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Are Islamic Equity Markets "Safe Havens"? Testing the Contagion Effect using DCC-GARCH

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Abstract *It is argued in the literature especially after the 2008 global crisis that the Islamic markets are more resistant than conventional markets against shocks in global markets. Therefore, in this study financial contagion effect is analyzed for both markets through dynamic conditional correlations (DCC) between international Islamic indices and conventional regional indices. In this context, the relations between regional markets of USA, EU, the Gulf and Asia-Pacific for the period of 2004-2016 are analyzed by DCC-MV-EGARCH method. The findings show that there is a high correlation between Islamic and conventional index returns. The study concludes that the Islamic markets do not react differently from conventional markets against financial shocks and they are not "safe havens" for investors during financial crisis.*

Key words Islamic financial markets, contagion effect, dynamic conditional correlation

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1. Introduction

The financial liberalization process, which increased towards the end of the 20th century, strengthened trade links through removal of the boundaries between countries and accelerated economic synchronization. With the increasing liberalization, international companies and investors could easily access to markets in different countries and as a result the integration of markets has also increased. Especially, stock market crash of October 1987 which is called as Black Monday and the Asian financial crisis in 1997 made the issue of the integration of international exchanges more popular. Blackman *et al.* (1994), identified that integration in 17 different stock markets have increased in the 1980s compared to the 1970s. Cha and Oh (2000) stated that, the relations between the world's two largest markets, the US and Japan, and the emerging Asian markets (Hong Kong, Korea, Singapore and Taiwan), has increased after the 1987 crisis and this relation intensified with the 1997 Asian financial crisis. Hoque (2007) argues that, the tight connection between the world stock markets was noticed by people just after the October 1987 crisis. Similarly, Lee and Kim (1993) and Arshanapalli and Doukas (1993), have reported increases in the degree of integration in the international markets after the 1987 stock market crash; In *et al*. (2002) and Yang *et al*. (2003), also pointed further increases in short-term and long-term relations of capital markets especially after the 1997 Asian crisis. The most recent global crisis, experienced in 2008, proved that mobility in a market may have a strong influence on many markets which have different foundations (Ahlgren and Antell, 2010).

The increase in economic integration of the world markets, has led investors (wishing to obtain higher returns) and academicians (aiming to contribute to finance literature) to research relations between capital markets. It is obvious that the relationship between financial markets concerns many stakeholders. The interaction of international financial markets and international portfolio investments, may affect macroeconomic indicators such as exchange rate, it may also affect financial policies of many individual investors and multinational companies which look for risk diversification. Determining the connection between the capital markets or the degree of integration of international stock markets is quite important for international portfolio diversification and for the financial stability of the countries (Mansor, 2005).

To understand the interaction between markets located in different regions provides the opportunity to diversify the risk and earn higher returns for international investors. However, the existence of long-term relationships between markets, leads to different opinions about whether international portfolio diversification is useful or not. Because highly correlated stocks have similar risk-return profile. Therefore, making portfolios from different markets having high correlation will not provide any opportunity for investors to diversify the risk. For risk diversification investors are required to identify stock markets with low correlation. Low correlation allows investors to minimize the risk of the portfolio with international diversification.

In early studies on international portfolio diversification it was concluded that diversified international portfolios have lower risk due to the lower correlations between stocks (Levy and Sarnat, 1970; Lessard, 1973; Hilliard, 1979). In later studies, it was stated that the benefit of international diversification started to decline due to the high correlation between stock markets (Lee and Kim, 1993; Arshanapalli and Doukas, 1993; Meric and Meric, 1997). However, in many studies the markets seem to have co-movement. This co-movement could in the form of stock markets integration as well as in the form of financial contagion (Dewandaru *et al*., 2014)

There is no consensus between researchers on definition of financial contagion in literature. In initial studies, the difference between contagion and interdependence could not be distinguished. If a shock in a country is leading to international affects the reason for that is the integration of the markets (Pericoli, 2003). However, financial contagion is defined as shocks during the crisis leading to significant changes across countries in short-term (Ahlgren ve Antell, 2010).

One of the most influential results of the recent financial crisis was the decrease in the benefits of the international diversification due to increase in financial contagion. Therefore international investors started to search for alternative ways of portfolio diversification. No doubt, one of the alternatives is Islamic financial sector products which have rapid growth rate in recent years (Alaoui *et al*., 2015; Saiti *et al.*, 2014). Islamic products are thought have different risk-return profile than the conventional ones. This difference is based on the idea that Islamic products have lower financial leverage when compared to conventional products and these products belong to smaller firms.

Islamic finance industry has shown a significant improvement over the past decade. According to the Stability Report 2014 of Islamic Financial Services Board (IFSB), from 2007 to 2012 Islamic products achieved a growth rate of 7.3%; whereas conventional products growth rate was 1.8% (IFSB, 2014). It is also stated that the growth rate of the Islamic finance industry was 17.04% for the years 2009 and 2013 (IFSB, 2014). According to World Islamic Banking Competitiveness Report (WIBC) by Ernst & Young (2013-2014), Islamic banking assets, with a total of US$1.7t in 2013, are expected to grow to US$3.4t by the end of 2018 (WIBC is, 2013-2014).

The difference between growth rates of Islamic and conventional finance industries show similarities also during the crisis period. For instance, during the global crisis for the period between 2007-2009 while Islamic financial assets annual growth rate was 28%, total assets growth rate of first 1,000 global banks was 21.6% in 2008 and 6.8% in 2009 (Akhtar and Jahromi, 2015). Therefore it is argued that Islamic finance industry was affected from global financial crisis to a lesser degree.

There are also findings in the literature that the differences between Islamic and conventional markets are evident in the financial crisis period (Karim *et al*., 2010; Dewandaru *et al*., 2015; Al-Khazali *et al.*, 2014). Eventually, the idea that Islamic markets are more resistant to shocks in international markets is particularly important for market users such as international portfolio investors and policy makers. Therefore, the contagion effect on whether there is a difference between Islamic and conventional markets in financial crisis period is the subject of this study. The study examines the financial contagion effect by calculating the dynamic conditional correlation (DCC) between international Islamic indices and regional conventional indices. In case of existence of structural breaks arising from financial shocks in correlation between markets then one can talk of contagion effect between those markets.

2. Literature review

The study carried out by Grubel (1968) explaining the benefits of international portfolio diversification has led to further studies on whether the international markets have co-movement or not.

Grubel in this study stated that due to low correlation between stocks investors generate revenue through international diversification. Similarly, findings by Levy and Sarnat (1970) and Solnik (1974) show that diversification is beneficial due to low correlation between markets. However studies conducted in recent years rather refer to the existence of correlation between markets. There are plenty of studies showing the co-movement of markets especially after financial crisis and spillover of a crisis from one country to another is made possible by financial contagion (Saiti *et al*., 2015).

Researchers have tested financial contagion generally by examining the relationship between stock markets. In these studies, correlations between stock returns after the crisis period are based on existence of financial contagion effect (Sachs *et al*., 1996; Baig and Goldfajn, 1999; Dungey and Martin, 2007; Pesaran and Pick, 2007). However in some studies a significant correlation between asset returns in the post-crisis period could not be identified. These studies have argued that there is interdependence between markets rather than financial contagion effect (Bordo and Murshid, 2001; Forbes and Rigobon, 2002).

Although there are a lot of studies examining the interaction between different financial markets, studies that examine the relations between Islamic and conventional markets are relatively less. Studies on Islamic markets could not reach a consensus on whether there is co-movement in markets or whether contagion effect exists. Although in some studies there were evidences of co-movement of markets, in some other studies weak or no relation between markets were indicated.

Examining the relationship between Islamic stock markets, Abdul Karim *et al.* (2010), found no clue on existence of a long-term co-movement in Islamic markets after 2008 crisis. Saiti *et al*. (2015), who tested the contagion effect in Islamic and conventional indices during the 2008 crisis, found no contagion effect in Islamic indices while observing contagion effect exist in most of the conventional indices. In exploring the relationship between Islamic financial markets and USA market, Majdoub and Mansour (2014), used three models namely; multivariate GARCH BEKK, CCC and DCC. The estimates derived from the models revealed a weak relation between Islamic markets and the US market. Using MGARCH DCC method Rizvi and Arshad (2014) found a weak relation between Islamic and conventional indices in long-term. Studying the relationship between Islamic indices and six big international markets, Abu Bakar and Masih (2014), have demonstrated that the relation between Islamic indices and Western markets are stronger than the Asian markets. Moreover, it was also stated that the effect of this relation was higher during the crisis periods. Alaoui *et al.* (2014), who studied co-movements of the Islamic indices, stated that Dubai Islamic index, GCC and Saudi indices have long-term co-movements and they also presented evidences on existence of contagion effect between close Islamic markets. In their study on the long and short-term relations between Asia-Pacific Islamıc markets and conventional stock markets of 2008 crisis, Hengchao and Hamid (2015), observed that integration within the Asia-Pacific Islamic markets and between conventional markets has increased after the crisis.

3. Methodology of research

In the study, dynamic conditional correlation (DCC), proposed by Engle (2002), model is applied in examining the relationship between regional indices. There are two stages in determining the DCC. In the first stage univariate generalized autoregressive conditional Heteroscedasticity (Univarite GARCH) model is set up and standardized residuals and conditional covariance matrix is formed from the model.

$$H_t = D_t R_t D_t \tag{1}$$

Where H_t is the conditional covariance matrix, R_t (^{n} x ^{n}) is the time-varying conditional correlations matrix and D_t is (^{n} x ^{n}) time varying standardized residuals matrix obtained from GARCH model in the first stage.

$$D_t = diag(h_{11t}^{1/2}, ..., h_{nnt}^{1/2}) \tag{2}$$

$h_{i,t}$, in equation is obtained from GARCH (p,q) as follows;

$$h_{i,t} = \omega_i + \sum_{p=1}^{p_i} a_{ip}\varepsilon_{i,t-p}^2 + \sum_{q=1}^{q_i} \beta_{iq} h_{i,t-q} \qquad \forall i = 1,2 \tag{3}$$

As the unconditional variance is a function of the size of lagged residuals in GARCH models, signs of the lagged residuals have been neglected. In such a case, we do not have opportunity to see the asymmetric structure in the markets. Therefore exponential GARCH (EGARCH) model, developed by Nelson (1991), is used in the study. Variance model in the Equation (3) is modified as follows:

$$\ln h_{i,t} = c_i + a_i(|\varepsilon_{i,t-1}| / \sqrt{h_{i,t-1}} - \gamma_i \varepsilon_{i,t-1} / \sqrt{h_{i,t-1}}) + b_i \ln h_{i,t-1} \tag{4}$$

In equation ϒ is coefficient representing asymmetric effect. The negative and statistically significant asymmetric coefficient indicates the presence of asymmetric effect.

$$R_t = diag(q_{11t}^{-1/2}, ..., q_{nnt}^{-1/2}) Q_t diag(q_{11t}^{-1/2}, ..., q_{nnt}^{-1/2}) \tag{5}$$

Where $Q_t = (q_{ij,t})$, represents (^{n} x ^{n}) the positively defined symmetric matrix of standardized residuals (ε_t).

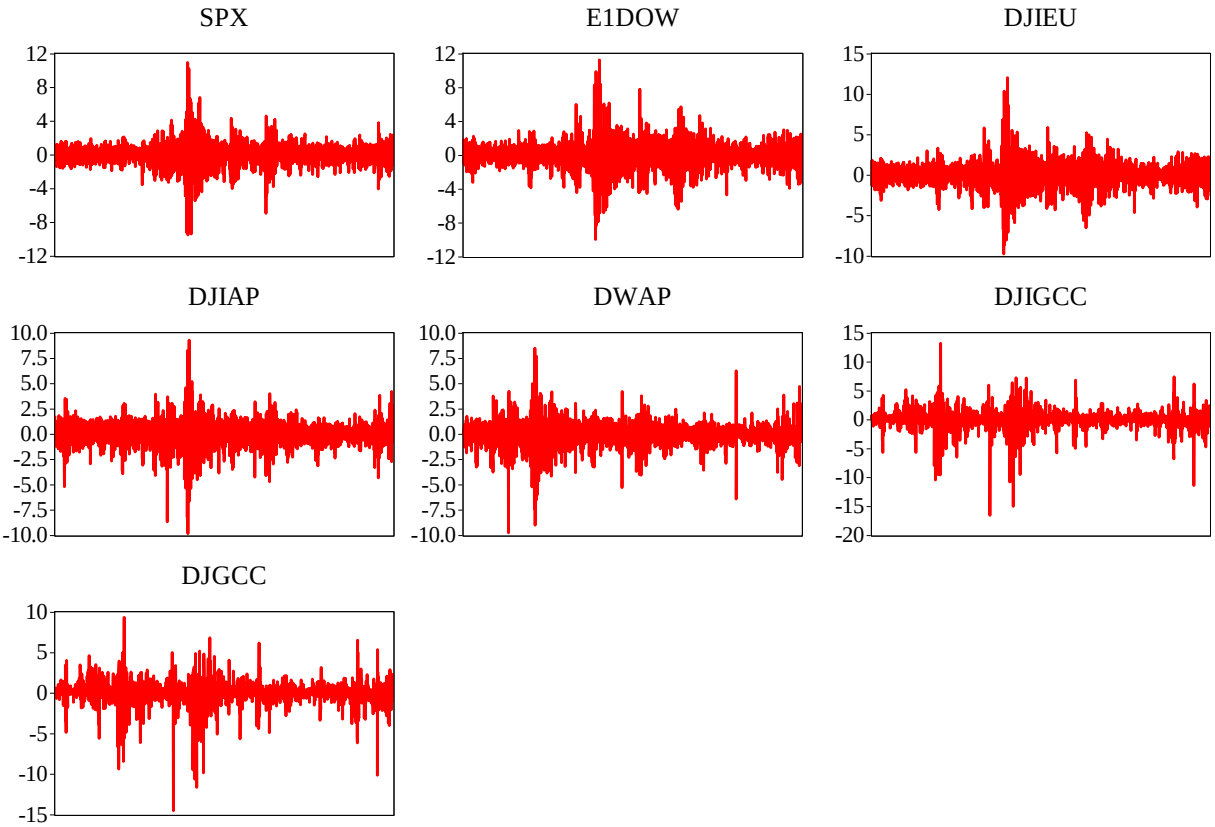

Figure 1. Return Series of Price Indices

$$Q_t = (1-\theta_1-\theta_2)\bar{Q} + \theta_1 \varepsilon_{t-1}\varepsilon_{t-1}' + \theta_2 Q_{t-1} \tag{6}$$

$\bar{Q} = E(\varepsilon_t \varepsilon_t')$ represents (^{n} x ^{n}) unconditional correlation matrix of standardized residuals (ε_t). Time varying conditional correlations (R_t), are calculated as follows:

$$p_{ij,t} = \frac{q_{ij,t}}{\sqrt{q_{ii,t} q_{jj,t}}} \tag{7}$$

I,j = 1,2, …, n ve i ǂ j. Following the Engle (2002), two stage approaches is adopted and maximum log-likelihood (L) is calculated as follows:

$$L = \left[-1/2 \sum_{t=1}^{T} (n \log(2\pi) + \log|D_t|^2 + \varepsilon_t' D_t^{-2} \varepsilon_t) \right] + \left[-1/2 \sum_{t=1}^{T} (\log|R_t| + \varepsilon_t' R_t^{-1} \varepsilon_t + \varepsilon_t' \varepsilon_t \right] \tag{8}$$

3.1. Data

As different institutions use different calculation methods for indices, to ensure homogeneity in daily data of Dow Jones Islamic and conventional regional indices (Europe, Gulf and Asia-Pacific) are used[1]. Additionally SPX index representing the US investors is also used. Data is obtained from Google Finance web-site, for DWAP index the period between 16.10.2006-01.03.2016 (dates are inclusive) and for other indices between 02.01.2004-01.03.2016 (dates are inclusive). Logarithmic return series are used in the analysis are calculated with r_t = 100 x ln(P_t/P_{t-1}) formula. Descriptive statistics on the series are given in Table 1.

Table 1. Descriptive Statistics

	SPX	E1DOW	DJIEU	DJGCC	DJIGCC	DWAP	DJIAP
N	3068	3068	3068	2925	2925	2366	3068
Mean	0.0195	0.0075	0.0123	0.0112	0.0136	-0.0006	0.0132
Std. Dev.	1.227	1.4291	1.3844	1.2481	1.4223	1.2281	1.1669
Skewness	-0.3298	-0.1495	-0.0385	-2.0859	-1.8723	-0.6527	-0.6239
Kurtosis	11.182	7.2941	8.2829	21.32	23.079	7.7116	7.8779
Jarque-Bera	16038 [0.0000]	6812.7 [0.0000]	8770.9 [0.0000]	57520 [0.0000]	66623 [0.0000]	6030.7 [0.0000]	8132.6 [0.0000]
ARCH (5)	216.17 [0.0000]	141.72 [0.0000]	161.03 [0.0000]	28.131 [0.0000]	35.552 [0.0000]	119.70 [0.0000]	191.96 [0.0000]
Q (20)	116.38 [0.0000]	53.744 [0.0000]	74.427 [0.0000]	78.252 [0.0000]	75.781 [0.0000]	39.669 [0.0055]	49.390 [0.0003]
Q_S (20)	4972.1 [0.0000]	3438.9 [0.0000]	3758.2 [0.0000]	543.39 [0.0000]	668.23 [0.0000]	2204.3 [0.0000]	3777.8 [0.0000]
ADF	-44.023***	-56.209***	-57.123***	-50.337***	-51.388***	-47.775***	-52.431***
PP	-61.891***	-56.367***	-57.458***	-50.591***	-51.581***	-47.768***	-52.364***
KPSS	0.073***	0.069***	0.052***	0.198***	0.177***	0.062***	0.045***

Notes: The figures in square brackets show the probability (p-values) of rejecting the null hypothesis. ARCH (5) indicates LM conditional variance test. Q(20) and Q_S(20) indicate Ljung–Box serial correlation test for return and squared return series respectively.

*** indicate that the series in question is stationary at the 1% significance level.

According to the Table 1, for analysis period, the SPX index has the highest average return and the lowest volatility compared with standard deviation. Normality test results indicate that frequencies of all the indices are not normally distributed. Also, the effect of autoregressive conditional Heteroscedasticity (ARCH) is observed in all indices and series are stationary at the level.

4. Findings

The correlation coefficients between the return series are calculated (See Table 2). Accordingly there is high correlation between Islamic and conventional indices of the regions.

[1]Abbreviation and full names for indices are; for the USA market, SPX: S&P 500 Index; for the European market E1DOW: Dow Jones Europe Index; DJIEU: Dow Jones Islamic Market Europe Index; for Gulf countries DJGCC: Dow Jones GCC Index; DJIGCC: Dow Jones Islamic Market GCC Index; for Asia/Pacific countries DWAP: Dow Jones Asia/Pacific Total Stock Market Index; DJIAP: Dow Jones Islamic Market Asia/Pacific Index.

Table 2. Correlation coefficients between return series

	SPX	E1DOW	DJIEU	DJGCC	DJIGCC	DWAP	DJIAP
SPX	1						
E1DOW	0.621***	1					
DJIEU	0.594***	0.980***	1				
DJGCC	0.099***	0.184***	0.166***	1			
DJIGCC	0.103***	0.171***	0.154***	0.978***	1		
DWAP	0.218***	0.486***	0.479***	0.348***	0.328***	1	
DJIAP	0.248***	0.516***	0.512***	0.242***	0.221***	0.965***	1

*** indicate statistically significance at the 1% level.

According to correlation matrix in Table 2, the highest correlation coefficient is between the USA and Europe while the lowest is between the USA and Gulf Region. We cannot detect any negative correlation between indices. Coefficients are statistically significant at 1% significance level.

Table 3 shows the variance equation results of multivariate exponential GARCH models, from which dynamic conditional correlation series are obtained. In models it is observed that there is no normal distribution of residuals, therefore Student's t distribution is used. Parameter, ϒ, which represents asymmetric information, is observed as negative and statistically significant for all models excluding European and Gulf countries' Islamic and conventional indices. This situation shows that negative news/information have more impact on volatility comparing with positive news/information.

Table 3. DCC-(MV)-EGARCH variance equation results

	ω	α	β	γ	df	Log-L
SPX_DJIEU	-0.163***	0.185***	0.967***	-0.188***	9.171***	-3447
SPX_E1DOW	-0.157***	0.176***	0.971***	-0.187***	8.458***	-3371.168
SPX_DJIAP	-0.119***	0.151***	0.987***	-0.077***	9.060***	-4031.679
SPX_DWAP	-0.107***	0.130***	0.977***	-0.243***	7.157***	-3216.878
SPX_DJGCC	-0.112***	0.138***	0.981***	-0.168***	6.781***	-3724.530
SPX_DJIGCC	-0.111***	0.137***	0.981***	-0.168***	6.780***	-3725.583
DJIEU_DJIAP	-0.081***	0.103***	0.988***	-0.113***	9.674***	-4279.459
DJIEU_E1DOW	0.001***	0.051***	0.938***		8.123***	20.12494
DJIEU_DWAP	-0.149***	0.189***	0.981***	-0.083***	6.470***	-3019.432
DJIEU_DJGCC	-0.111***	0.147***	0.983***	-0.110***	9.251***	-4270.826
DJIEU_DJIGCC	-0.111***	0.146***	0.983***	-0.110***	9.241***	-4273.647
E1DOW_DJIAP	-0.091***	0.118***	0.986***	-0.111***	8.694***	-4341.343
E1DOW_DWAP	-0.159***	0.201***	0.980***	-0.086***	6.648***	-3003.322
E1DOW_DJGCC	-0.112***	0.149***	0.983***	-0.115***	8.648***	-4334.529
E1DOW_DJIGCC	-0.111***	0.148***	0.983***	-0.115***	8.599***	-4337.367
DJIGCC_DJGCC	0.001***	0.055***	0.951***		2.557***	90.33856
DJIGCC_DJIAP	-0.051*	0.767**	0.967***	-0.200**	2.031***	-3553.796
DJIGCC_DWAP	-0.151***	0.196***	0.980***	-0.090***	6.735***	-2961.477
DJGCC_DJIAP	-0.077***	0.624**	0.965***	-0.154**	2.056***	-3286.193
DJGCC_DWAP	-0.023	0.761**	0.963***	-0.302**	2.025***	-2395.84
DWAP_DJIAP	-0.304***	0.229***	0.953***	-0.051***	5.293***	85.77476

Note: df indicate the Student's t-distribution parameter. ***, ** and * indicates statistically significance at the 1%, 5% and 10% level respectively.

In Table 4 descriptive statistics of the DCC series are shown. It can be seen that regions have a very high correlation between their own Islamic and conventional indices. While Europe region has the highest correlation with the USA, the Asia-Pacific and Gulf region come next. Another high correlation is observed between the Asia-Pacific region and Europe. Gulf region's correlation with other regions seems to be low.

Table 4. Descriptive Statistics of Dynamic Conditional Correlations

	Mean	Median	Max.	Min.	Std. Dev.
SPX_DJIEU	0.552	0.549	0.762	0.239	0.124
SPX_E1DOW	0.567	0.571	0.769	0.252	0.125
SPX_DJIAP	0.291	0.297	0.641	-0.044	0.158
SPX_DWAP	0.268	0.281	0.610	-0.043	0.150
SPX_DJGCC	0.088	0.095	0.193	-0.023	0.060
SPX_DJIGCC	0.081	0.090	0.177	-0.029	0.052
DJIEU_DJIAP	0.485	0.484	0.519	0.439	0.019
DJIEU_E1DOW	0.972	0.976	0.992	0.850	0.016
DJIEU_DWAP	0.463	0.463	0.463	0.463	0.000
DJIEU_DJGCC	0.125	0.178	0.275	-0.082	0.118
DJIEU_DJIGCC	0.111	0.144	0.284	-0.109	0.115
E1DOW_DJIAP	0.498	0.498	0.540	0.461	0.006
E1DOW_DWAP	0.478	0.478	0.530	0.326	0.008
E1DOW_DJGCC	0.133	0.190	0.307	-0.089	0.127
E1DOW_DJIGCC	0.122	0.156	0.321	-0.121	0.124
DJIGCC_DJGCC	0.952	0.958	0.994	0.769	0.028
DJIGCC_DJIAP	0.168	0.201	0.392	-0.085	0.134
DJIGCC_DWAP	0.227	0.236	0.378	-0.022	0.087
DJGCC_DJIAP	0.190	0.236	0.406	-0.086	0.143
DJGCC_DWAP	0.260	0.285	0.403	0.008	0.091
DWAP_DJIAP	0.958	0.971	0.989	0.371	0.062

DCC series of conventional indices are shown on charts in Figure 1, while Figure 2 shows DCC series for Islamic indices and Figure 3 shows other DCC series. Structural breaks in means and variance of series are shown on charts.

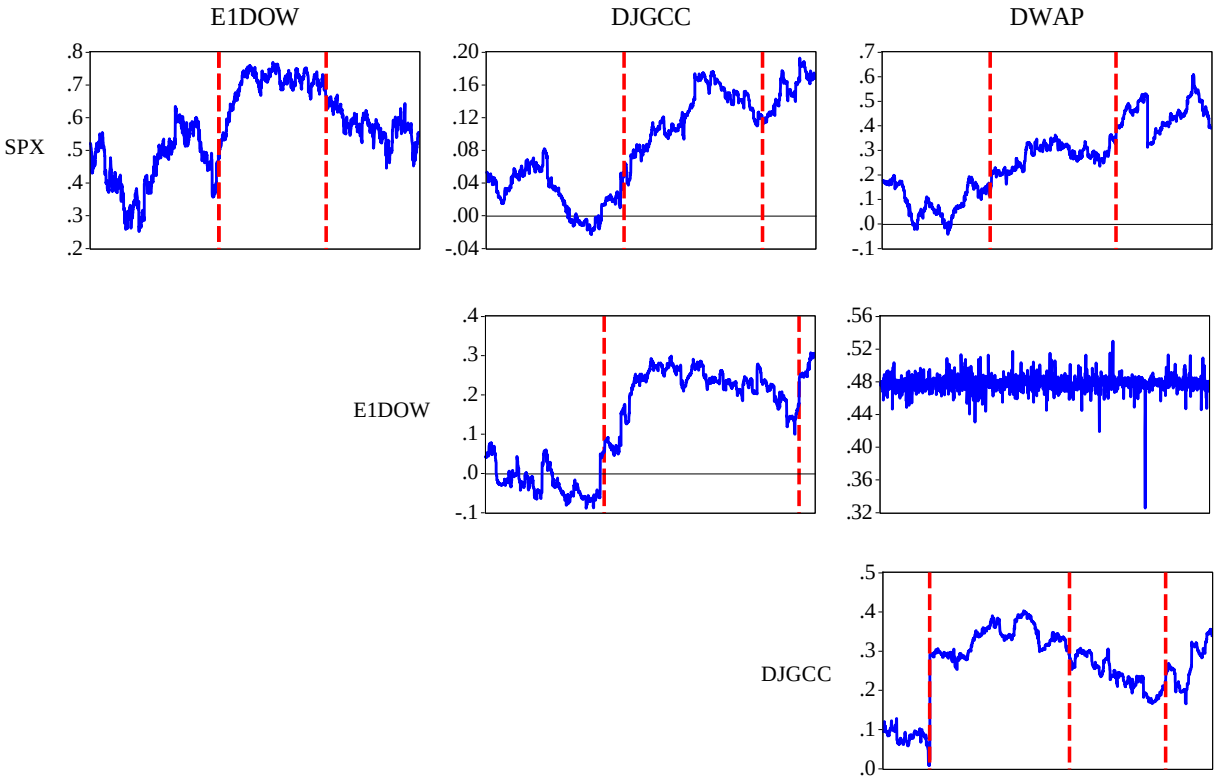

Figure 2. Dynamic Conditional Correlations between Conventional Indices

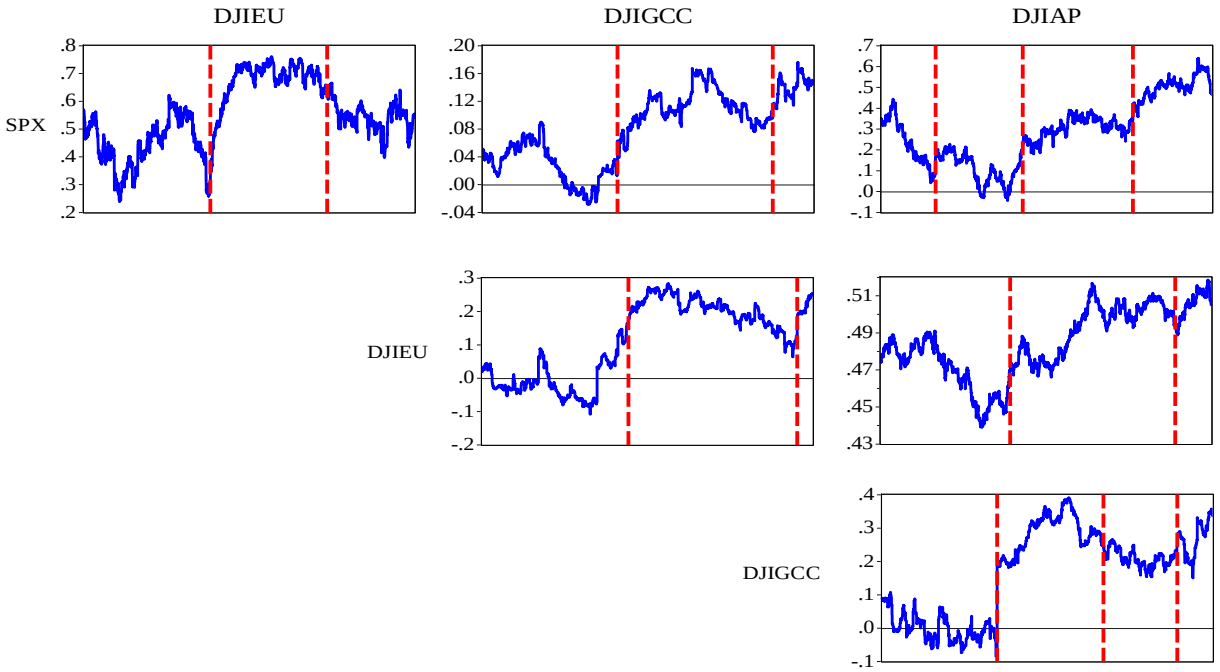

Figure 3. Dynamic Conditional Correlations between Islamic Indices

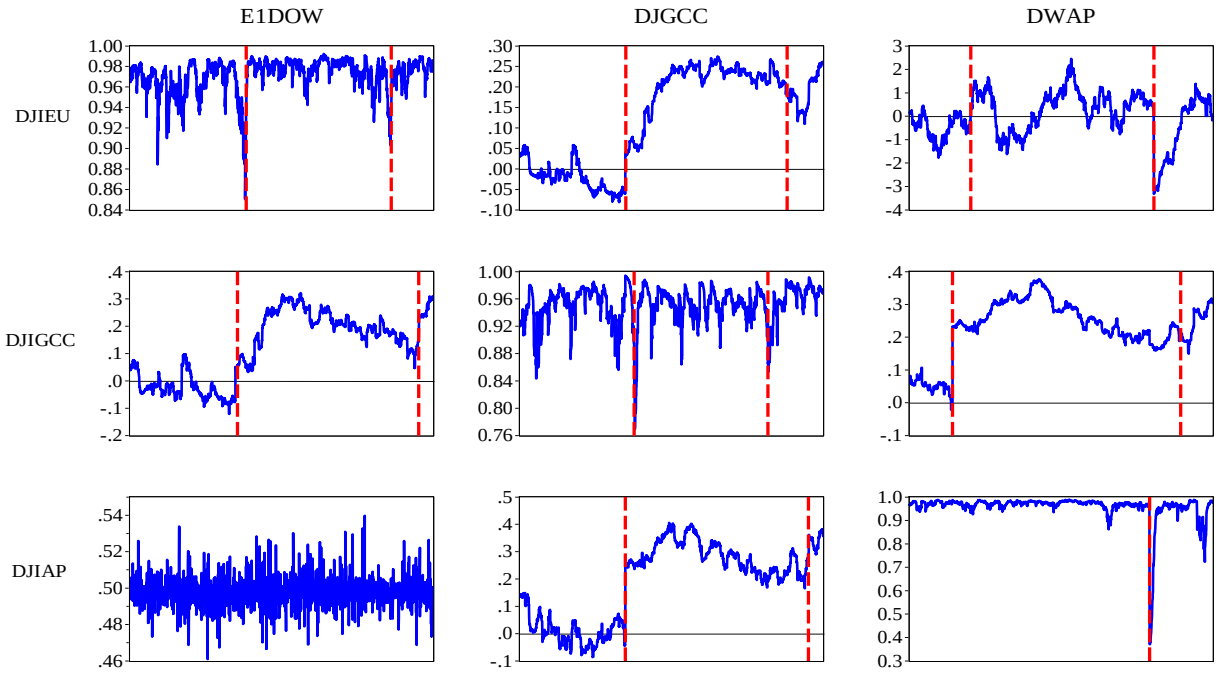

Figure 4. Dynamic Conditional Correlations between other Indices

It is seen that the correlation between American and European markets moved upward with 2008 mortgage crisis and move downward with 2012 European debt crisis. It can be said that this contagion effect also valid for the European Islamic and conventional markets. Low and sometimes negative correlation between USA, Gulf and Asia-Pacific regions, moved upward with mortgage crisis. Negative low correlation between Europe and the Gulf region moved upward with mortgage crisis. It is understood that there is financial contagion effect in all relationships between Islamic and conventional markets except the relationship between Europe and Asia-Pacific region. When structural break dates in DCC series are examined, it is seen that this effect is realized lately sometimes in Islamic markets and sometimes in conventional ones.

5. Conclusions

Although there is an argument that Islamic financial markets are more resistant than the conventional markets during the crisis periods, the findings show that co-movement between both markets are more common. Therefore in this study the validity of financial contagion effect against international financial shocks is tested for Islamic markets. In this context; the relations between USA, Europe, and the Gulf and Asia-Pacific markets were analyzed by DCC-MV-EGARCH method for the 2004-2016 periods.

Findings show that there is very high correlation between each region's own Islamic and conventional index returns. During the crisis period this relation is temporarily reduced and responses to shocks are realized at different times. However these findings are far from supporting the argument that Islamic financial markets are more resistant to financial shocks and there is no financial contagion effect in these markets. The study concludes that the Islamic markets do not react differently from conventional markets against financial shocks and they are not "safe havens" for investors during financial crisis.

References

1. Abdul Karim, B., Akila Mohd. Kassim, N. and Affendy Arip, M. (2010). The subprime crisis and Islamic stock markets integration. International Journal of Islamic and Middle Eastern Finance and Management, 3(4), 363-371.

2. Abu Bakar, N. and Masih A. M. (2014). The Dynamic Linkages between Islamic Index and the Major Stock Markets: New Evidence from Wavelet time-scale decomposition Analysis. MPRA Paper No. 56977.

3. Ahlgren, N. and Antell, J. (2010). Stock market linkages and financial contagion: A cobreaking analysis. The Quarterly Review of Economics and Finance, 50(2), 157-166.

4. Akhtar, S., Jahromi, M. (2015). Impact of the global financial crisis on Islamic and conventional stocks and bonds. Accounting & Finance, 1-33.

5. Al Asad Bin Hoque, H. (2007). Co-movement of Bangladesh stock market with other markets: Cointegration and error correction approach. Managerial Finance, 33(10), 810-820.

6. Alaoui, A. O., Dewandaru, G., Rosly, S. A. and Masih, M. (2015). Linkages and co-movement between international stock market returns: Case of Dow Jones Islamic Dubai Financial Market index. Journal of International Financial Markets, Institutions and Money, 36, 53-70.

7. Al-Khazali, O., Lean, H. H. and Samet, A. (2014). Do Islamic stock indexes outperform conventional stock indexes? A stochastic dominance approach. Pacific-Basin Finance Journal, 28, 29–46. doi:10.1016/j.pacfin.2013.09.003

8. Arshanapalli, B. and Doukas, J. (1993). International stock market linkages: Evidence from the pre- and post-October 1987 period. Journal of Banking & Finance, 17(1), 193-208.

9. Baig, T. and I. Goldfajn. 1999. Financial market contagion in the Asian Crisis. IMF Staff Papers 46 (2):167–195.

10. Blackman, S.C. Holden, K. and Thomas, W.A. (1994). Long-term relationships between international share prices. Applied Financial Economics, Vol. 4, ss. 297-304.

11. Bordo, M. D., and Murshid, A. P. (2000). Are financial crises becoming increasingly more contagious? What is the historical evidence on contagion?(No. w7900). National Bureau of Economic Research.

12. Cha, B. and Oh, S. (2000). The relationship between developed equity markets and the Pacific Basin's emerging equity markets. International Review of Economics & Finance, 9(4), 299-322.

13. Dewandaru, G., Rizvi, S. A. R., Masih, R., Masih, M. and Alhabshi, S. O. (2014). Stock market co-movements: Islamic versus conventional equity indices with multi-timescales analysis. Economic Systems, 38(4), 553-571.

14. Dewandaru, G., Bacha, O. I., Masih, A. M. M. and Masih, R. (2015). Risk-return characteristics of Islamic equity indices: Multi-timescales analysis. Journal of Multinational Financial Management, 29, 115–138. doi:10.1016/j.mulfin.2014.11.006

15. Dungey, M., and Martin, V. L. (2007). Unravelling financial market linkages during crises. Journal of Applied Econometrics, 22(1), 89-119.

16. Engle, R. (2002). Dynamic Conditional Correlation: A Simple Class of Multivariate Generalized Autoregressive Conditional Heteroskedasticity Models. Journal of Business & Economic Statistics, 20(3), 339–350. doi:10.1198/073500102288618487.

17. Fernández, J. and Morley, B. (2015). Interdependence among Agricultural Commodity Markets, Macroeconomic Factors, Crude Oil and Commodity Index.

18. Forbes, K. J. and Rigobon, R. (2002). No contagion, only interdependence: measuring stock market comovements. The journal of Finance, 57(5), 2223-2261.

19. Grubel, H. G. (1968). Internationally diversified portfolios: welfare gains and capital flows. The American Economic Review, 58(5), 1299-1314.

20. Hengchao, Z. and Hamid, Z. (2015). The Impact of Subprime Crisis on Asia-Pacific Islamic Stock Markets. Journal of Asia-Pacific Business, 16(2), 105-127.

21. Hilliard, J. E. (1979). The relationship between equity indices on world exchanges. The Journal of Finance, 34(1), 103-114.

22. In, F., Kim, S. and Yoon, J. H. (2002). International stock market linkages: evidence from the Asian financial crisis. Journal of Emerging Market Finance,1(1), 1-29.

23. Lavielle, M. (2005). Using penalized contrasts for the change-point problem. Signal processing, 85(8), 1501–1510.

24. Lee, S.B. and Kim, K.J. (1993). Does the October 1987 crash strengthen the co-movements among national stock markets. Review of Financial Economics, Vol. 3, pp. 89-102.

25. Lessard, D. R. (1973). International portfolio diversification: a multivariate analysis for a group of Latin American countries. The Journal of Finance, 28(3), 619-633.

26. Levy, H. and Sarnat, M. (1970). International diversification of investment portfolios. The American Economic Review, 668-675.

27. Majdoub, J. and Mansour, W. (2014). Islamic equity market integration and volatility spillover between emerging and US stock markets. The North American Journal of Economics and Finance, 29, 452-470.

28. Mansor, H. I. (2005). International linkage of stock prices: the case of Indonesia. Management Research News, 28(4), 93-115.

29. Meric, I. and Meric, G. (1997). Co-Movements of European Equity Markets Before and After the 1987 Crash, Multinational Finance Journal 1, 137-152.

30. Nelson, D. B. (1991). Conditional heteroskedasticity in asset returns: A new approach. Econometrica: Journal of the Econometric Society, 347–370.

31. Pericoli, M. and Sbracia, M. (2003). A primer on financial contagion. Journal of Economic Surveys, 17(4), 571-608.

32. Pesaran, M. H. and Pick, A. (2007). Econometric issues in the analysis of contagion. Journal of Economic Dynamics and Control, 31(4), 1245-1277.

33. Rizvi, S. A. R. and Arshad, S. (2014). An Empirical Study of Islamic Equity as a Better Alternative during Crisis Using Multivariate GARCH DCC. Islamic Economic Studies, 22(1), 159-184.

34. Sachs, J., Tornell, A. and Velasco, A. (1996). Financial crises in emerging markets: the lessons from 1995 (No. w5576). National Bureau of Economic Research.

35. Saiti, B., Bacha, O. I. and Masih, M. (2014). The diversification benefits from Islamic investment during the financial turmoil: The case for the US-based equity investors. Borsa Istanbul Review, 14(4), 196-211.

36. Solnik, B. (1974), Why not Diversify Internationally rather than domestically? Financial Analysts Journal 30, ss.48–54.

37. Turhan, M. I., Sensoy, A. and Hacihasanoglu, E. (2014). A comparative analysis of the dynamic relationship between oil prices and exchange rates. Journal of International Financial Markets, Institutions and Money, 32, 397–414.

38. Yang, J., Kolari, J. W. and Min, I. (2003). Stock market integration and financial crises: the case of Asia. Applied Financial Economics, 13(7), 477-486.

39. Yilmaz, M. K., Sensoy, A., Ozturk, K. and Hacihasanoglu, E. (2015). Cross-sectoral interactions in Islamic equity markets. Pacific-Basin Finance Journal,32, 1-20.