The Co-movement of Selective Conventional and Islamic Stock Markets in East Asia: Is there any Impact on Shariah Compliant Equity Investment in China?

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Abstract

This paper investigates the dynamic causal linkages in the daily returns among seven major conventional and Islamic stock indices in East Asia through the application of the time series techniques. We analyse seven conventional and *Shariah* -compliant stock indices (such as, FTSE *Shariah* China Index, Asia *Shariah* index, Malaysia EMAS *Shariah* Index, China SSE Composite Index, Hang Seng Index, Nikkei 225 and KOSPI) covering the period from 26 October 2007 to 1 March 2011. Essentially, the purpose of this research is to identify the extent of influence of conventional and Islamic, regional and international equity markets on *Shariah*-compliant equity investment in China. Our study is focused on investigating the following empirical questions: (i) which indices do the *Shariah* China Index commove with? (ii) which indices is the *Shariah* China Index Granger-causally related with ? and (iii) which major stock market was driving the selective conventional and Islamic markets?

Our findings tend to suggest: (i) the Sharia China Index appears to have a theoretical and long-run comovement with all the select conventional and Islamic markets (as evidenced in the Cointegration and LRSM tests) (ii) the *Shariah* China Index is Granger-caused by all the conventional and Islamic markets (as evidenced in the VECM tests) (iii) Finally, what stands out is the leadership of the China conventional SSE market followed by the Malaysia *Shariah* market in driving all indices including the Sharia China index (as evidenced in the VDCs tests).

Key Words: *Shariah*-Compliant Stocks, Unit Root Test, Cointegration, LRSM, VECM, VDCs, IRFs, Persistent Profiles

1. Introduction

Trade and financial liberalization since the late 20th century enhanced the process of globalization, with increased trade ties and economic synchronization, international stock market indices have become more integrated. A decision by a country's government to permit foreigners to buy stocks in that country's stock market is called stock market liberalization. The rational behind financial liberalization is to restore growth and stability by raising savings and improving economic efficiency. Following the collapse of the Bretton Woods system, the developed countries initiated the international financial liberalization process.

There is plenty of literature on stock market interdependence and integration. But, depending on the data, methodology, and theoretical models employed, there is no clear resolution of the issues relating to dynamic causal linkages among the stock markets as yet. These issues have been addressed by numerous studies (Errunza and Losq, 1985; Hietala, 1989; Masih and Masih, 1997, 1999, 2001). However, because of the inconsistent results, they are placed under critical exanimation. If there is a common long-term relationship among stock markets, the benefits of diversifying portfolios in international assets is doubtful. A common long-run relationship indicates relatively high long-term cross-market correlations, thereby reducing any possible diversification benefit over the long-run. Any potential achievement from international diversification of a portfolio is inversely correlated to the extent of stock

market integration. A low correlation between returns on stock market indices allows investors to minimize portfolio risk by international diversification. According to Masih and Masih (1997, 1999, 2001), another significant implication of integrated markets is that assets associated with similar degrees of risk in different countries should also lead to a similar degree of return. Therefore, an analysis of the long-run comovement of stock market prices and their short-run temporal relationships is significant for dealing with an international portfolio.

A more fundamental issue, at least from the perspective of the Chinese *Shariah* complaint equity investors, is to identify the impacts of conventional and Islamic, regional and international equity markets on *Shariah* compliant equity investment in China.

Basically, this paper has three research questions, namely:

(i)which indices do the *Shariah* China Index commove with ? (ii) which indices is the *Shariah* China Index Granger-causally related with ? and (iii) which major stock market was driving the selective conventional and Islamic markets?

These questions have been previously addressed by some researchers purely on conventional stock markets. However, over the recent years mainly because of the financial crises, the investors have been looking for alternative sources of investment such as, the fast growing Islamic finance. This paper, therefore, wants to shed more light on these issues by adding several *Shariah* compliant Islamic stock markets. Furthermore, China has received less attention in previous researches on the Asian stock market integration. This study wants to fill up these gaps.

This paper is organized as follows. Following this introduction, Section Two gives a brief review of the Islamic investment criteria and an overview of selective stock exchange markets; Section Three reviews the related literature and Section Four introduces a brief description on the methodology used in this study. This is followed in Section Five by a discussion of data and empirical results. Concluding remarks, limitations of study and directions of future research are given at the end of the paper.

2. Islamic Investment Criteria

Islamic investment is growing rapidly as an alternative investment class for all investors, both Muslim and non-Muslim, for its foundation in ethical business practices, social responsibility and fiscal conservatism. While Islamic investors may be mandated to invest only in a *Shari'ah*-compliant manner, other investors do so for the benefits they derive, including greater stability of returns, transparency and diversification[1].

In Islamic finance, a market should be free from prohibited activities and elements such as *riba* (usury), *maisir* (gambling), *gharar* (ambiguity), and also other activities like gambling, alcohol, and so on. To describe the Islamic principle in detail, *riba* technically is defined as the "premium" which should be paid by the borrower to the lender together with the principal amount as a condition in the contract of the loan or for an extension in the duration of loan" (Iqbal and Mirakhor, 2007). More specifically, both the premium and the principal are guaranteed regardless of the investment performance. Islamic stock must not include firms that pay or receive interest of any form. However, the percentage of today's listed firms that are fully in compliance with the *Shari'ah* is in small number. Some degree of tolerance therefore is required.

The modern *Shari'ah* scholars have provided general rules for *Shari'ah*-compliant investors to evaluate or screen whether a particular company is *halal* (lawful) or *haram* (unlawful) for investment (Wilson, 2004; Derigs and Marzban, 2008).There are two types of stock screening approaches such as qualitative and quantitative screens. The first one is qualitative screen, the screening process that focuses on the activity of a company that is used as the main principle in Islamic investment criteria. For a company that does not comply with *Shari'ah* principles, for example, a company is involved in the production of alcohol for

[1]Case for Islamic Asset Management, by CIMB bank, June 30, 2010.

drinking, gambling, and *riba*-based financial institutions, then, investment in this type of company is prohibited. The second one is quantitative screen, where Islamic scholars have applied a principle of tolerance associated with filtering criteria, namely:

(1) Debt/equity ratio. If a company's debt financing is more than 33 percent of its capital, then it is not permissible for investment.
(2) Interest-related income. If interest-related income of a company is more than 10 percent of its total income, then it is not permissible for investment. This income, however, should not come from its main business activities but from placing its surplus funds in investments that could yield interest income (Abdul Rahman et al,. 2010).
(3) Monetary assets. This parameter refers to the composition of account receivables and liquid assets (cash at banks and marketable securities) compared to total assets. Various minimums have been set for the ratio of non-liquid assets (assets that are not in the form of money) necessary to make an investment permissible. Some set this minimum at 51 percent while a few cite 33 percent as an acceptable ratio of non-liquid assets to total assets.

Chapra (2008) and Chapra, Ebrahim, Mirakhor, and Siddiqi (2008) who mention that there are four basic conditions in Islamic finance that may prevent the two main causes of financial crisis, which are excessive leverage and the formation of speculative bubbles in credit markets. Firstly, all transactions have to be based on real assets rather than merely fictitious or notional assets. This may discourage all speculative transactions which involve excessive ambiguity or gambling. Secondly, the transaction must involve the possession of exchange objects on the seller/lesser where this condition may guarantee that, to obtain certain return, the owner will share the risk with his partner. Thirdly, the transaction must be genuine with full intention to give and take delivery which in turn will prevent the excessive speculation using imaginary assets. Lastly, the credit risk must be borne by the creditor up to the maturity, which is subject to the rule of prohibition of selling the debt except at par value. This is to ensure that the creditor cannot transfer the risk by selling the debt to the market within a speculative and derivative transaction and that prevents the excessive growth of the debt beyond reasonable limits.

2.1 Overviews of Selective Stock Exchange Markets

In the middle of the 1990s, the international financial market had witnessed a drastic growth of Islamic funds all over the world. This phenomenon was because of the awareness of and demand from Muslims to participate in capital market investment. Dow Jones Index launched its Islamic index family in 1999 in order to facilitate and enable Islamic fund managers to transact business in the capital market world. After that, this innovation was followed by other stock markets and financial institutions in developing their own Islamic Indices, such as the Financial Times Stock Exchange (FTSE), the Wellington Islamic Index, the Citi Bank Islamic Index, the Global Alliance Islamic Index, etc. The first layer of qualitative DJIM screening removes companies involved in *Shariah* prohibited transactions such as alcohol, pork-related transactions, conventional financial services, entertainment, tobacco, and weapons and defence. A second layer of quantitative DJIM screening based on financial ratios, is intended to remove companies based on debt and interest income levels in their balance sheets[2].

In Malaysia, the Securities Commission (SC) lunched the Kuala Lumpur Stock Exchange *Shariah* Index (KLSESI) in 1997 as an important mechanism to accelerate the achievement of an Islamic capital market (ICM) plan. The ICM refers to the market where transactions are transacted in ways that do not conflict with the conscience of Muslims and the religion of Islam. In other words, the ICM represents an assertion of Islamic law in capital market transactions where the market should be free from the involvement of prohibited transactions by *Shariah* such as usury (*riba*), gambling (*maisir*), and ambiguity (*gharar*).

FTSE *Shariah* China Index, FTSE *Shariah* India Index and FTSE *Shariah* USA Index were launched by FTSE *Shariah* Global Equity Index Series in 26 October 2007. Screening is then undertaken by *Shariah* consultants, Yasaar Research Inc., against a clear set of guiding principles. Yasaar scholars, who apply

[2] DJ website

the *Shariah* screening to the FTSE Global Equity Index Series, represent all of the major *Shariah* schools of thought, creating a best practice approach that has credibility across all regions of the Islamic world.

3. Literature Review

One of the most important topics that have been studied extensively in the conventional finance literature is the comovements of the equity market indexes around the world. In a selected survey of the literature, the empirical works on conventional stock markets integration and interdependencies can be separated into two major groups. One group of researchers looked at the co-movements of stock market indices around the world by applying mainly the correlation and cointegration tests (see, for example, Taylor and Tonks 1989, Kasa 1992, Chung and Liu 1994, Corhay et al. 1995).

The second group of researchers employed time series techniques that have allowed a more rigorous analysis to be conducted, such as cointegration tests, vector autoregression (VAR) modelling, vector error correction modelling (VECM), variance decomposition and impulse response analysis (see, for example, Masih and Masih 1997,1999, 2001, Ratanapakorn and Sharma 2002). Instead of just evaluating the co-movements of stock price indices, this group of studies examined both the long run and short run aspects of market linkages and to further investigate the structure of these linkages, in terms of the speed and persistence of the interaction among markets.

Previously, the Asian stock markets were getting some attention from researchers, partially due to their high economic growth rates and the 1997 Asian financial crisis. In this regard, Masih and Masih (1997, 1999, 2001) made significant contributions to the conventional finance literature, not only by addressing the fundamental issue of stock markets interdependencies, but also providing further understanding of the trends of these linkages and the nature of the propagation mechanism driving the Asian stock market fluctuations. In the study of Masih and Masih (1997), the cointegration results showed that all the Asian Newly Industrializing Countries (NIC) of Hong Kong, Singapore, South Korea and Taiwan share long run relationship with the more established markets (Japan, U.S., U.K. and Germany). Further analysis by using the dynamic VECM consistently revealed to suggest the relatively leading role of all established markets in driving the fluctuations in the Asian NIC stock markets. Masih and Masih (1999) applied time series econometric techniques to examine the long- and short-term dynamic linkages among a set of eight international stock market indices, with a particular focus on four Asian emerging stock markets: Hong Kong, Singapore, Thailand and Malaysia. In addition to the evidence of significant interdependencies among these markets, their analysis showed the driving role of the US at the global level, whereas, the leader in the Southeast Asian region is Hong Kong. By applying similar methodologies, Masih and Masih (2001) investigated the dynamic causal linkages amongst nine major international stock indices. One of the interesting statistical findings was the growing role of the Japanese market as a long run leader in influencing the propagation mechanism driving international stock market linkages, including the emerging Asian stock markets.

In the conventional finance literatures, concerning researches on the causality of stock market interdependencies in Asia, empirical results are mixed. The role of Japan as the leader in the region has been highly controversial in this debate. As Masih and Masih (2001) investigated as well as Ghosh et al. (1999) concluded that Japan is a market leader, other researches (Yang et al. (2003)) suggest that Japan does not play a pivotal role in non-crisis periods. A few other studies have shown that especially Hong Kong is the most influential stock market in Asia (e.g., Masih and Masih, 1999; Dekker et al., 2001).

This paper will try to answer the following new questions: firstly, which equity (conventional or *Shariah*) markets are affecting the comovement of China *Shariah* compliant stock returns? Secondly, which stock indices (local, regional and international) will have more causal impact on China *Shariah* compliant stock returns? Last but not least, which major stock market dominated the selective Asian emerging markets? While these questions have been previously addressed by some researchers, this paper is able to shed more light on these issues by adding several *Shariah* compliant stock markets. Furthermore, China has received less attention in previous researches on the Asian stock market integration.

The study attempts to fill the gap in the literature in the following two aspects. First, previous researchers solely focus on the conventional stock markets whereas this study wants to analyze selective East Asian stock markets by adding several *Shariah* compliant stock markets. Second, as far as we are aware, analyzing the comovement and Granger-causality among conventional and Islamic indexes have not been investigated before in a growing market such as, China.

4. Econometric Concepts and Methodology

We want to apply the standard cointegration, long run structural modelling, vector error correction and variance decomposition techniques to address the issues of this paper.

5. Data, Empirical Results and Discussions

5.1 Data

This paper investigates the dynamic causal linkages in the daily returns amongst seven major international stock price indices in East Asia, namely, FTSE *Shariah* China Index, Asia *Shariah* index, Malaysia EMAS *Shariah* Index, SSE Composite Index, Hang Seng Index, Nikkei 225 and KOSPI from 26 October 2007 to 1 March 2011 all obtained from Datastream at INCEIF (International Centre for Education in Islamic Finance).

Variables	Country	Symbol	Level form	Difference form
FTSE *Shariah* China Index	China	CHISHA	LCHISHA	DCHISHA
S&P Pan Asia *Shariah* index	Dow Jones	ASIASHA	LASIASHA	DASIASHA
FTSE Bursa Malaysia EMAS *Shariah* Index	Malaysia	MYEMAS	LMYEMAS	DMYEMAS
SSE Composite Index	China	CHISSE	LCHISSE	DCHISSE
Hang Seng Index	Hong Kong	HANGSE	LHANGSE	DHANGSE
Nikkei 225	Japan	NEKKEI	LNEKKEI	DNEKKEI
Kospi	Korea	KOSPI	LKOSPI	DKOSPI

Table 1: List of Variables

In order to better estimate our results, we have included dummy variable for financial crisis period from 2 June 2008 to end of 2008 in our analysis.

5.2 Empirical Results and Discussions

The traditional regression analysis usually assumes that all variables are stationary. Then, they apply the Ordinary Least Square (OLS) method. In the real world, the variables are usually non-stationary, if so, the OLS method cannot be applied. We need to test each variable whether it is non-stationary or stationary by using Augmented Dickey-Fuller (ADF) test on each variable (in both level and differenced form).

Results in Table 2 tend to indicate that while all variables contain a deterministic trend, we cannot reject the presence of a unit root for any of the variables. Therefore, overall, we could not find evidence that the variables are not I(1) i.e. variables were found non-stationary at the 'level' form but stationary after 'first-differencing' (Δ).

	Augmented Dickey – Fuller	
	τ_u	τ_τ
	Levels	
LCHISHA	-2.5767	-3.4173
LASIASHA	-1.5202	-3.4173
LMYEMAS	-1.4420	-3.4173
LCHISSE	-1.8560	-3.4173
LHANGSE	-2.1228	-3.4173
LNEKKEI	-1.9495	-3.4173
LKOSPI	-2.1181	-3.4173
	First-differences (Δ)	
DCHISHA	-33.7200	-2.8653
DASIASHA	-18.5343	-2.8653
DMYEMAS	-26.6178	-2.8653
DCHISSE	-12.9218	-2.8653
DHANGSE	-31.3272	-2.8653
DNEKKEI	-15.1723	-2.8653
DKOSPI	-29.0941	-2.8653

Table 2: Tests of the unit root hypothesis of individual stock price indices

Notes: Variables represent aggregate national stock market price indices for FTSE *Shariah* China Index (CHISHA), Asia *Shariah* index (ASIASHA), FTSE Bursa Malaysia EMAS *Shariah* Index (MYEMAS), SSE Composite Index (CHISSE), Hang Seng Index (HANGSE), Nikkei 225(NEKKEI) and KOSPI. The optional lag used for conducting the augmented Dickey-Fuller test statistic was selected based on an optimal criteria (Akaike's final prediction error) using a range of lags.

Before proceeding with the cointegration tests, the authors had to determine the 'optimal' order for the vector auto regression (VAR), that is, the number of lags to be used. Results in Table 3 suggested that AIC favours an order of 2 while SBC favours one lag.

In this analysis we employ the Engle – Granger (1987) Method and Johansen and Juselius (JJ)(1993) procedure for testing the presence of multiple cointegrating vectors. A study by Gonzalo (1994) provides empirical evidence to support the Johansen procedure's relatively superior performance over other methods for testing the order of cointegration rank. In order to derive estimates of the long run coefficients of the cointegrating vectors, however, we employ both the JJ MLE and the residual method developed by Engle – Granger (1987).

According to Engle – Granger Method, the Table 4 shows that the test statistic is greater than the critical value which means the variable is stationary; it implies that the gap between variables get narrower in the long run, therefore, there is a cointegration. However, this method could not give us all possible number of cointegration vectors. Therefore, we conducted Johansen method which gives us all possible co-movements.

	Choice Criteria	
Optimal order	AIC	SBC
6	17713.8	16963.5
5	17738.4	17104.8
4	17756.7	17239.9
3	17766.0	17366.0
2	17766.1**	17482.5
1	17732.2	17565.5*
0	17592.8	17542.8

Table 3: Selection of Optimal Order
Note: ** indicates that optimal order based on AIC whereas * indicates optimal order based on SBC. The optimal lag structure for each of the VAR models was selected by maximizing the Akaike's information criteria. In the final analysis, we use a lag of 2.

	Augmented Dickey – Fuller	
	τ_u	τ_τ
Residual	-5.5652 (AIC)	-2.8653
	-6.0232 (SBC)	-2.8653

Table 4: Engle – Granger Method

Notes: in this method, we conducted augmented Dickey-Fuller test for the variable 'Residual'.

The results based on Johansen's (Johansen, 1988; Johansen and Juselius, 1990) multivariate cointegration tests (Table 5) tend to suggest that these seven variables are bound together by long-run equilibrium relationship.

Vector :	[LCHISHA, LASIASHA, LMYEMAS, LCHISSE, LHANGSE, LNEKKEI, LKOSPI]			Critical Values (95%)	
H_0:	H_1:	Eigenvalue	Trace	Eigenvalue	Trace
r = 0	r = 1	57.864**	186.930**	45.630	124.620
r ≤ 1	r = 2	38.984	129.066**	39.830	95.870
r ≤ 2	r = 3	32.256	85.081**	33.640	70.490
r ≤ 3	r = 4	24.659	42.826	27.420	48.880
r ≤ 4	r = 5	13.538	28.166	21.120	31.540

Table 5: Johansen's test for multiple cointegrating vectors
Note: r indicates the number of cointegrating relationships. ** indicates significance at the 5% level.

Evidence of cointegration among these seven conventional and Islamic indices have several implications. First, it rules out 'spurious' or 'accidental' comovements and also implies at least a unique channel for Granger-causality to emerge (either unidirectional or bidirectional). Secondly, the actual number of cointegrating (or equilibrium) relationships found in Table 5 shows that maximal Eigenvalue indicates

there is only one cointegrating vector, whereas the trace value indicates that there are three cointegrating vectors.

The authors tend to believe that there is one cointegrating vector based on intuition as long as the financial markets continue to become increasingly integrated internationally[3]; Based on the above statistical results as well as the purpose of this study regarding the comovement of the conventional and Islamic indices with the China *Shariah* compliant index, we shall assume that there is one cointegrating vector, or long-run relationship. This answers the first question of our study.

This finding is consistent with the studies by Masih and Masih (2001), among others, who find that nine major international equity markets possess at least one cointegrating vector.

After that, we try to test the coefficients of this cointegrating vector against the theoretically expected coefficients. By doing this, we are able to compare our statistical findings with the theoretical (or intuitive) expectations. We normalize on our focused variable (index), the China *Shariah* Index, by relying on the Long Run Structural Modelling (LRSM). We initially obtained the results in the Vector 1 of Table 6. We found three variables (indices) are significant – SSE Composite Index, Hang Seng Index and Nikkei 225 by calculating the t-ratios manually.

	Vector 1	Vector 2
FTSE *Shariah* China Index	1.0000 (*NONE*)	1.0000 (*NONE*)
Asia *Shariah* index	0.32943 (0.23828)	0.00 (*NONE*)
FTSE Bursa Malaysia EMAS *Shariah* Index	-0.20375 (0.29043)	-0.15890 (0.31678)
SSE Composite Index	-0.37902** (0.10177)	-0.39708** (0.11048)
Hang Seng Index	-0.53405** (0.16506)	-0.53596** (0.17576)
Nikkei 225	-0.45189 ** (0.15059)	-0.27887** (0.087459)
KOSPI	-0.14197 (0.23507)	0.034049 (0.22418)
Log Likelihood	17933.6	17932.7
Chi-Square[p-value]	None	1.8038[.179]

Table 6: ML estimates subject to exactly and over-identifying restriction
Notes: The output above shows the maximum likelihood estimates subject to exactly identifying (Vector 1) and over identifying (Vector 2) restrictions. Both results show that SSE Composite, Index, Hang Seng Index and Nikkei 225 are significant variables

[3] International Dimensions to U.S. Monetary Policy, available at: http://www.house.gov/jec/fed/intern.htm

while the rest of them are insignificant based on t-ratio. In over-identifying restrictions, p-value is greater than 0.05 which implies that H_0 is accepted. ** indicates the significant variables.

Furthermore, we decided to verify the significance of the variables by subjecting the estimates to over-identifying restrictions. We have done over-identifying restrictions in vector 2 of Table 6 for all the insignificant variables one by one and the results confirmed earlier findings that only SSE Composite Index, Hang Seng Index and Nikkei 225 were significant.

From the above analysis, we concluded that SSE Composite Index, Hang Seng Index and Nikkei 225 may have greater impact on China *Shariah* compliant stock, whereas, none of *Shariah* compliant indices have any significant influence on this particular China *Shariah* compliant market. However, since all the variables were earlier found cointegrated (i.e., theoretically related), we proceed with all the variables for our Granger-causality test in VECM.

	China *Shariah*	Asia *Shariah*	Malaysia *Shariah*	China SSE	Hang Seng	Nekkei 225	KOSPI
DChina *Shariah*(1)	-0.307 (0.053)	0.018 (0.025)	0.013 (0.016)	0.035 (0.038)	0.037 (0.036)	0.012 (0.032)	0.048 (0.028)
DAsia *Shariah*(1)	-0.232 (0.196)	-0.307 (0.093)	0.083 (0.058)	-0.244 (0.140)	-0.333 (0.132)	-0.438 (0.118)	-0.069 (0.103)
DMalaysia *Shariah*(1)	0.244 (0.135)	0.073 (0.064)	0.025 (0.040)	-0.052 (0.096)	0.106 (0.091)	0.028 (0.081)	0.060 (0.071)
DChina SSE(1)	-0.142 (0.054)	-0.104 (0.025)	-0.013 (0.016)	0.044 (0.038)	-0.153 (0.036)	-0.131 (0.032)	-0.092 (0.028)
DHang Seng(1)	0.457 (0.097)	0.184 (0.046)	0.056 (0.029)	0.025 (0.069)	-0.040 (0.065)	0.262 (0.058)	0.042 (0.051)
DNekkei 225(1)	-0.020 (0.123)	0.058 (0.058)	-0.107 0.037	-0.011 (0.088)	0.083 (0.083)	0.032 (0.074)	-0.053 (0.065)
DKOSPI(1)	0.231 (0.108)	0.058 (0.051)	0.019 (0.032)	0.116 (0.078)	0.226 (0.073)	0.159 (0.065)	0.028 (0.057)
ECM1(-1)	-0.116* (0.028)	-0.008 (0.013)	0.010 (0.008)	0.039 (0.020)	-0.022 (0.019)	0.008 (0.017)	-0.006 (0.015)
Chi-sq SC(1)	2.565[0.109]	0.220[0.639]	4.976[0.026]	0.051[0.821]	0.093[0.760]	3.573[0.059]	0.337[0.562]
Chi-sq FF(1)	73.071[0.0]	0.041[.840]	1.020[0.313]	1.611[0.204]	0.033[0.857]	2.236[0.135]	3.409[0.065]
Number of Days to return to equilibrium	8.62	125.50	98.00	25.50	45.14	119.54	181.25

Table 7: Vector Error Correction Estimates

Notes: The above within-sample results tend to indicate that in the long term China *Shariah* is endogenous, whereas the rest of variables are exogenous.

Cointegration test, however, cannot tell us the direction of Granger-causality among the variables as to which variable is leading and which variable is following (i.e., which variable is exogenous and which variable is endogenous). To identify the endogeneity/exogeneity of the variables, we applied the vector error-correction modeling technique. Information on the direction of Granger-causation can be particularly useful for the investors. Investors can better forecast or predict expected results of their investments by identifying which variable is exogenous and endogenous. Typically, an investor is interested in knowing which index is the exogenous, then the investor is able to monitor the performance of that index closely as it would have significant bearing on the expected movement of other indices in which the investor has invested. This exogenous index would be the index of interest to the investor.

Summary results, based on the VECM formulation, are presented in Table 7 and are of some interest. By looking at the significance or otherwise of the coefficient of the error-correction term, we find that the FTSE *Shariah* China Index variable is the only endogenous (ie, dependent) variable whereas the rest of variables are exogenous. That tends to indicate that the FTSE *Shariah* China Index is the follower whereas the rest of the variables are the drivers. This finding is consistent with the studies by Masih and Masih (1997), among others, who find the relatively leading roles of all the established markets in driving the fluctuations in the Asian NIC stock markets.

Percentage of Forecast Variance Explained by Innovations in:

		China *Shariah*	Asia *Shariah*	Malaysia *Shariah*	China SSE	Hang Seng	Nekkei 225	KOSPI
Days	∆China *Shariah*							
30		**82.00**	5.42	2.21	2.37	5.20	1.11	1.68
60		**76.31**	7.04	2.67	3.98	6.27	1.68	2.05
	∆Asia *Shariah*							
30		38.41	**58.12**	0.44	1.00	1.52	0.20	0.31
60		37.21	**59.27**	0.47	0.86	1.61	0.24	0.34
	∆Malaysia *Shariah*							
30		29.22	6.02	**63.43**	0.15	0.31	0.84	0.03
60		29.45	5.99	**63.20**	0.16	0.31	0.86	0.03
	∆China SSE							
30		39.19	1.50	0.09	**58.64**	0.08	0.40	0.10
60		42.70	1.74	0.07	**54.78**	0.11	0.52	0.08
	∆Hang Seng							
30		50.32	15.67	1.76	0.10	**30.54**	0.32	1.29
60		48.03	16.60	1.89	0.08	**31.61**	0.41	1.39
	∆Nekkei 225							
30		35.01	40.12	0.35	3.17	0.66	**19.95**	0.75
60		35.31	39.83	0.35	3.29	0.65	**19.81**	0.75
	∆KOSPI							
30		28.83	29.77	2.28	0.58	1.23	0.05	**37.26**
60		27.98	30.26	2.35	0.50	1.28	0.04	**37.60**

Table 8: Orthogonalized Variance Decomposition Analysis

The error-correction model also helps us distinguish between the short term and long term Granger-causality. The error-correction term stands for the long-term relations among the variables. The speed of short-run adjustment to bring about the long term equilibrium is given by the coefficient of the error-correction term. The results tend to indicate that if the long term equilibrium between the variables is disturbed by any shocks, they will take about between 8.62 and 182.5 days to restore the equilibrium. The FTSE *Shariah* China Index would get back to long-run equilibrium within the shortest period, while the KOSPI would take the longest period.

The diagnostics of all the equations of the error-correction model (testing for the presence of serial correlation and functional form) tend to indicate that the equations are more or less well-specified. Normality and heteroscedasticity are less important to time series data, so these two diagnostic tests are excluded from our analysis.

Although the error-correction model tends to indicate the endogeneity/exogeneity of a variable, we applied the Orthogolized Variance Decomposition Analysis (Table 8) to identify the relative degree of endogeneity or exogeneity of the variables. The relative exogeneity or endogeneity of a variable can be determined by the proportion of the variance explained by its own past. The variable which is explained mostly by its own shocks (and not by others) is deemed to be the most exogenous of all.

Percentage of Forecast Variance Explained by Innovations in:

		China *Shariah*	Asia *Shariah*	Malaysia *Shariah*	China SSE	Hang Seng	Nekkei 225	KOSPI
Days	∆China *Shariah*							
30		**21.08**	14.17	9.11	7.89	21.67	12.04	14.04
60		**19.33**	14.25	9.22	8.75	21.56	12.50	14.39
	∆Asia *Shariah*							
30		10.08	**25.31**	7.45	1.33	17.15	20.91	17.77
60		9.79	**25.37**	7.46	1.34	17.10	21.06	17.87
	∆Malaysia *Shariah*							
30		11.84	11.46	**39.62**	3.08	13.86	8.02	12.11
60		11.92	11.48	**39.52**	3.06	13.90	8.01	12.12
	∆China SSE							
30		20.74	4.84	4.23	**49.66**	13.18	2.35	4.99
60		22.05	5.02	4.34	**47.54**	13.58	2.38	5.10
	∆Hang Seng							
30		14.61	16.51	8.43	3.58	**27.79**	13.12	15.96
60		14.03	16.57	8.47	3.68	**27.81**	13.30	16.14
	∆Nekkei 225							
30		10.39	22.19	6.91	0.60	15.16	**28.16**	16.59
60		10.47	22.16	6.92	0.57	15.20	**28.08**	16.60
	∆KOSPI							
30		9.42	18.97	8.61	1.42	14.69	14.59	**32.31**
60		9.19	18.99	8.63	1.43	14.63	14.65	**32.49**

Table 9: Generalized Variance Decomposition Analysis

Firstly, it assumes that when a particular variable is shocked, all other variables are "switched off". Secondly, orthogonalized VDCs do not produce a unique solution. The generated numbers are dependent upon the ordering of variables in the VAR. Typically, the first variable would report the highest percentage and thus would likely to be specified as the most exogenous variable. This is the case in our variables, where CHISHA, which appears first in the VAR order, is reported to be the most exogenous. In order to get more intuitive solutions, we have applied Generalized Variance Decomposition Analysis which does not impose such unrealistic assumptions of the orthogonalized VDCs.

In order to interpret the numbers generated by the Generalized Variance Decomposition Analysis, we need to conduct additional computations. If we add up all row numbers, it is more than 1.0, whereas in the case of orthogonalized VDCs it is only 1.0. For a given variable, at a specified horizon, we add up the numbers of the given row and we then divide the number for that variable by the computed total. In this way, the numbers in a row will now add up to 1.0 or 100%. These results are shown in Table 9.

In Table 9, at the end of the forecast horizon number 30, we find that 39.62 per cent of the forecast error variance of FTSE Bursa Malaysia EMAS *Shariah* Index is explained by its own shocks, and in the case of FTSE *Shariah* China Index that proportion is only 21.08 per cent. But in the case of China SSE Composite Index, 49.66 per cent of the forecast error variance of China SSE Composite Index is explained by its own shocks. That tends to indicate that China SSE Composite Index is the most exogenous of all. These out-of-sample variance forecast results given by the generalized variance decompositions are consistent with our earlier within-sample results given by the error-correction model that FTSE *Shariah* China Index is the only endogenous variable. The relative rank in exogeneity is exactly same as in 30 days and 60 days time horizon.

Now we obtained intuitively more sensible rank of the indices by relative exogeneity, as shown in the Table 10. The Generalized VDCs method gives us the relative exogeneity of the variables regardless of the order of the variables.

Table 10: Relative exogeneity based on Generalized Variance Decomposition Analysis

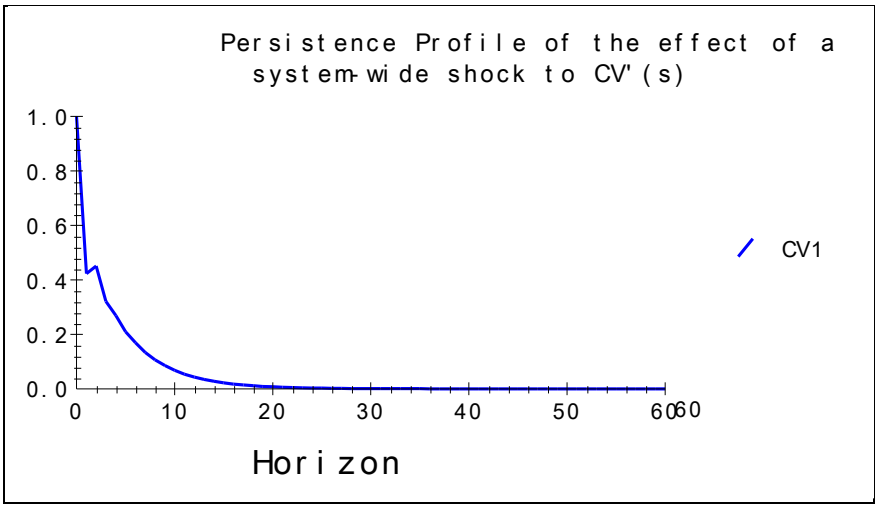
No.	Variable Relative Exogeneity At Horizon = 30 & 60
1	LCHISSE
2	LMYEMAS
3	LKOSPI
4	LNEKEI
5	LHANGSE
6	LASIASHA
7	LCHISHA

We have already identified that the generalized VDCs gives us more reliable information compared to the orthogonalized VDCs. So we just conducted generalized impulse response functions analysis in favour of its reliability. The generalized impulse response functions (IRFs) essentially produce the same information as the generalized VDCs, except that they can be presented in graphical form. We then applied the generalized impulse response functions (available upon request) and found that, consistent with the earlier results, the SSE Composite Index variable is the least sensitive to a one standard deviation shock to other variables while FTSE *Shariah* China Index is the most sensitive. These results are consistent with our earlier results in VECM and generalized VDCs.

Last but not the least, an application of the persistence profile analysis (**Figure 1**) indicates that if the whole cointegrating relationship is shocked, it will take about 20 periods/days for the equilibrium to be restored. The figure shows the persistence profile for the cointegrating equation of this study.

Our results hold several implications in the area of financial research concentrating on linkages among a set of conventional and Islamic equity markets, on both methodological and substantive levels. We briefly discuss the methodological implications of this analysis and also the implications that the derived results hold for issues associated with: (i) which indices does the *Shariah* China Index commove with ? (ii) which indices is the *Shariah* China Index Granger-causally related with ? and (iii) which major stock market was driving the selective conventional and Islamic markets?

Figure 1: Persistence Profile Analysis



The results of cointegration and causal linkages among conventional and Islamic markets provide some interesting evidence to compare with current and previous research. Foremost interest in much of the empirical international financial literature is the extent to which equity markets have become internationally integrated. We found that there is a long-run relationship among the conventional and Islamic markets. This finding is consistent with studies by Masih and Masih (2001), among others, who find that nine major international equity markets possess at least one cointegrating vector. Furthermore, based on evidence using similar techniques on a system of five OECD equity markets, Masih and Masih (1997) find evidence that the crash did not affect the number of common stochastic trends within this particular system.

By conducting Long Run Structural Modelling (LRSM), we concluded that China SSE Composite Index, Hang Seng Index and Nikkei 225 may have greater impact on China *Shariah* compliant stock. The implication of VECM is that, other than China *Shariah* compliant index, the rest of indices are exogenous variables which would receive market shocks initially and then transmit those shocks to other indices. An investor who invests in say, China *Shariah* compliant stock, would be interested to monitor movements in all the selected indices other than China *Shariah* compliant stock, as changes to those indices are likely to affect his investments in a significant way. To sum up, for an investor that is bound by *Shariah* compliant equity investment rules, both local (China) and regional or international equity markets have more bearing on China *Shariah* returns.

Another interesting statistical finding that comes out of Tables 9 is that the China SSE Composite Index (rather than Japan or Hong Kong) appears to be the more dominant market leader in the long run. The role of China as the leader in the region has been somewhat controversial. Masih and Masih (2001) investigated as well as Ghosh et al. (1999) concluded that Japan is a market leader. We believe that the

Chinese market requires some explanations. The Chinese stock market, as often measured by Shanghai stock exchange composite index, has been the very best stock index within the world[4]. Girardin and Liu (2007) explored the potential time-varying co-integration among the stock exchanges of Shanghai, Hong Kong, and New York during 1992–2005. They found that China's stock market integration within Asia and even the world may have been affected, given its huge economic growth, its enhanced economic interactions with the world through FDI and imports/exports, and the fast development of its stock markets since the beginning of the 1990s. According to Huyghebaert and Wang (2010), China, longing for a greater role in the region and in the world, has played a crucial role in curbing this crisis. Firstly, China did not devalue its currency, which alleviated the burden for its Asian neighbors that were devaluing theirs, by allowing these countries to increase their competitive position in terms of FDI inflows and exports. Second, China strongly advocated substantial funding packages at low conditions for the afflicted Asian economies. China's sense of unity with its neighbours was further demonstrated by its willingness to contribute to these support packages.

Furthermore, the new Government in Taiwan also started to ease their past restrictions on Taiwanese investment in mainland China and vice versa China investment in Taiwan. These new policies will help boost both Taiwan and China Stock Markets. Last but not the least, China has leapfrogged Japan to become the world's second-largest economy, a title Japan has held for more than 40 years.

Another interesting finding is that FTSE Bursa Malaysia EMAS *Shariah* Index is ranked number two among the selected stock markets. Malaysia is a fast growing economy with liberal market policies aimed to promote trade, entrepreneurship, industrial and economic development. Initiatives undertaken by the government and the private sector have always been investor-centric and business-friendly with the aim of encouraging market development. All these factors have enabled Malaysia to grow into one of the most dynamic business environments in South East Asia. According to the Financial Development Report 2010 which is published by World Economic Forum, Malaysia's financial development overall index is ranked 17 in the world in 2010[5].

Malaysia's Islamic finance industry positions itself as one of the proven platforms for conducting Islamic finance activities across the globe[6]. The vibrancy and dynamism of Malaysia's Islamic financial system is reflected by its continuous product innovation, a large and diverse pool of Islamic finance talent, diversity of financial institutions from across the world, a wide range of innovative Islamic financial products, a comprehensive Islamic financial infrastructures as well as adoption of global regulatory, legal and *Shariah* best practices. Malaysia has also the distinction of being the world's first country to have a full-fledged Islamic financial system operating in parallel to the conventional banking system. All those factors but not limited to, help boost the Malaysian stock market.

Finally, FTSE *Shariah* China Index is the most follower in the ranking list. It is still largely influenced by the national conventional stock markets such as, China SSE Composite Index. The scope of Islamic financial services in China goes beyond those laid out in the country's commercial banking law and therefore the introduction of Islamic financial services will require special permissions from various departments[7]. Furthermore, commercial banks lack experienced employees who are also familiar with Islamic doctrine. To sum up, the lack of adoption of global regulatory, legal and *Shariah* practices may lead to the FTSE *Shariah* China Index being still the lagging index at the current stage.

As a conclusion, among the equity markets of China, Hong Kong, Japan, Malaysia and Korea, it is the China SSE conventional composite Index followed by Malaysia *Shariah* market that are driving all other markets including the *Shariah* compliant Chinese equity market.

[4] www.stock-market-today.org
[5] www.mifc.com
[6] Ibid.
[7] ribh.wordpress.com/2009/08/27/islamic-finance-reaches-china/

6. Concluding Remarks and Limitations

This paper investigates the dynamic causal linkages in the daily returns amongst seven major conventional and Islamic stock indices in East Asia, namely, FTSE *Shariah* China Index, Asia *Shariah* index, Malaysia EMAS *Shariah* Index, SSE China Composite Index, Hang Seng Index, Nikkei 225 and KOSPI covering the period from 26 October 2007 to 1 March 2011. In order to find out the causal transmission patterns, we employ the standard time series methods of: (i) Unit root test, (ii) Optimal order of a VAR, (iii) Cointegration Test , (iv) Long-run Structural Modelling, (v) Vector Error Correction Model (vi) Variance Decompositions (vii) Impulse Response Functions and (viii) Persistent Profiles. These methods essentially provide robust and very useful information to international financial analysts and investors. Moreover, we tried to support the mechanical statistical results with economic intuition and policy implications, unlike many applied papers that concentrate mainly on methodological innovations.

At a more substantive level, this study provides further evidence of significant interdependencies among the selective conventional and Islamic stock markets, and the leadership of the China conventional SSE market followed by the Malaysia *Shariah* market in driving all indices including the China *Shariah* index.

Limitations of this analysis should not be ignored. A useful extension of the paper would be to adjust for differences in relative market sizes. The selection of indices is somewhat arbitrary. Many other available indices could have been considered and might have produced additional or even different results. One could have used many other indices – the Straits Times Index (STI), the Bombay Stock Exchange (BSE 30), the Shanghai Composite, the Australian All Ordinaries, and many others. Other deficiencies of this analysis include the lack of longer period of Islamic data. Our study covers only around three and a half years'data. A more detailed study focusing on these events and using data observed at longer period could provide a positive and practical step for future research in international finance and financial economics. Last but not the least, the theoretical relation and framework of this study also leave something to be desired. Underlying theories behind the empirical works are important or otherwise studies such as this may be attacked as purely an exercise of number crunching or statistical data mining. However, developing theories in such an area would be challenging as Islamic finance is at its initial stage of development. Nonetheless, efforts should be directed towards this end in the future.

Disclaimer:

The above works represent the humble effort and limited knowledge and experience of the authors. Errors, misrepresentations and flaws in argumentation and expression reflect the authors' weaknesses. In the interest of the pursuit of the truth, the authors welcome any feedback, comments and inputs.

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