EFFICIENCY AND MEMORY DEPENDENCE OF SHARIAH EQUITY MARKETS

Dr. Sania Ashraf¹ & Dr. Hazem Marashdeh²

Abstract

The present study attempts to examine the presence of informational efficiency and memory dependence of Malaysia and Gulf Cooperation Council (GCC) Shariah Equity markets using daily stock returns for the period of 01st January 2009 to 31st June 2017. The study employs both traditional and advanced approaches of finding out the informational efficiency and fractional co-integration of the Shariah equity markets. From the results of efficiency it was observed that Shariah equity market of Malaysia was highly efficient and GCC Shariah equity markets lacked efficiency in terms of its past information prevailed in the market. The results of integration test clearly indicated that there was short and long memory dependence in the returns of GCC Shariah indices. Hence it can be concluded that Malaysia Shariah equity market was efficient and GCC Equity Shariah markets were not informationally efficient but fractionally co-integrated during the study period.

Keywords: Random Walk Hypothesis; BDS test; Long memory; Fractional co-integration;

JEL Classification: G10, G14, G15

1. INTRODUCTION

The uniqueness of risk bearing capacity Islamic stock market and its products were documented only after the financial crisis of 2008. As the framework totally disallows any debt or obligation based financing strategies and raises equity or value financing which helped the market to withstand amid the crisis of 2008. As Islamic system doesn’t open itself to the utilization of any speculative products it could avert the invasion of the unsafe impact of pointless meltdowns and emergencies.

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The global finance Islamic market has grown at 23% CAGR to over 1.2 trillion and is expected to reach USD 2.6 trillion by the end of 2017 and is practiced by more than 75 countries across the globe. The most significant key players remain in the Malaysia as well as GCC countries in the banking, equity and sukuk market. United Arab Emirates tops the list among GCC second to Malaysia in countries practicing Shariah complaint products. Hence the study attempts to trace out the informational efficiency and fractional co-integration of Malaysia and GCC Shariah equity markets.

A market is rational when the price of the products are efficient and information’s circulated are equivalent and not controlled by any market player. In the event of distortions or data's not being disseminated similarly, would acquire an open door for a few speculators to take the benefit of the market. Such situation makes the market vulnerable to inefficiency and helps the irrational investors to earn abnormal profit at the cost of another investors. So a continuous look out for practices which will get irregular benefits will be the principal thing a speculator maybe would do. Therefore, discovering the condition of market and the open doors it offers has turned out to be a standout amongst the most fascinating topics of research.

The efficiency of stock market was much debated and ample number of studies have explored across the globe to identify the behavior and patterns of the market. The search started with Bachelier’s (1900) revolutionary work on random behavior of stock prices followed by Fama (1970) innovation on Efficient Market Hypothesis which lead to the theory of Fractal Market Hypothesis of Mandelbrot’s (1971) projecting new dimension of market study diverting from the application of EMH. Finally Lo’s (2004) study on the market based on vertical time scales named Adaptive Market Hypothesis. In any case, an ethical market ought to have proficiency in the data accessible to the investors and any adjustment in data must be instantly thought about the stock price generally will welcome inconsistency in the price and in the market.

It may be noted that studies pertaining to efficiency were in plenty whereas, integrating researches of Fama’s Efficient Market Hypothesis (EMH), Mandelbrot’s Fractal Market Hypothesis (FMH) and Lo’s Adaptive Market Hypothesis (AMH) to study price behavior in the stock market were negligible. It was witnessed from the researches available on Shariah indices that none of the studies conducted so far focused on market efficiency and fractional co- integration of Shariah indices in the Malaysian and GCC region. However, it has been noticed that some studies have investigated the market efficiency of Shariah market in other countries. A thorough and in depth study if done could help the market to draw attention of the investors, making it more vibrant and attractive for those who believe in ethical and socially viable investments across the globe. Although most of the earlier studies focused on examining the efficiency under efficient market hypothesis, very few applied fractal market hypothesis to test the fractional co-integration of stock returns which was postulated by Mandelbrot (1971).
The evaluation of FMH on conventional index have evidenced that there can be a chance of receiving an abnormal profit at least for a short run, if the investors are in a position to evaluate the market in terms of linear dependency. In fact, in the area of fractal market hypothesis there is absolutely no study that has been attempted on Malaysia and GCC Shariah equity markets.

In this backdrop, the main objective of this current research is to study the market efficiency and memory dependence of FTSE Bursa Malaysia Emas Shariah index and GCC Shariah indices in order to fill the gap that exists in the literatures. Also, assisting policy makers of Shariah to take appropriate policy directions for curbing out the inefficiency if any, of the market to a possible extent so that it donot violate the principles of Shariah.

The remainder of the paper proceeds as follows. Section 2 presents a brief overview of the theoretical background and previous research. Section 3 presents the model specification and methodology. The nature and the source of the data and the results of the econometric work are explained in section 4. Section 5 concludes the article.

2. PREVIOUS RESEARCH

In Modern financial literature, Fama’s (1970) theory on Market Efficiency is treated as foundation of all capital market studies and most of the studies focused on proving the informational efficiency of the market across the globe. Researchers focused on exploring the market efficiency and some studies highlighted on the dependence of current returns of stock prices on its past, thus exposing the possibility of predictability of the market which were contrary to Fama’s theory of efficient market hypothesis. When Shariah markets across the globe proved its uniqueness of averting the impact of crisis and downfalls and caught the attention of many investors, theory of market efficiency can be incorporated to analyze the characteristics of the market. If the market is found efficient, then it incorporates the principles of Shariah, otherwise violates and attracts abnormal profit which is prohibited by Islamic law.

A critical review on earlier studies revealed that the first market behavior study was the pioneering work of Bachelier (1900) exploring on the discounted returns of past, present & future of US stock market in his doctoral research work. Kendall (1953) evaluated on the behavior of the stock and commodity prices. He concluded that price changes were ‘random’. Roberts (1959) questioned the systematic patterns in US stock prices. These theories were not given serious look till Fama introduced his concept of market efficiency and introduced the theory of EMH by segregating the behavior of the market on the basis of Weak Form, Semi-Strong Form and Strong Form Efficiency. Though EMH contradicted both technical analysis and fundamental analysis, it was always treated as one of the strongest founding theories in Finance.
It was witnessed from the earlier studies that although studies tested the anomalies of efficient market hypothesis no one could completely corner EMH and its validity except by presenting some evidences of anomalies. If the market is inefficient, then the question of what describes the market situation existed until Mandelbrot (1971) discovered the theory of fractal market hypothesis (FMH). The author clarified that no market can be titled as instructively effective as fractals were discovered wherever in nature and workmanship thus likewise in the share trading system which can never be separated from the characteristic framework. Additionally, there will be a presence of long memory in the present returns mirroring the pattern of past returns in the market.

Peter (1994) analyzed the steadiness of the market and found out that existence of investors from different time horizon will ensure the stability of the market. Rogers (1997) explained that exchanging procedures in view of historical prices may end up being deliberately gainful and accessible to the data available to the investors may not be reflected in the market cost, rather the market drift shows the progressions in expected profit. Tan et al. (2010) evaluated the stock prices of Malaysian market during bull and bear period during 1985 to 2009 and found out that the market was fractionally co integrated during both the periods which enabled the investors to predict the market. A recent study on EMH was by Titan (2015) concluded theoretically that it is not easy to prove efficiency under Fama’s EMH as the changes in the market and macro-economic factors. Also, new models should be developed to identify the pattern of stock market returns which accommodates such changes which will reflect the efficiency of the market.

The study gets its attention if the Shariah market is found to be inefficient and has memory of the past information, as the principles donot allow any abnormal returns also it violates Shariah law. This necessitates appropriate steps on the part of regulators to bring the market to the state where there will not be any scope for such unethical behavior. Studies never focused on the type of market behavior and memory dependence of Shariah index in Malaysia and GCC market. Hence, exploring the application of efficient market hypothesis and fractal market hypothesis in the area of Shariah equity markets would help investors to understand the characteristics and informational efficiency which will enable them to take ethical decisions about their securities.

Majority of the studies on Shariah equity market were focused on proving its outperformance during the financial crisis of 2008. Some of the studies that focused on volatility transmission was by Hussein and Omran (2005). The authors made a comprehensive study on Dow Jones Islamic index for the period 1993 to 2003 and found out that during bear period the index outperformed the market and it was reversed during the bull period when compared to the conventional index.
Rahim et al. (2009) explored spread of information and correlation between Islamic stock indices of Kuala Lumpur Shariah and Jakarta Islamic Index during the period 2000 to 2006 using Vector Autoregressive model. The study concluded that the two markets were highly correlated which opened a venue for the investors to diversify the portfolio in each of the markets. Kou (2009) examined the transformative trends evolving geo financial landscape in South East Asia and concluded that new opportunities will bring in more scope to Islamic financial industry after the huge impact of subprime crisis in the economy.

Ahmed (2010) linked the crisis and its severity on the economy and justified the applicability of Islamic financial system to reduce the severity as the system prohibits speculative and gambling activities. Karim et al. (2010) examined the integration of Islamic stock market and subprime crisis during the period 2006 to 2008 of US, Japan, Indonesia, Malaysia and UK, using Johansen co-integration test and found out that the subprime crisis did not affect the Islamic markets of these countries. Abikan (2012) confirms the investment feasibility of Islamic index against conventional during the meltdowns. Hussin et al. (2012) analyzed the linkage between Malaysian Islamic stock market and macro-economic variables during the period from 1999 to 2007. The study concluded that there was a huge positive co integration between the Islamic stock market and macro-economic variables like Industrial production, money supply consumer price index and Islamic interbank rate.

Hussin et al. (2013) examined the dynamic integration of Islamic stock market of Malaysia and oil and gold prices along with macro-economic variables during the period 2007 to 2011. The study concluded that oil price had short run and long run impact on Shariah market of Malaysia. Ashraf & Deo (2013) proved that GCC Shariah markets were predictable and inefficient and necessary policy measures need to be corrected as it will be against Islamic law. Jawadi et al. (2014) observed the performance of Dow Jones Islamic Index from 2000 to 2011 using the Capital Asset Pricing Model. The study found out that before the financial crisis, the conventional market outperformed and during crisis the returns were high for Islamic funds.

In a more recent study by Andrianto and Adrian (2016) explored the efficiency of Indonesia conventional and Islamic stock returns by collecting the daily returns of LQ 45, Jakarta Islamic Index and Kompas 100 index during 2013 and 2014. The study used run test and serial correlation test to detect the efficiency in the return of the market. The study concluded that there is a perfect Random Walk Hypothesis and the market is efficient during the study period. The efficiency will not allow any irrational investor to earn abnormal profit by evaluating the past returns of Indonesia market.
Majority of the studies conducted earlier explored the volatility aspect of Shariah equity markets across the globe and reported it’s out performance, but very less studies focused on the behavior and market characteristics of Shariah index. Among them, market efficiency or informational efficiency of capital market which is a debated topic in conventional market, was less touched area in the field of Shariah market that adds to the literature.

3. MODEL SPECIFICATION AND METHODOLOGY

For the purpose of tracing out the Weak Form Efficiency of FTSE Bursa Malaysia Emas Shariah and GCC Shariah returns, the study used Augmented Dickey Fuller (1984) test to identify the auto correlation in the series and BDS test (1996) to identify the linearity in the Shariah equity markets. The study also considers traditional and modern test to detect fractional co-integration of the market. Lo’s (1991) modified rescaled range analysis & Hurst’s (1951) Hurst Exponent were considered as traditional method of identifying the short range dependence. Also the Semi-Parametric test of GPH by Geweke Porter Hudak (1983) method is considered as advanced econometric tools to trace out long memory dependence in the market.

3.1. Traditional Test for Weak Form Efficiency

The study employs Augmented Dickey Fuller test (ADF) to ascertain the stationarity property of the return series. The null hypothesis of a unit root is rejected in favor of the stationarity of the return series in each case if the test statistic is more negative than the critical value. The model specification was as follows;

\[ \Delta y_t = \alpha_0 + \delta y_{t-1} + \alpha_1 t + \sum \beta_i \Delta y_{t-1} + \varepsilon_t \]  

(1)

where \( \varepsilon_t \) is a pure white noise error term, \( t \) is the trend, \( \alpha_0 \) is an intercept (constant term), \( \delta, \alpha_1 \) & \( \beta_i \) are coefficients. The appropriate lag may be set based on Akaike Information Criterion (AIC), Schwartz Information Criterion (SIC) or Hannan Quinn Criterion.

3.2. Advanced Test for Weak Form Efficiency

The non-linear serial dependence in time series is captured through BDS test and it employs the concept of spatial correlation from chaos. The Brock-Dechert-Scheinkman-Le Baron (BDS) statistic is a non-parametric test to test the null hypothesis that a uni- variate time series \( \{x_t, t=1…n\} \) is independently and identically distributed against an unspecified alternative (Brock et al. 1996). If the returns shows that there is linearity in the market then it violates the principles of Shariah as any dependence will invite abnormal returns and the market will not be efficient. If it is found inefficient, appropriate steps need to be taken at the earliest, because such presence violates the principles laid down by Islamic guidelines indirectly.
BDS test is a two-tailed test, the null hypothesis would get rejected if the BDS test statistic is greater than the critical values (e.g. if \( \alpha = 0.05 \), the critical value = \( \pm 1.96 \)).

The specification is as follow;

\[
\text{BDS}_{n,m} = \frac{\sqrt{N[C_{z,m} - (C_{z})^{m}]} }{ \sqrt{V_{z,m} } } \tag{2}
\]

3.3. Traditional Tests for Fractal Market Hypothesis

As per fractal market hypothesis, if a market has long memory it means that there is high auto-correlation function which decays hyperbolically and dies out eventually. Any presence of memory dependence invalidates EMH proposition in the market and will invite inefficiency and abnormal returns to the investors. The study uses traditional model of Lo’s (1991), which is the Modified Rescaled Range Analysis and Hurst Exponent proposed by Hurst (1951). Though the model R/S statistics captures the long memory dependence, later on, was proved to have bias when (a) the series contains short memory (b) the series is characterized by heterogeneity (c) the series is non-stationary. Hence Lo (1991) modified the version of R/S statistics and named as Lo’s Modified Rescaled Range Analysis. The specification is as follows:

\[
Q_n = \frac{1}{\sigma_n(q)} \left[ \max_{1 \leq k \leq n} \sum_{t=1}^{k} (r(t) - r_n) - \min_{1 \leq k \leq n} \sum_{t=1}^{k} (r(t) - r_n) \right] \tag{3}
\]

where \( \sigma_n^2(q) = \sigma_x^2 + 2 \sum_{j=1}^{q} \omega_j(q) \gamma_j \), \( \omega_j(q) = 1 - \frac{j}{q+1} \) and \( q < n \). The value of \( q = \lceil k_n \rceil \) where \( \lceil k_n \rceil = \left( \frac{3n}{2} \right)^{1/3} \left( \frac{2r}{1-r^2} \right)^{2/3} \) where \( \lceil k_n \rceil \) indicates the greatest integer less than or equal to \( k_n \) & \( r \) is the sample first order autocorrelation co-efficient of the data. The short memory of the return will be captured through rescaled range analysis and long memory through Hurst Exponent (1951) which is a non-parametric approach. Peters (1994) suggested that financial markets have a fractal structure, when markets are stable, returns calculated over different time scales i.e. daily, weekly and monthly exhibit the same auto covariance structure. For instance, if daily returns exhibit positive temporal dependence so do weekly, monthly returns and this is termed as self-affinity. The Hurst Exponent model can be expressed as:

\[
H = \frac{\log R}{\log N} - \frac{1}{3} \tag{4}
\]

The independence index value of the return series lies between \( 0.5 < H < 1 \) indicating that (a) a value of \( H = 0.5 \) indicates a complete uncorrelated series (b) \( 0.5 < H < 1 \) implies a persistent time series which can be called a s Long memory process in the
return series \((c)\) \(0 < H < 0.50\) indicates that the time series would be anti-persistent which implies that there will be a frequent mean reverting process.

### 3.4. Advanced Tests for Fractal Market Hypothesis

To detect the long memory property in the returns of Shariah equity market, the study applies the Semi-Parametric method of GPH propounded by Geweke Porter Hudak (1983). According to GPH method, given the periodogram \(I_{\lambda_s}\) of variable \(Y_t\), \(\xi\) can be estimated by the following regression:

\[
\ln(I(\lambda_s)) = c - \xi \ln(4 \sin^2(\lambda_s)) + \epsilon_s
\]  

### 4. DATA AND EMPIRICAL RESULTS

In order to identify the efficiency and fractional co-integration the study uses daily Shariah equity returns of FTSE Bursa Malaysia Emas Shariah, Kuwait, Oman, Qatar, Bahrain, Kingdom of Saudi Arabia (KSA) and United Arab Emiraties for the period of 01st January 2009 to 31st June 2017 retrieved from Bloomberg. This section discuss the empirical results retrieved through various methodologies mentioned in the study.

Table 1 exhibits the results of the descriptive statistics of all the series. It can be inferred from the descriptive statistic results that the returns of FTSE Bursa Malaysia Emas Shariah and Kuwait were negatively skewed and positive skewness for the returns of Bahrain, Oman, KSA, Qatar and UAE with a leptokurtic distribution. The results of Jacque Bera statistics showed that the returns were not normally distributed for all the indices under study.

<table>
<thead>
<tr>
<th>Statistics</th>
<th>FTSE Bursa Emas Shariah</th>
<th>Bahrain</th>
<th>KSA</th>
<th>Kuwait</th>
<th>Oman</th>
<th>Qatar</th>
<th>UAE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>8.025</td>
<td>3.761</td>
<td>5.031</td>
<td>4.185</td>
<td>4.368</td>
<td>5.077</td>
<td>3.418</td>
</tr>
<tr>
<td>Median</td>
<td>8.053</td>
<td>3.717</td>
<td>5.0116</td>
<td>4.230</td>
<td>4.352</td>
<td>5.032</td>
<td>3.349</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>0.223</td>
<td>0.246</td>
<td>0.186</td>
<td>0.218</td>
<td>0.100</td>
<td>0.234</td>
<td>0.361</td>
</tr>
<tr>
<td>Skewness</td>
<td>-1.019</td>
<td>0.638</td>
<td>0.130</td>
<td>-0.412</td>
<td>0.026</td>
<td>0.334</td>
<td>0.1360</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>3.811</td>
<td>2.672</td>
<td>3.343</td>
<td>2.403</td>
<td>2.143</td>
<td>2.338</td>
<td>1.7115</td>
</tr>
<tr>
<td>Jarque-Bera</td>
<td>268.81*</td>
<td>182.82*</td>
<td>22.35*</td>
<td>117.87*</td>
<td>76.00*</td>
<td>100.81*</td>
<td>208.23*</td>
</tr>
</tbody>
</table>

* significance at 1%, level

The results of serial correlation test is presented in Table 2. The study employed Augment Dickey Fuller test to identify the auto correlation in the return series of Malaysian and GCC Shariah equity markets. It can be inferred that the returns of FTSE Bursa Emas Shariah had unit root and hence it is not serially correlated. Thus, concluding that the returns of Malaysia are efficient in weak form of EMH and investors were not able earn
any abnormal profit from the past returns. From the results of ADF test it can be observed that GCC Shariah equity market lacked informational efficiency at 1% significance level and is not efficient under weak form of Fama's Efficient Market Hypothesis. Thus based on the results of ADF test, inference can be drawn in the line that the that there was no randomness in return series of GCC Shariah equity markets hence, do not follow Random Walk Hypothesis of EMH.

**Table 2 - Results of Serial Correlation Test**

<table>
<thead>
<tr>
<th></th>
<th>FTSE Bursa Emas</th>
<th>Bahrain</th>
<th>KSA</th>
<th>Kuwait</th>
<th>Oman</th>
<th>Qatar</th>
<th>UAE</th>
</tr>
</thead>
<tbody>
<tr>
<td>p value</td>
<td>0.175</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.001</td>
<td>0.000</td>
<td>0.000</td>
</tr>
</tbody>
</table>

From the results presented in the table and the significant Z- values clearly direct the conclusion that there is no presence of linearity in the series of FTSE Bursa Emas Shariah as the BDS statistics is more than ±1.96 and not significant at any level of confidence. Hence the market is efficient under efficient market hypothesis. When observed the results of t- statistics and p- value of GCC Shariah index it showed that there was linearity at 1percent significance level in the market which rejects the identically distributed (IID) feature of efficiency. Thus, it can be concluded that GCC Shariah market was inefficient under BDS test during the study whereas Malaysian Shariah equity market was efficient. Hence, there is no requirement to check the short and long memory dependence of FTSE Bursa Malaysia Emas Shariah as the market is efficient and follows Random Walk Hypothesis.

**Table 3- Results of BDS Test for linearity and independence**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>BDS Statistic</th>
<th>FTSE</th>
<th>Bahrain</th>
<th>KSA</th>
<th>Kuwait</th>
<th>Oman</th>
<th>Qatar</th>
<th>UAE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimension</td>
<td>2</td>
<td>0.05</td>
<td>116.33</td>
<td>33.05</td>
<td>48.6</td>
<td>0.14</td>
<td>94.0</td>
<td>0.09</td>
</tr>
<tr>
<td>Dimension</td>
<td>3</td>
<td>0.10</td>
<td>37.77</td>
<td>0.25</td>
<td>102.54</td>
<td>0.17</td>
<td>118.73</td>
<td>0.17</td>
</tr>
<tr>
<td>Dimension</td>
<td>4</td>
<td>0.13</td>
<td>43.55</td>
<td>0.32</td>
<td>111.13</td>
<td>0.23</td>
<td>134.46</td>
<td>0.23</td>
</tr>
<tr>
<td>Dimension</td>
<td>5</td>
<td>0.16</td>
<td>49.78</td>
<td>0.37</td>
<td>122.79</td>
<td>0.27</td>
<td>152.21</td>
<td>0.26</td>
</tr>
<tr>
<td>Dimension</td>
<td>6</td>
<td>0.17</td>
<td>56.64</td>
<td>0.40</td>
<td>138.37</td>
<td>0.30</td>
<td>173.93</td>
<td>0.28</td>
</tr>
</tbody>
</table>

* shows significance at 1% level.

The Table 4 reports the results of rescaled range analysis with 11 days lag along with the results of HE with a time scales i.e. daily, weekly and monthly returns. The results of modified rescaled range analysis shows that there is a short dependence in the market during the study period. From the results of HE it can be observed that the daily return of GCC Shariah equity return are highly memory dependent whereas weekly and monthly return are less dependent and fractionally co-integrated. Hence there is presence of self-affinity in the GCC Shariah equity market during the study period.
It can be witnessed that returns of Bahrain and Kuwait showed a lesser dependence on its past returns when compared to Oman, Qatar, KSA and UAE. Also with regard to the weekly results Kuwait and Oman showed a lesser dependence when compared to other indices of GCC Shariah. When analyzing the monthly returns, Kuwait showed less dependency when compared to all other GCC Shariah indices.

Table 4 - Results of Hurst Exponent of GCC Shariah Equity Indices

<table>
<thead>
<tr>
<th>Indices</th>
<th>Rescaled Range Analysis log(rs)</th>
<th>Hurst Exponent - Daily</th>
<th>Hurst Exponent - Weekly</th>
<th>Hurst Exponent - Monthly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bahrain</td>
<td>1.986</td>
<td>0.998</td>
<td>1.01</td>
<td>0.97</td>
</tr>
<tr>
<td>Kuwait</td>
<td>1.539</td>
<td>0.997</td>
<td>0.67</td>
<td>0.55</td>
</tr>
<tr>
<td>Oman</td>
<td>1.500</td>
<td>1.042</td>
<td>0.65</td>
<td>0.61</td>
</tr>
<tr>
<td>Qatar</td>
<td>1.528</td>
<td>1.030</td>
<td>0.89</td>
<td>0.67</td>
</tr>
<tr>
<td>KSA</td>
<td>1.818</td>
<td>1.042</td>
<td>0.86</td>
<td>0.76</td>
</tr>
<tr>
<td>UAE</td>
<td>1.815</td>
<td>1.015</td>
<td>0.99</td>
<td>0.91</td>
</tr>
</tbody>
</table>

The long memory dependence of GCC Shariah index was observed by employing a semi parametric test i.e. Geweke Porter Hudak method with a chosen periodogram bandwidth range of \( T \) were \( T^{0.5}, T^{0.6} \). Table 5 depicts the results of Geweke Porter Hudak Test of GCC Shariah Index. It can be observed from the above table that the values for \( d \) in all the cases were not equal to zero and all were significant at 1% level. Thus it can be concluded that the returns of GCC Shariah index that it was fractionally integrated. In the past, the investors might have earned abnormal profit and taken advantage of the presence of long memory in the return series.

Table 5 - Results of Geweke Porter Hudak Test

<table>
<thead>
<tr>
<th>Indices</th>
<th>Degree of Integration ((m=10))</th>
<th>( t )-statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bahrain</td>
<td>0.617</td>
<td>10.33*</td>
</tr>
<tr>
<td></td>
<td>((0.059))</td>
<td></td>
</tr>
<tr>
<td>Kuwait</td>
<td>0.598</td>
<td>9.18**</td>
</tr>
<tr>
<td></td>
<td>((0.065))</td>
<td></td>
</tr>
<tr>
<td>Oman</td>
<td>0.95</td>
<td>3.11**</td>
</tr>
<tr>
<td></td>
<td>((0.034))</td>
<td></td>
</tr>
<tr>
<td>Qatar</td>
<td>0.852</td>
<td>12.11*</td>
</tr>
<tr>
<td></td>
<td>((0.077))</td>
<td></td>
</tr>
<tr>
<td>KSA</td>
<td>0.829</td>
<td>11.66*</td>
</tr>
<tr>
<td></td>
<td>((0.071))</td>
<td></td>
</tr>
<tr>
<td>UAE</td>
<td>0.729</td>
<td>9.833*</td>
</tr>
<tr>
<td></td>
<td>((0.075))</td>
<td></td>
</tr>
</tbody>
</table>

* shows significance at 5% level.
5. CONCLUSION

To the best of our knowledge, this study delivers the first time empirical evidence of informational efficiency and fractal co-integration theory from Malaysia and GCC Shariah Equity markets perspective. The indices include the daily returns of FTSE Bursa Malaysia Emas Shariah, Bahrain, Kuwait, Oman, Qatar, KSA and UAE Shariah equity markets. The study employed traditional as well as advanced tools for the both efficiency test and memory dependence test. From the results of Augmented Dickey Fuller test and Brock-Dechert-Scheinkman-Le Baron tests it can be observed that the Malaysia Shariah equity market is informationally efficient under weak form of EMH whereas, GCC Shariah Equity markets is informationally inefficient under efficient market hypothesis. The H value retrieved for GCC Shariah index showed that the value exceeded 0.5. The results of GPH test also supports the results retrieved from Hurst exponent. Hence it can be concluded that there was long and short memory in the returns of GCC Shariah indices during the study period.

During the study period, it was found that patterns in the returns of GCC Shariah equity market was predictable when tested using fractional co-integration and efficiency test. Hence can be inferred that the investors would have earned abnormal profits in the past by reviewing the trend and price movements of the market. As the result indicates the market lacks informational efficiency, necessary policy measures needs to be taken at earliest. This irregularity in the market violates the principles of Shariah guidelines of prohibition on abnormal returns. Keeping in mind the end goal to upgrade efficiency, policy experts and Shariah board needs to take fitting measures to enhance productivity by making the market more straightforward and data stream quicker. Asymmetric information will not allow ethical and rational investors for a rapid decision making as the prices reflected will not be appropriate. Subsequently, information transparency is very important for GCC Shariah market, as it can create a fair and a reasonable price in accordance with the real condition of the company’s stock issuance. In order to comply with the guidelines of Shariah principles, appropriate measures needs to be taken to correct the informational inefficiency to avoid any abnormal returns in the market. This conclusion adds value to the existing literatures on Shariah market and its efficiency.

Notes

Indices of Malaysia and GCC countries are FTSE Bursa Malaysia Emas Shariah (Malaysia), SPShHBH (Bahrain), SPShHKW (Kuwait), SPShOM (Oman), SPShSQQA (Qatar), SPShSA (Kingdom of Saudi Arabia), SPShAEE (United Arab Emirates).
Efficiency and Memory Dependence of Shariah Equity Markets

REFERENCES


