Interest Rate Exposure and Stocks Returns during Global Financial Crisis: Evidence from Islamic and Conventional Markets

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Abstract

This study aims to assess the impact of interest rate change on stocks returns and volatility of Islamic and Conventional stock market indices during global financial crisis for the period from 04 January, 2005 to 30 December, 2015.The stock indices of China (SSE), India (BSE) and Pakistan (PSE) as conventional, and Malaysia (DJIM), Indonesia (JKII) and Dow Jones World Islamic Index (DJWI) (Benchmark) as Islamic markets are employed into consideration, respectively. The volatility and conditional correlation are examined through GARCH (1, 1) and Multivariate-DCC GARCH, respectively. The results indicate that Islamic stock indices had low interest rate exposure and less stocks volatility than that of conventional stock indices during the global financial crisis period. This research has important implication for investors that they may consider Islamic stock markets as a safe haven during financial crises.

Keywords- Stocks Volatility, Interest Rate Exposure, Global Financial Crisis, Dynamic Conditional Correlation, Dow Jones World Islamic Index.

KAUJIE Classification: L41, L43, Q91

JEL Classification: E43, E44, G15, Z12

Introduction

Islamic finance industry has grown at an exponential rate during the past decade (Merdad, Hasan and Hippler, 2015). Islamic stocks are relatively considered less risky and have higher liquidity than conventional stocks (Al-Awadhi and Dempsey, 2017). The debate on empirical research regarding Islamic markets is growing and predicting the positive/ negative movements of the returns of Islamic and conventional stocks (Ben Rejeb, 2017; Aloui et al., 2015 and Saiti and Masih, 2016). Global financial crisis (GFC) has become an issue due to uncertainty and unexpected situation which harm the economy in term of loss of paper wealth. The volatile and unexpected behavior of stock markets create instability in it due to interest rate, inflation and exchange rate (Templeman, 2010) that result in high risk and financial fragility in markets (Minsky, 1977).

The whole world was affected by the crisis and Asia has no exception. The Asian countries were affected in term of declining demand of goods and services internationally where the growth in exports declined rapidly. The unemployment rate, GDP growth decline, foreign capital flow, FDI and short term foreign institutional investments were reduced in Asia due to decline in exports. The employment rate declined rapidly while the multiplier effects for exports sectors turned negative (Chhibber et. al., 2009). It created disturbance in the flow of liquidity which produced volatility in stocks returns in the markets and increased fiscal deficits and debts

severely. The difficulties for domestic industries increased with high cost working capital reducing sales and the profit margin. These problems led to lower expected profits and falling valuations which affected the stock markets badly. The credit crises globally in the world and volatility changes in Asian countries were the reflections of poor conditions of the stock markets. The prices of real estate and the exports of India declined sharply during GFC of 2007-2008 (Wade, 2009). From the Asian world, China and India both are the most populous countries, entirely in term of demographic scenario covered effectively on account of GFC, and the neighboring developing countries like Pakistan, Indonesia and Malaysia also had an impact.

As we know, Islamic finance prohibits the interest so, it is expected that Islamic stock indices are less exposed to interest rate volatility as compared to conventional stock indices. Due to Islamic restrictions on interest, the global financial crisis may affect the conventional stock indices more than Islamic stock indices. Earlier studies have attempted to explore the impact of macroeconomic variables along with interest rate change on returns and volatility of Islamic and conventional stock indices and delivers an understanding about conditional correlation for stock returns (Cheong, Nor and Isa, 2007., Ibrahim et. all. 2007 and Engle, Ghysels and Sohn, 2013) for Islamic and conventional stock markets during global financial crisis. The performance of Islamic stock indices and conventional stock indices for different periods have been observed in previous studies (Narayan and Banningidadmath, 2017; El-Mehdi et al., 2017; Boo et al., 2017; Narayan et al., 2016; Hayat and Hassan, 2017; Bahloul, Maria, and Naifar, 2017; Abu-Alkheil et al., 2017). They have explored performance by using different models but have not evaluated the performance of these indices during financial crises. As far as the financial crisis is concerned, the investment in Islamic stocks is perceived as a safe haven during uncertain times (Raj, 2020). Taking insights about the impact of interest rate exposure and asymmetric market conditions on returns and volatility (Nam, Pyun and Avard, 2001; Wu, 2001; Verhoeven and McAleer, 2004; Cheong, Nor and Isa, 2007; Zhang and Li, 2008; Liau and Yang, 2008 and Ibrahim, 2010), this study attempts to fill the gap in term of interest rate exposure and conditional volatility effects for Islamic and conventional stock markets. This study takes into account the financial equity markets of Asia i.e. China (SSE), India (BSE) and Pakistan (PSE) as conventional markets and Malaysia (DJIM), Indonesia (JKII) and Dow Jones Islamic World Index (DJWI) as bench mark from Islamic world are taken into consideration to explore the effect of interest rate change on returns and volatility of conventional and Islamic stock markets.

This study aims to address the following research questions. (i). Does interest rate change have impact on returns and volatility of stock markets? (ii). What other macroeconomic factors along with interest rate change affect the return and volatility of stock markets? (iii) What will be the behavior of conditional correlation of Islamic and Conventional stock indices during global financial crisis? To find the answers of above-mentioned questions, we use GARCH (1,1) modeling to identify the existence and persistence of volatility and effect of macroeconomic variables on returns and volatility of Islamic and conventional stock indices through mean and variance equation. To investigate the effect of interest rate change on the returns and conditional volatility of Islamic and conventional stock indices during global financial crisis, we employed multivariate GARCH-DCC methodology.

This study will be helpful for investors to better investment decisions on the basis of interest rate change and volatility of stock returns. Investors can develop investment criteria in order to select trading time outperformance through risk adjusted basis, hedge ratio and portfolio diversification (Halari et. al. 2015, Hasan, Hoque and Gasbarro, 2017 and Oloko, 2017) because Islamic system

is used instead of conventional counterparts for investment in order to adopt diversification and financial strength.

The remaining paper is organized as follow: Section II reviews the literature related to interest rate exposure, linearity, non-linearity in stocks and effects of macroeconomic variables during global financial crises. Section III describes the data and Methodology adopted to assess the impact of interest rate exposure on Islamic and conventional stock returns. Section IV provides discussion on results. The last section concludes the paper.

Literature Review

This study divides the literature in two groups of studies. First group of studies have investigated the impact of interest rate changes in financial and non-financial sectors in various countries across the world (Chen and Chan, 1989; Christie, 1982; El-Masry and Pointon, 2014; Faff and Howard, 1999; Ferrando et al., 2016; Ferrer et al., 2010; Hallerbach, 1994; Jareño et al., 2016; Joseph and Vezos, 2006; Rashid and Ahmad, 2008; Memmel, 2011; Oertmann et al., 2000; Shamsuddin, 2014). Consequently, it is worth mentioning here that most of the literature is related to linear interest rate exposure, while little attention has been given to non-linearity.

The relationship between stocks returns of markets and interest rate volatility is presumed negative and commonly driven by financial institutions in markets and macroeconomic variables have effects on companies' value domestically and globally (Oertmann, Rendu and Zimmermann, 2000). The capital stock and credit risk are predicted to be a significant components for the interest rate exposure in banking sector and expected risk of interest rate a role with regard to market risk (Ballester et al., 2009). The real estate and construction industries along with banking are exposed more to interest rate risk and degree of exposure is closely highly leveraged dependent to stability of monetary to manage the interest rate risk (Ballester, Ferrer and Gonzales, 2010 and 2011). Interest rate exposure was prominent at the time of change in financial system and changes were the result of deregulation, volatility in stock markets, interest rate and exchange rate exposure (Faff and Howard, 1999).

The interest rate change may cause the existence of volatility in stocks returns due to mispricing, noise trading and herd behavior; a reason to increase volatility volume rapidly (Bahloul & Bouri, 2016; Blasco, Corredor & Ferrer, 2018). The sensitivity of the stock markets of US and Spain with regard to interest rate has also been examined which contributed much attention to explore the effects of interest rate change under bullish, bearish or stable stock markets (Ferrando and Jareno, 2016). Moreover, the risk associated to volatility spillover is sensitive to economic events which change over time (Hamid, Akash & Ghafoor, 2019). Of course, a rare work has considered regarding interest rate change and volatility for Islamic stocks.

Islamic sector portfolios were found to be less exposed to interest rate exposure than conventional counterparts (Shamsuddin, 2014). Islamic stocks were less risky than the conventional stocks during crisis period and volatility in stocks was persistent with the bad news and asymmetric pattern but conventional stocks were more sensitive to asymmetric and bad news (Dewandaru et al., 2014; Fakhfekh et. al., 2016; Usman et al., 2019). The contagion effect was weak for Islamic and conventional stocks and small contagion effects were found in developed Islamic markets as compared to leading to developed BRICS countries. BRICS countries were proved best option for portfolio diversification as compared to developed Islamic indices (Kenourgios, Naifar and Dimitriou, 2016). Moreover, few studies have investigated the possibility of interest rate exposure complexity than linearity of it. The related studies in this

context were explored by Chen and Chan (1989), Benink and Wolff (2000), Joseph and Vezos (2006) who identify the asymmetric sensitivity of interest rate for US markets.

Second group of studies have investigated the performance of stocks during global financial crisis across different countries in the world (An and Jin, 2015; Chhibber et al., 2009; Duncan and Kabundi, 2014; Hong et al., 2010; Sohail and Javed, 2014; Wade, 2009; Wang, 2013).

The evidence is also available regarding transmission of interest rate volatility internationally and co-movements regarding volatility during global financial crisis in relation to Asia in 1997-1998, Brazil in 1999, Russia in 1998 and US in 2000 and 2007-2008 (Duncan and Kabundi, 2013 and 2014). Bad news were showing sever effect on volatility than good news and DJUSI and DJEMI (Islamic indexes) both proved efficient in risk adjustment return of portfolios than conventional counterparts during crisis period (El-Mehdi and Mghaieth, 2017). The crisis was severe in nature in advanced countries as compared to developing due to interdependence level and financial integration. Asian countries were affected through trade and financial channels (Hong, Lee and Tang, 2010). Stock markets were more integrated during shocks and less after crises. Korean markets were more integrated with Japanese markets and degree of integration was high when markets were showing high shocks (Wang, 2013). Depreciation in currency was increased 1% from Oct, 2004 to Oct, 2007 with US but 36% from Oct, 2007 to Aug, 2009. Poverty also increased in this period and crisis impact came from UAE and US by fall in remittances, GDP, exports and depreciation in exchange rate (Khawaja, Mahmood and Tahir, 2010). Weak linkages were found between markets of Indonesia and developed.

Developed markets were highly linked with each other for both Islamic and conventional counterparts (Majdoub, Mansour and Jouini, 2016). The contagion effect was significant in both the emerging and developed stock markets during GFC and Euro zone crisis. Latin American countries were affected equally as Asian, partially in both the crisis. African and Middle East countries were unaffected during GFC, but partially in Euro zone crisis, while diversification strategies were unaffected during GFC in US stock markets (Mollah, Quoreshi and Zafirov, 2015).

Similarly, Ng et al. (2017) found significant volatility, past shocks and leverage effect and the risk evaluations, cross market hedge ratio and risk minimization were proved appropriate for portfolio selection. The time varying effect of macroeconomic factors on stock returns of various sectors in India existed and economic changes were different among the sectors that indicated a message to investors for diversifying the investment (Sajid, 2013). The transmission of risk was significant in both Islamic & conventional counterparts at the time of beginning of 2007 global financial crises. The Islamic stock market could not use hedge strategy for investors as compared to conventional counterparts during financial turmoil. The degree of under and over reaction was declined and averted contagion affect after crisis period in 2007-2009 (Sohail and Javed, 2014) and the markets were more integrated during the global financial crisis (An and Jin, 2015; Visalakshmi and Shanmugam, 2015). On the basis of above literature review, the following hypothesis can be developed.

Hypothesis of Study:

H1: The returns of conventional stock indices are more volatile than Islamic stock indices due to higher interest rate exposure.

Data and Methodology

In order to assess the impact of interest rate change and volatility on Islamic and conventional stocks, the daily indices of the stock markets of China, India and Pakistan from Asian world and Malaysia and Indonesia from Islamic world have been taken into consideration in this study. Dow Jones Islamic Market Index as Benchmark was taken into consideration to represent the overall Islamic stocks, taken from Yahoo Finance website and DataStream website. The data regarding interest rate, comprised of monthly prices for the period of January 4, 2005 to December 30, 2015 was collected from World Bank website and Econostate.

The returns are calculated as follows:

$$r_{it} = \ln\left(\frac{p_t}{p_{t-1}}\right) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(1)}$$

In the first step residuals were calculated from GARCH model and then moved towards sign bias test as explained under below mentioned regression of squared residuals.

$$\hat{\varepsilon}_t^{\,2} = \lambda_0 + \lambda_1 \, \text{Signz}_{t-1}^{-} + \mu_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(2)}$$

Whereas, $\text{Signz}_{t-1}^{-} = 1$ if $\hat{\hat{\varepsilon}}_{t-1} < 0$ and $\text{Signz}_{t-1}^{-} = 0$ otherwise.

The symbol λ_1 is used as coefficient which involves t-test in size bias testing. The coefficient λ_1 will be statistically significant when there is diverse effect on volatility due to positive and negative shocks. The sign and size bias test are used to capture the past shocks upon which the volatility depended. Following regression equation can be used.

$$\hat{\varepsilon}_t^{\,2} = \lambda_0 + \lambda_1 \, \text{Signz}_{t-1}^{-} + \lambda_2 \, \text{Signz}_{t-1}^{-} \, \hat{\varepsilon}_{t-1} + \lambda_3 \, \text{Signz}_{t-1}^{+} \, \hat{\varepsilon}_{t-1} + \mu_t \quad \ldots \text{(3)}$$

$$\text{Signz}_{t-1}^{+} = 1 - \text{Signz}^{-}{}_{t-1} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(3a)}$$

If there would be no correspondence in term of sign and size bias then Null hypothesis will be written as $H_0\colon \lambda_1 = \lambda_2 = \lambda_3 = 0$. This element of test is to be used as Lagrange Multiplier (LM) test.

The mandatory element of model is residual for its repossession regarding variance equation.

In this regard, process of econometric, regarding returns is narrated as under.

$$r_t = \psi_0 + \sum_{i=1}^{p} \psi_i \, r_{t-1} + \sum_{i=1}^{q} \lambda_1 \, \hat{\varepsilon}_{t-1} + \hat{\varepsilon}_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(4)}$$

Where "ψ_0" is constant, ψ_i and λ_1 are the parameters, r_t is denoted for return at time t and $\hat{\varepsilon}_t$ is denoted as white noise at time t. ARMA (p, q) model in equation (3) which explores that returns are dependent on returns and shocks at previous values.

The understandability of ARCH model can only be assisted in term of first order auto regression as indicated in the following equation.

$$r_t = \alpha r_{t-1} + \hat{\varepsilon}_t \quad \ldots\ldots (5)$$

The function of residuals at historical can be perceived in term of conditional mean denoted as $\delta 2$ which indicates as conditional variance. The prediction may be improved through equation if the historical information in variance equation should be absorbed. Engle (1982) explored the model as under:

$$\delta t2 = \alpha 0 + \alpha 1 r_{t-12} + \hat{\varepsilon}_t \quad \ldots\ldots (6)$$

Where $\hat{\varepsilon}_t \sim \text{iid}(0,1)$., Engle (1982) proposed a method to parameterize i.e. $\delta t2$ in order to investigate the behavior in term of heteroscedasticity.

$$\delta t2 = \alpha 0 + \sum \alpha iqi = 1\hat{\varepsilon}_t - 12 \quad \ldots\ldots (7)$$

Where $\alpha 0 > 0$ and $\alpha 0 \geq 0$.

Bollerslev (1986) proposed GARCH model which is the generalized form of ARCH model (Engle, 1982). The non-negative constraint is considered in a better way with GARCH model and superior fit as compared to ARCH model which permits conditional variance, modeled by numbers of lagged values along historic shocks. GARCH (p, q) model is explained as equation under.

$$\delta t2 = \psi 0 + \sum \psi iqi = 1\hat{\varepsilon}_t - i2 + \sum \Upsilon jpj = 1\delta t2\text{-}j \quad \ldots\ldots (8)$$

Whereas, order of GARCH and ARCH terms are represented as p, q respectively. Conditional variance at time t denoted as $\delta t2$, $\psi 0$ is denoted as constant, parameters are denoted as ψi and Υj. $\hat{\varepsilon}_t - i2$ is the preceding square shocks indicator. $\Delta t2$-j expressed as variance at previous indicator.

Brooks (2008) explored GARCH (1,1) in most cases and investigated that it is enough to predict clustering volatility. Moreover, he indicated that it as unique case in finance studies because of having very exceptional use in term of higher order. Thick tailed returns and clustering volatility in GARCH (1,1) model are successfully investigated in terms of diverse number of financial time series. The condition i.e. ($\alpha + \beta < 1$) which fulfilled the requirement of stationarity of data in GARCH (1,1) model if on the other side if the condition i.e. ($\alpha + \beta = 1$) in process but said to be stationary due to infinite variance. If average value is zero then $\hat{\varepsilon}_t$ is considered as distributed normally and ($\hat{\varepsilon}_t \sim N(0, \delta t2)$) is expressed in time varying variance.

Engle (2002) explored the model of multivariate GARCH-DCC in order to employ the volatility regarding time-varying estimation and interdependence among series of returns. This model gives the output in term of volatility changes and interdependence over time. Specifically it defines the direction or movement of the output either positive/negative and strong/weak magnitude. The multivariate GARCH-DCC-model by Engle's (2002) is an improved form of the estimator (CCC) constant conditional correlation of Bollerslev (1990) which involved two steps as under.

The step (01) is the estimation of an individual stock index regarding conditional variance where a univariate GARCH (1,1) model, observed under k numbers for series of returns can be used as under.

$$h_{it} = v_j + \sum_{x=1}^{\chi_i} \alpha_{jx} r^2 it - x + \sum_{z=1}^{z_j} \beta_{jy} h_{it-y}, For\ j = 1,2,3 \dots\dots\dots, k \dots\dots \quad (9)$$

Whereas, v_j, α_{jx} and β_{jy} are elements which are non-negative and $\sum_{x=1}^{\chi j} \alpha_{jx}$ and $\sum_{z=1}^{z_j} \beta_{jy}$ <1. h_{it} is denoted as the estimation of conditional variance regarding asset individually, α_{jx} is denoted as shocks for short term returns for X (ARCH effect) and β_{jy} is denoted as shocks for returns Y, persistent to effect of GARCH in long run. In this regard, the specification of Engle's-DCC-model is further extended as under

$$\mathrm{D}_t = diagonal\ (\sqrt{\omega_{11,t}}, \sqrt{\omega_{22,t}}, \dots\dots \sqrt{\omega_{kk,t}}) \dots\dots\dots\dots\dots\dots\dots\dots \quad (10)$$

$$\hat{\mathrm{R}}_t = \mathrm{O}_t^{*-1}\ \ \mathrm{O}_t\, \mathrm{O}_t^{*-1} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \quad (11)$$

Whereas, *kxk* explored as asymmetric positive definitive matrix and $\mathrm{O}_t = q_{ij,t}$ is calculated as:

$$\mathrm{O}_t = (1 - \varphi - \chi)\, \tilde{\mathrm{O}} + \chi \mathrm{O}_{t-1} + \varphi \sigma_{i,t-1} \sigma_{j,t-1} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \quad (12)$$

Whereas, the (*k, k)* time varying covariance matrix for standardized residuals is denoted by O_t and unconditional correlation by $\tilde{\mathrm{O}}$ of σ_{it}, σ_{jt} and scalar parameters which are non-negative are indicated by φ and χ which fulfill $\varphi + \chi < 1$.

In this regard the market X and Z under conditional correlation at time t can be observed as under.

$$\rho_{ij,t} = (1 - \varphi - \chi)\bar{\rho}_{ij} + \varphi \sigma_{j,t-1} + \chi q_{ij,t-1} / [(1 - \varphi - \chi)\bar{q}_{ii} + \varphi \sigma_{i,t-1}^2 + \chi q_{ii,t-1}]^{\frac{1}{2}} [(1 - \varphi - \chi)\bar{q}_{jj} + \varphi \sigma_{j,t-1}^2 + \chi q_{jj,t-1}]^{\frac{1}{2}}$$

…….. (13)

Whereas, the element for matrix O_t at i^{th} row and j^{th} $column$ is denoted as q_{ij}, an assumption of Gaussian, the parameters regarding conditional log likelihood, introduced by Bollerslev (1988), is explained as follows.

$$LK = -\frac{1}{2}\sum_{t=1}^{N}[(\mathcal{K}\log(2\pi) + Log|\mathrm{D}_t|^2 + \varepsilon_t\mathrm{D}_t^{-1}\ \mathrm{D}_t^{-1}\varepsilon_t) + (\log|\hat{\mathrm{R}}_t| + \sigma_t'\hat{\mathrm{R}}_t^{-1}\sigma_t - \sigma_t'\sigma_t)] \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (14)$$

Results and Discussion

Table-1

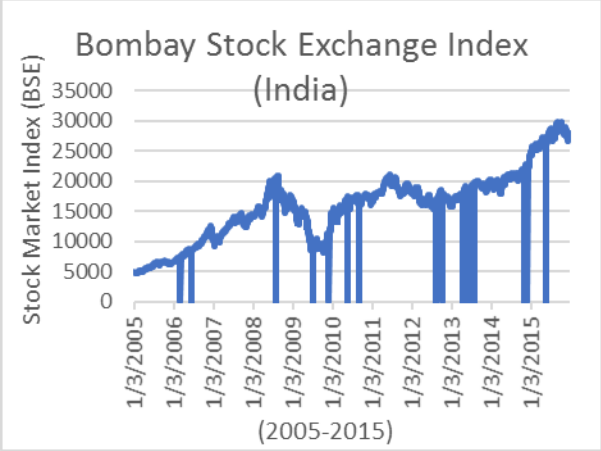
Descriptive Statistics of Stock market returns; for the period from 04 Jan, 2005 to 31 Dec, 2015

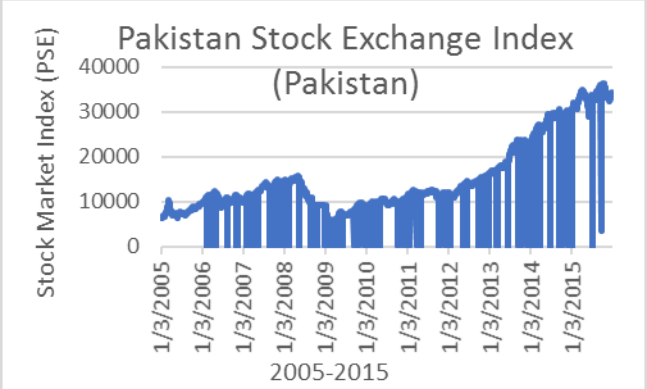
	Conventional Stock			Islamic Stock		
	SSE	BSE	PSE	DJIM	JKII	DJWI
Mean	0.0003	0.0005	0.0007	0.0003	0.0005	0.0002
Median	0.0003	0.0009	0.0110	0.0000	0.0007	0.0003
Maximum	0.0903	6.9078	0.0825	0.0463	0.3579	0.0983
Minimum	-0.0926	-6.9269	-0.0604	-0.1094	-0.1782	-0.0842
Std. Deviation	0.0175	0.1774	0.0128	0.0077	0.0176	0.0101
Skewness	-0.4709	-0.1813	-0.4106	-1.2422	2.2513	-0.4464
Kurtosis	7.0111	1496.5	6.2075	22.2104	67.5565	14.8376
Jarque-Bera	2187.0840	287000000.00		1412.3460	48340.170	539531.60
18156.070						
Probability	0.0000	0.0000	0.0000		0.0000	0.0000
0.0000						

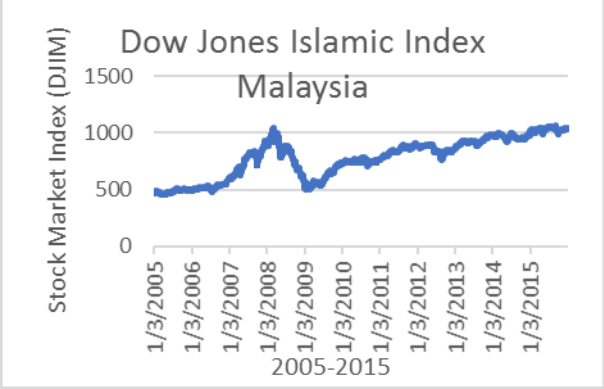
Table-1 explains the results of descriptive statistics regarding daily returns of conventional and Islamic stock markets. It covers the period from 04 Jan, 2005 to 30 Dec, 2015. The stock markets are Shanghai Stock Exchange (SSE)-China, Bombay Stock Exchange (BSE)-India, Pakistan Stock Exchange (PSE)-Pakistan, Dow Jones Islamic Market Malaysia (DJIM)-Malaysia, Jakarta Islamic Index (JKII)-Indonesia and Dow Jones World Islamic Index (DJWI). The stocks of PSE generated higher average returns but SSE and BSE stocks remained riskier. SSE, BSE, PSE, DJIMI and DJWI are negatively skewed but DJIM remained positively skewed. Jarque Bera normality test confirms exodus from normality regarding all the returns of market and shown in below graphs that the returns are fluctuating during crisis, after crisis and pre-crisis period.

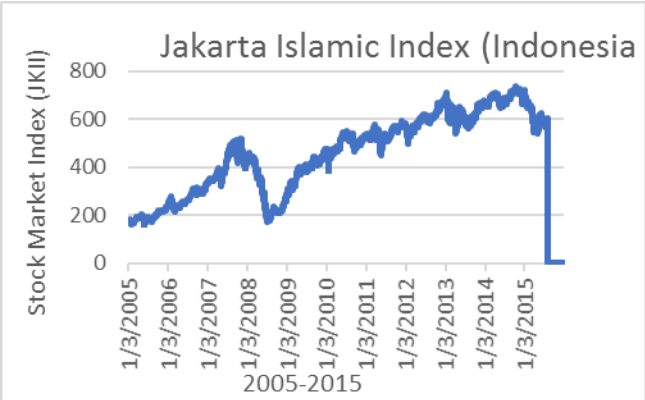
Figure 01: Plots of stock market returns of SSE, BSE, PSE, DJIM, JKII and DJWI.


Shanghai Stock Exchange Index
(China)
Stock Market Index (SSE)
7000
6000
5000
4000
3000
2000
1000
0
1/3/2005
1/3/2006
1/3/2007
1/3/2008
1/3/2009
1/3/2010
1/3/2011
1/3/2012
1/3/2013
1/3/2014
1/3/2015
(2005-2015)


Bombay Stock Exchange Index
(India)
Stock Market Index (BSE)
35000
30000
25000
20000
15000
10000
5000
0
1/3/2005
1/3/2006
1/3/2007
1/3/2008
1/3/2009
1/3/2010
1/3/2011
1/3/2012
1/3/2013
1/3/2014
1/3/2015
(2005-2015)


Pakistan Stock Exchange Index
(Pakistan)
Stock Market Index (PSE)
40000
30000
20000
10000
0
1/3/2005
1/3/2006
1/3/2007
1/3/2008
1/3/2009
1/3/2010
1/3/2011
1/3/2012
1/3/2013
1/3/2014
1/3/2015
2005-2015


Dow Jones Islamic Index
Malaysia
Stock Market Index (DJIM)
1500
1000
500
0
1/3/2005
1/3/2006
1/3/2007
1/3/2008
1/3/2009
1/3/2010
1/3/2011
1/3/2012
1/3/2013
1/3/2014
1/3/2015
2005-2015



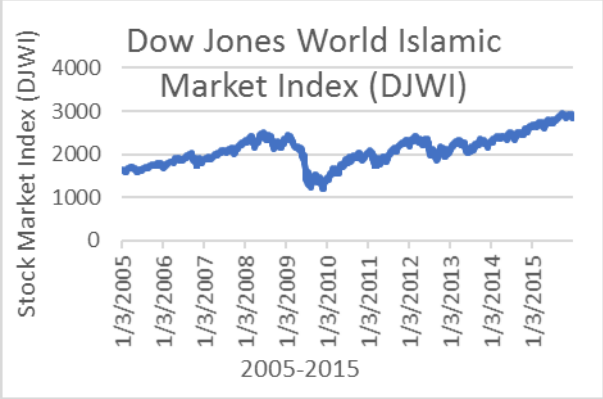


Figure 01 shows the plots of Islamic and conventional stock market indices for the period from Jan, 2005 to Dec, 2015. The trends of the plots indicate that the return indices of Islamic and conventional stock markets are fluctuating during the period of crisis, pre-crisis and post crisis period. The SSE indices are increasing at the start of 2007 and decreasing after 2008 rapidly, BSE is increasing from 2006-2008 and then decreasing after the mid of 2008. The trend of PSE is also decreasing after the mid of 2008. The DJIM and JKII indices are decreasing after 2008 while DJWI indices start decreasing after 2009. The fluctuations in Islamic and conventional indices of stock markets suggest that the global financial crisis had impact on Islamic stock market, but less as compared to conventional stock market indices.

Table-2

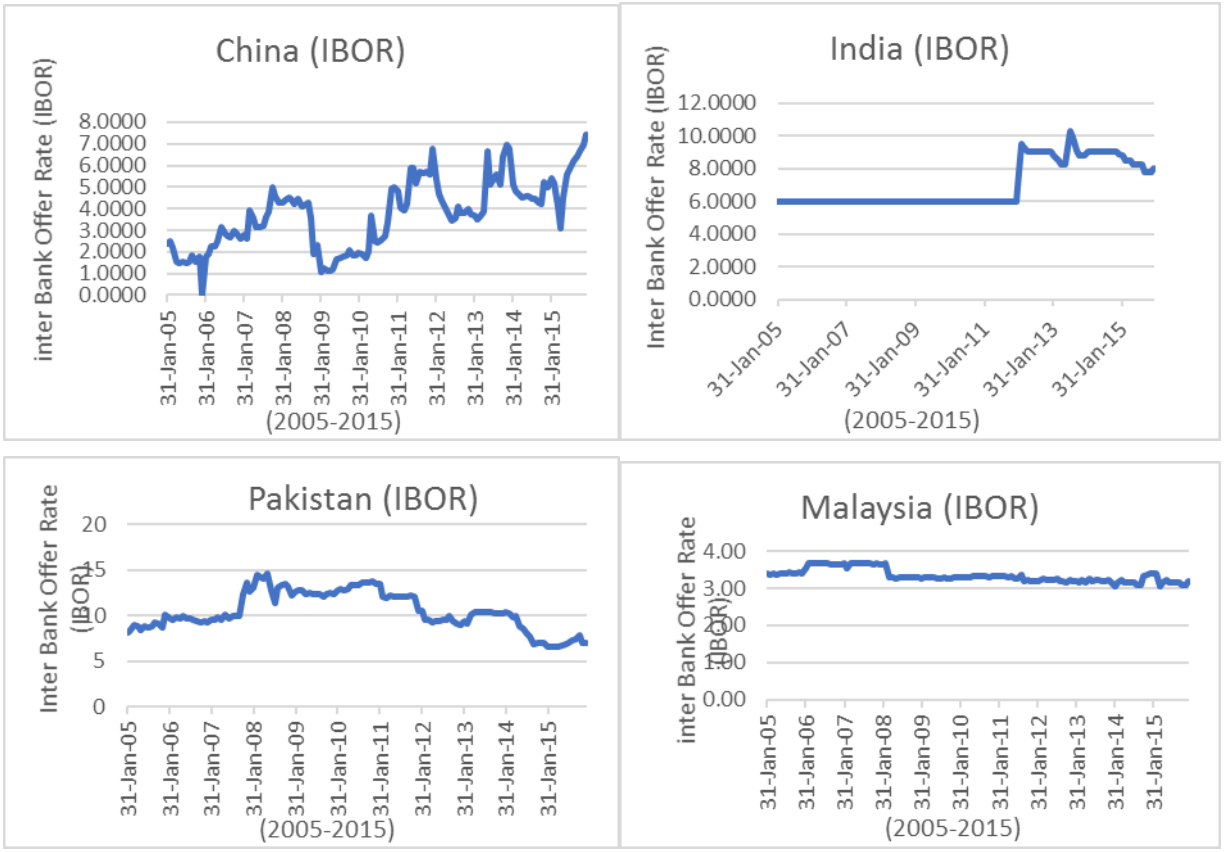
Descriptive Statistics of Monthly returns of Interbank Offer rates of China, India, Pakistan, Malaysia and Indonesia; for the period from 04 Jan, 2005 to 31 Dec, 2015.

	China	India	Pakistan	Malaysia	Indonesia
Mean	0.0103	0.0019	-0.0016	-0.0001	0.0019
Median	0.0105	0.0000	0.0000	0.0000	0.0002
Maximum	0.6025	0.2559	0.2179	0.0746	0.1335
Minimum	-0.7467	-0.0789	-0.1408	-0.1116	-0.1265
Std. Deviation	0.1741	0.0339	0.0505	0.0209	0.0445
Skewness	-0.3945	5.1211	0.3222	-1.5407	0.3005

Kurtosis	7.4422	35.9709	6.8679	14.3699	3.9070
Jarque-Bera	111.1048	6506.2480	83.9271	757.4519	6.4626
Probability	0.0000	0.0000	0.0000	0.0000	0.0000

Table-2 explains the results of descriptive statistics regarding monthly returns of interbank offered rates, proxy of interest rate of 05 countries (China, India, Indonesia, Malaysia and Pakistan). The returns of China (IBOR), India (IBOR) and Indonesia (IBOR) found positive on average except Pakistan (IBOR) and Malaysia (IBOR). China and Malaysia returns are negatively skewed but returns of India, Pakistan and Indonesia positively skewed. The normality of series confirms from normality test Jarque-Bera which explored that the series are not normal regarding all the returns of interbank offer rate of all countries as shown in below graphs that the return series of interbank offered rates are fluctuating during crisis, after crisis and pre-crisis period.

Figure 02: Plots of returns of Interbank Offer rates of China, India, Pakistan, Malaysia and Indonesia.



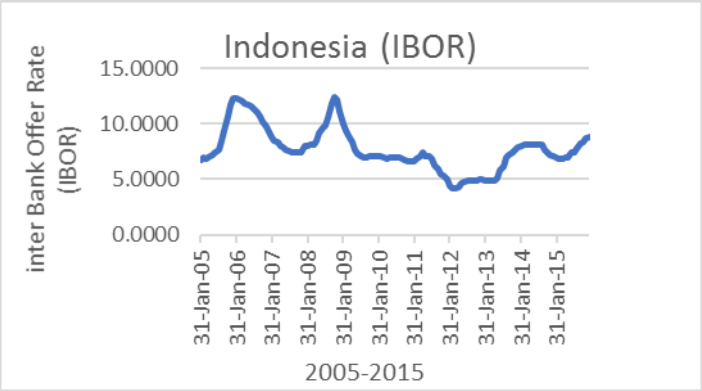


Figure 02 shows the plots of interbank offer rates (IBOR) of China, India, Indonesia, Malaysia and Pakistan for the period from Jan, 2005 to Dec, 2015. The trends of the plots of IBOR indicate the fluctuations during global financial crisis, pre-crisis and post crisis period. The IBOR of China decreased rapidly after 2008 but IBOR of India remained stable during global financial crisis of 2007-2008. The IBOR of Pakistan initially decreased slightly till 2008 and then increased after that then decreasing again after 2008. The IBOR of Malaysia was slightly decreasing after 2007 but remained stable after that. The IBOR of Indonesia also decreased after 2007 and then increased after 2008. Overall plots show that the fluctuations in IBOR of all the countries indicate the effects of global financial crisis on all except India.

Table-3

Estimation of Sign and Size Bias (SB) Test

	Conventional Stocks			Islamic Stock		
	SSE	BSE	PSE	DJIM	JKII	DJWI
SB-T	0.00002	-0.00008	-0.00003	0.00008	-0.00055**	0.00008
NSB-T	-0.00920**	-0.03347**	-0.01981**	-0.00223**	-0.07625**	-0.0186**
PSB-T	0.00807**	0.00904**	0.00946**	0.01549**	0.00192**	0.00588

Table-3 reports the results of sign and size bias test for conventional and Islamic stock indices where these were found positive and negative respectively at significance level of 5%. The markets are perceived significant with respect to NSB (negative sign bias) and PSB (positive sign bias) which means that the conventional and Islamic stock markets are showing asymmetric behavior. The results further reveal that the PSB and NSB are significant for all the conventional and Islamic stock markets except DJIM. Overall results explore that the returns series regarding all the markets showing asymmetric behavior but the DJIM rejected the null hypothesis. The non-linear trend was observed in return series, confirmed by Sign and Size bias test at 5% significance level.

Table-4:

Estimation of GARCH (1,1) Model.

		Conventional Stocks			Islamic Stocks		
Statistics	Parameters	SSE	BSE	PSE	DJIM	JKII	DJWI
Mean Equation	α	0.0005	0.0014**	0.0145**	0.0004	0.0016**	0.0015**
	β	0.0428	0.0947**	0.0825**	0.1873**	0.1114**	0.1131**

Variance Equation	ψ_0	0.0002**	0.0001**	0.0003**	0.00005**	0.00000082**	0.00003**
	ψ_1	0.0705	0.1458**	0.1785**	0.1935**	0.67719**	0.1498**
	φ_0	0.9350**	0.9652**	0.8749**	0.6399**	0.7875**	0.9129**
Diagnostic Testing	AIC-Statistics	-5.49058	-5.52988	-5.49048	-6.38487	-5.92674	-5.66108

Table-4 estimates GARCH model regarding coefficient of conditional mean equation where p-value <0.00001 and significant except SSE for conventional stock indices and Islamic stock indices. The confidence interval at 95% was significant in term of ARCH where current volatility regarding all markets is influenced by behavior of past price. The persistence regarding volatility at confidence interval of 95% perceived as significant in term of GARCH. Coefficient of stock returns, lagged which observed significant where p<0.005 that predicted that current volatility is affected significantly by volatility of lagged. Both the coefficients ψ_0 and ψ_1 are predicted significantly where p<0.00001 which indicated that hypothesis in term of constant variance is rejected. The model selection criteria applied in term of usage of methods i.e. AIC, Schwarz and Log likelihood.

Table- 05

Estimation of Multivariate GARCH-DCC between SSE, BSE, PSE, DJIM, JKII and Interbank offer rate (IBOR) of all countries.

Index	DCC-Coeff	Pre-Crisis (2005-2008)	Crisis Period (2008)	Post Crisis (2009-15)
		Interest Rate		
SSE	DCC (1)	0.0070*	0.0231	0.0158*
		-0.0042	-0.0094	-0.0086
	DCC (2)	0.9308***	0.8795***	0.9490***
		-0.0065	-0.1055	-0.0259
BSE	DCC (1)	0.0088**	0.0263	0.0136
		-0.0049	-0.0164	-0.0079
	DCC (2)	0.9867***	0.7868***	0.9843**
		-0.0076	-0.2267	-0.0303
PSE	DCC (1)	0.0047***	0.0104	0.0195**
		-0.0038	-0.0076	-0.0094
	DCC (2)	0.9265***	0.8261***	0.9837***
		-0.008	-0.067	-0.0531
DJIM	DCC (1)	0.0078*	0.0304	0.0148
		-0.005	-0.0162	-0.0098

	DCC (2)	0.9847***	0.8402***	0.9261***
		-0.0071	-0.2869	-0.0405
JKII	DCC (1)	0.0044	0.0108	0.0172**
		-0.0038	-0.0093	-0.0072
	DCC (2)	0.9539***	0.8693***	0.9450***
		-0.0088	-0.0872	-0.0473

Table-05 explores the results of Multivariate GARCH-DCC where the Coefficients of indices and interest rates of China, India, Indonesia, Malaysia and Pakistan. DCC-1 represents indices whereas DCC-2 represents interest rate. China stock indices and its interest rate are significant and positive during the pre-crisis, during crisis and post crisis periods. The values are 0.0070, 0.0230 and 0.0158 respectively. Coefficients show that the magnitude of coefficients of volatility is smaller during pre-crisis period and post crisis period than that of during crisis. In addition, the coefficients of Indian, Pakistani (Conventional) and Malaysian and Indonesian stock market (Islamic) indices and interest rate are also significant and positive during pre-crisis, during crisis and post crisis periods. Coefficients of indices and interest rates show that the magnitude of coefficients of volatility are smaller during pre-crisis and post crisis periods than that of during crisis period.

Conclusion

This research explores the effects of global financial crises and interest rate changes in terms of conditional correlation volatility of Islamic and conventional stock indices. The coefficients of China stock market indices and interest rate remained significant and positive in the pre-crisis, crisis and post crisis periods. Coefficients show that the magnitude of volatility was smaller during pre-crisis period and post crisis period than that of during crisis. In addition, the coefficients regarding Indian, Pakistan (Conventional) and Malaysian and Indonesian stock market (Islamic) indices and interest rate were significant and positive during the pre-crisis, during crisis and post crisis periods. Coefficients show that the magnitude of volatility was smaller during pre-crisis period and post crisis period than that of during crisis period. Overall conclusion suggested that there was no effect of interest rate change on stock indices of DJIM. On the basis of this study, the investors can invest their funds in better stocks from conventional and Islamic indices. They can manage the risk of any global financial crisis by investing in Islamic stocks rather than conventional stocks. The investment strategies for investors may be fruitful because they can lessen the risk and manage the investment in models of performance oriented and reasonable businesses. This research may be helpful for Government and policy makers to develop policies for businesses and investors. The policy makers may introduce policies to promote Islamic stocks and Shari'ah governing laws in business enterprises. Government may take steps to reduce the volatility which is a measure of risk for Islamic and conventional stocks. The volatility and crisis effect, if identified through best modeling selection, could identify the risk-return behavior of conventional and Islamic stock market indices and interest rate change in better way for excellent solution in future.

This study also provides directions for further research. The researchers may take larger sample of countries and expand this research to other regions or sub-regions e.g. Middle East, GCC, Europe etc. They may compare Islamic and conventional stock indices of the same country. Generally, conventional stock index also includes some of the top performing Islamic stocks by

default, which may dilute the results of comparison. Future researchers may focus on developing an index that can isolate the conventional stock index from the effects of Islamic stock.

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