaining unity and brotherhood in social and economic structure of human being in order to make an integrated muslim nation. Since economics plays a dominant role in human life, the process of integration may be accelerated if the economies of different countries are also integrated. Even though the concept of economic and financial integration is the essence of Islamic economic system, but practically, financial and stock market integration among Islamic nations is in question.

Researchers have dealt with the stock (equity) market integration in a number of ways in terms of variables and techniques. Classically, multiple regression and correlation have been used to examine the relation of one market with another. Further improvement over the traditional regression technique is the use of Johansen cointegration technique to examine the long run theoretical relationship among the markets. Decomposing variables into their permanent (non-stationary) and transitory (stationary) components would be an added advantage for the researchers for more precise analysis and prediction. This decomposition of the time series can be done by multivariate Beveridge-Nelson (BN) decomposition technique within a cointegrating framework.

The main objective of this study is to investigate the issue of integration of Islamic equity markets (i) not only whether these markets are moving together i.e., cointegrated or not (ii) but also whether the permanent and temporary components of these markets are moving together or not.

One of the dominant factors of cointegration of Islamic equity markets is the unified Shariah screening process in order to qualify stocks as halal (Shariah compliant) stocks to be included in Islamic equity indices. Even though different Islamic equity indices follow slightly different criteria, the common criteria for all Islamic indices are: prohibition of riba, gambling, gaming, mayasir, gharar, and production of unethical entertainment products. As this study is considering selected Dow Jones (DJ) Islamic equity indices, the Shariah screening criteria outlined by DJ are:

- Total debt divided by trailing 24-month average market capitalization must be less than 33 percent.
- The sum of a company's cash and interest-bearing securities divided by trailing 24-month average market capitalization must be less than 33 percent.
- Accounts receivables divided by trailing 24-month average market capitalization must be less than 33 percent.

Moreover, according to DJ stock screening process, stocks of firms engaged in the production of alcohol, pork-related products, conventional financial services, entertainment, tobacco, and weapons and defense are not qualified and certified as halal (Shariah compliant) stocks.

The results of this study would be valuable for researchers and academicians of economics and finance in general and of Islamic finance and economics in particular. In addition to academia and research, policy makers would make the best use of the outcome of this study in formulating effective policy measures to boost the Islamic equity markets globally. Moreover, investors in general and portfolio managers in particular would benefit from the findings of the study with a view to setting up profitable and efficient portfolio strategies.

To the best of our knowledge, this study would be the first to examine the issue of the integration of Islamic equity markets along with their permanent and transitory components employing modern time series techniques taking into account the linkage between the conventional and Islamic views of economic and financial integration.

This study finds one significant cointegrating relationship among the selected Islamic equity indices with the United Kingdom Islamic equity index being the only endogenous (i.e. dependent) index and Euro zone Islamic equity index being the most exogenous (i.e. most independent and dominant) Islamic equity market among the selected Islamic equity indices. This study also showed that a linear combination of the selected Islamic equity indices moves back to equilibrium condition after a certain period following any economic shock even though the equity indices are non-stationary in isolation. Beveridge-Nelson (BN) time series decomposition (into their permanent and transitory components) results show that permanent and transitory components of all Islamic equity indices tend to move almost together leading to integration of Islamic equity markets. Results of this study support the damaging effect of 2008 global financial crisis on the Islamic equity markets.

Remaining part of the study is organized as follows: section two reports the motivation of the study followed by the summary of the literature review of the study in section three. Sources of data and methodology of the study are presented in section four. Results and their interpretations are described in section five. Finally, the study wraps up with concluding remarks and policy recommendations in section six.

Motivation of the Study:

One of the great lessons of the portfolio theory of finance is that the investors can gain from portfolio diversification. However if the markets are fully integrated, the gains from diversification would be very limited indeed. A major objective of this study, therefore, is to investigate whether the Islamic stock markets are integrated or not which would have implications for portfolio diversification. There have been a lot of studies to investigate the issue of conventional stock market integration. But the studies on the integration of the Islamic stock markets are still very limited. This study intends to fill in this gap by employing the time series techniques of cointegration, vector error correction model, variance decomposition, impulse response functions, and persistence profile. Moreover, this study would apply the Beveridge-Nelson (BN) decomposition of a time series into its permanent (non-stationary) and transitory (stationary) components. Although the BN decomposition is not new but the BN decomposition within a cointegrating framework has been available only recently. Arguably, this study would be the first attempt to apply BN decomposition of a time series within a cointegrating framework in conjunction with the time series techniques in Islamic capital market research with a view to examining the issue of integration of Islamic equity markets, which is supported by Shariah rulings. The study used Dow Jones Islamic equity indices of Asia-Pacific, Kuwait, Europe, United Kingdom, and United States. The outcome of this study would be valuable for the investors in general and portfolio managers in particular in setting their portfolio diversification strategies. In addition, policy makers should be aware of the result of this study with regard to formulation of new policies and prudential regulations for the Islamic equity markets, given that the level of integration plays an important role as one of the key indicators for stock market development and portfolio diversification.

Literature Review:

Financial and equity market integration, the general focus of this study, has been an interest area of the economics and finance researchers for a long period of time applying mere classical to most modern econometric techniques. The main objective of this study, examining the cointegration of Islamic equity indices with decomposition into their permanent and transitory components, is still a new area of research in Islamic finance and economics. A summary of a few significant research is outlined below.

Stock Market Integration:

Stock markets have been theoretically and empirically recognized as a source of financial development and economic growth. Many literature show that a well-functioning stock market can promote economic growth by fuelling the engine of growth through faster capital accumulation, productivity improvements, and by improving economic efficiency through better resource allocation (Levine & Zervos, 1993, 1998; Atje & Jovanovic, 1993; Rousseau & Wachtel, 2000; Beck & Levine, 2002; Caporale, Howells, & Soliman, 2004; Toda & Yamamoto, 1995; and others). One of the key indicators of stock market development is the degree of stock market integration. Financial integration has been the major trends in the globalized economy to offer opportunities and remove barriers for international portfolio, providing significant impacts for portfolio allocation and asset pricing (Bartram & Dufey, 2001). Other studies have mentioned that financial openness and integration is very essential to: boost economic growth, improve factor productivity, lower cost of capital, promote better corporate governance, increase size and liquidity (Bekaert, Harvey, & Lundblad, 2005; Quinn & Toyoda, 2008; Rajan & Zingales, 2003; Gourinchas & Jeanne, 2006, and others).

There are numerous empirical studies which attempt to measure the degree of stock market integration in different regions. In Eurozone, some studies have investigated the increase of cross-border assets trading, indicating the increase of financial integration among its members. Lane (2006) finds that monetary union (EMU) has increased cross-border bond holdings among the Eurozone countries. De Santis & Gerard (2009) show the adoption of EMU which has enhanced regional financial integration by improving the access of Eurozone investors to euro area markets. Eurozone investors have reallocated considerably higher portfolio shares to Eurozone equity and fixed income assets. In other studies, some mention the important role of euro as a single currency which has increased international equity investment among its members (Lane & Milesi-Ferretti, 2008; Coeurdacier & Martin, 2009). Askari & Chatterjee (2005) find that the euro has benefited the non-euro area countries through a lower cost of capital. Non-euro countries pay less to diversify risk when purchasing euro assets (Coeurdacier & Martin, 2009).

On the other hand, we may observe different financial landscape of integration when it comes to emerging countries. Kim *et al.* (2006) find that the financial markets of East Asian countries are less integrated with each other than to the global market. Even though the degree of financial integration in East Asia has recently increased but it is mainly due to the integration with the global market (Jeon *et al.*, 2006). Lee (2008) shows that the degree of regional East Asian financial integration lags trade integration. Specifically, Kawai (2005) mentions the role of foreign direct investment (FDI) and FDI-driven trade, due to the rise in Asian newly industrialized economies' investment, to boost the integration of the East Asian economies. Another study measure the savings-investment correlation whereby although the correlation in East Asia has decreased over

time, it is still higher compared to that of the OECD economies, which indicates low capital mobility (Kim *et al.*, 2007). By applying the cointegration technique to five equity markets in the ASEAN countries, Click and Plummer (2005) find only one cointegrating vector, implying incomplete integration. Yu, Fung, and Tam (2010) assess the market integration among South Korea, Mainland China, Hong Kong SAR, Taiwan, Japan, Singapore, Malaysia, Indonesia, Thailand, and the Philippines, and find incomplete process of integration, which may due to the political, economic and institutional aspects across jurisdictions in Asia.

Islamic Capital Market:

There have been a number of empirical studies in Islamic capital markets. Al-Zoubi & Maghyereh (2007), applying the Risk Metrics, Student-t APARCH and skewed Student-t APARCH, showed that the DJIM is less risky than its respective benchmark. Hassan and Tag El-Din (2005) apply duration dependence tests of survival analysis, and find none of the evidence of speculative bubbles for weekly and monthly returns of AMANX, AMAGX and DJIMI. Hakim & Rashidian (2002) use a CAPM and find that the DJIMI performs well as compared to the Dow Jones World Index (DJW), but underperforms the Dow Jones Sustainability World Index (DJS). By capturing the effects of industry, size, economic conditions, and performance measures, some studies show that Islamic indices outperform during bull period while underperform during bear period, with the reasons of investing in growth and small-cap firms (Hussein 2004, 2005; Girard & Hassan, 2005). Other studies have focused on mutual funds' performance, and find that Islamic funds perform averagely similar to other conventional counterparts, and even are subject to multiple regimes (Hassan, Antoniou & Paudyal, 2005; Elfakhani, Hassan & Sidani, 2005; Hassan & Antoniou, 2006; Abdullah, Hassan, & Mohamad, 2007). Hoepner, Rammal, & Rezec (2011) find that Islamic funds from Malaysia or GCC neither significantly underperform their respective benchmarks nor are significantly affected by small-size stocks.

Beveridge-Nelson Time Series Decomposition:

The Beveridge-Nelson (BN) decomposition, first introduced by Beveridge & Nelson (1981) within the linear univariate context using ARIMA specification that commonly yields a dominant trend, whereas the structural time series approach yields a dominant cycle. Later on, Stock & Watson (1988) developed a more generalized approach of BN decomposition for multivariate cases to decompose an integrated economic time series into the sum of unobservable trend and cyclical components. The BN permanent component (trend) is defined as the long-horizon forecast of the level of the time series (adjusted for the drift term). Their contribution to time series decomposition was supported by the works of King, Plosser, Stock & Watson (1987), Vahid & Engle (1993, 1997), Barillas & Schleicher (2003). These papers consider both vector auto regression (VAR) and traditional time series specifications. A particular emphasis in two of these articles (Stock & Watson 1988, Vahid & Engle, 1993) is the ability to formally test for the presence of common features. In particular Stock & Watson (1988) formulate a test to determine common-trends based on autoregressive matrices. Similarly, Vahid & Engle (1993) derived a common-cycle test for series that are cointegrated. In addition to formulating a common-cycle test, they reviewed what they defined as the Beveridge-Nelson-Stock-Watson (BNSW) decomposition. This decomposition relates the cointegration specification to a structural time series framework. Structural time series approach to decompose trend and cycle parts was advocated (amongst others) by Harvey & Jaeger (1993). Specifically, the random disturbances of the permanent and temporary components are constrained to be independent of each other (De Silva *et al.* 2007).

Various other efficient computational methods for the BN decomposition (trend and cycle) have been provided in the works of Curington & Winters (1987), Miller (1988), Newbold (1990), Morley, Nelson & Zivot 2003, Proietti 2002 and Arino & Newbold (1998). In particular, Morley (2002), by employing the state-space approach, provided a general unified framework for exact calculation of the BN trend/cycle components for both univariate and multivariate linear processes. Sinclair (2005) considered the BN decomposition in the form of traditional state space model provides a detailed analysis of the American unemployment rate and GDP paying particular attention to Okun's law.

Morley *et al.* (2003), using US GNP, found that correlation between the trend and cycle components. Moreover, the estimates seem to suggest an almost perfect negative correlation between the two components. A similar outcome is observed for Italian real GDP (Proietti, 2002). The implication of these outcomes is very interesting as the univariate innovation form postulated by Anderson *et al.* (2006) implicitly assumes a perfect correlation between the trend and cycle components.

For the non-linear time series, Clarida & Taylor (2003) provided an extension of the BN decomposition to a particular class of univariate and multivariate time series. According to them, in the nonlinear case, generating long-horizon forecasts is non-trivial, and they suggest a tractable method of doing this using Monte Carlo Integration.

Methodology of the Study:

Sources of Data and Variables:

All data used in this study are secondary and collected from Datastream. This study used five Dow Jones Islamic equity indices (of Asia Pacific, Euro Zone, Kuwait, United Kingdom, and the United States. Total 374 weekly price observations of each index have been used in this study starting from January 05, 2005 to February 29, 2012. The study used all Dow Jones Islamic equity indices as proxies for major Islamic Capital market in order to maintain homogeneity in data. Moreover, these indices are selected based on the importance of the markets, for example, Asia Pacific index covers all major economies in the Asia and Pacific. Similarly, Euro zone index covers Islamic equity markets in all economies in Euro zone. Data of the same span has been used for decomposing the index series into their permanent and transitory components applying the Beveridge-Nelson trend decomposition procedure and plotting the decomposed trends thereafter. The study period also covers the 2008 global financial crisis. In addition to the five indices, this study uses a dummy variable (DUM) with a view to capturing the impact of that crisis on the price movement of the Islamic equity indices.

Table 1: Variables Used in the Study.

Variable	Explanation
LAP	Logarithmic Price of DJ Asia Pacific Islamic Index
LEURO	Logarithmic Price of DJ European Islamic Index excluding United Kingdom(Euro Zone)
LKUW	Logarithmic Price of DJ Kuwait Islamic Index
LUK	Logarithmic Price of DJ United Kingdom Islamic Index
LUS	Logarithmic Price of DJ United States Islamic Index
DUM	Dummy Variable

Table 1 above describes the variables used in this study. Dummy variable is defined as $D = 0$ for no crisis period and $D = 1$ for crisis period in this study.

Figure 1 below depicts the plot of the variables (Islamic Equity price indices) both at level and first difference form.

Plots of the level form variables clearly indicate that the variables are non-stationary. Any prediction with the non-stationary variables would be wrong as the mean and variance (average deviation of the individual price from the mean price) of the variables are not constant over time. On the contrary, plots of the first difference form of the same variables seem to have constant mean and variance over time, which shows that the variables concerned are stationary in their first difference form.

Econometric Modeling:

Traditionally, multivariate regression analysis has been widely used to examine the relationship between variables, which has serious limitations because of non-stationarity nature of most of the macroeconomic and financial variables. With the non-stationary variables traditional regression provides either spurious relationship (if the original ‘‘level’’ form of the variables was non-stationary) or a short run relationship (if the variables were ‘‘differenced’’ to make the original variables stationary) (Masih, Al-Sahlawi, & Mello, 2010). This study, because of the damaging shortcomings of multivariate regression analysis, employs the Johansen multivariate cointegration approach to examine the cointegration among the Islamic equity index prices with a view to checking the long run theoretical relationship of the Islamic indices.

After checking cointegration, this study applies vector error correction model (VECM) to determine the speed of the short-run adjustment towards long term equilibrium by the size of the error correction coefficient. VECM also helps to identify the endogenous and exogenous indices. Endogenous equity index is a dependent variable, the movement of which depends on the changes in the exogenous equity indices, which are independent variables. In addition, this study uses the impulse response and error variance decomposition technique to examine the relative exogeneity/endogeneity of the selected Islamic equity indices. Furthermore, this study employs persistence profile (PF) test to find out the time horizon required for the cointegrating relation to move back to equilibrium point following an economy wide shock. Finally, This study employs Multivariate Beveridge-Nelson decomposition technique within a cointegrating framework in order to decompose the price trends of Islamic equity indices into their permanent and transitory parts. Charting of the permanent and transitory parts of the trend would be very much conducive to track the price movement style of the indices due to the performance (fundamentals) of the firms in the indices and the temporary shocks in the economy.

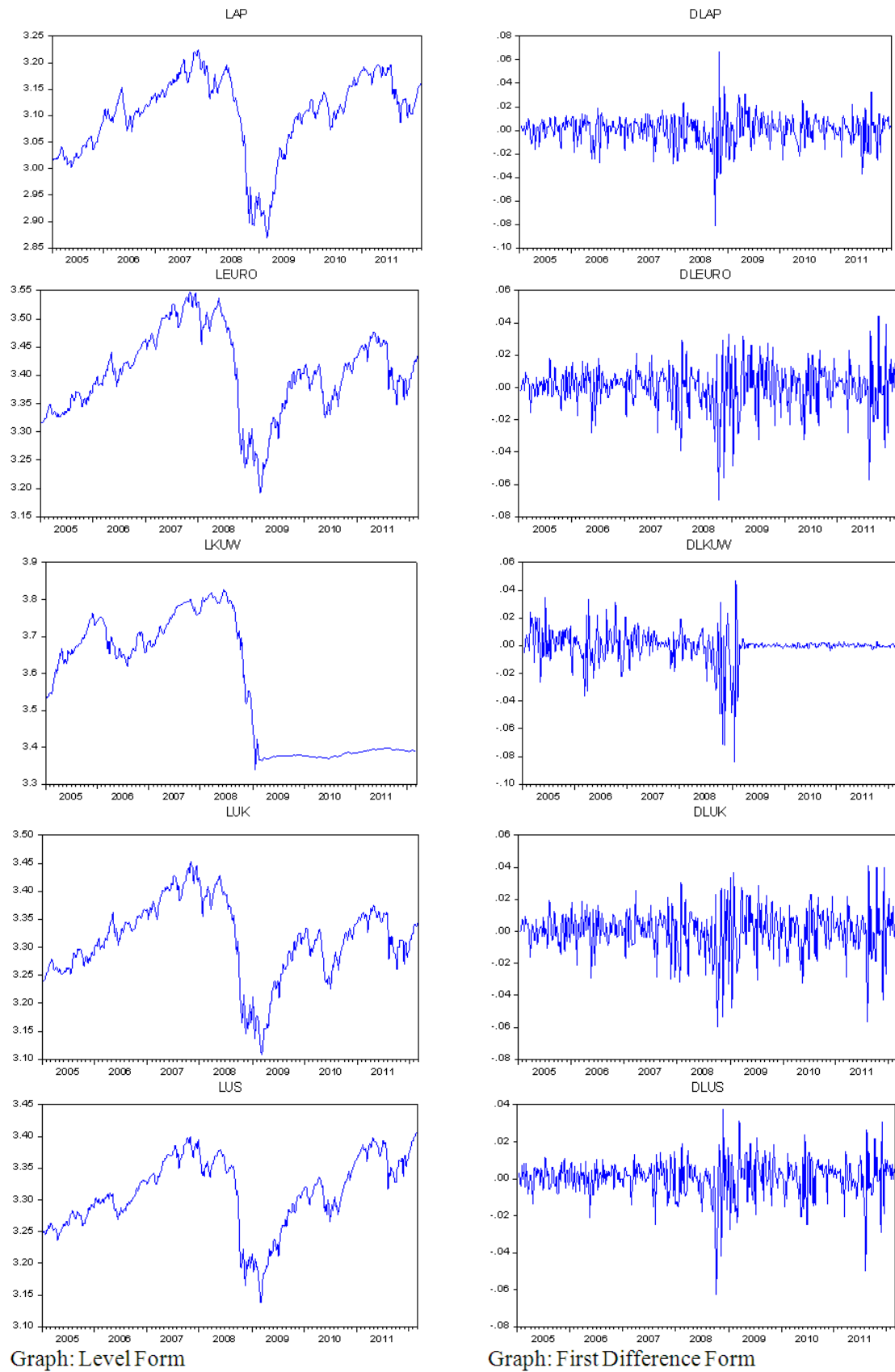


Fig. 1: Plot of Variables.

Johansen Cointegration and Other Related Tests:

The Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests are used to check the stationarity of the variables as a starting point of the Johansen cointegration test. The lag length for the time series analysis is determined by choosing the lag length given by the minimum Akaike Information Criteria (AIC) and Schwarz Information Criteria (SBC). The Augmented Dickey-Fuller (ADF) (1979, 1981) test involves the estimation of the following general specification:

$$\Delta X_t = \alpha_0 + \alpha_1 T + \beta X_{t-1} + \sum_{j=1}^p \delta_j \Delta X_{t-j} + \varepsilon_t \tag{1}$$

The Phillips-Perron (PP) (1988) test suggests a non-parametric method of controlling for higher order autocorrelation in a time series and is based on the following equation:

$$\Delta X_t = \alpha_0 + \beta T + \beta_1 X_{t-1} + \sum_{j=1}^p \delta_j \Delta X_{t-j} + \varepsilon_t \tag{2}$$

In both ADF and PP equations, Δ represents the difference operator, α , β , and δ are coefficients to be estimated. X stands for the variable whose stationarity should be checked and ε is the residual term. The critical values for the Phillips-Perron test are the same as those for the Dickey-Fuller test (DF) and depend on whether the DF regression contains an intercept term or a time trend.

After testing the stationarity of the variables, Johansen cointegration technique is employed to examine the cointegration of the concerned Islamic equity indices. Johansen (1988) and Johansen and Juselius (1990) suggested considering the vector autoregressive (VAR) model of the following form:

$$\Delta Y_t = C + \sum_{i=1}^k \Gamma_i \Delta Y_{t-1} + \Pi Y_{t-1} + \varepsilon_t \tag{3}$$

Where, Y_t is a vector of non-stationary variables and C is a constant term. The matrix Γ_i consists of the short run adjustment parameters and matrix Π contains long run equilibrium relationship information between the Y variables. The Π could be decomposed into the product of two $n \times r$ matrix α and β so that $\Pi = \alpha\beta'$, where β matrix contains r number of cointegration and α represents the speed of adjustment parameters. Johansen (1988) and Johansen & Juselius (1990) developed two statistics for identifying the number of cointegrating vectors, which are Trace statistic (λ_{Trace}) and the maximum Eigenvalue statistic (λ_{Max}). These two statistics can be expressed as follows:

$$\lambda_{Trace} = -T \sum_{i=r+1}^N \ln (1 - \hat{\lambda}_i) \tag{4}$$

and,

$$\lambda_{Max} = -T \ln(1 - \hat{\lambda}_{r+1}) \tag{5}$$

Where, λ_i is the estimated value of the i th characteristics root obtained from the estimated parameter matrix Π and T is the number of usable observations. The λ_{Max} statistic tests the null hypothesis that there are at least r cointegrating vectors as against the alternative of (r+1) cointegrating vectors.

Presence of cointegration indicates that there exists a theoretical relationship among the variables and they are in equilibrium in the long run in spite of short-run deviation from each other. Masih *et al* (2010) stated that a test of cointegration can also be considered as a test of the extent of the level of arbitrage activity in the long-term. Cointegration implies that these variables are interdependent and highly integrated (as if they are constituents of one integrated market). Cointegration also implies that each variable contains information for the prediction of other variables. Moreover, the evidence of cointegration has implications for portfolio diversification by the investors. The possibility of abnormal gain through portfolio diversification is limited in the long run in a cointegrated market.

Presence of cointegration, however, cannot express the direction of Granger causality between the variables as to which variable is leading and which variable is lagging (i.e., which variable is exogenous and which variable is endogenous) (Masih, *et al*, 2010). The Vector Error Correction Model (VECM) is applied to determine the endogeneity/exogeneity of the variables. The error correction term (ECT) stands for the long term relations among the variables. At least one of the ECT terms should be significant for the validity of the cointegrating relationship among the variables in the long term. If the error correction term is insignificant, the corresponding dependent variable is 'exogenous'. On the contrary, if the error correction term is significant, the corresponding dependent variable is 'endogenous'. This study estimates Vector Error Correction Model (VECM) following finding cointegration among the indices. The VECM implies that changes in the dependent variable are a function of the level of disequilibrium in the cointegrating relationship i.e., the departure from the

long-run equilibrium as well as changes in other explanatory variables. Considering the variables of this study, the VECM can be represented as follows:

$$\Delta Y_t = C + \Pi Y_{t-k} + \Gamma_1 \Delta Y_{t-1} \dots \dots \dots + \Gamma_{k-1} \Delta Y_{t-(k-1)} + \varepsilon_t \tag{6}$$

In equation (6), $\Pi = (\sum_{i=1}^k \beta_i) - I_g$ is the long run coefficient matrix of the lagged Y_t and $\Gamma_i = (\sum_{j=1}^i \beta_j) - I_g$ is a coefficient matrix of k-1 lagged difference variables, ΔY_t .

For intensive analysis, the generalized (reduced) form of VECM is derived as follows:

$$\Delta Y_t = C + \Pi Y_{t-k} + \sum_{i=1}^{k-1} \Gamma_i \Delta Y_{t-i} + \varepsilon_t \tag{7}$$

In equation (7), ΔY_t is the vector of first differences of the variables. The long run parameter matrix, Π with r cointegrating vectors ($1 \leq r \leq 5$), Π has a rank of r and can be decomposed as $\Pi = \alpha\beta'$, both α and β are $5 \times r$ matrices. β matrix contains the parameters in the cointegrating relationships and α matrix contains the adjustment coefficients which measure the strength of the cointegrating vectors in the VECM. Following estimation of VECM, this study performs variance decomposition technique to break down the variance of the forecast error for each variable into proportions attributable to each variable in the model including its own. The variable which is explained mostly by its own past is the most leading variable. The graphical representation of variance decomposition is called impulse response. This approach is to determine how each endogenous variable responds over time to a shock in that variable and in every other endogenous variable. The impulse response function traces the response of the endogenous variables to such shocks.

Beveridge-Nelson Time Series Decomposition:

Analysis of a time series is associated with decomposition of the time series into a set of interpretable components. Traditionally, a time series can be decomposed as follows:

$$y_t = M_t + C_t + S_t + I_t \tag{8}$$

Where, M_t , C_t , S_t & I_t denote the trend, cyclical, seasonal and irregular component of a time series y respectively at time t .

A more recent decomposition is that by Beveridge & Nelson (1981) who proposed that a time series can be partitioned into a stationary (temporary/transitory) and non-stationary (permanent) components. Formally, they tailored the permanent and temporary decomposition to the stochastic properties of the data. The permanent component always composed of a random walk with the same rate of drift as in the original data. In addition, the permanent component also comprised a disturbance term proportional to that of the original data. The transitory component represents the predictable part of the data, and was expected to dissipate as the series tends to its permanent level as stated by Silva (2007). He also pointed out that there are two different formulations to measure the trend and cyclical components, one is the ARIMA specification which is advocated by Beveridge & Nelson (1981), and the other is the structural time series approach advocated (amongst others) by Harvey & Jaeger (1993). The results from these two procedures are typically very different. The ARIMA specification commonly yields a dominant trend whereas the structural time series generates a dominant cycle. In recent times, there has been an attempt to reconcile these two approaches by Morley, Nelson & Zivot (2003) and Proietti (2002), who concluded that any structural time series model has an ARIMA representation, but not vice-versa.

The derivation of Multivariate BN decomposition starts by stating the Wold decomposition for a vector of time series integrated of order one, which is:

$$\Delta y_t = \mu + C(L)\varepsilon_t \tag{9}$$

Where, $C(0) = I_N$ and $\sum_{j=1}^{\infty} j|C_j| < \infty$. If we assume $\mu = 0$ for simplicity, equation (2) can be rewritten as follows:

$$\Delta y_t = C(1)\varepsilon_t + \Delta C^*(L)\varepsilon_t \tag{10}$$

Where, $C_i^* = -\sum_{j>i} C_j$ for all i and $C_0^* = I_N - C(1)$. Integrating both sides of equation (3) provides the following:

$$y_t = C(1) \sum_{s=0}^{\infty} \varepsilon_{t-s} + C^*(L)\varepsilon_t \tag{11}$$

Equation (4) represents the multivariate BN decomposition, where the first and the second terms denote the permanent (trend) and the temporary (cyclical) components of a time series respectively. In presence of a cointegrating relationship (means if a common trend exists), $C(1)$ will be of reduced rank. Specifically, the rank of $C(1)$ will equal k , where $k < N$ and $C(1)$ can be expressed in the following form:

$$C(1) = \gamma\delta' \tag{12}$$

Where, γ and δ are both of rank k . The common trend BNSW decomposition can be expressed as following:

$$y_t = \gamma\tau_t + C_t \tag{13}$$

Where, τ_t and C_t represent the trend and cycle components at time t . The trend component τ_t can be expressed as follows:

$$\tau_t = b + \tau_{t-1} + \delta' \epsilon_t \tag{14}$$

Repeated back substitution of equation (7) yields the following:

$$\tau_t = \delta' \sum_{s=0}^{\infty} \epsilon_{t-s} \tag{15}$$

Substituting equation (8) into equation (6), we get the following expression:

$$y_t = \gamma\delta' \sum_{s=0}^{\infty} \epsilon_{t-s} + C^*(L)\epsilon_t \tag{16}$$

Equation (9) is the common trend specification of the BN decomposition, which Watson (1994) refers to as the common trend representation of the cointegrated system.

Results and Interpretation:

Descriptive Statistics:

Table 2 below describes the statistical attributes of the Islamic equity indices used in this study. Statistics show that the highest and lowest average prices are attributable to Kuwait Islamic Index and Asia Pacific Islamic Index respectively. Standard deviation shows absolute time independent variability of the return, which is the highest for Kuwait Islamic Index and lowest for United States Islamic Index. This result states that Kuwait Islamic Index is the most volatile (highest risky), which is compensated for by the higher return (higher price). The opposite is valid for the United States Islamic Index.

Table 2: Descriptive Statistics.

	LAP	LEURO	LKUW	LUK	LUS
Mean	3.102	3.404	3.562	3.314	3.311
Maximum	3.225	3.546	3.826	3.453	3.406
Minimum	2.869	3.191	3.339	3.108	3.137
Standard Deviation	0.075	0.074	0.170	0.069	0.057
Skewness	-0.992	-0.275	0.052	-0.492	-0.554
Kurtosis	3.622	2.740	1.284	3.118	2.735

Skewness, the third moment of the any distribution, indicates asymmetry property of any distribution. Zero skewness leads to symmetry of a distribution. On the contrary, positive skewness refers to an asymmetric distribution with larger tail inclined to the right and negative skewness refers to an asymmetric distribution with larger tail inclined to the left. The result shows that distribution of all indices is negatively skewed except Kuwait Islamic equity index, which indicates that equity price distributions are not symmetric leading to higher variability and risk.

On the other hand, kurtosis, the fourth moment of the distribution, measures fatness of any distribution relative to normal distribution. Measures of kurtosis describe how concentrated data are around the mean of the distribution. The more peaked or flat is the distribution, the less normally distributed the data are and vice versa. Ideal value of kurtosis is 3 signifying the normality of the distribution, i.e. the distribution is neither peaked nor flat. Kurtosis value more than 3 indicates leptokurtic (peaked) distribution and the distribution is platykurtic (flat) with a kurtosis value of less than 3. Results show that kurtosis value of Asia Pacific and United Kingdom Islamic Indices are more than 3 indicating fatness of the distribution (leptokurtic). On the contrary, distribution of Europe, Kuwait and United States Islamic Indices are platykurtic as their kurtosis value is less than 3. In both cases, index prices are not normally distributed and consequently price variability and risk are higher.

Unit Root Tests:

This study applied Augmented Dicky Fuller (ADF) and Phillips Perron (PP) unit root tests with intercept and intercept and linear trend to check the stationarity of the Islamic equity indices. Table 3 summarizes the unit root test results.

Table 3: Summary of Unit Root Tests.

Variables	P - values			
	Intercept		Intercept & Linear Trend	
	ADF	PP	ADF	PP
LAP	0.3780	0.3142	0.6984	0.6236
LEURO	0.2850	0.2633	0.6010	0.5744
LKUW	0.5990	0.8846	0.3820	0.5366
LUK	0.2238	0.2599	0.5075	0.5586
LUS	0.4835	0.4573	0.7208	0.6935
Δ LAP	0.0000	0.0001	0.0000	0.0001
Δ LEURO	0.0000	0.0001	0.0000	0.0001
Δ LKUW	0.0000	0.0001	0.0000	0.0001
Δ LUK	0.0000	0.0001	0.0000	0.0001
Δ LUS	0.0000	0.0001	0.0000	0.0001

Both tests assume null hypothesis of non-stationarity against the alternative hypothesis of stationarity. Stationarity of the variables necessitates in accurate and efficient prediction in future. The above test results conclude that all variables are non-stationary at level and stationary at first difference, implying that the variables are integrated of order one, that is, I(1).

Johansen Cointegration Test:

The study applied the standard Johansen Cointegration test in order to check the cointegration among the selected Islamic indices with a VAR order of 3. The VAR order was determined by the appropriate lag length criteria of AIC and SBC. Table 4 shows the cointegration test results.

Table 4: Johansen Maximum Likelihood results for Cointegration.

Cointegration LR Test Based on Maximum Eigenvalue				
H ₀	H ₁	Statistic	95% critical	90% critical
R = 0	R = 1	47.84	37.86	35.04
R <= 1	R = 2	25.89	31.79	29.13
R <= 2	R = 3	1381	25.42	23.10
R <= 3	R = 4	9.1	19.22	17.18
Cointegration LR Test Based on Trace Stochastic Matrix				
R = 0	R = 1	102.91	87.17	82.88
R <= 1	R = 2	55.12	63.00	59.16
R <= 2	R = 3	29.23	42.34	39.34
R <= 3	R = 4	15.41	25.77	23.08

Both maximum eigenvalue test statistic and trace test statistic indicate presence of one cointegrating relationship among the I(1) variables. Results show that calculated eigenvalue statistic null hypothesis (H₀): r = 0 against alternative hypothesis (H₁): r = 1 is 47.84 > 37.86 (95% critical value), which implies rejection of H₀ and acceptance of H₁, and we conclude that there exists one statistically significant cointegrating relationship among the I(1) variables (theoretically cointegration does exist if both Trace and Maximum Eigenvalue statistic or either of the two measures shows the presence of cointegration). Trace statistic also shows presence of one cointegrating relationship among the concerned Islamic indices. Relationship among the variables is not spurious when they are cointegrated. This implies that there is a theoretical relationship among the Islamic indices and they are in equilibrium in the long run even though their movement may deviate from each other in the short run. An evidence of cointegrating relationship implies that there exists a common force that brings Islamic equity indices to equilibrium in the long term. This long run theoretical relationship also states that these Islamic indices are highly integrated and tends to form a common market where gain from arbitrage activity would insignificant. Each Islamic index contains information to predict another Islamic index when they are cointegrated. Possibility of abnormal gain from portfolio diversification would be at minimum when the assets (Islamic indices) are cointegrated. By the same token, multinational firms should prudently formulate their investment policies while investing across the countries.

However, the study finds only one cointegrating relationship among the selected five markets, which indicates as incomplete process of integration among the markets. In other words, the selected five markets are integrated as a whole instead of one-to-one integration, which implies that they are currently experiencing the convergence process. This incomplete process of integration may be attributed to differences in political, economic, cultural and institutional aspects of the concerned markets. In addition, this is understandable that the use of limited financial leverage in screening of Shariah compliant stocks will brings down the degree of

systemic risks. Therefore, Islamic equity indices will be less correlated not only in global market but also in regional markets.

Vector Error Correction Model (VECM):

Presence of cointegration, however, does not indicate the direction of Granger causality between the variables as to which variable is leading and which variable is lagging, i.e. which variable is exogenous and which variables is endogenous. This study applied vector error correction modeling technique in order to precisely identify the exogenous (independent) and endogenous (dependent) variables. Table 5 summarizes the results of vector error correction modeling.

Table 5: Vector Error Correction Estimates.

Dependent Variable	ECT (-1) Coefficient	T-ratio	P-value	Exogenous/Endogenous
Δ LAP	0.011	1.414	0.158	Exogenous
DUMMY	-0.004	1.770	0.077	
Δ LEURO	0.014	1.526	0.128	Exogenous
DUMMY	-0.005	2.320	0.021	
Δ LKUW	-0.009	1.203	0.230	Exogenous
DUMMY	-0.007	3.314	0.001	
Δ LUK	0.028	3.052	0.002	Endogenous
DUMMY	-0.007	2.824	0.005	
Δ LUS	0.9604E-3	0.138	0.890	Exogenous
DUMMY	-0.003	1.772	0.077	

The result shows that the coefficient of error correction term of United Kingdom Islamic Index is significant, which implies that United Kingdom Islamic index is the only endogenous variable. All other Islamic indices taken into account are exogenous variables as their coefficients of error correction terms are insignificant. That tends to signify that the exogenous variables (Asia Pacific Islamic index, Europe (Euro Zone) Islamic index, Kuwait Islamic index, and United States Islamic index) are the driver (leading) variables and the endogenous variable (United Kingdom Islamic index) is the respondent variable. Significance of the error correction term of United Kingdom Islamic index also implies that the deviation of the variables (represented by the error correction term) has a significant feedback effect on the United Kingdom Islamic index that bears the burden of short-run adjustment to bring about long-term equilibrium. In addition, error correction model helps to distinguish between the short-term and long-term Granger causality. The coefficient of error correction term also indicates the speed of short-run adjustment to bring about the long-term equilibrium. The coefficient of the error correction term of United Kingdom Islamic index is 0.028, which states that disequilibrium in the price of United Kingdom Islamic index tends to be corrected by only 2.8 percent in each week. It also indicates that if the long-run equilibrium between the Islamic indices taken into account is disturbed by any shocks, it would take about 36 weeks to restore the equilibrium. This result suggests that the endogeneity of United Kingdom Islamic equity market may be attributed to its relatively smaller size as compared to the other three regions (Asia Pacific, Euro Zone, and United State). Also, the exogeneity of Kuwait Islamic equity market may be due to its least integration with other Islamic equity markets. Finally, table 4 also reports the effect of 2008 financial crisis as evidenced by the significant coefficient of dummy variables.

Variance Decomposition:

Error correction models, although tend to indicate the endogeneity/exogeneity, are unable to distinguish the relative degree of endogeneity or exogeneity of the variables. This study applies variance decomposition technique in order to figure out the relative degree of endogeneity or exogeneity of the Islamic equity indices, the result of which is summarized in table 6. The relative endogeneity or exogeneity of a variable can be recognized by the proportion of the variance explained by its own past. We recognize the most exogenous or endogenous variable by looking at the proportion of the variable explained by its own past. The variable that is explained mostly by its own past, as compared to other variables, is supposed to be the most exogenous or least endogenous variable.

Table 6: Generalized Variance Decomposition Analysis.

Δ LAP	Δ LEURO	Δ LKUW	Δ LUK	Δ LUS
0.306424	0.010393	0.21829	0.251261	0.213632
0.037868	0.852311	0.036003	0.048838	0.02498
0.190881	0.004764	0.261168	0.289798	0.253389
0.192285	0.007432	0.261401	0.299154	0.239727
0.141731	0.006709	0.245226	0.249243	0.357091

The above result asserts that around 26 percent of the forecast error variance of Kuwait Islamic equity index is explained by its own shocks in week 50. As regards the exogenous market, we can observe that around 36

percent of the forecast error variance of United States Islamic equity index is explained by its own shocks in week 50. Whereas, during the same time horizon, around 31 percent, 85 percent, and 30 percent of the forecast error variance are explained by their own shocks for the Asia Pacific, Europe, and United Kingdom Islamic equity indices respectively. This result tends to indicate that Euro Zone Islamic equity index is the most exogenous market, i.e. most influential independent market. It implies that the United Kingdom Islamic equity index is mostly influenced by the changes of the Euro Zone Islamic equity index and we conclude that United Kingdom Islamic equity index (Market) is highly integrated with the Euro Zone Islamic equity index (market) along with other regional Islamic equity market.

Our results may strengthen the evidence of contagion in Euro area during 2008 subprime crisis originating in the United States. The flight-to-quality that triggered market turbulence in Euro zone has considerably affected not only its members but also non-members of Euro Zone. Our findings of variance decomposition tends to indicate that even though United Kingdom does not belong to the final stage of European Monetary Union (EMU) with single currency, the Euro Zone has become the most influential market for United Kingdom in the context of Islamic equity market.

Besides, our result shows that Kuwait Islamic equity index is the least dependent on its own past even though vector error correction model suggests the exogeneity of this market. This inconsistent result tends to indicate the possible least integration of Kuwait Islamic equity index with others.

Impulse Response Functions (IRFs):

IRFs portray the dynamic response path of a variable due to one standard deviation shock to another variable. The IRFs are normalized such that zero represents the steady-state value of the response variable. The following figure 2 reports graphs of the Impulse response functions of the concerned Islamic equity indices.

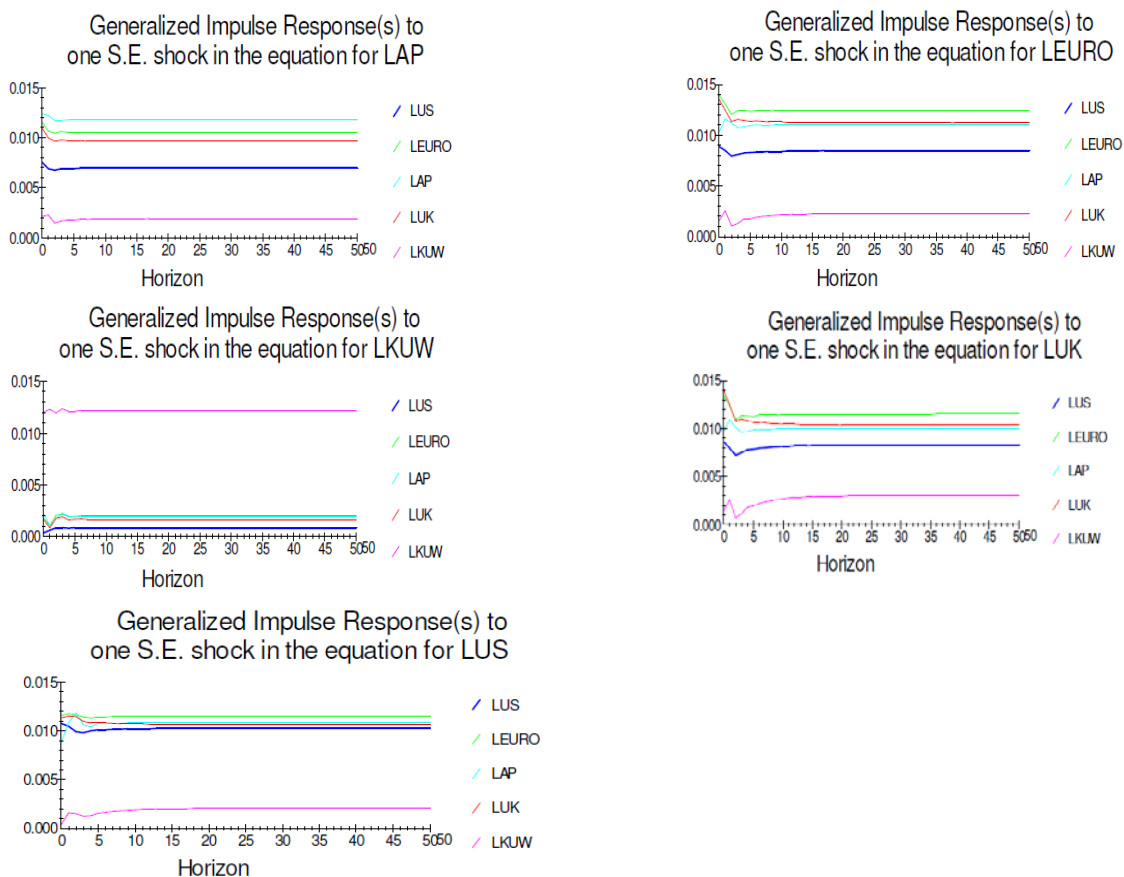


Fig. 2: Impulse Response Functions.

The above impulse response function graphs are consistent with the result obtained earlier from the variance decomposition of the variables, which states that Kuwait Islamic Equity index is the least sensitive to one standard deviation shock to other variables.

On the contrary, United States and Euro zone Islamic equity indices are the most sensitive according to Impulse response functions graph similar to what already explained by the variance decomposition.

The overall results suggest that United States and Euro Zone have played a leading role in Islamic stock market integration. The underlying reason could be attributed to the sequences of crises (2008 subprime crisis

and Euro zone crisis in 2010) they triggered to the global markets recently. This tends to indicate that even though Islamic equity markets portray incomplete process of integration, the two recent crises originated in developed market have questioned the financial stability and resiliency of Islamic capital markets.

Persistence Profile:

The persistence profile indicates the time horizon required for the cointegrating relation to get back to equilibrium when there is a system wide shock. The following figure 3 shows the persistent profile graph.

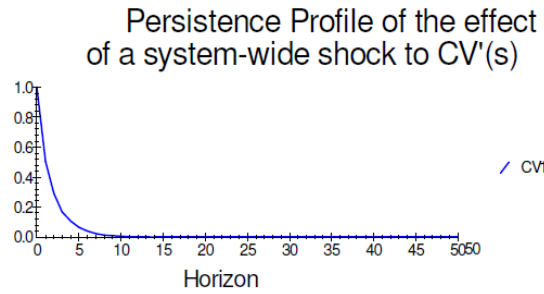


Fig. 3: Persistence Profile of the Effect of a System Wide Shock To Cointegrating Vector

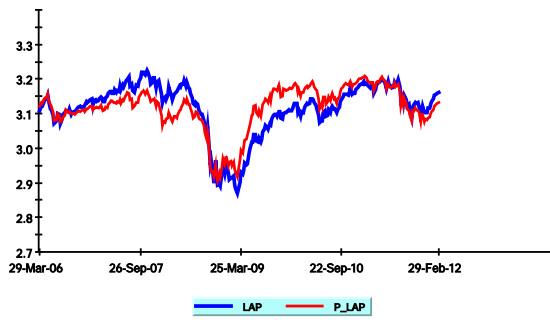
The figure shows that if the whole cointegrating relationship among the Islamic equity indices is shocked, it would take around ten weeks to restore the equilibrium. The relatively rapid long run adjustment to equilibrium relationship may imply a strong degree of integration in the long run, which supports our previous finding that Islamic equity markets are currently experiencing convergence process.

Beveridge-Nelson Time Series Decomposition:

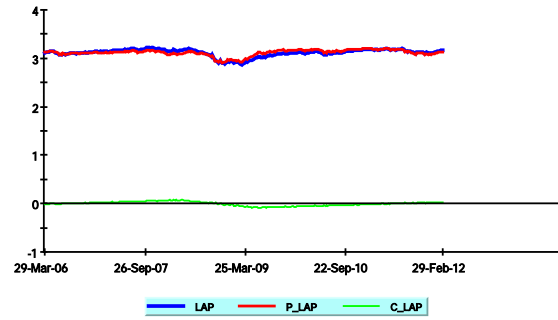
The multivariate Beveridge-Nelson procedure allows to extract a permanent component and a transitory component (cycle) from a non-stationary series. The permanent component is further partitioned into a trend or deterministic part and a stochastic component. The permanent component is the non-stationary part and the transitory (cycle) component is the stationary part of the time series. Permanent term contains a disturbance term proportional to that of the original data. On the contrary, the transitory component represents the predictable part of the data, which should be the main concern for accurate forecast of a variable. Therefore, we should look for underlying stationary processes, in terms of identifiable economic fundamentals, ideally with clear basis in the theory. Then we need to identify the predictive power of such stationary processes for the underlying variables. The transitory components are then simply projections from current values of the underlying stationary processes, and the trends themselves effectively drop out as whatever is left over. The nature of both trends and transitory components must thus depend directly on nature, and predictive power, of the fundamental stationary processes.

The following figure 4 shows the movement of all concerned Islamic equity indices (level form) along with their permanent (non-stationary) and transitory (stationary) elements. By looking at all figures (level data vs permanent), we can observe that both the original series and their permanent components are moving almost simultaneously for all indices except for the Kuwait Islamic equity index after the first quarter of 2009 in particular. During the first quarter of 2009 the permanent component of Kuwait Islamic equity index tends to be more deviated (volatile) from the original data, which indicates that Kuwait Islamic equity index was more volatile as compared to others aftermath the 2008 global financial crisis.

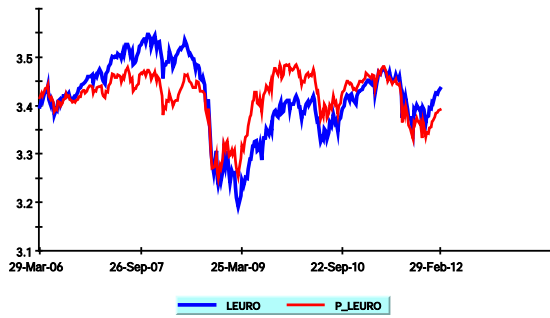
Shocks of 2008 global financial crisis is prevalent on all Islamic equity indices as evidenced by the figures. Surprisingly, effect of this financial crisis is the most dominant in United Kingdom Islamic equity indices, followed by the Europe and United States Islamic Equity indices. This result asserts that Islamic equity market was seriously vulnerable in the whole European continent and United Kingdom in particular, which could be evidenced by the continuous downturn in the European economy. Effect of 2008 Financial crisis is slightly less dominant on United States Islamic equity indices as compared to overall European market (including United Kingdom), which could be attributed to the “Economic Bailout” measures proposed and executed by the President Barack Obama. Interestingly, the effect of 2008 financial crisis on Asia-Pacific Islamic equity index seems to be the lowest among the indices undertaken by this study, which could be attributed to the relatively better position (performance) of individual stocks in the Asia-Pacific Islamic index. We also observe, from figure 4, that transitory components of the time series are almost flat in all cases, indicating the stationary process of the Islamic equity indices.



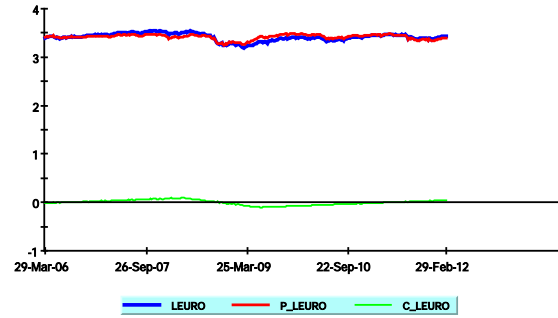
LAP with Permanent Component



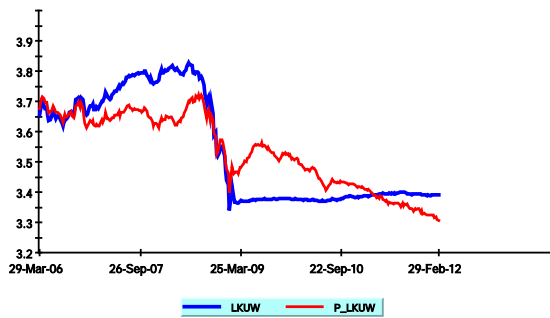
LAP with Permanent and Cycle Component



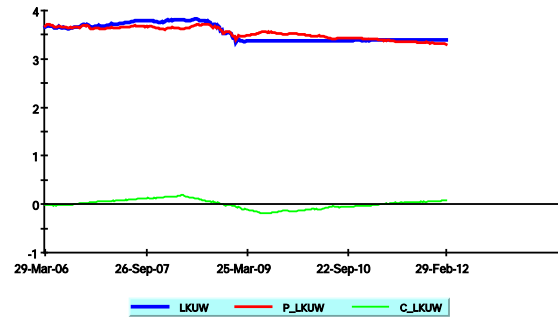
LEURO with Permanent Component



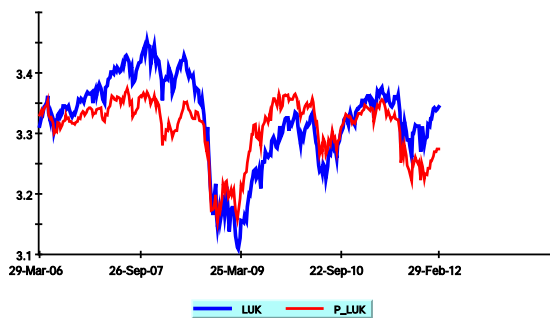
LEURO with Permanent and Cycle Component



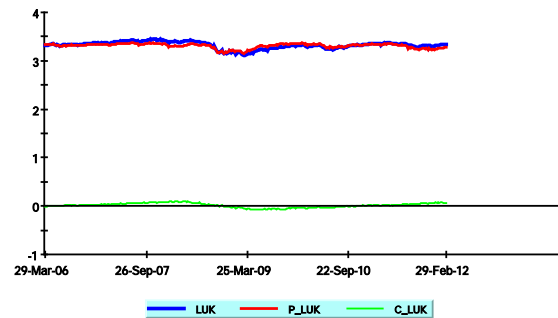
LKUW with Permanent Component



LKUW with Permanent and Cycle Component



LUK with Permanent Component



LUK with Permanent and Cycle Component

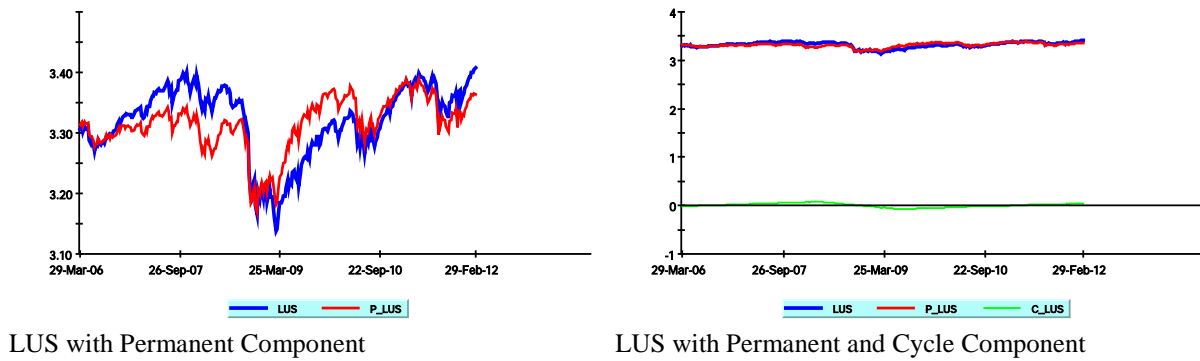


Fig. 4: Stock Indices Trend with their Permanent and Cycle Components.

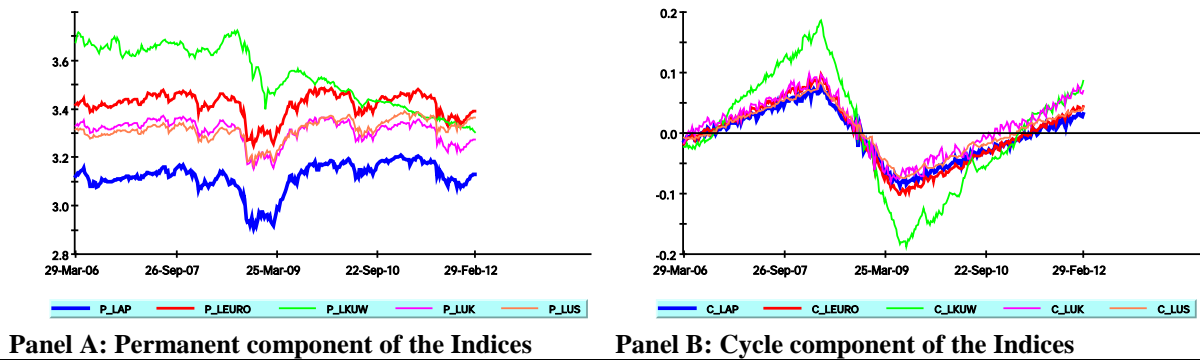


Fig. 5: Stock Indices Trend with all Permanent Components together and all Cycle Components together.

The panel A of figure 5 portrays the permanent components of all the Islamic equity indices undertaken by this study. We can observe that all permanent components of all Islamic equity indices are volatile over the time periods and during the 2008 financial crisis in particular. Notwithstanding this fact, this figure tends to show that Asia-Pacific Islamic index would be the relatively safer investment during crisis period. Surprisingly, cycle (stationary) component of Kuwait Islamic equity index was the most volatile during the crisis period as evidenced by the sharp spike in the graph in panel B of figure 5. This result tends to imply that prediction would be less accurate in case of Kuwait Islamic equity market as the predictable part of the index is the most fickle.

Both of the above results show that the permanent (non-stationary) and transitory (stationary) components of the concerned Islamic Equity indices are moving together and they are integrated in the long-term.

6. Concluding Remarks, Policy Implications and Recommendations:

This study applied the time series techniques to examine the issue of integration of five major Islamic indices (equity markets) of the Asia-Pacific, Kuwait, United Kingdom, Europe, and United States. Furthermore, in order to examine the integration among the permanent (non-stationary) and transitory (stationary) components of the selected Islamic equity markets, this study applied the Beveridge-Nelson time series decomposition technique within a cointegrating framework.

This study finds one cointegrating relationship among the selected five markets. In other words, the selected five markets are bound together by a theoretical relationship as a whole. We also find that the UK Islamic equity index is the only endogenous (dependent) market and all other Islamic equity indices are exogenous (independent) markets. That indicates that when there is any exogenous shocks, the UK market bears the burden of short-run adjustment to bring about long-run equilibrium in the Islamic markets. Among the five selected indices, Euro zone Islamic equity index is the most exogenous variable, i.e. most influential market among the Islamic equity indices under consideration. This finding may reflect the evidence of market turbulence in Euro zone, which has considerably affected not only its members but also non-members of Euro zone. Specifically, even though the United Kingdom does not belong to the European Monetary Union (EMU), the Euro zone has become the most influential market for the United Kingdom in the context of Islamic equity market. Besides, our result tends to indicate the possible least integration of Kuwait Islamic equity index with

others. When we turn into variance decomposition, the overall results suggest that the United States and Euro zone have played leading roles in Islamic stock market integration. The underlying reason could be attributed to the sequences of crises (2008 subprime crisis and Euro zone crisis in 2010) which triggered the global markets recently. This tends to indicate that even though the Islamic equity markets are moving towards integration, the two recent crises originating in the developed markets have had an impact on the stability and resiliency of Islamic capital markets. Moreover, the Beveridge-Nelson (BN) time series decomposition analysis shows that even the permanent and transitory components of all these Islamic markets (excepting those of Kuwait) also tend to move together.

The findings of this study have several implications for the investors and policy makers in general and portfolio managers in particular of Islamic equity markets. Since the markets are cointegrated, the opportunity to gain abnormal profits tends to be less in the long run, which could be less attractive to the portfolio managers and investors. However, there could be a short term gain from the arbitrage activities in these Islamic equity markets even though the abnormal gains from portfolio diversification would tend to disappear in the long term. In addition to portfolio managers, policy makers should be cautious and prudent when markets are cointegrated. Empirical evidence over the last two decades tends to suggest that capital mobility is concentrated within a few countries and it is challenging for the smaller economies to get easy access to international capital market when economies are cointegrated. Moreover, the existence of domestic misallocation of capital flows may limit the long-run growth potential of the integrated economies. This may happen when capital inflows are invested in low productivity investment projects, such as, real estate. Besides, capital inflows in an integrated economy may induce macro economic instability through rising inflation rate, widening current account deficits and imbalanced real exchange rate. Above all, financial integration may be conducive to transmit economic volatility and capital market turbulence from one economy to another more rapidly. Consequently, the efficacy of financial integration would be financial crisis, bank runs and overall economic vulnerability in cointegrated economies. A few of the issues have already been addressed in this study especially the contagion effect of Euro zone crisis and the 2008 subprime crisis on global Islamic capital markets. Policy makers should keep in mind that Islamic equities are subset of conventional equities after applying filtering process. Therefore, conventional equity markets are still more comprehensive to exert influence on Islamic equity markets.

However, cointegrated economies enjoy several benefits in spite of having the drawbacks. Most important is the exploitation of the economies of scale that allows small and medium sized firms in the economy to get better access to broader financial and capital markets. Thus, risk sharing and consumption smoothing (ability to borrow in 'bad' times and lend in 'good' times) help to accelerate domestic investment and growth in cointegrated economies. In addition, financial integration helps in achieving regulatory independence in the integrated economies that is supposed to improve the financial governance system in those economies. Decomposition of Islamic equity indices into their permanent and transitory components would be of much interest to the portfolio managers and policy makers given the distinct movement pattern of the permanent and transitory components.

Considering the above implications of financial integration, this study attempts to recommend a few suggestions. Most importantly, misallocation of capital resources should be reduced for the Shariah compliant business enterprises in the Islamic capital markets so that these firms can contribute more to the economic growth process of the country. It is also important to stop the Islamic capital flight to less-productive investment projects for the sake of long run economic growth. Long run growth of the economy also depends on the macroeconomic stability of the economy. Financial and stock market integration may bring more potential benefits in terms of co-operation when economies are at a similar stage of growth and development. This study has shown that the convergence process has started in the Islamic equity markets which should be enhanced in order to achieve long run growth in these markets through cooperation and brotherhood. In addition, the portfolio managers may consider incorporating the Kuwait Islamic equity index in their portfolio as it is the least cointegrated market. Moreover, they should be very much cautious to invest in the Islamic equities from Euro zone and the United States due to higher volatility and contagion effect. Above all, it would be relatively safer to invest in the Asia-Pacific Islamic index. Finally, policy makers should take the results of the study into account while formulating policies in the concerned Islamic equity markets in order to move towards resilient, robust and competitive Islamic capital markets globally.

While this study looked at only the Islamic equity indices, future research should try to look at a more comprehensive picture of integration pattern by taking into account both the Islamic and conventional equity markets together. In addition, a time-varying property should be taken into account in order to evaluate the integration progress as well as some key factors driving the co-movements. Some major indicators also should be considered, i.e. cross-border assets trading and listing, the role of foreign capital flows, regulations, and so on, in order to capture the comprehensive nature of integration.

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