

Between BRIC and G3: Shariah-Compliant Stock Markets Cointegration

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Abstract

This study aims to examine the persistence of Shariah-compliant stock markets cointegration between the BRIC (Brazil, Russia, India and China) and the G3 (US, Europe and Japan). The analysis utilises monthly data of seven S&P Shariah Dow Jones Indices to represent Shariah-compliant stock markets in the BRIC and in the G3, covering the period of November 2007 to August 2013. The method incorporated is autoregressive distributed lag (ARDL) model. It evidenced that each of the Shariah-compliant stock market in the BRIC countries is not cointegrated with their counterparts in the G3. This finding could cater Islamic-oriented investors and asset managers in the G3 countries significant risk reduction in their portfolio diversification for a given level of return for investing in one of the Shariah-compliant stock market in the BRIC countries.

Keywords: BRIC, Diversification, ARDL, Islamic Stock Markets, Islamic Finance, Emerging Market

1. Introduction

Islamic equity markets have promising potency for market penetration. Currently Muslim population is roughly 1.6 billions (23% of world population) and is estimated to be 1.9 and 2.1 billions (24.9% and 26.3% of world population) in 2020 and 2030 respectively (Pew, 2013). However, Islamic mutual funds had only 5.6% share over all Islamic financial service industry (Ernst & Young, 2011).

As old adage says, "*Don't put all your eggs in one basket!*" Opportunity could be disastrous if the attitude towards it is imprudent.

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Investing all the money merely in one pool of investment could turn investors into bankruptcy overnight once there is sudden market bearish. In the current state of financial markets, this also is interpreted to not invest in cointegrated markets. Once one market deteriorates the others keep pace with it.

This issue remains major concern for conventional investment world. Continuous research has been conducted as an effort to boost return and mitigate risks at the same time (see Abraham *et al*, 2001; Rao, 2008; Arouri and Nguyen, 2010; Rizwan and Khan, 2007; Ali and Afzal, 2012; Hoque, 2007; Nguyen, 2011). Nonetheless, due to its infancy, the study of *Shariah*-compliant stock markets cointegration is still scarce.

Majid and Yusof (2009), Majid and Kassim (2010), Karim *et al* (2010) and Moeljadi (2012) examined the existence of *Shariah*-compliant stock markets cointegration in developed countries (UK, US and Japan) and in emerging markets (Indonesia and Malaysia). It is obvious Muslims dominating the latter group. As the industry grows, many *Shariah* screeners (e.g., IdealRatings) and index providers emerge. Therefore opportunities arrive. *Shariah*-compliant stocks not only exist in Muslim countries but also otherwise. Depth and comprehensive analysis of Islamic capital markets in non-Muslim countries needs to be discussed to expose investors upon potential gains and comprehend risks contemporaneously.

The study focuses on Islamic stocks in the BRIC (Brazil, Russia, India and China) as investment targets of investors in the G3 (US, Europe and Japan). The BRIC are the four biggest emerging economies. Combined they account for two-fifths of the total Gross Domestic Product (GDP) of all emerging economies (Gay, 2008). Inward and outward foreign direct investment (FDI) of firms from and to Brazil, Russia, India and China has increased significantly during the last few years (Holtbrügge and Kreppel, 2012; Heinz and Tomenendal, 2012). Such positive facts might encourage Islamic-oriented investors in the G3 (US, Europe and Japan) to include *Shariah*-compliant stocks in these non-Muslim countries (i.e., the BRIC) into their portfolio.

In addition, Tahir and Brimble (2011) discovered that Islam does influence investment behaviour, however, the degree to which it does is influenced by the religious degree of the individual.

Also, evidence is found of “Western style” wealth maximisation amongst Muslim investors as well as a desire to consider sustainable investment principles in asset allocations. Thus in general, this study is expected to grow Islamic-oriented investors’ confidence in investing religiously yet still lucrative as conventional investment, and ultimately will foster the industry.

2. Literature Review

Ample studies have been done to investigate equity markets cointegration. The analyses could engage only developed country or developing country markets, or the mixed of both. In order to relate to the topic, this section also discusses the examination of Islamic equity markets cointegration.

2.1 Amongst Developed Markets

Within developed countries, Chong *et al* (2003) revealed that the Australian market has short-run and long-run linkages with the United States using the VAR approach while tests with France, Germany, Japan, UK markets found little evidence of interdependence. Likewise Camilleri *et al* (2005) analysed portfolio comprised Australia (domestic market), UK, USA, Hong Kong and Japan stock index futures. They found that investing in these five markets could increase portfolio return. Antoniou *et al* (2007) utilising the DCC model, the paper extracted the time-varying conditional correlations between the UK, US and European stock markets and industrial sectors. He also used the multivariate generalised autoregressive conditional heteroscedasticity (MVGARCH) to assess the transmission of volatility from the US and European stock markets to the UK. The findings suggested that the UK equity market is more integrated with Europe, in terms of both aggregate stock markets and sectors. Correlations are higher during bear markets and tend to fall during periods of recovery.

Most of current studies argued the findings above. Valadkhani *et al* (2008) based on the rotated loadings of the second factor using both the Principal Component and Maximum Likelihood methods, it was found that the stock returns in all five developed countries (UK, Germany, US, Australia and Japan) could be represented by a well-separated common factor in terms of their co-movements during the period of December 1987 to April 2007 implying high stock returns correlation in these developed countries. Kurihara and Nezu (2006) stressed that US stock prices have been highly influential on Japanese stock prices, suggesting an interdependence relationship between them. There is also a long-term stable relationship between the two variables using VECM. Ansari (2009) and Dhanaraj *et al* (2013) discovered cointegrating vectors among Australia, Canada, France, Germany, Hong Kong, Japan, Singapore, the UK and the US. Alexakis and Vasila (2013) investigated European equity market integration by analysing volatility spillover effects between selected indices of high liquidity from the major regulated European equity markets. The conditional variance of the VAR-GARCH model for each pair of indices was examined. The results provided evidence on strong EU equity market integration. The findings in general suggested a high degree of European equity market interconnection. This situation was depicted through strong effects from one European equity market to the other, as well as through significant feedback effects between them. Samitas and Kenourgios (2007) supported these findings.

Haque and Kouki (2009) examined the impact of 9/11 to financial market employing GARCH and resulted there was correlation increment among developed markets during respective periods. Chiou (2011) investigated the lead-lag relationships between three major stock markets (Tokyo, London, and New York) over the period 1997-2007, using the return-volatility variable. He found strong evidence that three stock markets are significantly interdependent; Tokyo leads London and New York; London leads New York and Tokyo; and New York leads Tokyo and London. In particular, the tie between London and New York is the strongest.

2.2 Amongst Emerging Markets

Amongst these markets, the stock market linkages are varied. Hoque (2007) discovered that Bangladesh stock market insignificantly responds to shocks in Indian market, however Perera and Wickramanayake (2012) and Batareddy *et al* (2012) argued this finding with evidence that equity market in Bangladesh, India, Pakistan, China, South Korea, Taiwan and Sri Lanka are cointegrated.

In the Middle Eastern world, employing bivariate cointegration GARCH (1,1), Egyptian prices contain useful information about Israeli stock prices (Floros, 2011) and amongst GCC countries the comovements are low (Arouri and Nguyen, 2010). Meanwhile in emerging European markets, Cyprus, Estonia and Slovakia are low correlated yet Malta and Slovenia are the inverse (Dunis *et al*, 2013). Thus the first three can more benefit international-oriented investors. More specifically, Majid *et al* (2009) and Majid and Kassim (2009) broke down the ASEAN equity markets cointegration into during, pre- and post-1997 financial crisis. They evidenced that the markets are cointegrated and the degree rises during and post crisis.

2.3 Between Developed and Emerging Markets

Between developed and emerging markets, the study (Abraham *et al*, 2001; Rao, 2008; Arouri and Nguyen, 2010) stated that GCC countries provide benefit for international diversification due to their low correlation relative to US. US equity markets also cointegrate with market in Pakistan (Rizwan and Khan, 2007; Ali and Afzal, 2012), Bangladesh (Hoque, 2007), Vietnam (Nguyen, 2011) and do not with Czech Republic, Hungary, Poland and Slovakia (Patev *et al*, 2006; Samitas and Kenourgios, 2007). In the Asian developed and developing context, there are contrast results that there is high degree of stock markets cointegration on one side (Anoruo, 2003; Valadkhani *et al*, 2008) and no cointegration on the other side (Rajwani and Mukherjee, 2012). Between Asia and Europe it was proved no correlation (Liow *et al*, 2005). Furthermore, from Thai investors' perspective, in the short-run their markets are interrelated with UK, US and Singapore (Valadkhani and Chancharat, 2008). Conversely, African stock markets are not cointegrated with global markets, except for South African's (Agyei-Ampomah, 2011).

Specifically to stock markets cointegration in the BRIC countries, Russian and Chinese equity markets provide diversification opportunities for investors in developed countries, as they are not cointegrated (Patev *et al*, 2006; Batareddy *et al*, 2012). On the other hand, Brazilian and Indian markets are not viable to be included in portfolios of investors in developed countries as they have long-run equilibrium (Rivas *et al*, 2006; Batareddy *et al*, 2012).

Asongu (2012) attempted to acknowledge the correlation among 33 stock markets during Japanese earthquake, tsunami and subsequent nuclear crisis by utilising heteroscedasticity biases based on correlation coefficients. The result showed such disasters affected stock markets in Taiwan, Bahrain, Saudi Arabia and South Africa.

2.4 *Shariah*-Compliant Stock Markets Cointegration

Those all above are of conventional markets. Islamic finance has been attracting not only Muslim investors but also non-Muslims due to its outperformance relative to conventional counterparts during financial crises (Al-Smadi and Almsafir, 2012; Kassim and Kamil, 2012; Moeljadi, 2012; Ashraf, 2013). However, there are limited numbers of study examining the cointegration of Islamic stock markets.

Employing ARDL method, Majid and Kassim (2010) found that Islamic stock markets are cointegrated amongst themselves within similar economic grouping. To be specific, Islamic stock markets in developed countries (i.e., Japan, US and UK) are cointegrated among themselves and so are they in developing countries (i.e., Malaysia and Indonesia). However, between developed and developing countries, it is evidenced that there is no long-run equilibrium between them. Karim *et al* (2010) partly disagreed with proof that there is no cointegration of Islamic stock markets in Indonesia, Malaysia, UK, US and Japan. They stressed straightforwardly that the prohibition of *riba*, *gharar* and *maysir* is one of the plausible reasons of no cointegration in the Islamic stock markets. Being a middleman, Moeljadi (2012) found that Indonesian and Malaysian Islamic stock markets are cointegrated with American, UK and Japan's in the pre-2007 global financial crisis period. Nonetheless, this relationship diminishes during crisis.

3. Data Collection

Particularly for the BRIC, the study does not utilise local country index due to the data availability. None of these provide Islamic stock index simply because they are non-Muslim countries and still categorised into emerging markets. Therefore, it instead incorporates seven S&P Dow Jones indices generated from Bloomberg. They are S&P Brazil *Shariah*, S&P Russia *Shariah*, S&P India *Shariah*, S&P China *Shariah*, S&P Europe 350 *Shariah*, S&P 500 *Shariah* and S&P Japan 500 *Shariah* to represent Brazilian, Russian, Indian, Chinese, European, American and Japanese *Shariah*-compliant stock markets respectively.

In terms of their constituents, the indices mentioned above vary to each other. S&P Europe 350 *Shariah* comprises 119 European equities, S&P 500 *Shariah* consists of 227 American stocks and S&P Japan 500 *Shariah* has 110 constituents. For the BRIC, there is no disclosure upon the number of companies included. To be specific, the data is 70 monthly returns of each *Shariah*-compliant stock markets covering from the period of November 2007 to August 2013 and all in US Dollar currency. Such short time horizon is merely due to the data availability in which the BRIC indices only were created in November 2007. Nevertheless Hung and Cheung (1995), and Piesse and Hearn (2002) in their papers implied that there are distortions occurring in weekly and daily stock returns data that caused by non-trading and non-synchronous trading. Therefore monthly stock returns data is preferred to prevent from such drawbacks and to capture clearer movements of short-term fluctuations.

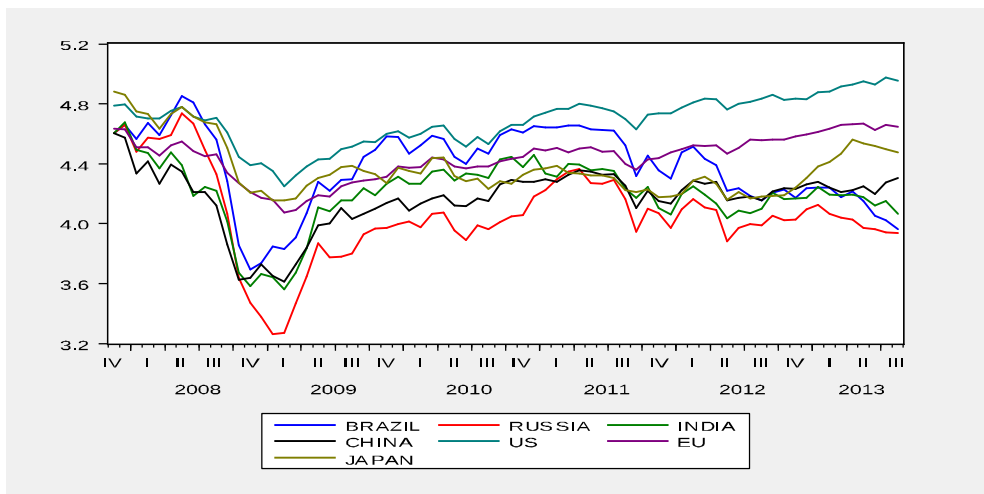
4. Research Methodology

This study applies the most current econometric model autoregressive distributed lag (ARDL) proposed by Pesaran and Shin (1995, 1998) and Pesaran *et al* (1996, 2001). Such approach has some advantages compared to other cointegration testing such as Engle and Granger (1987) Johansen (1988, 1991) and Johansen and Juselius (1990). This model needs not pre-unit root testing as it is applicable irrespective whether the series are integrated of order zero $I(0)$ or one $I(1)$ or fractionally integrated (Pesaran and Pesaran, 1997; Bahmani-Oskooee and Ng, 2002). In addition, this can estimate long-run and short-run coefficients simultaneously. Finally, since this study utilises small number of observations, such model is considerably suitable due to its robustness of providing results with small sample size study (Pesaran *et al*, 2001).

Although it is stated clearly that autoregressive distributed lag model can be run irrespective to its order of integration whether the variables are $I(0)$ or $I(1)$, unit root test is still needed to ascertain that they are not integrated of order two $I(2)$. Regarding with this, Glynn *et al* (2007) concluded that there is no consensus on the most appropriate methodology to perform unit root tests or no consensus about the empirical results of unit root tests has emerged from the survey conducted. As it is discretionary, this study incorporates the customarily unit root tests Augmented-Dickey Fuller (1979, 1981), henceforth ADF.

Another issue of the study is structural breaks of which are by definition sudden events that change the structure of the econometric model under consideration. The occurrence of it appears as one of the (if not the) most significant cause for the forecasting failure of many economic models (Kapetanios and Tzavalis, 2006). Through visual inspection towards Graph 1, there is known *a priori* the emergence of structural breaks of all variables in the month of February 2009 and August 2011. As depicted by the graph, from November 2007 to January 2009 overall the trend is downward that can be explained by the world financial crisis. Afterwards, the trend changed due to markets recovery. Starting from August 2011 the graph of developed and emerging markets moved in the opposite direction. The former rose whereas the latter turned relatively flat.

Graph 1: Shariah-compliant Stock Returns Performance



Source: Bloomberg and Data Processing

One of the tests used to investigate the existence of structural break is Chow (1960) test. This study incorporates such test as it acknowledges the breakpoints. If the test rejects the null hypothesis of there are no structural breaks in the corresponding periods, then dummy variables must be included in the equation to enhance the findings. The value of dummy variables embedded in the models are stated as follows:

$D1_t = 1$, over the period of February 2009 to July 2011, 0 elsewhere

$D2_t = 1$, over the period of August 2011 to August 2013, 0 elsewhere

Pesaran and Pesaran (2009) have analysed the cointegration of consumption, income and inflation. They concretely stated that they employed four lags because the observations were quarterly and the error correction version that was derived from the vector autoregressive (VAR) model was $ARDL(5,5,5)$. This implies that the number of lags for ECM formulation is depending on the data frequency. As this study incorporates monthly data, thus it uses 12 lags for its conditional ECM that is derived from its underlying VAR. The order of its ARDL is $ARDL(13,13,13)$. The error correction representation of the models are given by:

$$\begin{aligned} \Delta BR_t &= \alpha_0 + \sum_{i=1}^{12} \theta_1 \Delta BR_{t-i} + \sum_{i=1}^{12} \theta_2 \Delta US_{t-i} + \sum_{i=1}^{12} \theta_3 \Delta EU_{t-i} + \sum_{i=1}^{12} \theta_4 \Delta JP_{t-i} + \delta_1 BR_{t-1} + \delta_2 US_{t-1} \\ &+ \delta_3 EU_{t-1} + \delta_4 JP_{t-1} + D1_t + D2_t + \varepsilon_t \end{aligned} \quad (3.1)$$

$$\begin{aligned} \Delta RU_t &= \alpha_0 + \sum_{i=1}^{12} \theta_1 \Delta RU_{t-i} + \sum_{i=1}^{12} \theta_2 \Delta US_{t-i} + \sum_{i=1}^{12} \theta_3 \Delta EU_{t-i} + \sum_{i=1}^{12} \theta_4 \Delta JP_{t-i} + \delta_1 RU_{t-1} + \delta_2 US_{t-1} \\ &+ \delta_3 EU_{t-1} + \delta_4 JP_{t-1} + D1_t + D2_t + \varepsilon_t \end{aligned} \quad (3.2)$$

$$\begin{aligned} \Delta ID_t &= \alpha_0 + \sum_{i=1}^{12} \theta_1 \Delta ID_{t-i} + \sum_{i=1}^{12} \theta_2 \Delta US_{t-i} + \sum_{i=1}^{12} \theta_3 \Delta EU_{t-i} + \sum_{i=1}^{12} \theta_4 \Delta JP_{t-i} + \delta_1 ID_{t-1} + \delta_2 US_{t-1} \\ &+ \delta_3 EU_{t-1} + \delta_4 JP_{t-1} + D1_t + D2_t + \varepsilon_t \end{aligned} \quad (3.3)$$

$$\begin{aligned} \Delta CH_t &= \alpha_0 + \sum_{i=1}^{12} \theta_1 \Delta CH_{t-i} + \sum_{i=1}^{12} \theta_2 \Delta US_{t-i} + \sum_{i=1}^{12} \theta_3 \Delta EU_{t-i} + \sum_{i=1}^{12} \theta_4 \Delta JP_{t-i} + \delta_1 CH_{t-1} + \delta_2 US_{t-1} \\ &+ \delta_3 EU_{t-1} + \delta_4 JP_{t-1} + D1_t + D2_t + \varepsilon_t \end{aligned} \quad (3.4)$$

The terms with the summation signs in equation (3.1), (3.2), (3.3) and (3.4) represent the error correction mechanism whilst the second part (terms with δ) are akin to the long-run relationship. In detail, BR, RU, ID, CH, US, EU, JP, D1, D2 and ε consecutively denote Brazil, Russia, India, China, America, Europe, Japan, Dummy (February 2009 – July 2011), Dummy (August 2011 – August 2013) and error term variables. On the other hand, α , θ , Δ , δ and the subscript “t” refer to intercept, coefficient of difference of lagged changes variables, difference sign, coefficient of lagged one variables and the lag level of variables respectively.

Still pertaining to the equations, Pesaran *et al* (2001) imposed deterministic trend and without deterministic trend in their demonstrated example using OLS estimation for comparability purpose.

Regardless its significance level, this study utilises both with and without deterministic trend in the equations.

To begin with, before commencing the bound testing, the maximum lag length must be determined. In their paper Pesaran and Shin (1997) advocated to employ Schwartz Bayesian Criterion (SBC) as this method is slightly better than the other one (i.e., Akaike Information Criterion in their examination). Furthermore, Pesaran *et al* (2001) stated that their specification was also based on assumption that the error term was free from autocorrelation issue. It is therefore the lag order of the equation must be selected appropriately in order to relieve this problem. This study follows such suggestion by testing the autocorrelation of lag length selected by SBC.

The null hypothesis used for bound testing is $H_0: \delta_1 = \delta_2 = \delta_3 = \delta_4 = 0$ which represents no cointegration exists, and its alternative is $H_1: \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq 0$ if there is cointegration among variables. The F-statistic value found then will be compared to asymptotic critical values of Narayan (2005). The preference to incorporate such values as they have been widely used in ARDL application (for example see Narayan, 2005, 2006; Dell'Anno and Halicioglu, 2010; Hye, 2012) and are more robust for small samples rather than the values of Pesaran *et al* (2001) (see Narayan, 2005, 2006). If the F-statistic falls below the lower bound level $I(0)$ the null hypothesis cannot be rejected indicating no long-run cointegration. Conversely, if the F-statistic lies above the upper critical values $I(1)$ the null hypothesis is rejected implying the existence of long-run cointegration. If, nonetheless, the F-statistic falls between $I(0)$ and $I(1)$ the result is inconclusive.

Once the existence of cointegration confirmed, the study then can estimate the long-run relationship between *Shariah*-compliant stock markets in the G3 and the BRIC using selected ARDL models. Afterwards, the short-run parameter or the error correction term, which measure the speed of adjustment of dependent variables back to equilibrium, is estimated.

Ultimately, The robustness of the respective estimated ARDL model above needs to be examined. The analysis will conduct the diagnostic tests. For model stability estimation test, it employs CUSUM and CUSUMSQ proposed by Brown *et al* (1975).

5. Empirical Results

The rejection of null hypothesis as illustrated in Table 1 essentially proves that all the models comprise structural breaks. Hence dummy variables need to be incorporated in order to magnify the findings.

Table 1: Chow Test Results

Model	F-statistic		Decision
	D1	D2	
Model 1	32.69702	47.68104	Reject Null Hypothesis
Model 2	12.26451	22.74526	Reject Null Hypothesis
Model 3	29.83436	22.85856	Reject Null Hypothesis
Model 4	24.84086	15.24475	Reject Null Hypothesis

Notes:

- a. The null hypothesis is no breaks at specified breakpoints
- b. All the null hypotheses rejected at 1% significance level

Based on ADF test, the results in Table 2 evidence that none of the variables are integrated of order two $I(2)$. US and Brazil variables are integrated of order one $I(1)$ whereas the five remainders are integrated of order zero $I(0)$. Specifically, Japan and India series without involving trend reject the null hypothesis of variables having unit roots or non-stationary with confidence level of 5% and 10% respectively. On the other hand, EU and China variables reject the null hypothesis of 10% confidence level with trend for both of them. At the same time, Russia variable with trend or not, both are non-stationary with 1% and 5% significance level of null hypothesis rejection. The absence of series integration of order two $I(2)$, and strengthened by the mixed of $I(0)$ and $I(1)$, it further validates that the ARDL approach is the most appropriate model for this study.

Table 2: Augmented Dickey-Fuller Unit Root Tests Results

Variable	Level		First Difference		Order of Integration
	Intercept	Trend and Intercept	Intercept	Trend and Intercept	
US	-0.752953	-3.143223	-6.832165	-7.022252	$I(1)$
EU	-1.157888	-3.189278***	-7.016624	-7.351065	$I(0)$
Japan	-3.083854**	-2.582096	-6.195312	-6.479583	$I(0)$
Brazil	-2.208518	-2.273505	-5.967233	-5.925991	$I(1)$
Russia	-3.718389*	-3.671943**	-5.648761	-5.66853	$I(0)$
India	-2.7361***	-2.755035	-7.100396	-7.106302	$I(0)$
China	-2.421937	-3.185072***	-7.516511	-7.677366	$I(0)$

Notes:

- The null hypothesis is the variable has a unit root
- The asterisks *, ** and *** denote rejection the null hypothesis at 1%, 5% and 10% respectively
- The hypothesis of all the first difference variables value, either trend is included with intercept or not, is rejected at 1% significance level

As explained in Table 3, with the inclusion of trend, Model 1, 2, 3 and 4 suffer from autocorrelation issue at lag order 5, 7, 7, and 2 respectively. Therefore the maximum lag used for Model 1 is 6, Model 2 and 3 are 8, and Model 4 is 3. On the other hand, models without trend merely Model 3 is not autocorrelated whilst Model 1 and 4 are autocorrelated at lag order 2 and Model 2 at lag order 7. As a result, the maximum lag employed for bound testing for Model 1, 2, 3 and 4 with the exclusion of trend is 3, 8, 1 and 3 respectively.

Table 3: Maximum Lag Length Selections

Order of Lag	Model							
	1		2		3		4	
	Trend	No Trend	Trend	No Trend	Trend	No Trend	Trend	No Trend
1	1.302833	0.656119	0.201332	0.392626	4.751217**	1.107654	0.203386	0.002004
2	3.142959***	4.046094**	1.414752	1.263732	3.243626***	2.437571	3.626866***	4.266984**
3	0.004312	1.477929	3.156498***	3.674769***	0.11198	0.018424	0.031416	0.036147
4	2.979585***	0.110755	0.262224	0.0511	1.205704	0.625068	0.352615	0.200905
5	4.674666**	2.056743	2.760688***	4.551704**	0.269111	0.482268	0.857543	0.671659
6	0.092201	1.250963	0.43053	0.991898	0.412438	0.916058	1.063379	0.851242
7	0.097723	1.032783	3.0003***	3.207814***	2.771877***	2.454992	0.608542	0.643403
8	0.873541	0.044328	0.065458	0.002072	0.017112	0.083641	0.63813	0.590606
9	0.116965	0.896017	1.434529	0.978913	0.22671	0.195564	0.082998	0.113079
10	1.305762	0.143395	0.548174	0.235061	0.060626	0.009351	0.028841	0.000115
11	0.188709	0.015879	0.283126	0.519232	0.140127	0.263182	0.491497	0.526338
12	0.869402	0.471205	0.08751	0.397214	0.140169	0.071719	0.04258	0.093667

Notes:

- Probs from chi-square with 1 df for autocorrelation testing
- Null Hypothesis: no serial correlation at lag order 1
- The asterisks *, ** and *** denote rejection the null hypothesis at 1%, 5% and 10% respectively

Table 4 reports that all the models of cointegration between *Shariah*-compliant stock markets in the BRIC and the G3 fail to reject the null hypothesis of ARDL that there is no cointegration within variables under study. This means that each of the *Shariah*-compliant stock markets in the BRIC is not cointegrated with their counterparts in the G3. Therefore their long-run coefficients and speed of adjustment cannot be estimated.

Karim *et al* (2010) stressed that the prohibition of *riba*, *gharar* and *maysir* is one of the plausible reasons of no cointegration in the Islamic stock markets. However they did not explain clearly this argument and it is deemed too straightforward. It implies that as long as the stock markets are *Shariah*-compliant, they are not cointegrated. Moeljadi (2012) has proved that during financial crisis Islamic stock markets are not cointegrated and conventional stock markets are, and in contrast, Islamic stock markets are cointegrated and conventional stocks market are not within pre-crisis period. This simply tells that the main factor of *Shariah*-compliant stock markets cointegration is not their Islamic-based principles, but solely the matter of periods under examination. It is also worth noting that by removing the title "*Shariah*," stock markets also may not cointegrate as other factors are more logically can explain this relationship.

Table 4: F-statistics for Testing the Existence of a Long-run Stock Market Equation

Model	Trend		No Trend	
	Lag	F-statistics	Lag	F-statistic
Model 1	6	3.442874 ^a	3	1.871037 ^a
Model 2	8	1.991891 ^a	8	1.812887 ^a
Model 3	8	3.576861 ^a	1	2.496359 ^a
Model 4	3	1.508674 ^a	3	1.753613 ^a

Notes:

- a. means that the F-statistic lies below the lower bound
- b. means that the F-statistic lies between the lower and the upper bound

The main reason of stock markets cointegration is macroeconomic factors. Choudhry (1997) and Morana and Beltratti (2008) implied in their research that countries of similar economic development have similar economic policies thus they could link their stock prices over time, or in other words they could cointegrate. Moreover, Ibrahim (2005) noted that, in the long-run, stock markets in various countries need not be cointegrated as they may be driven by country specific factors.

Relating to this study, it is clear that the G3 are developed countries while on the other hand the BRIC are developing countries. Both groups could have different economic policies. Under this fact, it is reasonable why *Shariah*-compliant stock markets in the G3 countries do not have long-run impacts on each of their counterparts in the BRIC countries. Furthermore, the fundamental economic factors may have dominated the *Shariah*-compliant stock markets long-run trends in the BRIC countries.

In addition, these findings are in line with Majid and Kassim (2010) and Karim *et al* (2010) stating that Islamic stock markets in developed and developing countries are not cointegrated. As this study does not separate the period where financial structure changes explicitly, especially for pre and during financial crisis, it is hard to argue whether it contravenes or agree with the findings of Moeljadi (2012).

Specifically to stock markets in the BRIC countries, yet not Islamic stock markets, the findings vary from the previous studies. The findings of no cointegration between Russian and the G3 stock markets and no cointegration between Chinese and the G3 stock markets concur with Patev *et al* (2006) and Batareddy *et al* (2012) respectively. On the other hand, the finding of there is no long-run equilibrium between stock market in Brazil and in the G3 contradicts with Rivas *et al*'s (2006) where they found that within the time horizon of 1995 to 2000 the US and Spanish stock markets affected Brazilian stock market. Regarding with India, it is akin to the latter case. It is not consistent with the finding of Batareddy *et al* (2012) stated that Indian stock market is cointegrated with the US and Japanese stock markets.

The contradictory findings of this study with Rivas *et al* (2006) and Batareddy *et al* (2012) could be explained by some reasons. First of all, the data and time period used in cointegration analyses may affect the results. As stated before, Moeljadi (2012) evidenced that Islamic stock markets and their conventional counterparts showed different results of cointegration persistence when dealing with crisis issue.

Rivas *et al* (2006) and Batareddy *et al* (2012) employed conventional Brazilian and Indian stock markets data whereas this study uses Islamic stock markets to represent Brazilian and Indian stock markets. As the performance of conventional and Islamic stock markets vary over time that is showed by the returns data, this assumption maybe one of the reasons to why this study generates no cointegration whilst Rivas *et al* (2006) and Batareddy *et al* (2012) did the vice versa.

Furthermore, conventional cointegration tests presume that the long-run equilibrium between economic variables in an analysis is stable over the entire sample observations. This assumption may be misleading as the degree of integration among countries tends to change over time due to significant changes in economic policies (Elyasiani and Kocagil, 2001; Batareddy *et al*, 2012), and to be straightforward to the stock markets, major crisis events can influence the relationship among them (Dhanaraj *et al*, 2013). Batareddy *et al* (2012) examined the cointegration amongst variables in the period of January 1998 to July 2008, Rivas *et al* (2006) of January 1988 to December 2004 and this study of November 2007 to August 2013. Noticing this long haul time differences, it is plausible if the findings of cointegration of Brazilian and Indian stock markets with developed countries have changed by taking into account Asian financial crisis in 1997, Russian crisis in 1998, the period when EMU members switched to the Euro currency, and hyperinflation in Brazil.

All in all, models incorporated might cause the divergent of the findings. This study employs ARDL whereas Rivas *et al* (2006) and Batareddy *et al* (2012) did VAR and Johansen (1991) respectively. This study also argues that it has produced the more reliable results as it uses the most current and appropriate approach for examining the long-run equilibrium amongst variables under study.

Pertaining to the findings similarity with Majid and Kassim (2010), Karim *et al* (2010), Patev *et al* (2006) and Batareddy *et al* (2012) of Russian and Chinese stock markets cointegration with developed countries, the readers could refer to the notion of Choudhry (1997), Ibrahim (2005) and Morana and Beltratti (2008) as mentioned before. It simply evidences that regardless the data, time and models employed, the absence of cointegration among them adheres the underpinning theorem that developed and developing markets have different level of economic development hence they have different economic policies, which in the end their stock markets are likely not linked in the long-run.

Instead, they are more influenced by country specific fundamental factors.

6. Conclusion

This study incorporates seven S&P Dow Jones indices generated from Bloomberg. They are S&P Brazil *Shariah*, S&P Russia *Shariah*, S&P India *Shariah*, S&P China *Shariah*, S&P Europe 350 *Shariah*, S&P 500 *Shariah* and S&P Japan 500 *Shariah* to represent Brazilian, Russian, Indian, Chinese, European, American and Japanese *Shariah*-compliant stock markets respectively. To be specific, the data is 70 monthly returns of each *Shariah*-compliant stock markets covering from the period of November 2007 to August 2013 and all in US Dollar currency. By applying autoregressive distributed lag (ARDL) model, it has evidenced that each of the *Shariah*-compliant stock market in the BRIC countries is not cointegrated with their counterparts in the G3 countries thus their long-run coefficients and speed of adjustment cannot be estimated.

The cointegration absence amongst each of the *Shariah*-compliant stock market in the BRIC countries and their counterparts in the G3 countries grants Islamic-oriented investors and asset managers in the G3 countries one significant practical implication. It could cater them significant risk reduction in their portfolio diversification for a given level of return if they invest in one of *Shariah*-compliant stock markets in the BRIC countries.

References

- Abraham, A., Seyyed, J. F., & Al-Elg, Ali (2001). Analysis of diversification benefits of investing in the emerging Gulf equity markets. *Managerial Finance*, 27(10/11), 47-57.
- Agyei-Ampomah, Sam (2011). Stock market integration in Africa. *Managerial Finance*, 37 (3), 242-256.
- Al-Smadi, A. A., & Almsafir, K. M. (2012). Islamic finance versus conventional finance, from macroeconomic perspective: a review. *Journal of Islamic and Human Advanced Research*, 2(4), 419-430.
- Alexakis, P., & Vasila, A. (2013). On the integration of European capital markets. *Managerial Finance*, 39(9), 825-836.
- Ali, Rafaqet & Afzal, Muhammad (2012). Impact of global financial crisis on stock markets: evidence from Pakistan and India. *E3 Journal of Business Management and Economics*, 3(7), 275-282.
- Anoruo, Emmanuel (2003). Return dynamics across the Asian equity markets. *Managerial Finance*, 29(4), 1-23.
- Ansari, Mohammed (2009). Impact of globalization on stock market synchronization: some empirical evidence. *International Journal of Commerce and Management*, 19(3), 208-221.

- Antoniou, A., Pescetto, M. G., & Stevens, I. (2007). Market-wide and sectoral integration: evidence from the UK, USA and Europe. *Managerial Finance*, 33(3), 173-194.
- Arouri, H. E. M., & Nguyen, K. D. (2010). Time-varying characteristics of cross-market linkages with empirical application to Gulf stock markets. *Managerial Finance*, 36(1), 57-70.
- Ashraf, Dawood (2013). Performance evaluation of Islamic mutual funds relative to conventional funds: empirical evidence from Saudi Arabia. *International Journal of Islamic and Middle Eastern Finance and Management*, 6(2), 105-121.
- Asongu, A. S. (2012). The 2011 Japanese earthquake, tsunami and nuclear crisis: evidence of contagion from international financial markets. *Journal of Financial Economic Policy*, 4(4), 340-353.
- Bahmani-Oskooee, M., & Ng, R. C. W. (2002). Long-run demand for money in Hong Kong: an application of the ARDL model. *International Journal of Business and Economics*, 1(2), 147-55.
- Batareddy, M., Gopaldaswamy, K. A., & Huang, C. (2012). The stability of long-run relationships: a study on Asian emerging and developed stock markets (Japan and US). *International Journal of Emerging Markets*, 7(1), 31-48.
- Brown, L. R., Durbin, J., & Evans, M. J. (1975). Techniques for testing the constancy of regression relations over time. *Journal of the Royal Statistical Society*, 37, 149-192.
- Camilleri, D., Tahir, I. M., & Wang, S. (2005). Optimal asset allocation and risk management. *Asian Review of Accounting*, 13(1), 1-14.
- Chiou, Ingyu (2011). The volatility transmission of stock returns across Asia, Europe and North America. *Managerial Finance*, 37(5), 442-450.
- Chong, L., Drew, E. M., & Veeraraghavan, M. (2003). Stock market interdependence: evidence from Australia. *Pacific Accounting Review*, 15(2), 51-76.
- Choudhry, T. (1997). Stochastic trends in stock prices: Evidence from Latin American markets. *Journal of Macroeconomics*, 19(2), 285-304.
- Chow, G. C. (1960) Tests of equality between sets of coefficients in two linear regressions. *Econometrica*, 28(3), 591-605.
- Dell'Anno, R., & Halicioglu, F. (2010). An ARDL model of unrecorded and recorded economies in Turkey. *Journal of Economic Studies*, 37(6), 627-646.
- Dhanaraj, S., Gopaldaswamy, K. A., & M. B., Suresh (2013). Dynamic interdependence between US and Asian markets: an empirical study. *Journal of Financial Economic Policy*, 5(2), 220-237.
- Dickey, A. D., & Fuller, A. W. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association*, 74(366), 427-431.
- Dickey, A. D., & Fuller, A. W. (1981). Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica*, 49(4), 1057-1072.
- Dunis, C., Sermpinis, G., & Karampelia, F. M. (2013). Stock market linkages among new EMU members and the Euro area: Implications for financial integration and portfolio diversification. *Studies in Economics and Finance*, 30(4), 370-388.
- Elyasiani, E., & Kocagil, E. A. (2001). Interdependence and dynamics in currency futures markets: a multivariate analysis of intraday data. *Journal of Banking & Finance*, 25(6), 1161-86.

- Engle, F., & C. W. J., Granger (1987). Co-integration and error correction representation, estimation, and testing. *Econometrica*, 55(2), 251-276.
- Ernst & Young (2011). Islamic funds & investments report 2011: achieving growth in challenging times. Retrieved from Ernst & Young website: [http://www.ey.com/Publication/vwLUAssets/IFIR_2011/\\$FILE/IFIR_2011.pdf](http://www.ey.com/Publication/vwLUAssets/IFIR_2011/$FILE/IFIR_2011.pdf)
- Floros, Christos (2011). Dynamic relationships between Middle East stock markets. *International Journal of Islamic and Middle Eastern Finance and Management*, 4(3), 227-236.
- Gay, D. R. Jr., (2008). Effect of macroeconomic variables on the stock market returns for four emerging economies: Brazil, Russia, India and China. *International Business & Economic Research Journal*, 7(3), 1-8.
- Glynn, J., Perera, N., & Verma, R. (2007). Unit root tests and structural breaks: A survey with applications. *Revista de Métodos Cuantitativos para la Economía y la Empresa*, 3(1), 63-79.
- Haque, M., & Kouki, I. (2009). Effect of 9/11 on the conditional time-varying equity risk premium: evidence from developed markets. *The Journal of Risk Finance*, 10(3), 261-276.
- Heinz, B. D., & Tomenendal, M. (2012). The emerging market hype - putting market size and growth in BRIC countries into perspective. *Critical Perspectives on International Business*, 8(3), 241-258.
- Holtbrügge, Dirk & Kreppel, Heidi (2012). Determinants of outward foreign direct investment from BRIC countries: an explorative study. *International Journal of Emerging Markets*, 7(1), 4-30.
- Hoque, B. A. A. H. (2007). Co-movement of Bangladesh stock market with other markets: cointegration and error correction approach. *Managerial Finance*, 33(10), 810-820.
- Hung, B., & Cheung Y. (1995). Interdependence of Asian Emerging Equity Markets. *Journal of Business Finance and accounting*, 22(2), 281-288.
- Hye, A. M. Q. (2012). Exports, imports and economic growth in China: An ARDL analysis. *Journal of Chinese Economic and Foreign Trade Studies*, 5(1), 42-55.
- Ibrahim, H. M. (2005). International linkages of stock prices: the case of Indonesia. *Management Research News*, 28(4), 93-115.
- Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control*, 12, 231-54.
- Johansen, S. (1991). Estimation and hypothesis testing of cointegrating vectors in gaussian vector autoregressive models. *Econometrica*, 55, 251-76.
- Johansen, S., & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration-with application to the demand for money. *Oxford Bulletin of Economics and Statistics*, 52(2), 169-210.
- Kapetanios, George & Tzavalis, Elias (2006). Nonlinear modelling of autoregressive structural breaks in some US macroeconomic series. In Milas, C., Rothman, P., & van Dijk, Dick (Eds.), *Contribution to economic analysis* (pp.175-197). Amsterdam: Elsevier.
- Karim, A. B., Kassim, M. A. N., & Arip, A. M. (2010). The subprime crisis and Islamic stock markets integration. *International Journal of Islamic and Middle Eastern Finance and Management*, 3(4), 363-371.
- Kassim, H. S., & Kamil, S. (2012). Performance of Islamic unit trusts during the 2007 global financial crisis: evidence from Malaysia. *Asian Academy of Management Journal*, 17(2), 59-78.

- Kurihara, Yutaka and Nezu, Eiji (2006). Recent stock price relationships between Japanese and US stock markets. *Studies in Economics and Finance*, 23(3), 211-226.
- Liow, H. K., Ooi, J., & Gong, Y. (2005). Cross-market dynamics in property stock markets: some international evidence. *Journal of Property Investment & Finance*, 23(1), 55-75.
- Majid, A. S. M., & Kassim, Hj. S. (2009). Impact of the 2007 US financial crisis on the emerging equity markets. *International Journal of Emerging Markets*, 4(4), 341-357.
- Majid, A. S. M., & Yusof, M. R. (2009). Long-run relationship between Islamic stock returns and macroeconomic variables: an application of the autoregressive distributed lag model. *Humanomics*, 25(2), 127-141.
- Majid, A. S. M., & Kassim, Hj. S. (2010). Potential diversification benefits across global Islamic equity markets. *Journal of Economic Cooperation and Development*, 31(4), 103-126.
- Majid, A. S. M., Meera, M. K. A., Omar, A. M., & Aziz, A. H. (2009). Dynamic linkages among ASEAN-5 emerging stock markets. *International Journal of Emerging Markets*, 4(2), 160-184.
- Moeljadi (2012). Resilience of Islamic and conventional stock markets during the 2007 global financial crisis: a comparative empirical examination. *Asia-Pacific Management and Business Application*, 1(1), 81-102.
- Morana, Claudio and Beltratti, Andrea (2008). Comovements in international stock markets. *Journal of international financial markets institutions and money*, 18(1), 31-45.
- Narayan, K. P. (2006). Examining structural break and growth rates in international health expenditure. *Journal of Health Economics*, 25(5), 877-890.
- Narayan, P. K. (2005). The saving and investment nexus for China: evidence from cointegration tests. *Applied Economics*, 37(17), 1979-90.
- Nguyen, Tho (2011). US macroeconomic news spillover effects on Vietnamese stock market. *Journal of Risk Finance*, 12(5), 389-399.
- Patev, P., Kanaryan, N., & Lyroudi, K. (2006). Stock market crises and portfolio diversification in Central and Eastern Europe. *Managerial Finance*, 32(5), 415-432.
- Perera, Anil & Wickramanayake, J. (2012). Financial integration in selected South Asian countries. *South Asian Journal of Global Business Research*, 1(2), 210-237.
- Pesaran, H. M., & Y. Shin. (1998). An Autoregressive distributed lag modeling approach to cointegration analysis. In Storm, S. (Ed.), *Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch Centennial Symposium* (pp. 371-413). Cambridge: The Press Syndicate of the University of Cambridge.
- Pesaran, H. M., & Y. Shin (1995). Autoregressive distributed lag modeling approach to cointegration analysis, DAE Working Paper Series, 9514, Department of Economics, University of Cambridge.
- Pesaran, M. H., Y. Shin & R. Smith (1996). Testing for the existence of a long-run relationship, DAE Working Papers, 9622, Department of Applied Economics, university of Cambridge.
- Pesaran, M., H. and Pesaran, B. (2009). *Time series econometrics using Microfit 5.0*. Oxford: Oxford University Press.
- Pesaran, M. H., Y. Shin & R. Smith (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, 16(3), 289-326.

- Pew (2013). The future of the global Muslim population. Retrieved from Pew website: <http://features.pewforum.org/muslim-population-graphic/>
- Piessens, J., & Hearn, A. B. (2002). Equity market integration versus segmentation in three dominant markets of the Southern Africa Customs Union: cointegration and causality tests. *Applied Economics*, 34(14), 1711-1722.
- Rajwani, Shegorika & Mukherjee, Jaydeep (2012). Is the Indian stock market cointegrated with other Asian markets? *Management Research Review*, 36(9), 899-918.
- Rao, Ananth (2008). Analysis of volatility persistence in Middle East emerging equity markets. *Studies in Economics and Finance*, 25(2), 93-111.
- Rivas, A., Rodríguez, A., & Albuquerque, H. P. (2006). Are European Stock Markets Influencing Latin American Stock Markets? *Análisis Económico*, 21(47), 51-67.
- Rizwan, F. M., & Khan, U. S. (2007). Stock return volatility in emerging equity market (KSE): the relative effects of country and global factors. *International Review of Business Research Papers*, 3(2), 362-375.
- Samitas, G. A., & Kenourgios, F. D. (2007). Macroeconomic factors' influence on "new" European countries stock returns: the case of four transition economies. *International Journal of Financial Services Management*, 2(1-2), 34-49.
- Tahir, Imran and Brimble, Mark (2011). Islamic investment behaviour. *International Journal of Islamic and Middle Eastern Finance and Management*, 4(2), 116-130.
- Valadkhani, Abbas and Chancharat, Surachai (2008). Dynamic linkages between Thai and international stock markets. *Journal of Economic Studies*, 35(5), 425-441.
- Valadkhani, A., Chancharat, S., & Harvie, C. (2008) A factor analysis of international portfolio diversification. *Studies in Economics and Finance*, 25(3), 165-174.