

## International Transmission of Stock Market Movement: Evidence from the Islamic Equity Markets

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### ABSTRACT

*This study examines whether the widely accepted conclusion from the generic equity markets, that the emerging equity markets remain segmented from the world markets but exhibit strong intra-regional leaderships, is also supported from Islamic equity market viewpoint. The new evidence is sought through investigating the relationships between Malaysia and most important players in world equity markets, namely the US, the UK, Japan, and Canada as well as the Asia Pacific and several world equity markets. This study utilizes macro levels data of daily closing price index of the Dow Jones Islamic Market (DJIM) indexes from the most recent period of 1999:06 to 2007:06. Using Granger-causality and multiple time series regression tests, it investigates the chain of information leadership within the universe of Malaysia and the rest of the selected markets. The results indicate that the stock prices at time  $t$  in Malaysian Islamic equity markets can be better predicted by incorporating information transmitted from the Asia Pacific region (excluding Japan) and World Emerging markets at time  $t-1$  and from World Developed markets including the US at time  $t-5$ . As for Japan, this market consistently fails to show any significant role in explaining returns on stocks traded in Malaysian Islamic markets.*

### ABSTRAK

*Kajian ini menguji sama ada kesimpulan paling popular dari pasaran ekuiti generik, iaitu pasaran-pasaran sedang membangun kekal terpencil daripada pasaran dunia tetapi menunjukkan kepimpinan serantau yang agak kukuh, turut disokong dalam konteks pasaran ekuiti Islam. Bukti baru ini dicari dengan mengkaji hubungan antara Malaysia dengan pasaran-pasaran ekuiti terbesar dunia, iaitu AS, Britain, Jepun, dan Kanada serta Asia Pasifik dan juga beberapa pasaran ekuiti dunia. Kajian ini menggunakan data makro indeks harga harian indeks Pasaran Islam Dow Jones (DJIM) bagi tempoh mutakhir antara 1999:06 hingga 2007:06. Menggunakan ujian pimpin-*

*lengah Granger dan regresi siri masa berganda, kajian ini mengkaji rantaian kepimpinan maklumat dalam kesejagatan pasaran di Malaysia dan negara-negara yang dikaji. Hasil kajian menunjukkan harga saham pada masa  $t$  di pasaran ekuiti Islam di Malaysia boleh diramalkan dengan lebih baik setelah mengambilkira maklumat yang disalurkan dari rantau Asia Pasifik (kecuali Jepun) dan pasaran Dunia Sedang Membangun pada masa  $t-1$ , dan dari pasaran Dunia Maju termasuk AS pada masa  $t-5$ . Sementara itu, Jepun secara konsisten gagal menunjukkan sebarang peranan signifikan dalam menjelaskan pulangan bagi saham Islam yang didagangkan di Malaysia.*

## INTRODUCTION

Theoretically, the market transaction of common stocks which is in compliance with the *Shariah* should result in a stable aftermarket behavior. The stability supposed to be derived from the fact that businesses which are *Shariah* compliance will come clean from unethical transactions of products and services. On top of that, *Shariah* compliant companies must also fulfill additional screenings. Among others, the companies must not employ more than 33 debt financing, making investment in these companies less exposed to financial risks. With that stringent screening process, void of bribery, insiders' trading and other business fraudulent acts, the return of the business is expected to be normal. Finding by Girard and Hassan (2005) showed that the exclusion of stocks that are non-*Shariah* compliance do not make any difference in the performance of the Islamic Equity Market. This phenomenon should attract immediate attention given the role of equity investment in Islamic Capital Market.

The fact that Dow Jones now has a family of 70 Islamic securities indexes (*Shariah*-compliant equities and *sukuk*) that are selected from 47 capital markets is a good indication on the prospects that this index provider sees in this segment. But, if Islamic Capital Market has indeed been taken seriously by the international investors, then there should also be a certain pattern of international transmission stock market movement among the Islamic Capital Market across the participating countries. As such, the stand of this paper is that, as is the case in generic equity markets, we would like to trace a pattern of the behavior of this transmission to understand the behavior of the Islamic Equity to help improve the ability to predict stock returns and accordingly trace the leadership role of each market. One way to accomplish this is by examining how and to what extent stock returns on Islamic equity in Malaysian market are influenced by the world advanced markets of the US, UK, Canada, and Japan and the regional Asia Pacific market as well as other world markets.

For the purpose of this paper, this study focuses only on the information spillovers to Malaysia from world most advanced markets, regional markets

(including Europe), world developed as well as world emerging markets. In short, while additional evidence from emerging market itself is a contribution by nature, providing evidence from the Islamic capital markets is its main strength. The need for investigating stock market interdependence in Islamic capital market separately from the generic stock markets is essentially because the differences in the nature of the former market which is reflected in the filtering process of the index constituent selection. The remaining of this paper is organized in the following format. It continues with section 2 which presents a brief discussion on the generic stock market integration and background of Islamic equity instruments. Section 3 describes the data and research methodology. Section 5 reports and discusses the results and section 6 presents the conclusions and implications.

## BACKGROUND STUDIES

Literature in international transmission of stock market movement cites tremendous improvement in the flows of capital across national borders that have resulted from increasing financial liberalization and various economic integration mechanisms (Choudhry, Lu & Peng 2007; Kim 2005; Marashdeh 1994; Masih & Masih 1999; Miyakoshi 2003; Narayan, Smyth & Nandha 2004). This development leads to the increasing integration in the world equity markets. There are two rather established conclusions regarding the equity market integration. First is that the close integration tends to be more of a phenomenon for developed markets. Second, while the emerging equity markets seem to remain segmented from the world markets, ample evidences exists suggesting strong intra-regional stock market integrations (Kim 2005; Marashdeh 1994; Masih & Masih 1999; Narayan et al. 2004).

Evidence on stock market integration is critical to the understanding of international stock market behavior essentially because that it identifies the channel through which information in a particular stock market is being transmitted to other markets. The role of information leadership is most commonly associated with the more advanced markets, practically due to the sophistication of information technology and economic influence on the other less developed markets (Choudhry et al. 2007; Kim 2005; Masih & Masih 1999; Miyakoshi 2003; Narayan et al. 2004; Yong 1994;). From international investment viewpoint, stock price transmission mechanism implies information in leader market is a significant predictor of stock price movement in the home market. In that regard, Yong (1994) conjectures that an information leadership that is proven to be stable over time flags a trading rule that could be exploited profitably. The subsequent implication is the market efficiency also depends on its ability to adjust to the leader market information.

In so far as studies on Shariah (Islamic) international transmission of stock market movement is concerned, none has cited clear relationship among the stock markets except a study on transmission of stock price movement for GCC (the six Gulf Cooperation Council countries) stock markets by Assaf (2006). The results of the study suggest, among others, that there were substantial evidence of interdependence and feedback effects among GCC stock markets and Saudi Arabia shows a slow process in responding to shock originated in other markets. Such findings prompt us to investigate further on the wider markets that accommodate the trading of specifically the Shariah compliant stocks. Following that, this paper uses Dow Jones Islamic Indexes which trace the performance of strictly Shariah compliant stocks to shed some lights on transmission of stock market movement and the information leadership in the Islamic investment universe. Theoretically, the Muslim jurists contend that all economic activities, except those prohibited by the Shariah, are permissible under Islam (Zaman 1986). Fairness and social justice in economic activities have been the principal criteria for judging whether or not a particular form of economic activity is acceptable to Islam. More so, it is the objective of Islamic Economic/ Financial System that propagates social justice in equitable distribution of the economic resources (Shamsudin 2000). As such the sources and uses of fund in business are guided by the Shariah principle in order to achieve the above objective. To ensure fairness and to prevent impropriety, Muslim jurists quote a number of traditions of the prophets (*pbuh*) (Islahi 1980, 1982) which indicate that the state should take an active role in maintaining prices for products and services. The establishment of Shariah Advisory Council (SAC) by Securities Commission, Malaysia is one such example.

From several sources of fund available to businesses, the equity fund such as common stock is permissible from the Islamic point of view. Officially, permission has been granted by the Council of the Islamic Fiqh (CIFA) in 1993 (Naughton & Naughton 2000). The permissibility of equity instruments is due to the fulfillment of the *Qirad or Mudharabah or Sharikat* concept whereby each contributor to the enterprise receives shares of gain and losses in direct proportion to his or her contribution. It differs greatly from *Riba* concept which is not permissible from Islamic point of view. Therefore common stock issue has become one of the main sources of fund for the firms provided that it has to come clean through the *Shariah Screening Process*.

The common stock screening process according to Shariah councils (based on *Al-Quran, Al-Hadith, Al-Ijama'* and *Al-Qias*) basically consists of two stages. In the first stage, it will look at the core business of the said company. The primary business of this company should not involve in activities such as alcohol, tobacco, pork-related products, conventional financial services (banking, insurance, etc.), weapons and defense, 'gharar'

element and/or entertainment (hotels, casinos/gambling, cinema, pornography, music, etc). Once the business has passed the first stage of screening process, it has to go through the second screening stage. This stage looks at the business from several aspects. Firstly, if the business still contains *haram* (prohibited) element it has to be very small and insignificant. Secondly, the image of the company must be good in the eye of the Muslim public/society. Thirdly, the main activities of the company should be very important and provide *maslahah* (benefit) to the *ummah* (society). Finally, businesses must also fulfilled additional screens for acceptable level of less than a specified percentage in all of the following ratios:

- Total debt divided by trailing 12-month average market capitalization of not more than 33 percent,
- The sum of a company's cash and interest-bearing securities divided trailing 12-month average market capitalization of not more than 5 percent, and
- Accounts receivable divided by trailing 12-month average market capitalization of not more than 45 percent.

The screening tests for selecting Shariah-compliant stocks produces a new segment in equities investment, distinct from the generic markets. Take the first screening test for instance. In addition to the naturally vast market of more than 1.4 billion conscientious Muslims around the world, the first screening tests also feed the needs of some non-Muslims around the world. Specifically, the fast development of this segment to some extent is also supported by growing trend of "socially responsible" investment in the US as well as the growing popularity of indexing (such as ETFs) rather than active investment strategies (Hakim & Rashidian 2004; Hayat 2006). In the meantime, the second screening test of Shariah-compliant stocks essentially produces a universe of investment vehicles that are less exposed to financial risks. Thus, the distinct nature of Shariah-compliant stocks serves as the basic motivation for this study to investigate this segment of the equity market separately from the broad markets with the hope that it can shed some lights on the information leadership in the Islamic investment universe.

## DATA AND TESTING METHODOLOGY

To examine the interdependence among the Islamic stock markets, this study utilizes macro levels data from the most recent period (1999:06 to 2007:06). It employs daily closing price index of the Dow Jones Islamic Market (DJIM) indices for 11 selected markets. Specifically, the indexes are (1) DJIM Malaysia, (2) DJIM Canada, (3) DJIM Japan, (4) DJIM US, and (5) DJIM UK.

Also incorporated in the analysis are several regional and global market indexes namely (1) DJIM Asia Pacific, (2) DJIM Asia Pacific (excluding Japan), (3) DJIM Europe, (4) DJIM World Emerging, (5) DJIM World Developed, and (6) DJIM World (excluding the US). The choice of DJIM World which excludes the US instead of DJIM (global) is intentional because the later is comprised of 60 percent DJI US. All data are to be retrieved from the DataStream and denominated in US dollar. Even though Financial Times (FTSE) also provides Islamic Indexes, its coverage is slightly narrower than Dow Jones.

For the purpose of this study, the daily closing price indexes are transformed to rate of return on stock market index or more specifically the relative rate of returns from buying the asset at time  $t-1$  and selling it at time  $t$ . Because of differences in time zones, returns at time  $t$  in the Asian markets and World Emerging markets are matched against the lagged returns of  $t-1$  in the UK, US, Canada, Europe, World Developed and World markets.

The empirical analysis begins by investigating the directions of causality between the stock indices of the 11 Islamic equity markets. According to Granger (1969), time series  $X_t$  are said to cause another time series  $Y_t$  if time series  $Y_t$  can be predicted better by using past values of  $X_t$  than by using only the historical values of series  $Y_t$ . This causality test is expressed in the following regression equations:

$$R_{Y,t} = \alpha_0 + \sum_{l=1}^L \beta_l R_{X,t-l} + \sum_{l=1}^L \alpha_l R_{Y,t-l} + \varepsilon_t \quad (1)$$

where  $R$  is returns,  $L$  is a particular autoregressive lag length ( $l = -1 \dots L$ ) and  $\varepsilon_t$  is a white noise. The test for causality is based on the Wald F-statistics. If the F-statistic is greater than the critical value of a given significant level for an  $F(L, t-2L-1)$  distribution, the null hypothesis that return series  $X_t$  does not Granger-cause return series  $Y_t$  would be rejected.

Because the focus of this study is on the spillover effect of the other markets on Malaysia, the results from Granger-causality tests serve only as a basis of understanding the direction of causality between the other markets and Malaysia. This study requires more specific details regarding when the changes in prices of stocks in the  $X$ -th market is actually being transmitted to those in Malaysia. At the same time, this study also needs to determine the role that Malaysian own past prices might have in explaining its current prices, in isolation and in conjunction with past returns on other markets. This issue is addressed by running further tests in several stages of multiple time series regression analyses. Because the focus of these analyses is Malaysia, for simplicity, the remaining discussion always associates variable  $Y$  to refer to Malaysian ISM.

The first stage of the time series regression analysis examines the transmission of information from the  $X$ -th Islamic equity markets, individually, to Malaysian Islamic equity market.

$$R_{Y,t} = \alpha_0 + \beta_1 R_{X,t-1} + \dots + \beta_L R_{X,t-L} + \varepsilon_Y \quad (2)$$

Note that Eq. (2) concentrates only on the first element in Eq. (1). The advantage of this test is it identifies exactly which lagged return ( $R_{X,t-1} \dots R_{X,t-L}$ , if any) is significant in predicting returns at time  $t$ . Note that when variable  $X$  in Eq. (2) takes variable  $Y$ , it tests the role of  $Y$ 's lagged returns in explaining its own returns at time  $t$ . The second stage runs the time series regressions which test the transmission of information in  $X$ -th market to Malaysian Islamic equity market while controlling for its lagged returns.

$$R_{Y,t} = \alpha_0 + \beta_1 R_{X,t-1} + \dots + \beta_L R_{X,t-L} + \alpha_1 R_{Y,t-1} + \varepsilon_Y \quad (3)$$

Basically, Eq. (3) is similar to Eq. (1) except that the results of time series regression locate directly when the information in the  $X$ -th market is being transmitted to  $Y$ -th market in the presence of  $Y$ 's own lagged returns. In other words, the results will indicate whether the role of the  $X$ -th market remains important or disappears when information in  $Y$ -th market is also being incorporated.

In the final stage of regression analyses, the influence of each of the  $X$ -th markets on the returns on Malaysian ISM is again considered while controlling for the influence of Malaysian ISM's lagged returns as well as returns on the other  $X$ -th market. Because there are 10  $X$ -th markets in this study,  $X$  is now replaced with  $i, j$ -th identity ( $i = 1 \dots j$ ) to avoid confusion. In general,

$$R_{Y,t} = \alpha_0 + \beta_{i,1} R_{i,t-1} + \dots + \beta_{j,L} R_{j,t-L} + \alpha_1 R_{Y,t-1} + \dots + \alpha_L R_{Y,t-L} + \varepsilon_{Y,t} \quad (4)$$

where  $i$  to  $j$  represent  $X \neq$  Malaysia. Eq. (4), which is the full model within the scope of this study, may reduce to a parsimonious equation provided that the role of some of the  $i$ th market ( $I = 1 \dots j$ ) is absorbed by the  $j$ th market ( $i \neq j$ ).

## RESULTS AND DISCUSSION

### DATA PRELIMINARIES

Table 1 reports the statistical properties of the daily return series of each of the 11 Islamic equity markets. The mean values suggest that with the exception of Canada (0.5%), emerging Islamic equity markets always offer

average daily returns (0.4% - 0.5%) higher than developed Islamic equity markets. It is interesting to note that the lowest average daily returns (0.1%) are actually being offered by two world most advanced markets, i.e., Japan and the US. To simplify interpretation, the Sharpe ratios are calculated to yield a standardized measure of the risk-return profiles of these markets. The results suggest that Malaysian Islamic equity market offers the lowest risk per unit of returns (23.10). The ratios for the Asia Pacific indexes (AP and AP\*) tend to indicate that the region is sharing a common advantage as offered by Malaysia, particularly when Japan is taken out of the picture. As far as Japan and the US are concerned, the ratios (269.72 and 94.98, respectively) for these markets suggest that their Islamic equities are not likely to pose any threat to Malaysia or the Asia Pacific region or even the emerging markets in general (27.30).

Table 1 also reports the results on the normal distribution and unit root tests of the return series. As commonly found in previous studies, this study also finds that the daily return series in this study also violate the normal distribution assumptions. The distributions of the return series are most of the times skewed to the left and with fat tails. The resulting Jarque-Bera statistics indicate that the normality distribution assumption is not fulfilled in all cases (i.e.  $H_0: JB = 0.00$  that the series are normally distributed is not rejected). Fortunately, both the augmented Dickey-Fuller and Phillips-Perron for testing unit root in time series data consistently reject the null hypothesis (i.e.  $H_0: \rho = 0$ ) that the series have a unit root. These results confirm that returns on ISM indices are in stationary process.

Table 2 reports the correlations amongst returns of Islamic equity indexes. Focusing on Malaysia, its correlations with the other markets range between 0.06 with Japan to 0.39 with Asia Pacific (without Japan, AP\*). This finding suggests that while Malaysia is nearly uncorrelated with Japan, its correlations with other markets in the Asian region are rather significant. The fact that Malaysia is also significantly correlated with emerging markets ( $WE = 0.32$ ) seem to indicate that its correlations with AP\* and not with Japan is due to the similarity in the characteristics of most markets in the Asia Pacific region (Masih & Masih 1999). The correlations between Malaysia and other developed markets are slightly higher than with Japan, but still relatively weak (0.14 - 0.23). On the contrary, Mat Nor and Halid (1994; 67) find that for the period of 1990-1992, there are equally significantly high correlations between Malaysia and Japan and Malaysia and the US. For the period of 1987 to 1992, Ibrahim and Sharif (1994) find the correlations to be imperfect but still within the higher range of 0.2159 to 0.6084. Since the samples used in these studies are broad market indexes, the results of this study suggest that Islamic equities have characteristics that are different from the broad market. From international portfolio viewpoint, the finding of this study could be used as an important selling point for Malaysian

TABLE 1. Statistical properties of daily returns on indexes of selected Islamic equity markets

STATS	MAS	JPN	CN	UK	US	AP	AP*	WE	EU	WD	W*
Mean	0.0004	0.0001	0.0005	0.0002	0.0001	0.0003	0.0005	0.0004	0.0003	0.0002	0.0004
StdDev	0.0094	0.0294	0.0171	0.0126	0.0123	0.0122	0.0116	0.0122	0.0120	0.0098	0.0101
Sharpe	23.10	269.72	32.24	73.01	94.98	35.34	24.42	27.30	44.21	57.86	33.59
Skwnss	0.26	0.21	-0.60	-0.05	0.14	-0.28	-0.34	-0.19	-0.09	-0.02	-0.25
Krtosis	18.03	4.15	11.68	6.29	5.56	5.29	7.23	4.49	4.72	5.13	4.36
J-Bera	19675	131	6686	944	576	482	1598	205	259	396	182
Prob.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADF	-38.5	-47.0	-42.4	-30.2	-46.6	-41.9	-39.7	-38.3	-29.3	-39.7	-41.1
Prob.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
P.Perron	-38.9	-47.5	-42.3	-50.1	-46.8	-41.8	-39.8	-38.4	-46.8	-39.4	-40.9
Prob.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note: Abbreviations MAS = Malaysia, US = United States, UK = United Kingdom, CN = Canada, AP = Asia Pacific, AP\* = Asia Pacific excluding Japan, WE = World Emerging markets, EU = Europe, WD = World Developed markets, and W\* = World excluding the US.

TABLE 2. Correlations between daily returns on indexes of selected Islamic equity markets

	MAS	JPN	CN	UK	US	AP	AP*	WE	EU	WD	W*
MAS	1.00	0.06	0.19	0.14	0.23	0.32	0.39	0.32	0.16	0.24	0.22
JPN		1.00	0.12	0.11	0.18	0.72	0.11	0.07	0.13	0.19	0.35
CN			1.00	0.38	0.60	0.38	0.44	0.35	0.43	0.67	0.31
UK				1.00	0.34	0.27	0.28	0.20	0.88	0.59	0.09
US					1.00	0.48	0.52	0.44	0.37	0.93	0.47
AP						1.00	0.73	0.61	0.31	0.49	0.63
AP*							1.00	0.83	0.32	0.54	0.58
WE								1.00	0.25	0.45	0.56
EU									1.00	0.67	0.11
WD										1.00	0.41
W*											1.00

*Note:* Abbreviations MAS = Malaysia, US = United States, UK = United Kingdom, CN = Canada, AP = Asia Pacific, AP\* = Asia Pacific excluding Japan, WE = World Emerging markets, EU = Europe, WD = World Developed markets, and W\* = World excluding the US.

Islamic equities. That is, given its risk-return profiles, the low correlations between Malaysia and these advanced markets indicate that Malaysia is a great candidate for maximizing their diversification effects. In the meantime, it is rather interesting to note that the three highest correlations reported are between AP\* and WE (0.83), the UK and EU (0.88), and the US and the WD index (0.93). These very high correlations correctly explain the weight that these markets have on the construction of the respective indexes.

#### RESULTS OF GRANGER-CAUSALITY TESTS

To conserve space, the results of the Granger-causality tests are transformed into a simple diagram in Figure 1. Both Groups A and B in Figure 1 represent markets which have uni-directional relationships with Malaysia. The difference is because Group A represents uni-directional relationships moving toward Malaysia whereas Group B represents a uni-directional relationship coming from Malaysia. In Granger sense, the lagged returns of markets in Group A can predict Malaysian returns better than the Group B's own lagged returns. It also means that in general the stock price movements in each of these markets lead the stock price movements in Malaysia. Notice that except for Canada, all indexes in Group A are more likely to be associated with emerging markets. In the meantime, the market in Group B has its returns predicted better by lagged returns in Malaysia or more specifically Malaysia leads the US. This finding basically contradicts the popular perception that advanced market is supposed to play the leading role in information transmission. But so does Group D which reports that Japan, another world most advanced market, has no role whatsoever in disseminating market information to Malaysia. As surprising as these results might seem, several previous studies (Marashdeh 1994; Miyakoshi 2001; Kim 2005; Ibrahim 2006; Choudhry et al. 2007) using broad market indexes have also found results similar to this regarding the role of Japan and the US in Asian emerging markets and regarding the closer relationship between Asian emerging markets and the US than Japan.

To some extent the results so far is not totally out of context with popular perception which associate lead-lag relationships with the development of the markets being considered. This is because when it comes to its involvement in Islamic capital markets Malaysia is nothing but advanced (Naughton & Naughton 2000; Hayat 2006; Wilson 2007). Malaysia was first to successfully initiate an Islamic Bond in 1983 (by Malaysian government) and to launch Islamic equity index in 1996 (by RHB Unit Trust Management Bhd) (OICU-IOSCO 2004). In 2003, the market capitalization of Malaysian Islamic equity has reached USD103 billion, which accounts for 58 percent of the national equity market (OICU-IOSCO 2004). Malaysia is also

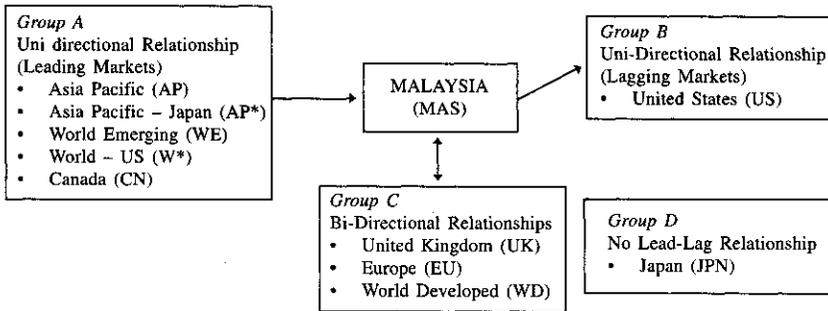


FIGURE 1. Summary of the lead-lag relationships between Malaysian and other selected Islamic stock markets

among the first to set an independent body of Shariah Advisory Council (SAC) which is responsible for the screening of the constituents of the Kuala Lumpur Shariah Index (KLSI). The fact that Dow Jones produces DJIM Malaysia, not to mention the coverage that it consistently receives, is also a good indication of the importance of Malaysia. This conclusion can be further reinforced by the bi-directional relationships in Group C which suggest stock prices in Malaysia influence and are influenced by three other developed markets, namely the UK, Europe and World developed.

#### RESULTS OF THE TIME SERIES REGRESSION ANALYSES

This study proceeds with regression analyses in Eq. (2) to identify when (if ever) the stock prices in the  $i$ th market (column heading) are being transmitted to Malaysian stock market. Five lags are used throughout the regression analyses based on the optimal lag length of Akaike Information Criteria (AIC). The results in Table 3 are in general consistent with those from Granger-causality tests. That is, each of the markets in Group A (CN, AP, AP\*, WE & W\*) in Figure 1 has at least three coefficients on lagged returns that are significant in explaining Malaysian returns. In the meantime, while lagged returns on markets in both Groups B and C also play significant role in explaining Malaysian returns, they are smaller both in number and magnitude. The fact that 1-day lagged returns in Malaysia significantly explain current returns support the existence of several bi-directional relationships. The results on Japan is also consistent with Granger-causality test in that the time series regression shows that there is no information being transmitted from the Japanese to Malaysian stock market.

Table 4 present results from running regression analyses in Eq. (3). Perhaps the most important result is the consistently significant coefficients on lag 1 return on Malaysian stock in predicting its own returns. That is,

TABLE 3. Results of regressing lagged returns of the *i*th Islamic stock market on Malaysian returns

Mkt <i>i</i>	MAS	JPN	US	UK	CN	EU	AP	AP*	WE	WD	W*
Const	0.000 (1.61)	0.000 (2.00)*	0.000 (1.91)	0.000 (1.96)*	0.000 (1.67)	0.000 (1.85)	0.000 (1.73)	0.000 (1.55)	0.000 (1.50)	0.000 (1.87)	0.000 (1.56)
R <sub><i>j</i></sub> (-1)	0.170 (7.7)**	0.000 (0.04)	0.029 (1.72)	-0.001 (-0.06)	0.029 (2.5)*	0.010 (0.60)	0.051 (3.1)**	0.071 (4.0)**	0.097 (5.8)**	0.027 (1.29)	0.154 (7.7)**
R <sub><i>j</i></sub> (-2)	-0.005 (-0.22)	-0.001 (-0.09)	0.030 (1.81)	0.023 (1.40)	0.028 (2.31)*	0.042 (2.45)*	0.018 (1.07)	0.016 (0.91)	0.033 (1.93)	0.043 (2.04)*	0.002 (0.07)
R <sub><i>j</i></sub> (-3)	0.017 (0.77)	0.010 (1.49)	0.050 (3.0)**	0.026 (1.61)	0.040 (3.3)**	0.041 (2.42)*	0.055 (3.3)**	0.048 (2.7)**	0.035 (2.04)*	0.053 (2.5)*	0.066 (3.3)**
R <sub><i>j</i></sub> (-4)	0.040 (1.79)	-0.007 (-0.97)	0.041 (2.5)**	0.048 (2.9)**	0.037 (3.1)**	0.055 (3.2)**	0.019 (1.14)	0.039 (2.2)*	0.042 (2.5)*	0.061 (2.9)**	0.050 (2.5)*
R <sub><i>j</i></sub> (-5)	-0.011 (-0.52)	0.006 (0.87)	0.025 (1.51)	-0.029 (-1.78)	-0.002 (0.13)	-0.026 (-1.53)	0.036 (2.17)*	0.036 (2.03)*	0.045 (2.7)**	-0.005 (-0.22)	0.067 (3.3)**
Adj R <sup>2</sup>	0.029	0.000	0.008	0.006	0.014	0.009	0.011	0.017	0.030	0.009	0.039
S.E.	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009
D-W	1.999	1.655	1.690	1.660	1.701	1.671	1.709	1.745	1.772	1.688	1.737
F-stat	13.241	0.805	4.290	3.323	6.950	4.968	5.660	8.041	13.938	4.920	17.771
Prob.	0.000	0.546	0.001	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: MAS = Malaysia, JPN = Japan, US = United States, UK = United Kingdom, CN = Canada, EU = Europe, AP = Asia-Pacific, AP\* = Asia-Pacific (excluding Japan), WE = world emerging markets, WD = world developed markets, and W\* = World (excluding the US).

TABLE 4. Results of regressing Malaysian returns on lagged returns of the Malaysian and  $j$ th Islamic stock markets

Mkt $j$	JPN	US	UK	CN	EU	AP	AP*	WD	W*	WE
Const	0.000 (1.607)	0.000 (1.613)	0.000 (1.604)	0.000 (1.452)	0.000 (1.558)	0.000 (1.516)	0.000 (1.426)	0.000 (1.591)	0.000 (1.381)	0.000 (1.397)
Lagged returns on Malaysian Islamic stock market										
Lag 1	0.172 (7.8)**	0.166 (7.3)**	0.174 (7.9)**	0.158 (7.1)**	0.171 (7.7)**	0.162 (7.0)**	0.152 (6.4)**	0.168 (7.5)**	0.135 (6.0)**	0.130 (5.6)**
Lag 2	-0.006 (-0.3)	-0.015 (-0.6)	-0.006 (-0.3)	-0.017 (-0.8)	-0.011 (-0.5)	-0.015 (-0.6)	-0.017 (-0.7)	-0.017 (-0.7)	-0.004 (-0.2)	-0.024 (-1.0)
Lag 3	0.015 (0.7)	0.004 (0.2)	0.013 (0.6)	0.004 (0.2)	0.008 (0.4)	-0.004 (-0.2)	-0.007 (-0.3)	0.004 (0.17)	0.001 (0.1)	-0.002 (-0.1)
Lag 4	0.043 (1.9)	0.033 (1.5)	0.030 (1.3)	0.029 (1.3)	0.030 (1.3)	0.042 (1.8)	0.031 (1.3)	0.028 (1.2)	0.029 (1.3)	0.025 (1.1)
Lag 5	-0.013 (-0.6)	-0.015 (-0.6)	-0.006 (-0.3)	-0.010 (-0.5)	-0.005 (-0.2)	-0.025 (-1.1)	-0.026 (-1.1)	-0.008 (-0.3)	-0.024 (-1.1)	-0.028 (-1.2)

*continue next page*

TABLE 4 (continue)

Lagged returns on the <i>j</i> th market										
Lag 1	-0.003 (-0.4)	0.000 (-0.0)	-0.018 (-1.1)	0.014 (1.2)	-0.009 (-0.5)	0.013 (0.7)	0.025 (1.3)	-0.011 (-0.5)	0.128 (6.2)**	0.066 (3.8)**
Lag 2	0.000 (-0.1)	0.028 (1.6)	0.022 (1.4)	0.026 (2.1)*	0.042 (2.4)*	0.017 (1.0)	0.017 (0.9)	0.049 (2.3)*	-0.015 (-0.7)	0.031 (1.7)
Lag 3	0.010 (1.5)	0.043 (2.5)*	0.017 (1.0)	0.034 (2.8)**	0.029 (1.7)	0.052 (3.0)**	0.048 (2.5)*	0.040 (1.9)	0.067 (3.2)**	0.034 (1.9)
Lag 4	-0.010 (-1.4)	0.027 (1.6)	0.039 (2.94)*	0.028 (2.4)*	0.044 (2.5)*	0.000 (0.0)	0.023 (1.2)	0.047 (2.2)*	0.033 (1.6)	0.032 (1.8)
Lag 5	0.007 (1.1)	0.020 (1.2)	-0.037 (-2.3)*	-0.004 (-0.3)	-0.035 (-2.0)*	0.037 (2.1)*	0.037 (1.9)*	-0.012 (-0.6)	0.061 (3.0)**	0.044 (2.5)*
A-R <sup>2</sup>	0.029	0.032	0.034	0.036	0.036	0.033	0.034	0.034	0.054	0.043
S.E.	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009
D-W	1.997	1.997	2.002	2.000	2.002	1.994	1.998	2.000	1.991	2.000
F-Stat	7.193	7.836	8.333	8.729	8.757	8.164	8.388	8.252	12.885	10.448
Prob.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: MAS = Malaysia, JPN = Japan, US = United States, UK = United Kingdom, CN = Canada, EU = Europe, AP = Asia-Pacific, AP\* = Asia-Pacific (excluding Japan), WE = world emerging markets, WD = world developed markets, and WD\* = developed world (excluding the US).

despite the uni-directional relationship found in Granger-causality, Malaysia's lagged return remains significant even after controlling for lagged returns of Group A markets. This finding suggests that investors in Malaysian Islamic equities should pay as much as or may be more attention on yesterday's own returns than those lagged returns in Group A markets. Evidently, the coefficients of lagged returns on these markets reduce, both in number and magnitude, once the lagged returns on Malaysian stocks are incorporated in the equations. In the meantime, the results for the US explain the uni-directional Granger-causality coming from Malaysia to the US. That is, the coefficient on Malaysian lagged returns (lag 1,  $p < 0.01$ ) is clearly more significant compared to that on the US lagged returns (lag 3,  $p < 0.05$ ). Regarding the influence of Group C markets, the results show no evidence of reducing role in Malaysian lag 1 returns in the presence of these markets' lagged returns. More accurately, given the reducing significance of their respective coefficients, the results suggest that the roles of these markets are absorbed by Malaysian lagged returns. As for Japan, the coefficients of its lagged returns remain insignificant throughout the 5-day lags, suggesting Japan trivial role in determining Malaysian returns.

Finally, Table 5 reports the results from several variants of time series regression represented in Eq. (4). For simplicity, only the results of the 1 and 5 days lags are reported for each market unless if the coefficients on the other lags are significant. The results of these regression models are expected to identify which markets must be of particular concerns when predicting returns on Malaysian Islamic equity market. The results from Model I (full model) for instance suggest that besides Japan, the UK, Canada, Europe and Asia Pacific also do not seem to have any significant role in predicting Malaysian returns. This finding suggests that their roles are absorbed by the other markets that are controlled for in this model. In other words, investors in Malaysian Islamic equity market do not need to pay attention to these markets provided that they have information from the US, Asia Pacific\*, World Developed, World Emerging and World\*. The fact that Asia Pacific is not in the picture of Malaysian equity market is rather disturbing. However, this is not for long because when Japan is taken out to form Model II, Asia Pacific comes back into the picture of Malaysian market.

Model III is tested to examine whether the roles of Canada, the UK and Europe are recovered in the absence of the US. The results tend to suggest that these markets are no replacements for the importance of the US to Malaysia and simultaneously complement the emphasis that Malaysia religiously puts on the market. Finally, the analysis gets down to the reduced model (Model IV) which considers only those markets that have been consistently showing significant roles in explaining Malaysian Islamic stock returns. These markets are the US, Asia Pacific, Asia Pacific\*, World

TABLE 5. Results of regressing Malaysian returns on lagged returns of the Malaysian and all relevant  $j$ th Islamic stock markets

Variable	L	Model I		Model II		Model III		Model IV	
		Beta	t-Stats	Beta	t-Stats	Beta	t-Stats	Beta	t-Stats
Constant		0.000	1.207	0.000	1.196	0.000	1.180	0.000	1.281
$R_{MAS}$	-1	0.156	6.588**	0.157	6.643**	0.155	6.586**	0.158	6.717**
	-5	-0.028	-1.200	-0.028	-1.203	-0.027	-1.169	-0.027	-1.145
$R_{JPN}$	-1	-0.007	-0.304						
	-5	0.016	0.674						
$R_{US}$	-1	0.181	0.506	0.181	0.504			0.203	0.573
	-5	0.213	2.275*	0.222	2.376*			0.129	2.761**
$R_{UK}$	-1	-0.048	-1.351	-0.048	-1.339	-0.049	-1.366		
	-5	-0.026	-0.763	-0.029	-0.834	-0.026	-0.738		
$R_{CN}$	-1	0.029	1.135	0.025	1.000	0.023	0.947		
	-5	0.001	0.081	0.000	0.021	-0.006	-0.395		
$R_{EU}$	-1	0.111	0.512	0.061	0.285	0.043	0.203		
	-5	0.074	1.270	0.078	1.358	-0.022	-0.537		
$R_{AP}$	-1	-0.043	-0.503	-0.066	-2.467*	-0.068	-2.543*	-0.065	-2.444*
	-5	-0.129	-0.931	-0.072	-0.694	-0.064	-0.625	0.010	0.382
$R_{AP^*}$	-1	-0.149	-2.217*	-0.134	-3.442**	-0.128	-3.293**	-0.126	-3.246**
	-2	-0.138	-2.024*	-0.068	-1.685	-0.077	-1.960*	-0.066	-1.681
	-5	0.024	0.346	-0.014	-0.351	-0.001	-0.014	-0.015	-0.375
$R_{WD}$	-1	-0.395	-0.685	-0.395	-0.687	-0.105	-2.761**	-0.413	-0.726
	-5	-0.330	-2.227*	-0.341	-2.307*	-0.002	-0.048	-0.190	-3.279**
$R_{W^*}$	-1	0.188	6.568**	0.189	6.633**	0.192	6.722**	0.191	6.707**
	-5	0.165	0.410	0.161	0.404	0.289	0.864	-0.021	-0.089
$R_{WE}$	-1	0.127	4.154**	0.128	4.196**	0.122	4.032**	0.127	4.187**
	-2	0.077	2.049*	0.077	2.055*	0.088	2.754**	0.082	2.206*
	-5	0.070	1.864	0.070	1.854	0.050	1.568	0.064	1.727
Adj-R <sup>2</sup>		0.074		0.075		0.074		0.074	
S.E.		0.009		0.009		0.009		0.009	
D-W Stat		2.008		2.007		2.006		2.007	
F-Stats		4.026		4.3716		4.700		5.761	
Prob.		0.000		0.0000		0.000		0.000	

Note: MAS = Malaysia, JPN = Japan, US = United States, UK = United Kingdom, CN = Canada, EU = Europe, AP = Asia-Pacific, AP\* = Asia-Pacific (excluding Japan), WE = world emerging markets, WD = world developed markets, and WD\* = developed world (excluding the US).

Emerging, World Developed, and World\*. To be more specific, the stock prices at time  $t$  in Malaysian Islamic equity markets can be better predicted by incorporating information transmitted from any Asia Pacific region (except Japan) and World Emerging markets at time  $t-1$  and from World Developed markets including the US at time  $t-5$ . Overall, the results of this study lend strong support to earlier findings on generic stock markets

(Choudhry et al. 2007; Ibrahim 2006; Kim 2005; Masih & Masih 1999; Miyakoshi 2003; Narayan et al. 2004; Yong 1994) regarding the greater weight that the US stock market has as opposed to Japanese stock market in influencing the Malaysian stock market. In the meantime, the 4 additional days delay in incorporating news in developed markets suggest some level of market inefficiency which opens up opportunities for arbitrage. It is rather important to note that the full models in Table 5 produce adjusted- $R^2$  and F statistics that are consistently higher than those in Tables 4 and 3. Similarly, the Durbin-Watson statistics equal to 2.0 indicate that these models are better specifications for explaining Malaysian Islamic stock returns.

### CONCLUSIONS

International equity market integration has received tremendous attentions for quite some times mainly as a response to the growing importance of financial and trade liberalizations and its implication on international portfolio management. These studies however seem to overlook an important segment in equity market, namely the Islamic equity markets. Even though still in infant stage by age, this segment has been growing very fast consistent with the growing trend of “socially responsible” investment in the US, growing popularity of indexing (such as ETFs) rather than active investment strategies, not to mention a vast market of more than 1.4 billion conscientious Muslims around the world. This study attempts to fill-up the gap by examining the information leadership amongst 11 of most important players in the Islamic equity world-Malaysia, the US, the UK, Canada, Japan, Europe, Asia Pacific (with and without Japan), World Emerging, World Developed, and World (excluding the US) by using Islamic indexes created by Dow Jones.

The preliminary results from the study suggests evidence consistent with the broad equity markets in that emerging markets including Malaysia are potential investment centers capable of offering enormous returns. As suggested by the Sharpe ratios, Malaysia, Asia Pacific (without Japan) and World Emerging offer the lowest risk per unit of returns. On the contrary, both world most advanced markets (the US and Japan) are reported to offer highest Sharpe ratios. In addition to its risk-return profiles, Malaysian Islamic equity market possesses another criterion critical in international portfolio management. That is, Malaysia Islamic equity market tends to be weakly correlated with all the other markets especially with the advanced markets. This is an important element for Malaysia’s vision to become the hub of Islamic capital markets because practically most excess investable funds are sourced from these advanced markets.

Using Granger-causality and multiple time series regression tests, this study provides evidence on the extent to which information in these markets

are being transmitted to Malaysia. The results of the Granger-causality suggest that all of the studied markets have some directional relationships with Malaysia except for Japan. The results from Granger-causality tests are in general confirmed in multiple regression analyses. However, the results from running the full models identify specifically which markets must be of more concerns to investors in Malaysian Islamic equity markets. The full model is gradually reduced to a parsimonious model (IV) which show that only the US, Asia Pacific, Asia Pacific\*, World Emerging, World Developed, and World\* have significant role in predicting returns on Islamic stocks traded in Malaysian market. Specifically, the stock prices at time  $t$  in Malaysian Islamic-equity markets can be better predicted by incorporating information transmitted from any Asia Pacific region (except Japan) and World Emerging markets at time  $t-1$  and from World Developed markets including the US at time  $t-5$ . In the meantime, as also documented in earlier studies, Japan consistently show insignificant role in explaining returns in Malaysian Islamic markets despite their geographical and economic closeness. Furthermore, the 4 additional days delay in incorporating news from developed markets suggest some level of market inefficiency which opens up opportunities for arbitrage.

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