Available online at www.jeeir.com
JEEIR

Journal of Emerging Economies and Islamic Research
www.jeeir.com

Examining Market Efficiency and Integration of the Islamic Stock Indices

Noryati Ahmad*

Arshad Ayub Graduate Business School, Faculty of Business and Management, Universiti Teknologi MARA Selangor, Malaysia

Abstract

The question of whether the stock market is efficient has been an ongoing debate among researchers. Generally, empirical evidence indicates that most conventional stock indices for developed countries are weak form efficient while inconclusive results are discovered for developing countries. With the growing importance of the Islamic capital markets that run parallel to the conventional stock markets, similar question arises as to whether these new Islamic capital markets are also efficient. Hence this paper aims to examine the weak form efficiency of the Islamic stock indices. Autocorrelation Function (ACF) test and Variance Ratio (VR) test are used to test the market efficiency of the Islamic stock indices from China, India, South Africa, Malaysia, Dubai, Qatar and Japan. The study uses daily data covering the year 2008 until 2012. In addition, this paper attempts to unveil the dynamic causal relationships among the Islamic capital markets. Bivariate Granger Causality test is employed to achieve the objectives. Interestingly only the Islamic stock indices for Malaysia and India are weak form efficient while the results of the Islamic stock indices for Qatar and Kuwait are not. The results of the other Islamic stock indices studied are inconclusive. Johansen multivariate cointegration tests reveal no long-term relationship among the Islamic stock indices. On the other hand, bivariate Granger Causality tests report short run co-movements between Islamic stock indices of Muslim countries and non-Muslim countries, an indication of growing interest of the Islamic financial markets among investors.

Keywords: Islamic stock indices; weak form efficient; bivariate granger causality tests; Johansen multivariate cointegration tests

1. Introduction

Theory of efficient market hypothesis (EMH) explained that traders would not be able to make abnormal profits based on historical prices as well as information accessed publicly or privately since all information is already incorporated in the price of the financial assets. Fama (1965) argued that all

* Corresponding author. Tel.: +0122870480; fax: +603 55444695.
E-mail address:noryatia@salam.uitm.edu.my.edu.my.

investors should be given with precise information and should receive a rate of return that implicitly comprises the perceived risk of the security when buying stock at efficient price. The debate on whether the market is efficient led to two schools of thought. The first school of thought advocates the arguments that markets are indeed efficient. Furthermore, Kendall (1943), Osborne (1962), Cootner (1962), and Fama (1965) explained that for emerging markets, weak form efficiency does exist in those markets. On the other hand, the other school of thought believes that markets are inefficient and therefore investors can make abnormal profits. Empirical researches have been carried out to seek proof of anomalies that contradict the EMH (Fama and French, 1988; Lo and MacKinlay, 1988 and Poterba and Summers, 1988).

Why are investors and policymakers concern about the capital market being efficient? Under an efficient market condition, once investors have developed their investment portfolio, they should not be worried about their investment and should freely practice a buy and hold strategy. The rationale behind this is that there is no benefit and extra return in changing from one group of stock portfolio to another as no trader could secure higher than expected return if the capital market is efficient. On the other hand, if a market is inefficient, then investor should capitalize on this situation to gain excess return using various trading strategies. For policymakers, an efficient market would imply that they have provided a sound regulatory platform that would promote trading activities and market growth and therefore infuse investors confidence.

As financial market becomes globalized, more deregulated and liberalized, investors found more opportunities for them to create cross-border portfolio and diversify their investments. A globalized financial market cultivates interdependence among stock markets and increases market integration. Samaratunga (2008) explains that market integration connotes market efficiency. Investors and portfolio managers are not able to gain through diversification if financial markets are highly integrated. International diversification is effective when these financial markets are not fully integrated. Essentially, investors can optimize their returns with minimum risks by putting their funds in uncorrelated stock portfolio.

Plethora past literatures on market efficiency and integration have focused on conventional stock indexes (Samartunga, 2008; Kim, 2010 and Menezes, 2013) but relatively limited studies have been carried out on the Islamic stock indexes. For the past decade, there has been a significant growth in the Islamic capital market that triggered the pressing needs to establish Islamic equity indices. In 1999 the first global Islamic indices were launched to promote regional and geographical capital flows and funding activities that are in compliance with the Shari'ah principles. To date there are four global Islamic indices: Dow Jones Islamic Market Indices, S&P Shari'ah Indices, MSCI Global Islamic Indices and FTSE Global Islamic Indices. The emergence of the Islamic capital markets provides cross-border capital flow and funding for investment managers and/or companies who are seeking Shari'ah-compliant investments. Shari'ah-compliant investments refer to financial assets that conform to Shari'ah principles. In short, Shari'ah-compliant companies should not be involved in liquor, pork, gambling and interest-based activities to name a few. Although majority of the Islamic financial assets are concentrated in the Middle Eastern and Asian region, however of late, there have been indication of these assets concentration moving to countries in Europe, US and Latin America.

In comparison to its conventional counterpart, Islamic stock indices are relatively new. Being newly established capital markets to what extent are the Islamic stock indices efficient. Are they also integrated? Thus, this research intends to examine the weak-form market efficiency of the individual Islamic stock indices. Results from this study will provide a better understanding of the predictability

price behavior of this newly emerging capital market. If individual Islamic stock index is efficient, then traders could not make abnormal profits. Secondly, the study also attempts to investigate the dynamic linkages among the Islamic stock indices. Information on the linkages and causal relationships among these markets enables investors to make better Islamic portfolio investment decisions. An effective international Islamic portfolio diversification is achieved when stock indices are not integrated.

Hence, the rest of this paper is structured as follows: Section 2 discusses the related previous studies on market efficient as well as the linkages and causality relationship of capital markets. Section 3 provides the data and methodology utilized to achieve the objectives. Section 4 presents the results and conclusion, discussion and implications are provided in the last section.

2. Review of Previous Studies

Topic on market efficient and integration has always attracted the interest of many researchers. To date voluminous of studies on market efficiency have concentrated on conventional stock indices of developed and developing countries. Worthington and Higgs (2004) conducted a study on 20 European equity markets using the Augmented Dicker-Fuller (ADF), Kwiatkowski, Philips, Schmidt and Shin (KPSS) unit root tests as well as variance ratio tests. In their study, they reported that only the stock indices of Germany, Ireland, the Netherlands, Portugal and the United Kingdom adhere to random walk characteristics. In addition, study by Dicle and Levendis (2011) on the Greek stock market also found evidence of inefficiencies at both market and individual level. Their period of study dated from January 2000 until December 2007. Study of Jarrett and Kyper (2005) also found similar results when they tested the weak form hypothesis test on the US market using daily prices. Findings from the result concluded that movement of historical prices for United States market are not random and hence is not weak form efficient. Generally, the empirical evidences found the developed capital markets to be more efficient of a weak form.

On contrary, research findings on the weak-form market efficiency of developing countries tend to display mixed results. Abdmoulah (2010), Worthington and Higgs (2004), Raghbendra and Nagarajan, (2000) and Alam, Hasan and Kadapakkam (1999) are among researchers that have examined the market efficiency of the conventional capital market in the emerging and developing countries. Results from Worthington and Higgs's study revealed that none of emerging conventional European stock markets satisfied the random walk tests with exception to the Hungarian stock market. They rationalized that the Hungarian stock market is found to be weak form efficient due to it being institutionally matured market. Alam, Hasan and Kadapakkam (1999) applied the variance-ratio test on the stock markets of Bangladesh, Hong Kong, Malaysia, Sri Lanka and Taiwan using monthly data from November 1986 to December 1995. With exception to Bangladeshi market, all the other Asian markets are found to follow random walk. Raghbendra and Nagarajan, (2000), observed efficiency of price transmittals of market structure in two main national stock exchanges in India which are the National Stock Exchange and the Bombay Stock Exchange. Findings from their studies indicated that both National Stock Exchange and Bombay Stock Exchange are efficient. Abdmoulah (2010) tested the efficiency of the Arab conventional stock indices and found that as these markets evolved and traders become more sophisticated, the markets become weak form efficient. These studies show that the conventional capital markets in those emerging markets are in line with the random walk hypothesis that postulates the markets to be weak form efficient.

Generally, many researches agreed with the efficient market hypothesis and concluded that investors cannot gain surplus return by forecasting future price changes. Empirical studies on interrelationship

among conventional stock market indices are mixed. Kim (2010) reported that the US stock market Granger-causes almost all the East Asian stock indices. A study by Menezes (2013) also found US stock market to Granger-cause the G7 countries stock indices. Besides, it is revealed that France and Germany stock indices do not Granger-cause each other.

Due to the newness of the Islamic capital markets, relatively very few studies have examined the market efficiencies and co-integration of these markets. Most of the studies are qualitative in nature, focusing on the framework and shari'ah principles of the Islamic capital markets. Simpson and Evans (2004) discovered that Bahrain Granger causes Oman while Saudi Arabian markets and Bahrain Islamic stock indices Granger cause each other. Generally, the authors concluded that the GCC markets to be weakly integrated. She also pointed out that investors could develop effective international portfolio diversification since the Islamic indexes are found not to be integrated. Guyot (2011) studied the efficiency and dynamics relationship on Dow Jones Islamic market indexes (DJII). Her findings revealed that the Dow Jones Islamic market indices are more efficient than the conventional market indices. In addition, she also discovered that DJII to be not co integrated. On the other hand, empirical evidences from Girard and Hassan (2008) disclosed that both FTSE Islamic and conventional indexes are not only integrated but also efficient from the year January 1999 until December 2006. Majid and Kassim (2010) investigated if the Islamic indices of Malaysia, Indonesia, Japan, the UK and the US are integrated for the period January 1999 to August 2006. Their findings concluded that integration prevails between the Malaysian and Indonesian Islamic indices as well as among the US, UK and Japanese Islamic indices. They are of opinion that interdependence existed due to the intensity of economic development of the countries. Khalichi, Humayun, Arouri and Teulon (2014) investigated the market efficiency and integration of Islamic indices of Dow Jones, S&P 500, MSCI and FTSE. Using daily data from the date of the establishment of the indices until March 2011, their study revealed that the Islamic indices of MSCI and FTSE are not weak-form efficiency but integrated, while the opposite results are indicated for Islamic indices of Dow Jones and S&P 500.

Several interpretations could be made from empirical evidences of these previous literatures. Firstly, the common methods used to test weak-form market efficiency are ACF, ADF, KPSS and VR tests, while Granger causality tests and Vector Auto Regressive models are applied to detect cointegration among conventional and Islamic indices. Secondly, most of the conventional stock market of developed countries are more weak-form efficient in comparison to those of Islamic stock markets.. This is not surprising as conventional stock markets have established financial institutional structure and regulatory framework. Besides, the markets are made up mainly of well-informed and experienced investors (Menez, 2013 and Kim, 2010). In contrast, Islamic stock markets (particularly from developing and non-developing countries) appear to differ in terms of the maturity of the markets, have weak regulatory framework and tighter investment restrictions on investors (locally and abroad). These factors contributed to illiquidity of the markets and infrequent trading (Charles and Darne, 2009 and Dicle and Levendis, 2011) and hence affect the efficiency and interdependence of these markets.

3. Data and Methodology

The unit of analysis of the study is the Islamic stock indices. Daily closing prices of seven Islamic stock indices covering the period January 2008 to December 2012 are collected from Datastream. Initially, eleven Islamic stock indices were identified for the purpose of this study. However due to the unavailability of data, the sample population was narrowed down to seven Islamic stock indices. These stock market indices are FTSE Shari'ah China, FTSE Shari'ah India, FTSE/JSE Shari'ah All Share

(South Africa), FTSE Bursa Malaysia Hijrah Shari'ah, FTSE Nasdaq Kuwait15 Shari'ah, FTSE Nasdaq Qatar 10 Shari'ah, and S&P Japan 500 Shari'ah. These daily closing prices are transformed into continuously compounded returns as given in the following equation:

$$r_t = lo \left(\frac{P_t}{P_{t-1}}\right) \quad (1)$$

Equation 1 shows that r is the return at time t, P_t is the closing price at time t and P_{t-1} is the closing price at time t-1.

As highlighted in the previous section, a market is efficient if all available information is embedded in the prices of the financial assets. Investors are not able to predict the movement of prices if information arrives randomly. Random walk hypothesis (RWH) stated that change of financial price is independent of past financial price changes and therefore current financial prices are not related to its past prices. RWH is classified as is known as a weak form of EMH. Fawson, Glover, Fang and Chang (1996) explained that to examine the weak form efficiency of a particular market is to investigate whether the current financial prices are related with the past financial prices. Thus, this study uses Autocorrelation Function (ACF) test and Variance Ratio (VR) test to examine the weak-form market efficiency of each of the Islamic stock indices studied. In establishing the dynamic short-run relationships among the Islamic stock indices, a Granger causality test is employed.

3.1 Autocorrelation Function (ACF) and Ljung-Box Q Statistic Test

The statistical tools used for measuring the relationship between current returns of stock indices and its previous returns in a given time series is known as Autocorrelation (also known as serial correlation coefficient). The test were used to examine and identify the degree of autocorrelation in a time series. It measures the relationship between the lagged and current observations of the stock returns time series. The autocorrelation function, ACF (k) for the time series *Yt* and the *k*-lagged series *Yt-k* is defined as:

$$A = \frac{\sum_{t-1}^{n-k}(Yt - \bar{Y})(Y + k - \bar{Y})}{\sum_{t=1}^{n}(Yt - \bar{Y})(Y - \bar{Y})} \quad (2)$$

Where:

$\bar{Y}$: the overall mean of the series with
n: observations.

If the time series of the Islamic stock indices studies display no autocorrelation, then the return series is assumed to follow a random walk. In addition, Ljung-Box Q-Statistic test is also used to determine if all autocorrelations are jointly equal to zero and are formulated as follows:

$$\mathrm{Q(m)} = T(T+2)\sum_{k=1}^{m}(\rho_k{}^2 / (\mathrm{T}-\mathrm{k})) \quad (3)$$

ρ_k refers to the k^{th} autocorrelation and T is number of observations.

3.2 Variance Ratio (VR) Test

Lo and MacKinlay (1988) proposed the variance ratio test as an alternative to test the weak-form market efficiency hypothesis. Under the null hypothesis, the VR statistic must be equal to 1. Positive and negative serial correlation exist if VR> 1 and if VR < 1 respectively. Furthermore if the variance of random walk increments is a linear function of time interval, then the RWH is said to prevail (Campbell, Lo and MacKinlay, 1997). The variance ratio test is in the following equation:

$$V\ (q) = \frac{v\ (r,(q))}{q\ v\ (r)} = 1 + 2\sum_{k=1}^{q-1}\left(1-\left(\frac{\mathrm{k}}{\mathrm{q}}\right)\right)p_k \quad (4)$$

The above formula is appropriate for returns that are homoskedastic. If the error terms are found to be serially uncorrelated, then the following heteroskedastic-robust standardized VR test can be applied.

$$Z(q) = \frac{V\ (q) - 1}{[\emptyset\ (q)]^{1/2}} \sim N\ (0,1) \quad (5)$$

$$Z*(q) = \frac{V\ (q) - 1}{[\emptyset*(q)]^{1/2}} \sim N\ (0,1) \quad (6)$$

3.3 Bivariate Granger Causality Test

This study uses the Johansen Cointegration test to identify if there is cointegration relationship among the Islamic stock indices. The test uses trace statistics and max-eigenvalue statistics to detect if three or more variables are cointegrated. A detailed explanation of Johansen cointegration test can be referred to Johansen (1988). Bivariate Granger causality test is applied since there is no long-term relationship among the indices. Majid and Kassim (2010) accentuate that this approach indicates the direction of causation and provides explanation on which indices influence the other indices.

Granger (1986) explains that causality exist in at least one direction. Bivariate Granger causality equation can be formulated as:

$$R_{1,t} = a_0 + \sum_{i=1}^{p} a_i R_{1,t-i} + \sum_{j=1}^{q} b_i R_{2,t-j} + \varepsilon_t \quad (7)$$

$$R_{2,t} = a_0 + \sum_{i=1}^{p} a_i R_{2,t-i} + \sum_{j=1}^{q} b_i R_{1,t-j} + \varepsilon_t \quad (8)$$

Where a_0, a_i and b_i are estimated coefficients and ε_t represents the error term. R_1 and R_2 denote the returns of two Islamic stock indices respectively at time t. The lag-length of p a q is derived through using Akaike's minimum final prediction error (FPR). Wald's F-test for joint significance of the estimated coefficients is carried out to test the null hypothesis that returns in Islamic stock market R_1 does not Granger-cause returns in Islamic stock market R_2 and vice versa. Granger Causality test determines whether a particular stock price series is useful in forecasting another.

4. Empirical Results

4.1 Descriptive statistics

Table 1. Descriptive Statistics of Seven Islamic Stock Indices (January 2008 to December 2012)

Statistics	LCH	LIN	LSA	LMS	LKW	LQT	LJAP
Mean	7.6788	7.8514	7.9215	9.0693	8.5052	8.5709	6.7222
Maximum	8.2177	8.4237	8.3051	9.4249	9.1502	9.0764	7.1186
Minimum	6.8955	7.2109	7.4762	8.7413	7.9553	8.0136	6.3748
Std. Dev.	0.2539	0.2711	0.1744	0.1515	0.3594	0.2566	0.1922
Skewness	-0.8967	-0.8347	0.1008	-0.3355	0.5743	0.3497	0.5521
Kurtosis	3.0162	2.8836	2.4388	2.5578	1.7245	2.4646	2.0523
Observations	437	437	437	437	437	437	437

Overall, the return series of Malaysia Islamic indices provide the highest return with the lowest risk (Table 1). The series return of Japanese Islamic indices offer the lowest return, while Kuwait Islamic indices have the highest standard deviation (risk). The Chinese Islamic indices, Malaysian Islamic indices and South African Islamic indices are negatively skewed. Only Chinese Islamic indices have the kurtosis value that is above three. This implicates high volatility in returns in this market and therefore investors could experience extremely large future returns.

4.2 ACF and Ljung-Box Q-Statistic results

Table 2a and 2b illustrate the ACF and the Ljung-Box Q-Statistics for 10 lags for the daily returns of the seven Islamic stock returns from 2008 to 2012 respectively. The 10 days lags are adopted in accordance with previous studies done by Shaker (2013) and Borges (2010). In most cases, the daily returns for those countries studied are negative. Investor uncertainty about the future of these markets and their performance as well as lack of liquidity due to the infancy stage of these markets could be the contributing factors. The ACFs for Chinese Islamic stock indices are statistically significantly different from zero indicating that the market is inefficient. For India, Qatar, and Japan stock indices, the ACFs are insignificant at all lags. The results imply that there is no evidence against India, Qatar, and Japan's

Islamic stock indices being efficient. However, in South Africa, Malaysia, and Kuwait, the results are rather vague, where most of the lags order ACFs are insignificant. Plausible explanation to the findings could be due to weak regulatory policies and low maturity level of the markets (Shaker 2013).

Table 2a: Autocorrelations and Ljung-Box Q-Statistic for daily return of China, India, South Africa and Malaysia (January 2008 to December 2012)

	CHINA		INDIA		SOUTH AFRICA		MALAYSIA	
Lag	**ACF**	**Q-Stat**	**ACF**	**Q-Stat**	**ACF**	**Q-Stat**	**ACF**	**Q-Stat**
1	-0.1180	18.1780*	0.0230	0.7140	0.0530	3.3953*	0.0740	6.5022**
2	0.0350	19.7730*	0.0160	1.0288	-0.0090**	3.4864	0.0320	7.7031**
3	-0.0660	25.4340*	-0.0200	1.5623*	-0.1040**	16.5690*	0.0070	7.7689**
4	-0.0340	26.9450*	0.0410	3.7729	-0.0270***	17.4800*	0.0530	11.079**
5	-0.0260	27.7990*	0.0200	4.2920	-0.0330***	18.8370*	0.0300	12.1370**
6	-0.0280	28.7980*	-0.0510	7.7081*	-0.0690***	24.5510*	0.0160	12.1370**
7	0.0430	31.2620*	-0.0030	7.7203	0.0470***	27.2660*	-0.0180	12.8280*
8	0.0320	32.6450*	0.0160*	8.0746	-0.0490***	30.2480*	-0.0210	13.3300
9	-0.0080	32.7330*	0.0790**	16.1540**	0.0300***	31.3380*	-0.0120	13.5040
10	-0.041	34.9460*	0.1070	31.1090*	-0.0070	31.3990*	0.0220	14.0810

Note: ***, ** and * denote significant at 1% , 5% and 10% level respectively

Table 2b: Autocorrelations and Ljung-Box Q-Statistic for daily return of Kuwait, Qatar and Japan (January 2008 to December 2012)

	KUWAIT		QATAR		JAPAN	
Lag	**ACF**	**Q-Stat**	**ACF**	**Q-Stat**	**ACF**	**Q-Stat**
1	0.0670	3.3651*	0.0110	0.0465	-0.0130	0.2035
2	-0.0130	3.4934	0.0270	0.3387	-0.0070	0.2563
3	-0.0130	3.6165	0.0770	2.6617	-0.0650	5.1871
4	0.0110	3.7077	-0.0240	2.8849	0.0390	6.9124
5	-0.0980	10.945*	-0.0800	5.4014	0.0090	7.0057
6	-0.0910	17.1880***	0.0060	5.4139	0.0130	7.1940
7	-0.0460	18.7620***	-0.0490	6.3791	0.0320	8.3560
8	-0.0350	19.6760**	-0.0100	6.4154	0.0240	9.0467
9	0.0030	19.6840**	-0.0380	6.9981	-0.0010	9.0472
10	0.0090	19.7380**	-0.0610	8.4788	0.0020	9.0504

Note: ***, ** and * denote significant at 1% , 5% and 10% level respectively

The results of the Ljung Box Q-Statistics for Qatar and Japan are insignificant at all lags. This shows that past returns of Qatarian and Japanese stocks cannot be used to predict future returns. Hence, both of these markets are weak form efficient. On the other hand, Islamic stock indices for India, Malaysia and Kuwait display mixed results where the Q-statistics are significant in-betweens the lags. As explained by Gimba (2012), infrequent trading, low liquidity as well as inexperienced investors in these Islamic markets could be the causes for the inconsistent findings. Significant Q-statistics results are shown for

China and South Africa for all lags and therefore it can be concluded that these two Islamic stock indices are random walk hypothesis cannot be accepted.

4.3 Variance Ratio (VR) test results

Variance ratio test is also employed to verify the results of ACFs and Ljung Box tests. Table 3 shows the results of the variance ratio tests for lag 2, 4, 8 and 16 respectively. The rationale to display those lags is to allow comparison with previous studies that also used those lags in their researches of the conventional stock indices (Shaker, 2013; Charles and Darne, 2009 and Samaratunga, 2008). VR test statistics increases as q increases for India, and Malaysia but decreases as q increases for China, South Africa and Japan. With exception to China and Japan, all the other five countries return series are said to be positively correlated since the VR test statistics are greater than 1 (Lo and MacKinlay, 1988) suggesting persistence in the returns of these indices over the long period of time (Borges, 2010).

Table 3. Variance ratio test results

Country / Statistic	**Number q of base information aggregated to form VR**				**Joint Wald test p-value**	**Ho: is random walk Accept / Reject**
	2	**4**	**8**	**16**		
China						
VR	0.8819***	0.8247***	0.7072***	0.6422***	0.0001	Reject
Φ(q)	0.8827***	0.8269***	0.7116***	0.6505	0.0001	Reject
Φ* (q)#	0.8833	0.8286	0.7149	0.6574	0.7233	Accept
India						
VR	1.0235	1.0399	1.0710	1.1651	0.5969	Accept
Φ(q)	1.0248	1.0437	1.0800	1.1847	0.4303	Accept
Φ*(q)	1.0251	1.0448	1.0827	1.1926	0.7758	Accept
South Africa						
VR	1.0459	1.0025	0.8375***	0.7099***	0.0022	Reject
Φ(q)	1.0529*	1.0093	0.8462*	0.7217**	0.0015	Reject
Φ* (q)	1.0538	1.0117	0.8509	0.7304	0.5786	Accept
Malaysia						
VR	1.0404	1.0959*	1.1542*	1.1979	0.4915	Accept
Φ(q)	1.0484*	1.1082**	1.1702**	1.2345*	0.3436	Accept
Φ* (q)	1.0490	1.1093	1.1680	1.2346	0.6770	Accept
Kuwait						
VR	1.1152***	1.1968***	1.2669***	1.1383	0.0030	Reject
Φ(q)	1.1494***	1.2185***	1.3265***	1.1708	0.0000	Reject
Φ* (q)	1.1509***	1.2232***	1.3387***	1.1941	0.0118	Reject
Qatar						
VR	1.0354	1.3179***	1.2983**	1.2698	0.0000	Reject
Φ(q)	1.0584	1.3308***	1.3386**	1.3424	0.0000	Reject
Φ* (q)	1.0601	1.3422***	1.3611**	1.3869	0.0143	Reject
Japan						
VR	1.0071	0.9012*	0.8227**	0.7482**	0.0224	Reject
Φ(q)	1.0141	0.9103	0.8360*	0.7616*	0.0180	Reject
Φ* (q)	1.0142	0.9100	0.8402	0.7729	0.8132	Accept

Note: ***, ** and * denote significant at 1%, 5% and 10% level
Φ(q) represents standardized VR test
#Φ* (q) represents the heteroskedastic-robust standardized VR test

The insignificant standard VR test statistics for India at all lags are consistent with the VR test statistics; implying that Indian Islamic stock market is efficiency of weak form. Ambiguous results are found for the Islamic stock indices of China, South Africa, Malaysia, Qatar and Japan. For instance, for Qatarian indices, it can be observed that at q=1, the random walk hypothesis hold for both VR and standardized VR test statistics but not at q=4 and q=8. Results of VR and standardized VR test statistics for Islamic stock market for Kuwait are significant for q=2, 4 and 8 indicating that market is inefficient. A joint Wald test statistic is done for both VR test and Standardized VR tests. Conflicting results are found for Chinese, South African and Japanese Islamic stock indices for VR test and Standardized VR test. In short, market efficiency for these three Islamic stock indices cannot be reached. On the other hand, similar conclusions are evidence for India, Malaysia, Kuwait and Qatar. Based on the joint Wald tests of both statistics, it can be concluded that there is evidence that Islamic stock indices for India and Malaysia are efficient but not for Kuwait and Qatar.

4.4 Results of the Granger causality tests

Johansen multivariate cointegration test is carried out on the log price series of the seven Islamic stock indices. Results of both Trace–test statistics and Max-Eigen Statistic statistics are less than the 5% critical value at r=0 level (Table 4), implying that there is no cointegration among the seven Islamic stock indices studied. Since cointegration relationship is not detected among the Islamic stock indices, therefore this study proceed to examine the short-run dynamics among the Islamic indices using bivariate Granger causality tests as suggested by Samaratunga (2008).

Table 4. Johansen Multivariate Cointegration Test Results

H_0: No Cointegration	**Trace Statistics**	**5% Critical Value**	**Max-Eigen Statistics**	**5% Critical Value**
r = 0	77.8726	125.6150	31.6046	46.2314
r ≤ 1	46.2680	95.7537	19.2408	40.0776
r ≤ 2	27.0273	69.8189	16.5953	33.8769
r ≤ 3	10.4319	47.8561	6.2534	27.5843
r ≤ 4	4.1785	29.7971	2.2945	21.1316
r ≤ 5	1.8840	15.4947	1.6076	14.2646
r ≤ 6	0.2765	3.8414	0.2765	3.8417

Both Akaike Information Criteria (AIC) and Schwaz Information Criteria (SIC) are used to determine the optimal lag length. Table 5 presents the results of bivariate causality among the seven Islamic stock indices. Only those results with p-value of the F-statistics (that is less than 0.05) are discussed in the following section.

Table 5. Results from the Bivariate Granger Causality Approach

→ H_0: Does not Granger Cause	China	India	S. Africa	Malaysia	Kuwait	Qatar	Japan
China		5.0154 (0.0253)**	4.3207 (0.0378)**	0.0165 0.8977	0.6442 (0.4224)	6.6266 (0.0104)**	5.2954 (0.0216)**
India	2.4737 (0.1160)		1.4431 (0.2299)	0.9477 (0.3305)	0.0002 (0.9901)	7.5993 (0.0061)***	10.6176 (0.0012)***
S. Africa	3.2731 (0.0707)**	0.1851 (0.6670)		0.0844 (0.7717)	3.9677 (0.0468)**	17.2920 (0.000)***	7.4003 (0.0066)***
Malaysia	2.4432 (0.1183)	0.46644 (0.4957)	7.6282 (0.0058)***		1.4178 (0.2342)	5.5547 (0.0190)**	2.2868 (0.1308)
Kuwait	5.1944 (0.0229)**	1.7556 (0.1856)	0.1882 (0.6646)	8.7610 (0.0036)***		1.8871 (0.1704)	0.4921 (0.4832)
Qatar	4.80806 (0.00441)**	1.6396 (0.2012)	0.3228 (0.5702)	8.7610 (0.0033)***	1.3210 (0.2511)		0.0180 (0.8931)
Japan	4.4829 (0.0344)**	7.8560 (0.0058)***	2.9491 (0.0862)*	11.8728 (0.0006)***	7.0804 (0.0082)***	0.0100 (0.9200)	

Note: Significance levels are at 1%***, 5%** and 10%*

4.1.1 Granger causality relationship between Chinese Islamic indices and the other Islamic indices

It appears that there is bilateral relationship or two ways runs between China and South Africa, Japan and Qatar. The proximity among the countries could explain the bilateral relationship that existed among those countries. Unilateral relationship between China and Kuwait existed where it appears that Granger causality runs one-way from Kuwait to China. China's increasing dependence on the Gulf oil since 1993 and increase of Kuwait's investment contribute to the unilateral relationship between the two Islamic indices. Both China and India are part of newly emerging national economies comprise of Brazil, Russia, India, China and South Africa (BRICS) members and one-way relationship has found from India to China. Ironically, there is no sign of Granger causality relationship between China and Malaysia. The plausible explanation is that China is relatively new in its involvement in the Islamic capital market. It has yet to optimize its usage of the market when dealing with Malaysia.

4.1.2 Granger causality relationship between India Islamic indices and the other Islamic indices

In the case of Indian Islamic stock indices, China Granger causes India. On the other hand, India Granger causes both Japan and Qatar. However, there is no sign of short-run dynamic relationship with other countries like Kuwait, Malaysia, Japan and South Africa. Both India and Japan is classified as the newly emerging markets. Export-Import Bank of India reported that China has become the country's top import source followed by the UAE (Sedghi, 2013).

4.1.3 Granger causality relationship between South Africa Islamic indices and the other Islamic indices

South African Islamic stock indices appear to have causal relationship with China, Japan, Malaysia, Kuwait and Qatar. Specifically, bidirectional linkages exist between South Africa and Japan as well as China. Unilateral relationship happens from South Africa to Qatar and Kuwait and from Malaysia to South Africa. In recent years, China, Japan and Africa have proclaimed a new mutually beneficial economic, political, and regional alliance. Being part of the newly emerging markets (BRICS), China, South Africa and India have intensified their business relationship with each other. South Africa had also

seen an increase in Japanese investment into the country. For example Japanese global company, Toyota has already penetrated the South Africa market and grown its business in the country. In the case of Malaysia, it is South Africa's 8th largest export and import partner and South Africa remains Malaysia's most important trade partner in Africa (Zuma, 2013). As for South Africa and Qatar, they have enjoyed good relations and this relationship has strengthened over the years. Nevertheless, both India and South Africa do not Granger cause each other.

4.1.4 Granger causality relationship between Malaysia Islamic indices and the other Islamic indices

There is bidirectional relationship between Malaysia and Qatar. Both Kuwait and Japan Granger cause Malaysia. Malaysia also Granger causes South Africa. The dynamic relationship between Malaysia with Qatar and Kuwait is expected because all these Muslims countries have a long standing trade relationship and are part of the Organization of Islamic Cooperation (OIC) members. Ever since the 9/11 event, most of the Middle East countries have diverted their investment towards Asia.

4.1.5 Granger causality relationship between Kuwait Islamic indices and the other Islamic indices

Most of the Granger causality relationship between Kuwait Islamic indices and the other Islamic indices are unilateral. One-way causality appears from Kuwait to China and Malaysia. This is not unexpected because in recent years, the country has started to look East and increase its investments in these two countries. It seems that South Africa Islamic indices Granger causes Kuwait Islamic indices. Proximity between the two countries has boosted trade relationship between these two countries. South Africa is one of Kuwait's biggest import trading partner and agricultural products made up the main import component.

4.1.6 Granger causality relationship between Qatar Islamic indices and the other Islamic Indices

It can be observed that Islamic stock indices from Japan, India and South Africa Granger cause Qatar, while there is no causality relationship with Kuwait and vice versa . Bidirectional relationship existed between Qatar and two countries from Asia, that is, Malaysia and China. Even though traditionally most of Qatar's investments are in developed countries, it has now started to invest in Asia. In the first seven months of 2012, bilateral trade between Malaysia and Qatar has increased significantly to USD1.15 billion and has become the third largest trading partner for Qatar. Qatar is one of the most important China's economic partners and it is reported that China's trade with Qatar has increased to USD5 billion in 2011 due to the sales of liquefied natural gas (Mahmud, 2012).

4.1.7 Granger causality relationship between Japan Islamic indices and the other Islamic indices

It appeared that Japan Islamic stock indices Granger cause Malaysia and Qatar. Unidirectional relationship exists from South Africa to Japan, while there appears to be bidirectional linkages with India and China. The bilateral trade agreement via Comprehensive Economic Partnership Agreement (CEPA) has helped strengthen the economic ties between India and Japan. In addition, Qatar is also the main trading partner for Japan. Trade relationship between Japan and Malaysia has gone back a long time and the Malaysia-Japan Partnership Agreement (MJEPA) that was implemented on July 2006 has further intensified the trade relationship between the two countries. Apparently, there is no causality relationship between Japan and Kuwait.

5. Conclusion, Discussion and Implications of the Study

This paper attempts to investigate whether the Islamic stock indices are weak form efficiency and determine the bivariate granger causality relationship between the indices. Seven Islamic stock market indices of China, India, South Africa, Malaysia, Kuwait, Qatar, and Japan are used to achieve the objective of the study. Autocorrelation Function (ACF) test and Variance Ratio (VR) test are used to attain the first objective. Table 6 summarizes the results of the tests performed. Ayadi and Pyun (1994) and Lo and MacKinlay (1988) have indicated that the variance ratio tests to be a more powerful test than other form tests.

Table 6. Summary of test results

Statistical Tests	China	India	South Africa	Malaysia	Kuwait	Qatar	Japan
ACF & Ljung-Box	No	No	No	No	No	Yes	Yes
Variance Ratio Tests	No	Yes	No	Yes	No	No	No
Standardized Variance Ratio Tests	Yes	Yes	Yes	Yes	No	No	Yes

Empirical findings revealed that Islamic stock indices of Malaysia and India to be weak form efficient while in the case of Qatar and Kuwait there is evidence against the efficiency of these two Islamic stock indices. However, no concrete conclusion can be drawn from market efficiency for China, India and Japan. It is not surprising to discover incongruent results among these Islamic indices since these Islamic financial markets are still at its growth stage. In comparison to the conventional stock markets, Islamic stock markets in those countries inherently have different market structure development due to different shari-ah compliant screening process criteria being practiced, lack of accepted operational standards, unresolved regulatory issues and weak regulatory environment (Majid and Kassim, 2010). For instance, the development and level of maturity for the Chinese, Indian and Japanese Islamic stock markets are still far behind those of its Islamic counterparts. In addition, investors and portfolio managers trading in Islamic stock markets are confronted with different product characteristics. As mentioned earlier, stocks that make up the Islamic indices of the respective countries are strictly monitored and screened by appointed Shari'ah Advisory Council to ensure that the only stocks of shari'ah compliant companies are considered in the indices. Failure to adhere to those principles will result in the company of a particular stock to be excluded from Islamic indices component. Constant changes in the component of Islamic indices due to shari'ah non-compliant criteria could possibly results in low liquidity and infrequent trading that could lead to Islamic stock markets to be weak form inefficient.

The second objective of this study is to examine whether the existence of causality influences among those Islamic stock indices by using the bivariate Granger Causality test. Results from Johansen cointegration test indicates that the seven Islamic stock indices are not integrated in the long run but only in short run period. This implies, in the short run, investors and portfolio managers should avoid investing and developing portfolio in these stock indices to minimize their risks and maximize their returns. On the other hand, since these stock indices are not integrated in the long term, therefore market participants can gain by spreading their investments in these Islamic stock indices. Table 7 presents the summarized results of the causality relationship. Generally, the results indicate that the short-run dynamics relationship existed among most of these Islamic stock indices.

Table 7. Summary of Bivariate Granger causality test of the Islamic stock indices

	Granger Causality Relationship		
Country	**Bidirectional**	**Unilateral From Other Countries**	**Unilateral To Other Countries**
China	Qatar, South Africa	Kuwait	India
India	-	China	Japan, Qatar
S. Africa	China, Japan	Malaysia	Qatar, Kuwait
Malaysia	Qatar	Kuwait, Japan	South Africa
Kuwait	-	-	China, Malaysia
Qatar	Malaysia, China	Japan, South Africa, India	-
Japan	China, India	South Africa	Malaysia, Qatar

In addition, empirical results from this study show that the Japan Islamic stock indices Granger cause almost all of the Islamic stock indices. There are also Granger causality influences from non-Islamic countries like China, Japan and South Africa with Islamic countries like Malaysia, Qatar and Kuwait. This implies that these Islamic stock indices are slowly being integrated into the global Islamic financial systems, as there is a growing interest among international investors to include Islamic financial products in their portfolio (Guyot, 2011). As reported in the Islamic Financial Services Industry (IFSI) Stability Report 2014, the growth of the Islamic capital market has seen the launching of Islamic equity indices not only at country level but has expanded to regional as well as global level.

Table 8 displays the timeline of the introduction of Islamic indices at global level. Currently, 70 countries have introduced country-level indices and this includes non-Islamic countries of China, Japan, Hong Kong, US, UK and South Africa that have shown interest in venturing into the rapidly growing Islamic capital market (IFSI Stability Report, 2014). Those indices provide a benchmark for market players to track the performance of Shari'ah compliant financial products. Introduction of these indices create opportunity for interested market players to invest in varieties of risk/return stock portfolio exposures and hence, long-run interdependence among stock markets. In October 2012, the IFIS Stability Report also documented that a growth in the Islamic funds' asset, out of which 53% of funds are allocated to the Islamic equities (Figure 1). This could reflect a sign of rising investor confidence in Shari'ah-compliant stock indices.

Table 8: Timeline introduction of Islamic Indices

Year	**Introduction of Islamic Indices**
1999	Dow Jones Islamic Indices (Country, Global, Regional, Blue Chip and Strategy/Thematic Indices)
2006	FTSE Global Islamic Indices and S & P Shariah Indices(Country, Global, Regional, Market Cap and Industry/Sector Indices)
2007	MSCI Islamic Indices (Developed Market, Emerging Market, Frontier Market and Regional Indices)
2013	Russell-Ideal Ratings Islamic Indices(Global, Regional, Market Cap and Industry/ Sector Indices

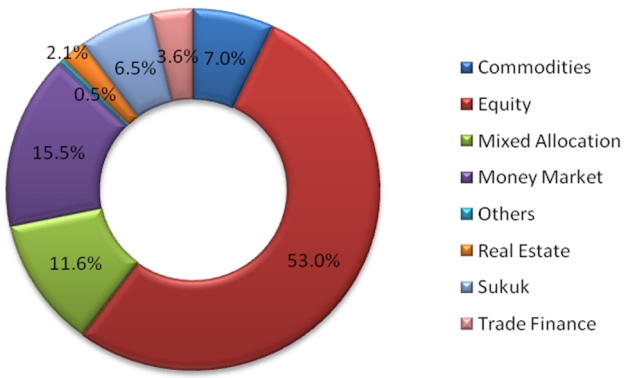

Fig. 1. Islamic Fund Assets by Asset Class as at October 2012 (IFSI Report, 2013)

Several implications are inferred from the empirical evidences obtained from this study. For investors, weak-form inefficient Islamic stock markets do not suggest that short-term profits can be obtained but also huge losses can also be realized. In addition, inefficient Islamic stock markets also reflect the inability of the markets to offer efficient allocated and fairly priced equity capital that is fundamental to the national and regional development of Islamic financial institution (Worthington and Higgs, 2004). For the regulatory bodies and policy makers of the respective countries, there is a need to accelerate the infrastructure development of the Islamic financial industry in an attempt to achieve efficiency of Islamic stock markets. Increase efficiency in the Islamic financial market can amplify market integration and hence improved liquidity, trading and increase economic activities among countries and enhance the confidence of market players who are interested in the Islamic financial products (Majid and Kassim, 2010).

Furthermore, long-run market integration can be achieved through concerted efforts among countries of the Islamic stock markets to harmonize accepted standardize operation and to address legal, regulatory and operational issues related to Islamic financial markets. Such efforts could enhance the confident of global investors especially those who have been familiar with the conventional financial products.

Opportunity for future research on market efficiency of the Islamic stock indices could be made to observe the changes in the market efficiency of the Islamic stock indices once harmonization of legal and regulatory framework is attained and include other Islamic stock indices. In addition, researchers could also investigate and test the market efficiency of the Islamic stock indices at semi-strong form. Different statistical techniques such as vector autoregressive regression and impulse response function could also be considered in the future study. Last but not least, it should be highlighted that in lieu of the scarcity of previous literatures related to the market efficiency and co-integration of Islamic indices, this study faced limitation to compare and conclude if the empirical findings obtained are similar or dissimilar to previous studies.

Acknowledgements

The author would like to thank Amirah Aqilah and Nur Atikah for their invaluable assistant in collecting data and making this paper to materialize.

References

Abdmoulah, W. (2010). Testing the evolving efficiency of Arab stock markets, *International Review of Financial Analysis, 19*(20), 25–34.

Alam, M. I., Hasan, T. & Kadapakam, P. R. (1999). An application of variance ratio test to five Asian stock markets. *Review of Pacific Basin Financial Markets and Policies, 2*(3), 301-315.

Alden, C. & Hirano, K. (2003). *Japan and South Africa in a globalizing world: A distant mirror*. Ashgate Publishing Limited.

Ayadi, O. F., & Pyun, C. S. (1994). An application of variance ratio test to the Korean Securities market. *Journal of Banking and Finance, 18*(1),643-658.

Campbell, J. Y., Lo, A. W. & MacKinlay, A. C. (1997). *The Econometrics of Financial Markets*. New Jersey: Princeton University Press.

Charles, A. & O. Darne (2009). Variance-ratio tests of random walk: An overview, Journal *of Economic Surveys, 23*(3), 503–527.

Cootner, P. (1962). Stock prices: random vs. systematic changes. *Industrial Management Review, 3*, 24-45.

Dicle, M. F., & Levendis, J. (2011). Greek market efficiency and its international integration. *Journal of International Financial Markets, Institutions and Money, 21*(2), 229-246.

Fama, E. (1965). The behavior of stock market prices. *Journal of Business, 38*(34),105-114.

Fama, E. & French, K. (1988). Permanent and temporary components of stock prices. *Journal of Political Economy, 96*, 246-273.

Fawson, C. T., Glover, F., Fang, W. & Chang, T. (1996). The weak form efficiency of the Taiwan share market. *Applied Economics Letters, 3*, 663-667.

Granger, C. W. J. (1986). Developments in the study of co integrated economic variables, *Oxford Bulletin of Economics and Statistics, 48*, 213-128.

Gimba, V. K. (2012). Testing the weak-form efficiency market hypothesis: Evidence from Nigerian stock markets. *CBN Journal of Applied Statistics, 3*(1): 117-136.

Girard, E. C. & Hassan, M. K. (2008). Is there a cost to faith-based investing: Evidence from FTSE Islamic indices? *Journal of Investing, 17*(4),112-121.

Guyot, A. (2011). Efficiency and dynamics of Islamic investment: Evidence of geopolitical effects on Dow Jones Islamic Market Indexes. *Emerging Markets Finance and Trade, 47*(6): 24-45.

Islamic Financial Services Industry Stability Report (2013).

Jarret, J. E., & Kyper, E. (2005). Daily variation, capital market efficiency and predicting stock market returns. *Management Research News, 28*(8),34 – 47.

Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control,12*, 231-54.

Kendall, M. G. (1943). *The advanced theory of statistics.*Volume.1, London: Griffin Press.

Kim, H. (2010). Dynamic causal linkages between the US stock market and the stock markets of the East Asian economies, *CESIS Working Paper* No. 236.

Lo, A. W. & MacKinlay, A. C. (1988). Stock market prices do not follow random walks: Evidence from a simple specification test. *Review of Financial Studies, 1*, 41-66.

Mahmud, D. (2012). Business Opportunities In Qatar , Malaysia External Trade Development Corporation, Retrieved from http://www.matrade.gov.my/en/aboutmatrade/media/speeches/speeches-2012/2434-business-opportunities-in-qatar-25September-2012.

Majid, M. S. A & Kassim, S. H. (2010). Potential diversification benefits across Global Islamic equity markets. *Journal of Economic Cooperation and Development, 31*(4),103-126

Menezes, R. (2013). Globalization and granger causality in international stock markets. *International Journal of Latest Trends Finance & Economic Science, 3*(1),413-421.

Osborne, M. F. M. (1962). Periodic structure in the Brownian motion of stock prices. *Operation Research,10*, 345-380.

Poterba, J. M. & Summers, L.H. (1988). Mean reversion in stock prices: Evidence and implications. *Journal of Financial Economics, 22*(1), 27-59.

Raghbendra, J. & Nagarajan, H. K. (2000) The structure and price efficiency of an emerging market. *International Journal of Commerce and Management, 10*(2), 50-59.

Samaratunga, D. (2008). Stock market efficiency and integration: A study of eight Economies in the Asia Pacific region, *Staff Studies, 38*(1-2), 95-117.

Sedghi, A. (2013). India's Trade: Full list of export, import and partner countries, The Guardian. Retrieved from http://www.theguardian.com/news/datablog/2013/feb/22/cameron-india-trade exports-imports-partners.

Shaker, A. T. M. (2013). Testing the weak-form efficiency of the Finnish and Swedish stock market. *European Journal of Business and Social Sciences, 2*(9), 176-185.

Simpson, J. & J. Evans. (2004). Interdependence and causality in Gulf Cooperating Stock Markets, *University of Wollongong in Dubai Working Paper Series.*

Worthington, A. & Higgs, H. (2004). Random walks and market efficiency in European equity markets. *Global Journal of Finance and Economics, 1*(1), 59-78.

Zuma, J., (2013). Address by His Excellency President Jacob Zuma at the official opening of the South Africa Malaysia Business Forum, Kuala Lumpur, Malaysia. Retrieved from http://www.thepresidency.gov.za/pebble.asp.