International Business Management 10 (17): 3914-3920, 2016
ISSN: 1993-5250
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Is Islamic Stock Market no Different than Conventional Stock Market? An Evidence from Malaysia

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Abstract: The Islamic stock market is exposed to global financial crisis. Its return and risk performance are likely to share similar characteristics as its conventional counterpart. This study investigates the dependence between the returns of Islamic stock market index and conventional stock market index in two periods, in which one period contains the global financial crisis. The association between the two markets increases across periods: from stable to financial crisis period. Using the copula approach, the joint returns exhibit strong symmetric dependence during the financial crisis period. The symmetric tail dependence index suggests moderate extreme dependency in times of bull and bear markets. As Malaysia is a frontier in Islamic finance, it is no surprise that many large corporations becoming Sharia-compliant companies. Hence, this phenomenon has caused the increment of association measure between Islamic and conventional stock markets across time.

Key words: Islamic stock market, conventional stock market, dependence, ARMA-GARCH, copula

INTRODUCTION

Malaysia is known to be the leading country that has a strong Islamic financial system. Since, the establishment of Malaysia International Islamic Financial Center (MIFC) in August 2006, the Islamic market has seen its growth with the increasing demand of Islamic investment products. It is no surprise today if there are many large corporations in Malaysia are sharia-compliant companies. Furthermore, it would be most likely possible that the Islamic stock and the conventional stock market share common behaviors especially in terms of stock price movements, returns and risks.

According to Hammoudeh *et al*. (2014), the Islamic equity universe behaved similarly to the conventional equity market indices on average but with some peculiarities under extreme market conditions. Specifically, both markets were found moving together but differently in times of bull and bear market conditions. The universal Islamic stock market is also exposed to global disturbance that are common to the financial systems around the globe. The counter effect of this experience has increased the growth of Islamic markets due to the Sharia-compliant concept which contributes to the stability of the financial system (Mohieldin, 2012). Studies concerning the comovements of financial markets and contagions have been increasing. Among the reasons of high interest in such studies are unexpected financial disasters and the rapid evolvement of statistical tools.

Through such studies, investors would obtain information about potential diversifiers and hedgers and joint risk of any combination of assets. Furthermore, they can also obtain the probability of simultaneous extreme losses or gains. The comovements of two markets can described the correlation concept. For the Malaysian case, Razak and Ismail (2014) found that conventional stock exhibit similar statistical properties and had some tendency to boom and crash together. The comovements between Islamic and conventional markets could be strong during bear market or turmoil. If this inference holds true, risk adverse investors may not be willing to invest in Sharia products since the yields face similar consequences as convectional investment products.

In earlier studies, the comovements or correlation of two markets are measured by linear correlation. Statistically, investors are able to know the basic idea of the magnitude of the markets performance. In finance, the association measure shows that how strong the prices or return rate moves concurrently. Correlation is also the fundamental to portfolio performance measures including risk. Embrechts proved that using linear correlation as a measure of dependence would give misleading

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interpretations for risk management. In reality, the stock market or equity price indices tend to have large fluctuations thus making them hard to have Gaussian distribution.

Embrechts was one of a few early researchers who used copulas in risk management. The copula theory is notably used for capturing joint distribution of two or more random variables without including standard linear dependence and multivariate independently and identically distributed return distribution restrictions. It also provides the dependence structure and can generate the tail dependence indices (Nelsen, 2006). The most important property of copulas is that the dependence structure and marginal distribution function can be modelled separately (Ning, 2010). Researchers have used unconditional distribution (Rong and Truck, 2010; Vaz *et al*., 2011), DCC-GARCH (Righi and Ceretta, 2011), EGARCH (1,1) (Shamiri *et al*., 2011), TGARCH (Hammoudeh *et al*., 2014) and ARMA-GARCH Models (Righi and Ceretta, 2013; Razak and Ismail, 2014) as marginal models. However, there is no consensus of which marginal models that would influence the accuracy of the dependence estimation.

The aim of this study is to investigate the dependence between Islamic and conventional stocks at 4 years period with and without the inclusion of the financial crisis. The copula approach is used as alternative to linear correlation. The outcome of this study will give insights to the performance of copula approach in detecting the dependency of stocks during two different periods. It is expected that the marginal models prior to copula parameter and dependence estimation may be different than the usual AR(1)-GARCH(1,1) Model used in earlier studies. The remaining sections of this study consist of methodology (data, copula theory and statistical methods), findings and discussions of study and conclusion of study.

MATERIALS AND METHODS

Data: The data used in for this study are the daily closing prices of the FTSE Bursa Malaysia Hijrah Shariah Index (FBMHS) and the FTSE Bursa Malaysia Kuala Lumpur Composite Index (KLCI) for the period January 2003 to December 2010. Due to the statistical properties of the original data, the following formula is used to transform each price series to returns series based on the following equation:

$$R_t = \log P_t - \log P_{t-1}$$

The returns of each stock market index are separated into two sub periods: 2003-2006 and 2007-2010. The returns of both FBMHS and KLCI indices were recovering from the 1997 Asian Financial Crisis in the early 2000s. However, there was no information about the length of the recovering period (Angabini and Wasiuzzaman, 2011). The second sub period contains the 2008's Global Financial Crisis. In this study, the first sub period is referred to as stable period and the latter period as financial crisis period.

Copula: The mathematical concept of copula was first introduced by Abe Sklar in 1959. Sklar's theorem states that a copula linking each univariate marginal distribution function of a random variable in a vector is the multivariate joint distribution of that random vector. Considering a bivariate case, the Sklar's theorem is mathematically expressed as follows:

$$H(x, y) = C\left[F_1(x), F_2(y)\right]$$

Where:

H = The bivariate distribution function
C = Symbolizes the copula
F_1 and F_2 = The univariate marginal distribution function of each random variable X and Y, respectively

The copula function provides the degree of dependence and the dependence structure of the multivariate case.

In bivariate context, copulas has been used extensively especially in finance. Among the applications of copula in finance are asset allocation, default risk modeling, derivative pricing and financial risk management (Vaz *et al*., 2011). The important attraction of copulas is that they are invariant to transformations of data (Ning, 2010). This property is indeed useful in economics and finance where original data are often transformed. Statisticians are interested in copulas because of its scale-free measures of dependence (Nelsen, 2006) and the flexibility that it offers in modeling multivariate data (Vaz *et al*., 2011). It allows users to separately model marginal distributions and the dependence structure. Furthermore, the copula function allows for tail dependence and asymmetric dependence (Shamiri *et al*., 2011).

Tail dependence measures the probability that two variables are in the upper-right and lower-left quadrants. Referring to Nelsen (2006), the lower or left tail dependence is expressed as follows given the estimated bivariate copula C and pseudo observations u:

$$\lambda_{LOWER} = \lim_{u \to 0^+} \frac{C(u, u)}{u}$$

The lower tail dependence indicates the potential of simultaneous extreme losses in both stock markets. The joint loss is also known as the joint downside risk. The significance of the lower tail dependence implies that the two markets crash together.

The upper or right tail dependence measures the probability of simultaneous extreme positive values. The significance of the upper tail measure implies that both markets boom together. The equation of the upper tail dependence is as follows given the estimated bivariate copula C and pseudo observations u (Nelsen, 2006):

$$\lambda_{UPPER} = \lim_{u \to 1^-} \frac{1 - 2u + C(u, u)}{1 - u}$$

The copula families included in this study are Gaussian, Student's t, Clayton, Gumbel, Frank, Galambos and Husler Reiss. The first two copulas are Elliptical copulas that have symmetric distribution. Student's t copula has an advantage over Gaussian copula in terms of capturing the symmetric tail dependence. The Archimedean copulas such as Clayton and Gumbel copulas have asymmetric distribution and measure one-sided tail dependence. Unlike the other Archimedean copulas, Frank copula has symmetric distribution and it is relatively weak at capturing extreme dependence. Finally, Galambos and Husler Reiss copulas belong to extreme value copula family.

Marginal model and dependence estimation: As discussed in the previous sub section, the joint distribution function of two stock market returns can be decomposed to its univariate marginal distributions and a copula. For the present case, the univariate marginal distribution of each returns series is modelled by an autoregressive moving average with generalized autoregressive conditional heteroscedasticity (ARMA-GARCH) Model. The use of this time series model is twofold. First, its filters data thus leaving those not modelled to be captured by the copula. Secondly, the ARMA-GARCH parameters describe the stylized facts of financial returns. On the statistical point of view, the ARMA-GARCH Model with order p and q and Gaussian distribution errors are as follows:

$$Y_t = \alpha_0 + \sum_{i=1}^{p} \varphi_i Y_{t-i} + \sum_{j=1}^{q} \theta_j \varepsilon_{t-j} + \varepsilon_t$$

$$\varepsilon_t = z_t \sigma_t \quad \text{where } z_t \sim N(0,1)$$

$$\sigma_t^2 = \omega + \sum_{i=1}^{q} \alpha_i \varepsilon_{t-i}^2 + \sum_{j=1}^{p} \beta_j \sigma_{t-j}^2$$

Where:

- Y_t = The return at t-th day
- ε_t = A white noise process assumed to follow normal distribution with zero mean and standard deviation of 1. The autoregressive and moving average parameters are denoted as ϕ_i and θ_j respectively
- σ_t^2 = The notation of variance while
- $\alpha_i \varepsilon_{t-i}^2$ and $\beta_j \sigma_{t-j}^2$ = ARCH and GARCH components, respectively

Since, GARCH processes are often heavy-tailed. ε_t is also considered to follow innovations such as skew normal distribution, student-t distribution with L degrees of freedom, skew student-t distribution, generalized error distribution and skew generalized error distribution. The selection of the best ARMA-GARCH Model with innovation that fits the returns series is based on diagnostic checking, model misspecification tests and model selection criterion.

Diagnostic checking involves observing the residual plots and its Autocorrelation Function (ACF) and Partial Autocorrelation Function (PACF) diagrams. The selected ARMA-GARCH Model is appropriate if there are no significant lags in the diagrams. We further conduct the Ljung-Box test of autocorrelation which verifies whether the autocorrelation of the residual series are different from zero. Residuals are independent and uncorrelated if the hypothesis is not rejected. Otherwise, the ARMA-GARCH Model needs further modification if serial correlation remains in the residual series. For model misspecification test, the Lagrange Multiplier (LM) test is employed in order to confirm the empirical adequacy of the marginal model. The correctness of the copula estimates depends on the correct specification and validity of the marginal model (Ning, 2010). The model selection criterion such as the Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), Schwarz Information Criterion (SIC) and Hannan-Quinn Information Criterion (HQIC) further helps determine which marginal model that best fit the data series.

The residual series obtained from marginal models are transformed to pseudo observations using U_i = Rank $X_i/(n+1)$ and V_i = Rank $Y_i/(n+1)$ where i = 1, 2, 3, ..., n. Given the pseudo observations, Kendall's τ is computed and used to estimate the copula parameters. Kendall's τ is a copula-based dependence measure that does not depend on the marginal distribution (Heinen and Valdesogo, 2012). Its mathematical function is:

$$\tau = -1 + 4 \int_{[0,1]^2} C(u, v) dC(u, v)$$

In order to determine which copula model best describe the dependence structure of the paired stock markets, the commonly used goodness-of-fit test via the Cramer-von Mises statistics (s_T) is adopted. Equation of s_T is showed as:

$$S_T = \sum_{t=1}^{T} \left\{ C_T(u_t, v_t) - C_{\theta_T}(u_t, v_t) \right\}^2$$

This statistic measures how close the fitted copula $C_{\theta T}$ is from the empirical copula C_T. The null hypothesis of the goodness-of-fit test is the true copula C is from the assumed copula family. The p-value of the test is computed using the parametric bootstrap as described by Genest *et al*. (2009).

RESULTS AND DISCUSSION

Descriptive statistics: The daily price indices of the Hijrah Shariah Index (FBMHS) and the Kuala Lumpur Composite Index (KLCI) were examined in two sub periods 2003-2006 and 2007-2010. The results of the preliminary analysis are shown in Table 1. It includes that mean, Standard Deviation (SD), Coefficient of Variation (CV) and the p-values of the Augmented Dickey-Fuller (ADF) unit root test and the Jarque-Bera (JB) test for normality. The CV is the ratio of standard deviation to the mean. This measure is useful for comparing volatilities across several series. The ADF unit root test is used to for checking the stationarity of the data. The JB test for normality is conducted under assumption that the price index is normally distributed.

In general, the all averages and standard deviations of daily price index are smaller during the stable period (2003-2006) than of that in the 2007-2010 period. Relative to the mean, the higher CV value indicates that price indices are more volatile for the period with financial crisis compared to the prices in the stable period. Generally, both stock markets had increasing volatility of price indices in the financial crisis period. Specifically, the Sharia stock price index is more volatile compared the conventional stock price index during the first sub period. However, in the second sub period, the Sharia stock price index is less volatile than its conventional counterpart. This case was possible due to the government support on the expansion of the Islamic financial market in Malaysia. Furthermore, Islamic market was likely to be affected the least in time of financial disaster (Razak and Ismail, 2014).

The price index series are non-stationary given by the insignificant p-values of the ADF unit root test. In addition, the distribution of each series is non-normal which is indicated by the significant value of the JB test. Due to the two criteria, the price index series are transformed via log difference thus resulting daily returns.

Table 1: Summary statistics of daily price index series and normality test

Stock (period)	FBMHS 2003-2006	FBMHS 2007-2010	KLCI 2003-2006	KLCI 2007-2010
Mean	5436.37	9040.06	853.75	1228.84
SD	740.35	1270.99	103.78	177.16
CV	13.62%	14.06%	12.16%	14.42%
ADF test	0.4487	0.7696	0.5506	0.9584
JB test	<3.8e-10	<2.9e-03	<1.9e-13	<2.2e-16

Table 2: Summary statistics of daily return series and normality test

Stock (period)	FBMHS 2003-2006	FBMHS 2007-2010	KLCI 2003-2006	KLCI 2007-2010
Mean	0.00058	0.00039	0.00055	0.00033
SD	0.00638	0.01091	0.00617	0.00999
Skewness	0.0955	-1.2443	0.1684	-1.2895
Kurtosis	5.4028	16.0444	4.8154	15.0351
ADF test	0.01	0.01	0.01	0.01
JB test	<2.2e-16	<2.2e-16	<2.2e-16	<2.2e-16

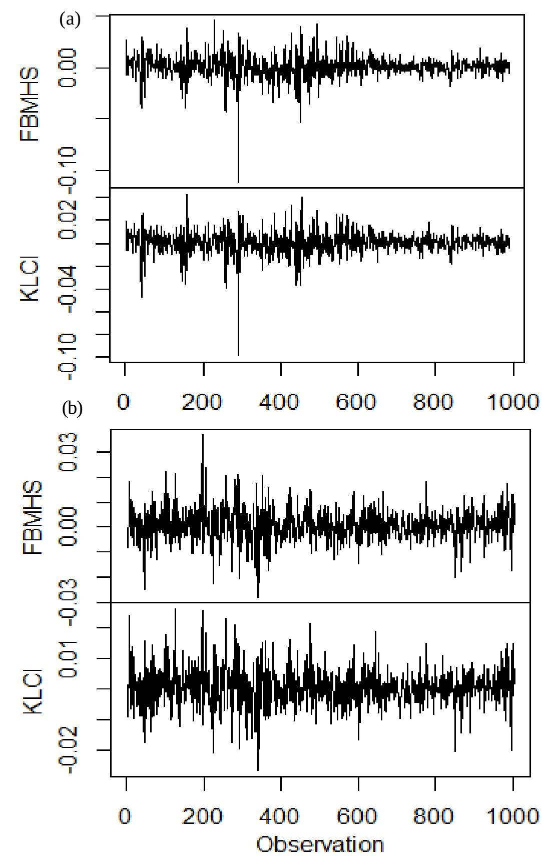

Fig. 1: The line plot of daily return series for FBMHS and KLCI during: a) 2003-2006 and b) 2007-2010

Figure 1 shows the daily returns movements for each stock and periods. During the first sub period, both stock market returns seemed to behave a similar manner as returns rise and fall together. No major shock occurred in this period. However, in the second sub period, the major shock was evident and extreme negative returns were caused by the global financial disaster that occurred in 2008-2009. Table 2 shows the summary statistics of the daily return series including the p-values of the ADF unit root test and normality (JB) tests. Based on Table 2, the average daily returns for both stocks are higher during the stable period but smaller during the financial crisis period. Furthermore, the dispersion of daily returns is higher for the latter period than of that during the stable period. In 2003-2006, the daily returns for both FBMHS and KLCI have non-normal and right-skewed distribution. These findings are evident by the positive skewness values and the significance of JB statistics. During the stable period, both FBMHS and KLCI have extreme positive returns. This positive skewed returns often attracts more investors.

The distribution of daily returns in 2007-2010 for each stock is non-normal and left-skewed. In addition, the large kurtosis indicates the existence of fat tails. This statistical finding is further supported by the significance of JB statistics at 1% level. In times of financial crises and recovery of market crash, it is common to obtain negative skewed returns. However, excess kurtosis implies that the effect of global financial crisis have caused stocks to experienced more extreme negative returns. Interestingly, FBMHS had slightly more extreme negative returns than KLCI but the price index was less volatile than KLCI as reported earlier. After the transformation of the price index series, the returns series are stationary. They are evident by the mean and standard deviation of returns which are close to zero. This matter is supported by the significant statistical values of the ADF unit root test at 5% level.

Marginal distribution and dependence estimation: For the marginal distribution of returns series, each series are fitted to a univariate time series model. First, the Autoregressive Moving Average (ARMA) Model applied to estimate the conditional mean equation. The model with the lowest Akaike Information Critera (AIC) value is chosen as the best fitted model to the series. For the 2003-2006 period, the ARMA(1,1) Model was the best fit model to the Sharia (FBMHS) returns series. In other words, the current return of FBMHS depends on the previous day return and residual. For the conventional stocks (KLCI), the AR(1) model was the suitable model to capture the linearity in the returns series. This finding implies that the current return of KLCI is only affected by the previous day's return. However, for the 2007-2010 period, the moving average or MA(1) was chosen as the best model for all return series. Both current returns of FBMHS and KLCI are affected by the previous day residual.

Based the p-values of the ADF unit root test at 5% level in Table 3, each residual series are stationary and

Table 3: Summary statistics of residuals series for best-fitted models

Stock (period)	FBMHS 2003-2006	FBMHS 2007-2010	KLCI 2003-2006	KLCI 2007-2010
Mean	-1.02e-06	-2.12e-06	9.02e-07	-1.37e-06
SD	0.00633	0.01079	0.00611	0.00989
Skewness	0.08422	-1.1535	0.1571	-1.1754
Kurtosis	5.0767	15.9378	4.6739	15.1295
ADF test	0.01	0.01	0.01	0.01
JB test	<2.2e-16	<2.2e-16	<2.2e-16	<2.2e-16
Q-stat, Q(10)	0.5994	0.7954	0.918	0.5701

Table 4: GARCH (1,1) model estimates

Stock (period)	FBMHS 2003-2006	FBMHS 2007-2010	KLCI 2003-2006	KLCI 2007-2010
ω	1.2926e-06*	7.2493e-07*	4.4339e-07	2.1358e-06**
	(7.759e-07)	(4.321e-07)	(3.129e-07)	(9.305e-07)
α	7.3362e-02***	9.4727e-02***	5.1771e-02***	1.4950e-01**
	(2.593e-02)	(2.624e-02)	(1.753e-02)	(3.115e-02)
β	8.9621e-01***	9.0685e-01***	9.3782e-01***	8.3591e-01***
	(3.949e-02)	(2.268e-02)	(2.187e-02)	(3.075e-02)
Shape	7.0868e+00***	4.5058e+00***	1.3080e+00***	6.2740e+00***
	(1.505e+00)	(6.694e-01)	(8.029e-02)	(1.225e+00)
Q(10)	0.7715977	0.5461706	0.9067376	0.4688007
$Q^2(10)$	0.7795364	0.7848394	0.6812275	0.7638051
LM test	0.6663516	0.8897121	0.8015557	0.8670138
AIC	-7.395653	-6.661412	-7.476674	-6.760267
BIC	-7.376085	-6.641623	-7.457106	-6.740478
SIC	-7.395685	-6.661445	-7.476706	-6.760299
HQIC	-7.388217	-6.653887	-7.469238	-6.752742

The value is significant at 10*, 5** or 1%***. Standard errors for each parameter estimates are provided in parentheses. For Q-statistics, Q(10) on residuals and squared residuals and Lagrange Multiplier (LM) test, the p-values are provided in table

does not contain a unit root. These findings are further supported by constant mean which is close to zero. The series are also normally distributed as according to the significant p-values of JB test. However, the insignificance of the Ljung-Box Q-statistics at lag 10 (Q(10)) suggests that the residuals are not correlated for each FBMHS and KLCI at both periods. The presence of Autoregressive Conditional Heteroscedastic (ARCH) effects can be detected by the Langrage Multiplier (LM) test on the residuals. The result of the LM test which is not shown here, rejects the null hypothesis that no ARCH errors are present. Hence, the ARCH and generalized Autoregressive Conditional Heteroscedastic (GARCH) Models are applied to capture the volatility in the series.

The ARCH (1) Model had higher AIC values compared to the GARCH (1,1) Models. Furthermore, there were ARCH errors present after applying the former model. Table 4 below shows the best fitted GARCH(1, 1) Model estimates with model misspecification tests such as Ljung Box Q-statistics on residuals (Q(10)) and squared residuals ($Q^2(10)$) and also the Lagrange Multiplier (LM) test. The model selection criterion such as the AIC, Bayesian Information Criterion (BIC), Schwarz Information Criterion (SIC) and Hannan-Quinn Information Criterion (HQIC) are also included in Table 4.

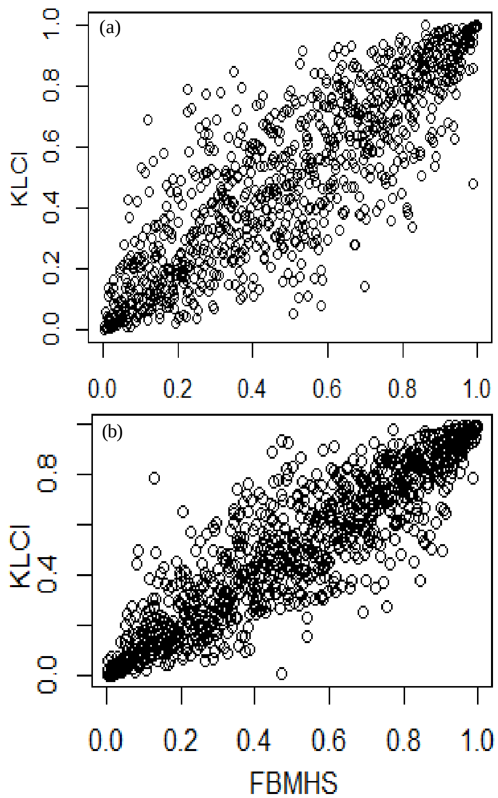

Fig. 2: Plots of pseudo observations for the FBMHS-KLCI during; a) 2003-2006 and b) 2007-2010

Generally, all GARCH parameters are significant at 10%. A significant indicates the current volatility or variance is affected by the previous day volatility. If α is significant, then the current volatility is also affected by the previous squared residual. Through the diagnostic tests, the residuals of each GARCH Model are normally distributed. Moreover, the insignificant Q-statistic on residuals and squared residuals indicate that the residuals are independently distributed. The insignificant values of the LM statistic suggest that ARCH errors are absent in the series.

The GARCH(1,1) have correctly accounted the volatility in the series. For the 2003-2006 period, the marginal models identified are ARMA(1,1)-GARCH(1,1) with student's t distribution innovation for Sharia stock (FBMHS) and AR(1)-GARCH(1,1) with generalized error distribution innovation for the conventional stock (KLCI). MA(1)-GARCH(1,1) with student's t innovation is the marginal model for both FBMHS and KLCI in 2007-2010 period. At the present case, it is proven that univariate distribution of each return series is the ARMA-GARCH Model. The standardized residuals are transformed to pseudo observations for further use in dependence and copula parameter estimations. Figure 2 illustrates the dependence between FBMHS and KLCI. The plots for both stable and financial crisis periods show symmetric dependence at the tails. Specifically, the tail dependence seemed to be stronger during the financial crisis period. This matter depicts that returns tend to rise and fall concurrently during the bull and bear market conditions. Furthermore, the overall dependence between Islamic and conventional stock markets looked stronger during the 2007-2010 period.

Table 5: Copula parameter estimated, goodness-of-fit test and tail dependence index during 2003-2006

Copula	Parameters	SE	GOF	λ_{LOWER}	λ_{UPPER}
Normal	0.868642	0.008998	0.4081	0	0
Student's t	0.871406	0.006673	0.482	0.4145808	0.4145808
	(9.500644)	(3.207961)			
Clayton	4.0609	0.2124	0.0004995	0.8430831	0
Gumbel	3.0304	0.1062	0.003497	0	0.7429987
Frank	10.1596	0.4409	0.0004995	0	0
Galambos	2.3199	0.1064	0.001499	0	0.7417237
Husler Reiss	2.9945	0.1215	0.001499	0	0.7384166

Table 6: Copula parameter estimated, goodness-of-fit test and tail dependence index during 2007-2010

Copula	Parameters	SE	GOF	λ_{LOWER}	λ_{UPPER}
Normal	0.907535	0.006771	0.2383	0	0
Student's t	0.906623	0.005168	0.3032	0.5598534	0.5598534
	(6.590690)	(1.644794)			
Clayton	5.2484	0.2696	0.0004995	0.8762805	0
Gumbel	3.6242	0.1348	0.0004995	0	0.7892307
Frank	12.6050	0.5516	0.0004995	0	0
Galambos	2.9144	0.1349	0.0004995	0	0.7883302
Husler Reiss	3.6719	0.1535	0.0004995	0	0.785363

Using pseudo observations, Kendall's τ computed for both stable and financial crisis periods are 0.67 and 0.724, respectively. The increase in the dependence value suggests that FBMHS has stronger relationship with KLCI. This could be due to the fact that the number of Sharia-compliant companies in the top 30 largest companies is increasing. Table 5 and 6 contains copula parameter estimates, the p-values of Goodness of Ffit test (GOF) and tail dependence index for each period.

The p-values of goodness-of-fit tests for the normal and student's t copulas are insignificant for both periods. These findings suggest that Elliptical copula is suitable for representing the dependence between FBMHS and conventional stocks. Student's t copula is selected as the most appropriate fit. This matter is due to the higher probability of not rejecting the null hypothesis that the assumed copula distribution is the right fit to model dependence between the two markets.

The results above imply that the returns of FBMHS and KLCI move concurrently. The symmetric tail dependence index indicates that both markets tend to crash and boom together. During normal times, diversification benefits can be gained by mixing Islamic and conventional stocks in portfolios. However, like other countries Islamic stock market (Hammoudeh *et al*., 2014), Malaysian Islamic stock market is also unprotected against global shocks as well as contagion risks.

The dependence between the FBMHS and KLCI are quite strong and positively correlated. The movement of returns in each period for the two stocks is alike. Both stocks are likely to experience shocks around the same time if another financial disaster occurs. This finding conforms past findings that Islamic stock returns behave in similar manner to its conventional counterpart (Hammoudeh *et al*., 2014).

CONCLUSION

The purpose of conducting this study was to investigate the dependence between Islamic and conventional stocks during the stable period (2003-2006) and the financial crisis period (2007-2010). The copula approach with ARMA-GARCH marginal models was used to obtain the overall and tail dependence measures. Through this study, we found that the marginal models for shorter periods was different the usual AR(1) GARCH(1,1) Model.

The overall dependence between FBMHS and KLCI increases across period. This finding implies that the top 30 largest companies in Malaysia are continuing to be conquered by Sharia-compliant companies. The result is expected since Malaysia is the frontier in Islamic finance. Student's t copula was the best fit to describe the dependence structure between FBMHS and KLCI during the stable and financial crisis periods.

Both stock markets tend to behave similarly during normal times and during financial crisis. Since Islamic stock market is also exposed to global financial disasters, it can neither act as a hedge nor safe haven for risk-adverse investors who wish to protect their investment in case of turmoil. Despite this finding, investments in Islamic market would yield higher expected returns and has smaller risk. In addition, this study also reveals that conventional market is more prone to financial disasters.

This study is limited to the dependence of returns of two stock markets. Further study can extend this research to find the joint risk of the markets. Furthermore, the choice of marginal models can be extended to other GARCH Models which give more information about the financial data such as leverage effect and news impact.

ACKNOWLEDGEMENTS

The researchers are grateful to Multimedia University for funding this research(MMUI/150013). Special thank you is dedicated to Nurul Syafrinaz Ramlee for her assistance in statistical programming for this research.

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