이슬람 주식의 포트폴리오 편입

Hong-Bae Kim[1]

Abstract

This paper investigated the volatility spillover effects between Islamic stock markets and Korean stock market using the AR-DCC-GARCH models.

Bi-directional volatility transmissions between the Islamic and Korean financial markets 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. the S&P 500 Sharia stock Index(SHX) acts as a better hedge asset than DJIM against the risk of stock market.

Last, 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. the pair of KOSPI-SHX relatively shows a cheaper hedging cost than that of KOSP-DJIM pair.

Keywords: Islamic market, hedge ratio, AR-DCC-GARCH model,
ime-varying conditional correlations,

[1][Received ## January 20##; Revised ## January 20##, ## February 20##; Accepted ## February 20##]

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.

A few studies have been conducted on the volatility spillover between Islamic and conventional markets. If the Islamic finance system is only weakly linked or even decoupled from conventional markets, Islamic finance and conventional finance in the asset returns are substitutes or complements in terms of taking risk. Then this system may provide a cushion against potential losses resulting from probable future financial crises.

Hence the objective of this study is to investigate whether Islamic stock indices provide more diversification benefits in terms of volatility spillover effects.

There has been no consensus on the evidence of volatility spillover between Islam and conventional markets in the prior literature. First, 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).

On the contrary to decoupling hypothesis, Linkage effects of Islamic equity finance and conventional equity finance exist. Hence the volatility of conventional markets spills over to the that of Islam market, or vice versa. Ahdi Noomen Ajmi, Shawkat Hammoudeh., Duc Khuong Nguyenc Soodabeh Sarafrazi (2014) Marcos ÁAlvarez-Díiaz, Shawkat Hammoudeh, Rangan Gupta (2014) Ajmi A, Hammoudeh S, Nguyen D.K., Sarafrazi S (2014)

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. Therefore, the Islamic stock market may not be a strong therapy that heals from global financial crises. This requires an empirical investigation of linkage between the conventional and Islamic stock indices.

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 and divide the full sample period into 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:

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

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 an standard GARCH(1,1) model of Bollerslev (1986) as follows:

$$h_{i,t} = \omega + \alpha\epsilon_{i,t-1}^2 + \beta h_{i,t-1}\,,$$

where $\omega > 0$, $\alpha \geq 0$ 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:

$$H_t = D_t R_t D_t\,,$$

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

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 correlations.

The covariance matrix $Q_t = [q_{ij,t}]$ of the standardized residual vector $\epsilon_t = (\epsilon_{1,t}, \epsilon_{2,t}, \cdots)'$ is denoted as:

$$Q_t = (1-\alpha-\beta)\overline{Q} + \alpha(\epsilon_{t-1}\epsilon'_{t-1}) + \beta Q_{t-1}\,,$$

where $\overline{Q} = [\overline{q_{ij}}]$ 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 $diag(Q_t)^{1/2} = \{\sqrt{q_{ii,t}}\}$ is a diagonal matrix containing the square root of the i^{th} diagonal elements of Q_t, the dynamic correlation can be expressed as:

$$\rho_{ij,t}=\frac{(1-\alpha-\beta)\overline{q_{ij}}+\alpha\epsilon_{i,t-1}\epsilon_{j,t-1}+\beta q_{ij,t-1}}{\sqrt{\left[(1-\alpha-\beta)\overline{q_{ii}}+\alpha\epsilon_{i,t-1}^{2}+\beta q_{ii,t-1}\right]\left[(1-\alpha-\beta)\overline{q_{jj}}+\alpha\epsilon_{j,t-1}^{2}+\beta q_{jj,t-1}\right]}}.$$

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:

$$\log L=-\frac{1}{2}\sum_{t=1}^{T}\left[k\log(2\pi)+2\log|D_t|+\log|R_t|+\epsilon_t{}'R_t^{-1}\epsilon_t\right].$$

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 returns, 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)[2] 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. All sample data are obtained from Blooomberg 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).

2 The first Dow Jones Islamic market index (DJIM) was launched in February 1999. The DJIM is based on December 31, 1995, with a base value of 1000. The DJIM includes 2381 companies from 56 countries representing 10 economic sectors.

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-nomrality 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.

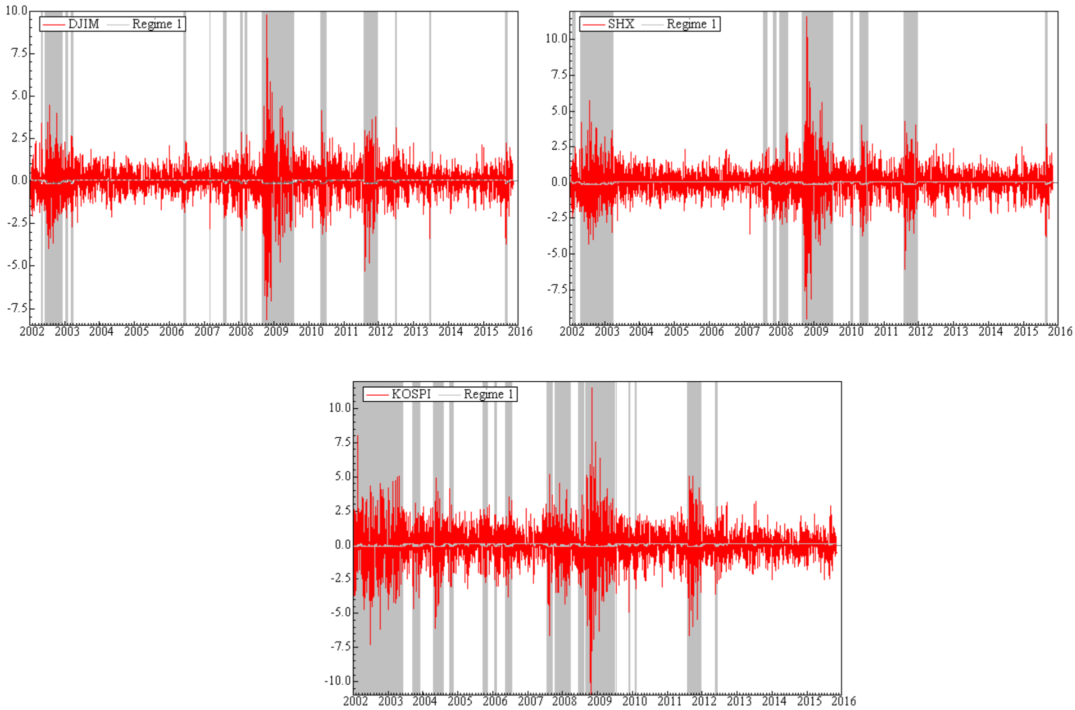
Table 1. Descriptive statistics and results of unit root tests

	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

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.



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

Figure 1. Regimes in the return dynamics

4. Empirical results

4.1. Estimate of 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.

The 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. 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.

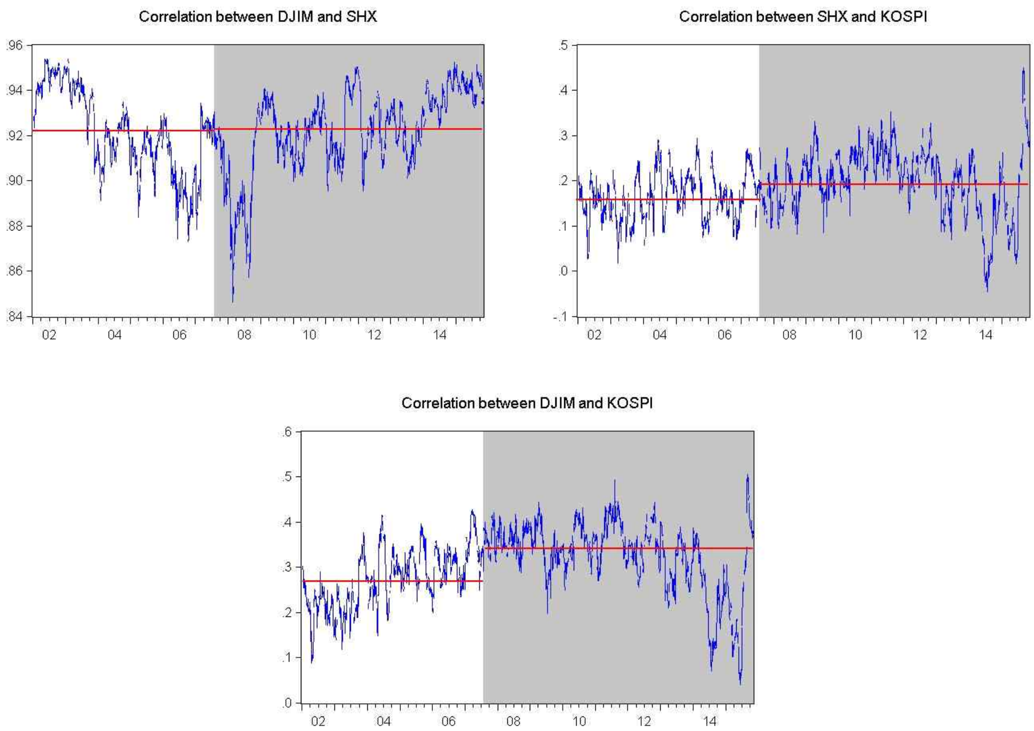


Figure 2. Estimates of dynamic conditional correlation (DCC) between two markets

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

4.2. Implications for risk management and portfolio allocation

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:

$$\beta_t = \frac{h_t^{CS}}{h_t^{C}},$$

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 ratio is 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. 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.[1]

1 But considering KOSPI-Gold portfolio allocation as a safe haven it has a mean value of 0.0718, KOSPI-SHX portfolio with a mean value of 0.0718 is higher. On the other hand, The Islamic finance of the Sharia principles have restrictive domain in Investment because conventional markets use several kinds of hedging strategies against risks which may have helped to shield themselves from cross market spillovers from the unhedged Islamic market. Consequently, the Islamic market may outperform the conventional counterparts during bull markets but underperform in bear markets because of lack of hedging.( )

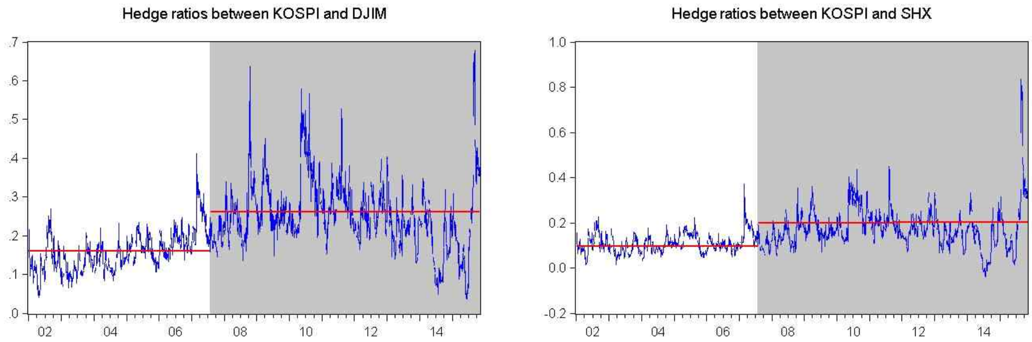


Figure 3. Time-varying hedge ratios between the Islamic and Korean stock markets

5. Conclusions

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.

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 ratio 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. 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.

References

Abul Shamsuddin, Are Dow Jones Islamic equity indices exposed to interest rate risk? Economic Modelling 39 (2014) 273–281

Ahdi Noomen Ajmia, How strong are the causal relationships between Islamic stock markets and conventional financial systems? Evidence fromlinear and nonlinear tests, Int. Fin. Markets, Inst. and Money 28 (2014) 213– 227

ÁAlvarez-Dı́iaz M, Hammoudeh S, Gupta R, Detecting predictable non-linear dynamics in Dow Jones Islamic Market(DJIM) and Dow Jones Industrial Average(DJIA) indices using nonparametric regressions, North American Journal of Economics and Finance 29 (2014) 22–35

Al-Khazali, Lean H, Samet A, Do Islamic stock indexes outperform conventional stock indexes? A stochastic dominance approach, Pacific-Basin Finance Journal 28 (2014) 29–46

Buerhan Saiti, The Diversification Benefits from Islamic Investment during the Financial Turmoil: The case for the U.S-based Equity Investors, Borsa istanbul Review (2014)

Bollerslev, T. (1986). Generalized autoregressive conditional heteroskedasticity, *Journal of Econometrics*, 31(3), 307-327.

Ciner, C., Gurdgiev, C., Lucey, B. M. (2013). Hedges and safe havens: an examination of stocks, bonds, gold, oil and exchange rates, *International Review of Financial Analysis*, 29, 202-211.

Catherine Soke Fun Ho, Performance of global Islamic versus conventional share indices: International evidence, Pacific-Basin Finance Journal 28 (2014) 110–121

Dickey, D. A., Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root, *Journal of American Statistical Association*, 74(366), 427-431.

Engle, R. F. (1982). Autoregressive conditional heteroscedasticity with estimates of the variance of United Kingdom inflation, *Econometrica*, 50(4), 987-1007.

Engle, R. (2002). Dynamic conditional correlation: a simple class of multivariate generalized autoregressive conditional heteroskedasticity models, *Journal of Business & Economic Statistics*,

Fredj Jawadi, Conventional and Islamic stock price performance: An empirical investigation, international Economics, 137 (2014) 73–87 20(3), 339-350.

Ho, Rahman, Yusuf, Zamzamin Performance of global Islamic versus conventional share indices: International evidence, Pacific-Basin Finance Journal 28 (2014) 110–121

Hosking, J. R. M. (1980). The multivariate portmanteau statistic, *Journal of the American Statistical Association*, 75(371), 602-608.

Hood, M., Malik, F. (2013). Is gold the best hedge and a safe haven under changing stock market volatility? *Review of Financial Economics*, 22(2), 47-52.

Inclán, C., Tiao, G. C. (1994). Use of cumulative sums of squares for retrospective detection of changes of variance, *Journal of the American Statistical Association*, 89(427), 913-923.

Jeong, S., Jei, S. Y. (2011). Shocks of international oil price on Korea stock markets' asymmetric volatility and its determinants, *Journal of the Korean Data Analysis Society*, 13(6), 3153-3163. (in Korean).

Imam Wahyudi, Interdependence between Islamic capital market and money market: Evidence from Indonesia, Borsa _Istanbul Review 14 (2014) 32-47

Jihed M., Mansour W., Islamic equity market integration and volatility spillover between emerging and US stock markets North American Journal of Economics and Finance (2014)

Jawadi F., Jawadi N., Louhichi W, Conventional and Islamic stock price performance: An empirical investigation , International Economics,137 (2014), 73–87

Kroner, K. F., Sultan, J. (1993). Time-varying distributions and dynamic hedging with foreign currency futures, *Journal of Financial and Quantitative Analysis*, 28(4), 535-551.

Kwiatkowski, D., Phillips, P. C. B., Schmidt, P., Shin, Y. (1992). Testing the null hypothesis of stationarity against the alternative of a unit root: how sure are we that economic time series have a unit root? *Journal of Econometrics*, 54(1-3), 159-178.

McLeod, A. I., Li, W. K. (1983). Diagnostic checking of ARMA time series models using squared residual autocorrelations, *Journal of Time Series Analysis*, 4(4), 269-273.

Marcos ÁAlvarez-Dı́iaz, Detecting predictable non-linear dynamics in Dow Jones Islamic Market and Dow Jones Industrial Average indices using nonparametric regressions, North American Journal of Economics and Finance 29

(2014) 22–35

Nazrol K.M. Kamil, Heads we win, tails you lose: Is there equity in Islamic equity funds Pacific-Basin Finance Journal 28 (2014) 7–28

Narayan, P. K., Narayan S. (2010). Modelling the impact of oil prices on Vietnam's stock prices, *Applied Energy*, 87(1), 356-361.

Osamah Al-Khazali, Do Islamic stock indexes outperform conventional stock indexes? A stochastic dominance approach, Pacific-Basin Finance Journal 28 (2014) 29–46

Phillips, P. C. B., Perron, P. (1988). Testing for a unit root in time series regression, *Biometrica*, 75(2), 335-346.

Reboredo, J. C. (2013). Is gold a safe haven or a hedge for the US dollar? Implications for risk management, *Journal of Banking & Finance*, 37(8), 2665-2676.

Rizvi S.A, Dewandaru G, Bacha O.I, Masih M. An analysis of stock market efficiency: Developed vs Islamic stock markets using MF-DFA Physica A 407 (2014) 86–.99

Shamsuddin A, Are Dow Jones Islamic equity indices exposed to interest rate risk, Economic Modelling, 39 (2014) 273–281

Syed Aun R. Rizvi, An analysis of stock market efficiency: Developed vs Islamic stock markets using MF-DFA, Physica A 407 (2014) 86–.99

Sansó, A., Aragó, V., Carrion, J. L. (2004). Testing for changes in the unconditional variance of financial time series, *Revista de Economía Financiera*, 4, 32-53.

Umar F. Moghul, "Introduction to Islamic Finance.", Publication of the Federal Reserve Bank of Boston (2006)

Wahyudi I., Sani G.A. , 2014 Interdependence between Islamic capital market and money market: Evidence from Indonesia, Borsa Istanbul Review 14 (2014) 32-47