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THE PORTFOLIO MANAGEMENT WITH ISLAM EQUITY IN KOREA STOCK MARKET[1]

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ABSTRACT

This paper investigated the volatility spillover effects between Islamic stock markets and Korean stock market using the AR-DCC-GARCH models. First, we found bi-directional volatility transmissions between the Islamic and Korean financial markets. Second, we compared the correlation of KOSPI-DJIM portfolio and that of KOSPI-SHX portfolio. It shows the former has stronger linkage than the latter. In the portfolio perspective, the S&P 500 Sharia stock Index (SHX) acts as a better hedge asset than DJIM against the risk of stock market. Lastly, the hedge ratio between two Islamic stock market and Korean stock market pairs is generally low, indicating that the Korean stock risk can be effectively hedged by taking a short position in the Islamic stock markets. In comparison with two pairs, the pair of KOSPI-SHX relatively shows a cheaper hedging cost than that of KOSP-DJIM pair. This evidence indicates that S&P 500 Sharia index serve more effective hedging role against the risk of Korean stock market.

Key Words: *Islamic market, Spillover effect, Hedge ratio, AR-DCC-GARCH model. Portfolio management.*

Jel Classifications: *C14, C22, G10.*

1. INTRODUCTION

The Islamic equity markets are seemingly different from conventional markets in the United States and other developed countries. Islamic finance is guided by the principles of Islamic law (shariah) which prohibits interest (riba), excessive risk-taking (gharar), gambling (maysir), and promotes risk sharing, profit-sharing, asset-backed financial transactions, and ethical investment. Islamic investment can be also regarded as a subset of the socially responsible or ethical investment universe. The growing

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demand for Islamic investment products emerges as new business opportunities. To explain the diversification benefits through investing in Islamic stock market we explore the volatility spillover effects between Islamic and conventional finance markets. A few studies have been conducted on the volatility spillover between Islamic and conventional markets. But there has been no consensus on the evidence of volatility spillover between Islam and conventional markets in the prior literature.

Some studies show an Islamic stock index is argued to be more resilient to a financial crisis compared to a conventional stock index (Charles, Pop & Darné, 2011; Sukmana and Kolid, 2012). Majid and Kassim (2010) found that investors can gain benefits by diversifying in the Islamic stock markets across economic grouping. It is generally argued that the characteristics of the Islamic stocks are different compared to those of the conventional stocks in that the former entails a lower leverage, smaller size of firms and less diversified markets resulting in different risk-return portfolios. The quantitative criteria, Debt/equity ratio and the limit of interest-based leverage would also lead to lower systemic risks of Islamic stocks indices, both during expansion and recession. Due to the ethical foundations of Islamic stock indices, Iqbal, et al., (2010) argue that Islamic stock indices provide better diversification benefits compared with their conventional counterparts. Majdoub and Mansour (2014) find the weak and low conditional correlations between the Islamic emerging and US Islamic markets based on the multivariate GARCH-BEKK (1,1) along with the robust test of using the CCC and DCC-GARCH models. They argue that Islamic financial markets are weakly integrated and the volatility spillovers among them are weak as well, which can be a reason for international diversification.

On the contrary to decoupling Islamic financial markets from conventional markets, The Linkage effects of Islamic equity finance with conventional equity finance exist. That is, the volatility of conventional markets spills over to the that of Islam market, or vice versa. Ahdi et al., (2014) reveal evidence of significant linear and nonlinear causality between the Islamic and conventional stock markets but more strongly from the Islamic stock market to the other markets. They also show potent causality between the Islamic stock market and financial and risk factors. Marcos et al., (2014) also find that the Islamic markets are causal and interactive with conventional markets, and they also do not perform much better than the conventional markets during crises. It implies that the Islamic equity markets may not be good candidates as risk diversifiers in asset allocations and hedgers against risk exposures. Ajmi A, et al., (2014) show that the Islamic equity market is not isolated from external shocks of different types, regions, and sources. They find that there is a causal link coming from the Islamic market to both the European and the Asian stock markets and Brent oil market, which are stronger Islamic relationship with regions in which Islamic Finance is more developed. These findings thus suggest the rejection of the decoupling hypothesis of Islamic equity finance from conventional equity finance, still implying that the Islamic finance system may not provide either a good cushion against financial shocks affecting the conventional markets or large diversification benefits for portfolio

managers. Hence the Islamic finance system is also exposed to global shocks common to the world financial system as well as to contagion risks in the case of economic and financial crises.

Some findings are mixed. For example, Majdoub and Sassi (2017) find that return and volatility spillover bidirectionally between China and five Asian countries' Islamic markets based on the Bivariate VARMA-BEKK-AGARCH model. They also compute the effectiveness of portfolio diversification based on the conditional volatility of returns series. The average hedge ratios range from 0.329 (0.334) for the Malaysian Islamic stock index to 0.640 (0.639) for the Korean Islamic stock index. For the Chinese/Malaysian Islamic stock market portfolio, the most effective hedging strategy is to short Islamic stock indices of the Malaysian market among Asian Islamic stock indexes. In addition, Majdoub et al. (2016) explain the Islamic index is found to be strongly linked with its conventional counterpart for each economy based on AGDCC-GARCH process, which cannot diversify their portfolios at the national level. They also show long-run relationships (cointegration) exist for all countries except for the UK. İt helps to explain that the Islamic finance industry in the considered economies (except the UK) does not seem to be compliant to Islamic law's maxims, which hinders portfolio managers and market participants to benefit from the opportunities of international diversification and hedging effectiveness. However, they find the evidence of weak linkages between the Indonesian market and the developed markets for both conventional and Islamic stock indexes. It suggests that investors can diversify their portfolios at the international level to minimize risks. Shahzad et al.(2018) also find the downside and upside risk spillovers and positive dependence structures (contagion) between five Islamic stock markets (DJIM, Islamic indices of USA, UK, Japan, and Dow jones the Islamic Financials sector index) and WTI oil market using Copular method. The results underscore the presence of asymmetric down- and up-side risk spillovers from oil to the Islamic stock markets and vice versa. The positive dependence and asymmetric downside risk spillover effect is lowest between WTI oil market and the Islamic financial sector among Islamic indexes, indicating the presence of diversification opportunities in these two markets. More importantly, it highlights the Islamic financial sector could be refuge assets in the case of extreme negative oil shocks.

Hence the objective of this study is to investigate whether Islamic stock indices provide more diversification benefits in equity portfolio management in Korean financial market. This requires an empirical investigation of linkage between the conventional and Islamic stock indices. Especially, an understanding of how volatilities and correlations change between asset returns of both markets over time including their directions (positive or negative) and size (stronger or weaker) is of crucial importance for investors with a view to diversifying their portfolios for hedging against unforeseen risks. If the Islamic finance system is only weakly linked or even decoupled from conventional markets in terms of volatility spillover effects, Islamic finance and conventional finance in the asset returns are substitutes or complements in terms of hedging risk. Then this system may provide a cushion against potential losses resulting from probable future financial crises.

The remainder of this paper is organized as follows. Section 2 presents the econometric methodology. Section 3 provides the descriptive statistics of the sample data in pre- and post-crisis periods using a Markov-switching dynamic regression (MS-DR) model. Section 4 discusses the empirical results. Section 5 concludes.

2. EMPIRICAL METHODOLOGY

We assume that the return generating process can be described by an AR (1) model in which the dynamics of current stock returns are explained by their lagged returns. The AR (1) model is defined as follows:

$$r_{i,t} = \mu + \phi_1 r_{i,t-1} + \varepsilon_{i,t} \text{ , with } \varepsilon_{i,t} = z_{i,t}\sqrt{h_{i,t}} \text{ , } z_{i,t} \sim N(0,1), \quad (1)$$

Where $|\mu| \in [(0,\infty),\ |\phi_1| < 1$ and the innovations $\{z_{i,t}\}$ are an independently and identically distributed process. The conditional variance $h_{i,t}$is positive.

We also assume that the conditional variance generating process can be described by a standard GARCH (1,1) model of Bollerslev (1986) as follows:

$$h_{i,t} = \omega + \alpha\varepsilon_{i,t-1}^2 + \beta h_{i,t-1} \quad (2)$$

where ω>0, $\alpha \geq 0$ and $\beta \geq 0$. In the above equation, the persistence of conditional variances can be measured by the sum $(\alpha + \beta)$.

To evaluate the volatility spillovers, we applied a trivariate GARCH model to commodity futures and stock returns. We decided to model the structure of conditional correlations using the DCC approach of Engle (2002). This approach allows us not only to investigate the time-varying correlations, but also to ensure the positive definiteness of the variance-covariance matrix (H_t) under simple conditions imposed on specific parameters. The parameterization of a trivariate GARCH-DCC model enables direct inferences about the time-varying correlations between the Islamic stock markets and Korean stock markets and can handle a relatively large number of variables in the system without encountering a numerical convergence problem at the estimation stage. In the multivariate case we used, the variance-covariance matrix of residuals is defined as follows:

$$H_t = D_t R_t D_t, \quad (3)$$

$$R_t = (diag(Q_t))^{-1/2}\ Q_t\ (diag(Q_t))^{-1/2} \quad (4)$$

where $D_t$is a (3×3)diagonal matrix of time-varying conditional standard deviation from the univariate AR (1)-GARCH (1,1) model. $R_t$is a matrix of time-varying conditional correlation.

he covariance matrix $Q_t = [q_{ij,t}]$ of the standardized residual vector

$\varepsilon_{i,t} = (\varepsilon_{1,t}, \varepsilon_{2,t}, \cdots)'$ is denoted as:

$$Q_t = (1 - \alpha - \beta)\bar{Q} + \alpha(\varepsilon_{t-1}\,\varepsilon'_{t-1}) + \beta Q_{t-1} \tag{5}$$

where $\bar{Q} = \left[\overline{Q_{i,J}}\right]$ denotes the unconditional covariance matrix of ε_t. The coefficients α and β are non-negative scalar parameters depicting the conditional correlation process and $\alpha + \beta < 1$. If $diag(Q_t)^{1/2} = \left\{\sqrt{q_{ij,t}}\right\}$ is a diagonal matrix containing the square root of the i^{th} diagonal elements of Q_t, the dynamic correlation can be expressed as:

$$\rho_{ij,t} = \frac{(1 - \alpha - \beta)\overline{q_{ij}} + \alpha\varepsilon_{i,t-1}\varepsilon_{j,t-1} + \beta q_{ij,t-1}}{\sqrt{\left|(1 - \alpha - \beta)\overline{q_{ii}} + \alpha\varepsilon_{i,t-1}^2 + \beta q_{ii,t-1}\right|\left|(1 - \alpha - \beta)\overline{q_{JJ}} + \alpha\varepsilon_{j,t-1}^2 + \beta q_{jj,t-1}\right|}} \tag{6}$$

The significance of α and β implies that the estimators obtained from the trivariate GARCH-DCC model are dynamic and time-varying. α indicates short-run volatility impact, implying the persistence of the standardized residuals from the previous period. β measures the lingering effect of shock impact on conditional correlations, which indicates the persistence of the conditional correlation process. $\rho_{ij,t}$ indicates the direction and strength of correlation. If the estimated $\rho_{ij,t}$ is positive, the correlation between the i^{th} and j^{th} return series is moving in the same direction and vice versa.

We estimate the DCC model using the quasi-maximum likelihood (QML) estimation method in which the log-likelihood can be expressed as:

$$\log L = -\frac{1}{2}\sum_{t=1}^{T}[k\log(2\pi) + 2\log|D_t| + \log|R_t| + \varepsilon_t'\,R_t^{-1}\,\varepsilon_t] \tag{7}$$

The DCC model's design allows for the two-stage estimation procedures of the conditional covariance matrix H_t. In the first stage, we fit the univariate GARCH-type models for each return, and then obtain estimates of $h_{ii,t}$. In the second stage, we transform the return series using the estimated standard deviation from the first stage; this information is then used to estimate the parameters of the conditional correlation.

3. DATA

3. 1. Descriptive Statistics

This paper considered daily closing stock index series for two Islamic stock indexes of Dow Jones Islamic Index (DJIM) and S&P 500 Sharia index (SHX) as well as for Korean Composite Stock Price Index (KOSPI200) from 2 January 2002 to 10 November 2015. The SHX includes all Shariah-compliant

constituents of the S&P 500 for the U.S. equity market, whereas DJIM measures the performance of stocks traded globally that pass rules-based screens for adherence to Shariah investment guidelines.

All sample data are obtained from Bloomberg database. We calculate the continuously compounded daily returns by taking the difference in the logarithms of two consecutive prices: that is, $r_{i,t} = \ln(P_{i,t}/P_{i,t-1}) \times 100$, where $r_{i,t}$ denotes the continuously compounded percentage returns for stock indexes at time t and $P_{i,t}$ denotes the price level of stock indexes at time t.

Table 1 presents the descriptive statistics and unit root tests of the daily return series for the Islam and Korean stock markets. In Panel A of Table 1, the KOSPI200 return presents the highest average return, followed by the S&P 500 Sharia index series. Regarding to risk, the KOSPI index return shows the highest value of the value of standard deviation (volatility). Conversely, the Dow Jones Islamic market DJIM return is found to have the lowest volatility. This implies that the Korean stock market provides higher return with higher risk.

Regarding to non-normality features, skewness is negative for all return series, with DJIM being the most skewed, implying frequent small gains and extreme large losses. The excess kurtosis values for all return series are above three, indicating the presence of the peaked distributions and fat tails. That is, all return series display a leptokurtic distribution with a higher peak and a fatter tail than the case of a normal distribution. Accordingly, the Jarque-Bera test results are consistent with the aforementioned deviations from the Gaussian distribution, signaling a non-linearity process.

Table 1. Descriptive Statistics and Results of Unit Root Tests

	DJIM	SHX	KOSPI
Panel A: Descriptive statistics			
Mean	0.0172	0.0211	0.0290
Max.	9.7745	11.582	11.539
Min.	-8.7745	-9.5306	-10.903
Std. dev.	1.0306	1.1664	1.4382
Skewness	-0.3662	-0.0410	-0.3414
Kurtosis	11.971***	12.974***	8.4347***
J-B	12206.4***	14991.0***	4520.4***
$Q^2(30)$	7176.1***	7389.8***	3778.6***
ARCH-LM (10)	173.95***	133.46***	90.277***
Panel B: Results of unit root tests			
ADF	-42.394***	-47.267***	-59.629***
PP	-53.400***	-66.901***	-59.755***
KPSS	0.0595	0.1353	0.1180

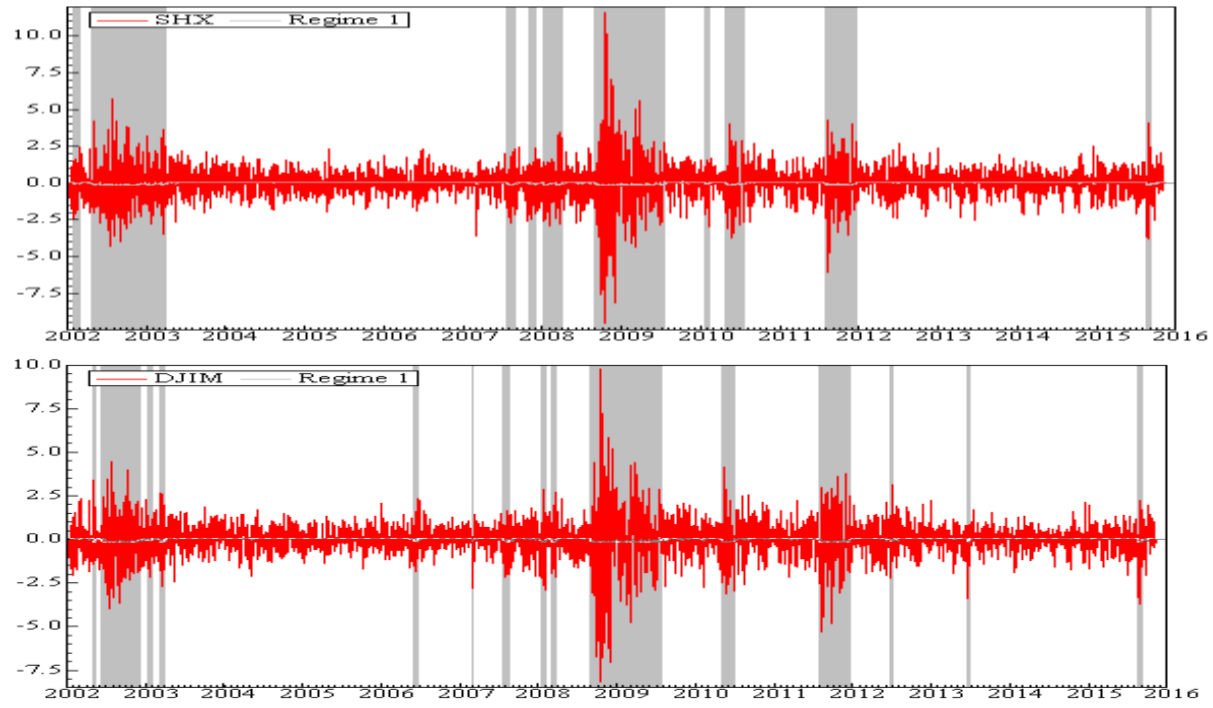
Notes: J-B and $Q^2(30)$ refer to the empirical statistics of the Jarque-Bera test for normality, the Ljung-Box test for autocorrelation, respectively. ADF, PP and KPSS are the empirical statistics of the Augmented Dickey-Fuller (1979), and the Phillips-Perron (1988) unit root tests, and the Kwiatkowski et al. (1992) stationarity test, respectively. The ARCH-LM (10) test of Engle (1982) checks the presence of ARCH effects. *** denotes the rejection of the null hypotheses of normality, no autocorrelation, unit root, non-stationarity, and conditional homoscedasticity at the 1% significance level.

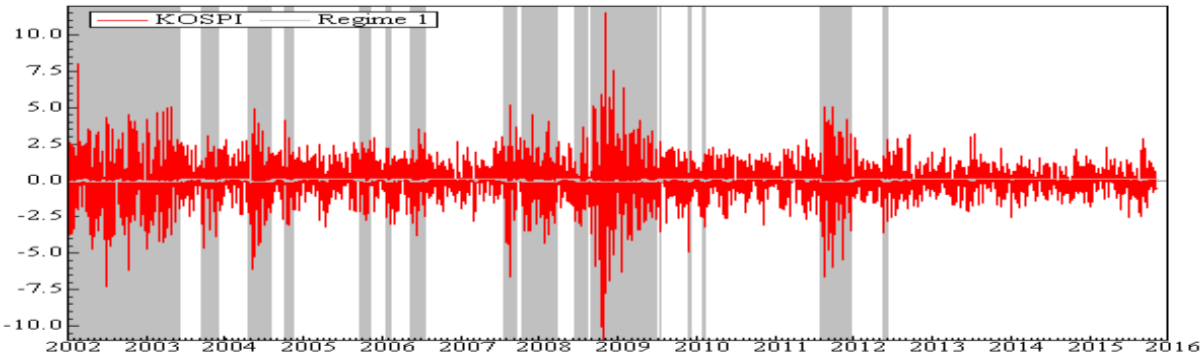
3.2. Identification of Regimes

In this section, we further analyze the impact of crisis events on the dynamic correlations and provide additional explanation of the factors driving the correlations between Islamic stock index returns and KOSPI200 return. In order to identify excess conditional volatility regimes, we apply a Markov-switching dynamic regression (MS-DR) model, which allows the data to determine the beginning and end of each phase of the crisis. The MS-DR model classifies the existence of two regimes: regime zero ('stable' regime) and regime one ('volatile/crisis' regime). Note that regimes zero and one indicate lower and higher values of conditional volatility, respectively.

Figure 1 shows the several regimes in the unconditional variance of the Islamic stock markets and Korean stock market. In general, important political, social and economic events at the local, regional and global levels such as country-specific economic situations, the 2000 IT bubble, the 2003 Iraq war, the 2007 sub-prime mortgage crisis, the 2008-2009 global financial crisis (GFC), and 2011-2012 Eurozone sovereign debt crisis (ESDC). Among these regimes, the most severe regime point is the 2008 global financial crisis (GFC), triggered by the 2007 sub-prime mortgage crisis. Hence, we can consider the 1st August 2007 as a structural breakpoint in order to identify the GFC occurrence and divide the full sample period into pre- and post-crisis periods. The pre-crisis period spans the period from 1st January 2002 to 31th July 2009, while the post-crisis period ranges from 1st August 2007 until the end of the sample.

Figure 1. Regimes in the Return Dynamics





Notes: The shaded areas highlight regimes of excess volatility according to the Markov switching dynamic regression model.

4. EMPIRICAL RESULTS

4. 1. Estimate of trivariate DCC-GARCH Model

This section considers volatility transmission effects between two Islamic stock markets and Korean stock market, using the trivariate DCC-GARCH model. Table 2 presents the estimation results of trivariate AR (1)-DCC-GARCH (1,1) model in three different time periods, such as the whole period, pre- and post-crisis periods. We explain the estimation results in the whole sample period and then compare the results between pre- and post-crisis periods.

First, the estimation results in Panel A reveal similarity in the estimates of the univariate GARCH model for Islamic stock markets and Korean stock market. For example, the sum of ARCH and GARCH term is very close to unity, implying volatility persistence or volatility clustering in the markets. Panel B of Table 2 presents the estimates of the trivariate dynamic conditional correlation (DCC) model. As shown in this table, the ARCH effect (α) is positive and significant, indicating the importance of shocks between the Islamic stock markets and Korean stock market. For the GARCH effects and (β), the estimates are significant, implying volatility clustering. And sum ($\alpha + \beta$) is very close to one, confirming the high persistence of volatility between the Islamic stock markets and Korean stock market.

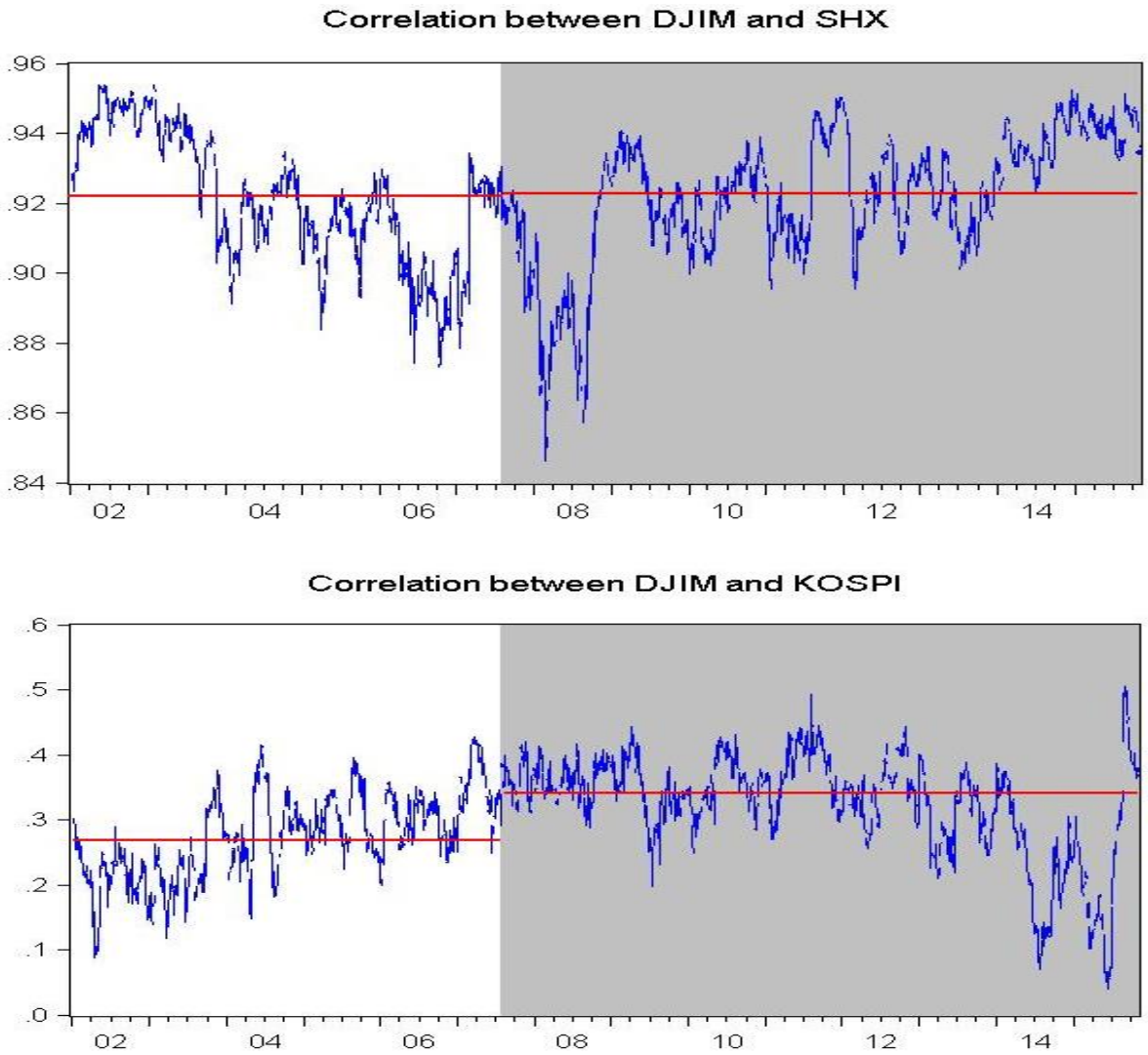
In particular, the average conditional correlations ρ_{ij} between the Islamic stock markets and Korean stock markets are all positive and significant at the 1% level, indicating bi-directional causality between Islam Indexes and KOSPI200 Index. We also found bi-directional volatility transmissions by employing VAR-GARCH-BEKK models between the Islamic and Korean financial market Moreover, the correlation of KOSPI-DJIM portfolio ($\rho_{KOSPI-DJIM}$) shows stronger linkage than that of KOSPI-SHX portfolio ($\rho_{KOSPI-SHX}$). In the portfolio perceptive, the S&P 500 Sharia stock Index (SHX) acts as a better hedge asset than DJIM against the risk of stock market due to the lower correlation of KOSPI-SHX pair.

Second, we now compare the results between pre- and post-crisis periods in Table 2. In all cases, the average conditional correlations ($\rho_{KOSPI-DJIM/SHX}$) become stronger in the post-crisis period,

indicating that the GFC leads to strengthen linkages between the Islamic markets and Korean stock market. However, the KOSPI-SHX pair shows weaker correlation than KOSPI-DJIM portfolio in the post-crisis and the pre-crisis, respectively. The KOSPI-SHX pair is only weakly linked from Korean stock markets in terms of volatility spillover effects, Islamic stock market and Korean stock market complements in terms of hedging risk. We can also see these features in Figure 2.

Finally, according to the diagnostic tests (in Panel C), Hosking's (1980) and McLeod, Li's (1983) tests accept the null hypothesis of no serial correlation in trivariate models, at least at the 1% significance level, indicating that there is no evidence of statistical misspecification of the trivariate AR (1)-DCC-GARCH (1,1) models.

Figure 2. Estimates of Dynamic Conditional Correlation (DCC) between Two Markets



Figures 2 shows that the plots display positive inter-market linkages throughout the period under study for Islamic stock prices as well as conventional and Islamic stock prices. Furthermore, the conditional correlation of global Islamic stock market and conventional stock of KOSPI index is lower

than that of both global Islamic stock market and U.S. Islamic index. The results also show the evidence of high correlations between the Islamic stock prices, suggesting that equity portfolio diversification is not advantageous for these markets.

The average conditional correlations between conventional and Islamic stock returns are calculated and found to be 0.92 for DJIM/SHX, 0.30 (stable period 0.28/ turbulence period 0.32) for DJIM/KOSPI. As mentioned above, these results indicate that correlation between the global Islamic market and the Korean stock markets is quite low for Islamic stock markets of both the global and nationwide. From the perspective of portfolio diversification, this constitutes a reason for investors to diversify their assets portfolios at the international level in order to minimize risks.

Table 2. Estimation Results of Trivariate AR-DCC-GARCH Model

	Whole sample period			Pre-crisis period			Post-crisis period		
	DJIM	SHX	KOSPI	DJIM	SHX	KOSPI	DJIM	SHX	KOSPI
Panel A: Estimates of AR (1)-DCC GARCH (1,1) model									
Const. (M)	0.0514***	0.0546***	0.0518***	0.0556***	0.0413**	0.1254***	0.0479**	0.0640***	0.0209
	(0.0138)	(0.0128)	(0.0182)	(0.0206)	(0.0193)	(0.0339)	(0.0186)	(0.0170)	(0.0213)
AR(1)	0.1216***	-0.0648***	0.0082	0.1208***	-0.0682***	0.0225	0.1249***	-0.0607***	-0.0034
	(0.0165)	(0.0169)	(0.0166)	(0.0259)	(0.0260)	(0.0258)	(0.0222)	(0.0221)	(0.0216)
Const. (V)	0.0104***	0.0199***	0.0118***	0.0062***	0.0086	0.0223***	0.0127***	0.0237***	0.0107**
	(0.0031)	(0.0049)	(0.0040)	(0.0028)	(0.0047)	(0.0103)	(0.0042)	(0.0056)	(0.0044)
ARCH (1)	0.0791***	0.0897***	0.0619***	0.0480***	0.0435***	0.0610***	0.0986***	0.1164***	0.0617***
	(0.0114)	(0.0116)	(0.0082)	(0.0102)	(0.0110)	(0.0121)	(0.0169)	(0.0165)	(0.0117)
GARCH (1)	0.9088***	0.8910***	0.9322***	0.9410***	0.9449***	0.9292***	0.8911***	0.8662***	0.9311***
	(0.0122)	(0.0123)	(0.0088)	(0.0119)	(0.0134)	(0.0140)	(0.0166)	(0.0155)	(0.0123)
Panel B: Estimates of the DCC equation									
$\rho_{SHX-DJIM}$	0.9268***			0.9252***			0.9267***		
	(0.0053)			(0.0076)			(0.0069)		
$\rho_{KOSPI-DJIM}$	0.3022***			0.2594***			0.3359***		
	(0.0356)			(0.0585)			(0.0429)		
$\rho_{KOSPI-SHX}$	0.1910***			0.1634***			0.2085***		
	(0.0377)			(0.0548)			(0.0485)		
α	0.0148***			0.0078**			0.0188***		
	(0.0027)			(0.0037)			(0.0037)		
β	0.9764***			0.9874***			0.9700***		
	(0.0055)			(0.0080)			(0.0082)		
$Q^2(30)$	32.601	19.190	28.587	32.843	21.064	19.105	26.753	22.719	45.904
	[0.3401]	[0.9359]	[0.5393]	[0.3293]	[0.8858]	[0.9377]	[0.6361]	[0.8266]	[0.0317]

Notes: P-values are in brackets and the standard errors are in parentheses. *, **, and *** indicate significance at the 10%, 5% and 1% levels respectively.

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4. 2. Implications for Risk Management and Portfolio Allocation

In risk management and portfolio allocation decisions, an optimal portfolio requires a preliminary and accurate estimation of the temporal covariance matrix. To manage the risk of both the Islamic and Korean stock markets more efficiently, we use the estimates of the trivariate AR-DCC-GARCH model which allows investors to make optimal portfolio allocation decisions by constructing dynamic risk-minimizing hedge ratios. We compute thus the hedge ratios for designing optimal hedging strategies.

As for the hedge ratios, we consider the beta hedge approach of Kroner, Sultan (1993) in order to minimize the risk of this portfolio (Korean and Islamic stock). We measure how much a long position (buy) of one dollar in the Korean stock index (KOSPI200), should be hedged by a short position (sell) of β_t dollar in the Islamic stock indexes (DJIM and SHX) that is:

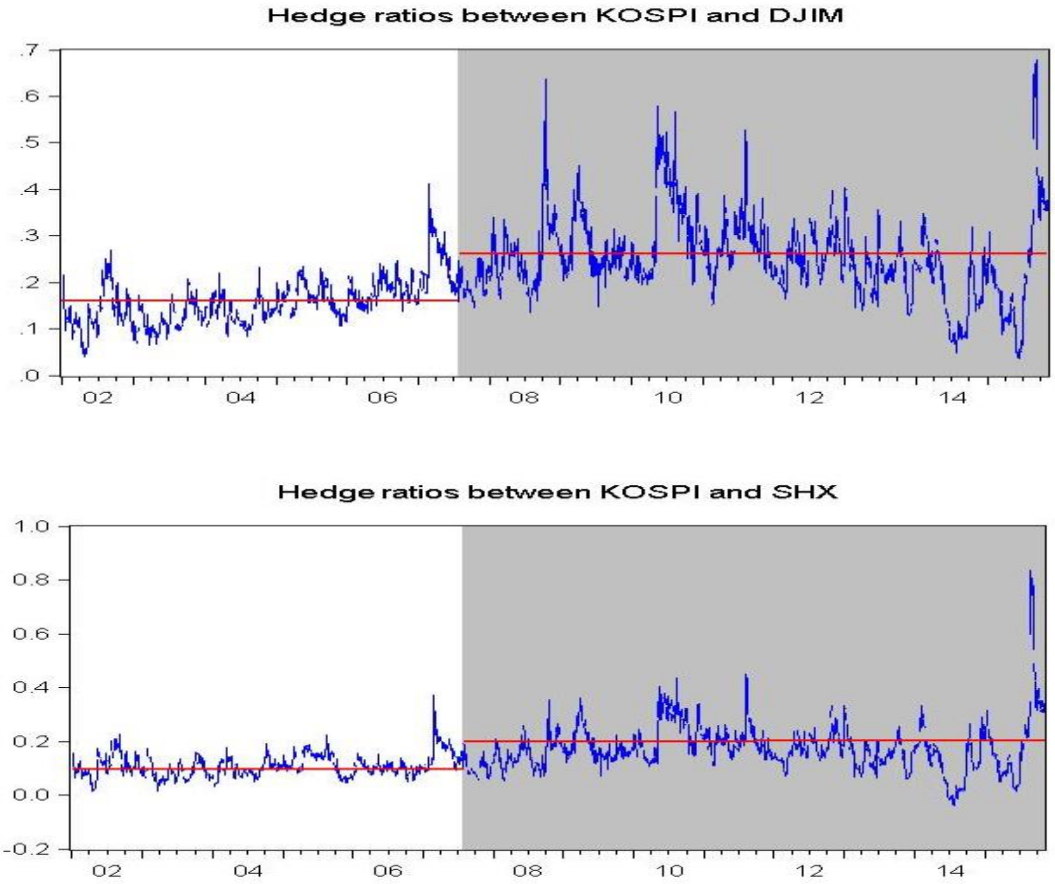
$$\beta_t = \frac{h_t^{cs}}{h_t^c}, \tag{8}$$

where h_t^c, h_t^s and h_t^{cs} are the conditional volatility of the Islamic indexes returns, the conditional volatility of the KOSPI returns and the conditional covariance between the Islamic and the KOSPI returns at time t, respectively.

Figure 3 represents the hedge ratio evolution between the Korean and Islamic stock market pairs (KOSPI-DJIM and KOSPI-SHX), estimated from the trivariate AR-DCC-GARCH model. These hedge ratios are generally low except specific period, indicating that the Korean stock risk can be effectively hedged by taking a short position in the Islamic stock markets. The average hedge ratios range from 0.10 (0.20) for the SHX to 0.15 (0.25) for the DJIM. In comparison with two pairs, the pair of KOSPI-SHX relatively shows a lower average hedge ratio (cheaper hedging cost) than that of KOSP-DJIM pair. This evidence indicates that S&P 500 Sharia index serve more effective hedging role against the risk of Korean stock market.

These graphs also show the time-varying hedging ratios over the time. Investors adjust their portfolio structure and hedging positions corresponding to the stock market conditions (bullish and bearish markets). In the post-crisis period (in the grey shed), the average hedge ratios is higher than that in the pre-crisis period. This implies that investors reconstruct the optimal portfolio, including a lower proportion of Korean stock (KOSPI 200) than of Islamic stock (DJIM and SHX) during the episodes of financial turmoil (in the grey shed period).

Figure 3. Time-varying Hedge Ratios between the Islamic and Korean Stock Markets



This study conforms Majid and Kassim (2010) that limited benefits are available if conventional finance investors only diversify their investments in the uncorrelated or less correlated Islamic stock index. This study also highlights the diversification benefits of investing in the various Islamic stock markets.

5. CONCLUSION

The Islamic equity markets are seemingly different from the well-known and well-established conventional markets with perspectives of the principles of Islamic law (shariah) and ethical investment. This paper investigated the volatility spillover effects between Islamic stock markets and Korean stock market using the AR-DCC-GARCH models. First, we found bi-directional volatility transmissions between the Islamic and Korean financial markets during the study period we cover, indicating that Islamic market volatility increases Korean stock market volatility and vice versa. We reject decoupling hypothesis of the linkage between Islamic stock markets and Korean stock market. Therefore, the Islamic stock market may not be a strong therapy that heals from global and Korean financial crises. Second, we compared the correlation of KOSPI-DJIM portfolio and that of KOSPI-SHX portfolio. It shows the correlation of KOSPI-DJIM portfolio has stronger linkage than that of KOSPI-SHX portfolio.

In the portfolio perceptive, the S&P 500 Sharia stock Index (SHX) acts as a better hedge asset than DJIM against the risk of stock market. Last, we investigated the hedge ratio evolution between two Islamic stock market and Korean stock market pairs. These hedge ratios are generally low, indicating that the Korean stock risk can be effectively hedged by taking a short position in the Islamic stock markets. In comparison with two pairs, the pair of KOSPI-SHX relatively shows a cheaper hedging cost than that of KOSP-DJIM pair. This evidence indicates that S&P 500 Sharia index serve more effective hedging role against the risk of Korean stock market.

Overall, this evidence leads to the rejection of the decoupling hypothesis of the Islamic equity market from Korean stock markets, there by increases the portfolio benefits from diversification with Sharia-based markets. The further study needs to investigate the filtering criteria for Islamic indices[2].This requires an empirical investigation of the Islamic stock indices on the characteristics of firm and sectors based on Sharia principle

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[2] Among filtering criteria there are the concentration of sectors such as industrials, technology, consumption services, and the quantitative criteria of the debt/equity ratio to lower systemic risks and the limit of interest-based leverage less influenced by interest rate movement.

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