

Research Article

Examining the Validity of the Weak and Semi-Strong Market Efficiencies at the Global Islamic Stock Markets: Evidence Linear and Nonlinear Unit Root Tests and Bootstrap Causality Approach

Küresel İslami Borsalarda Zayıf ve Yarı-Güçlü Piyasa Etkinliklerinin Geçerliliğinin Araştırılması: Doğrusal ve Doğrusal Olmayan Birim Kök Testleri ve Bootstrap Nedensellik Yaklaşımı ile Kanıtlar

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Abstract

The objective of this paper is to test whether the validity of the weak and semi-strong form of efficient market hypothesis in selected Islamic stock markets using new econometric methods in the literature. To this end, the weak-form is examined employing linear and nonlinear unit root tests while the semi-strong form is examined employing bootstrap causality test. The unit root tests revealed that the weak form is supported for most of the Islamic stocks, indicating that stock prices fully reflect all historical information. The bootstrap causality results indicate that the semi-strong form holds in the three stock markets, namely, FTSEBMI, KATLM, and the ACWI. The overall results suggest that the investor has not a chance to make an abnormal profit in Islamic stock markets. Enhancing the efficiency of the stock markets would have a significant effect on capital allocation, equity price predictability and international portfolio diversification. Therefore, the performance of financial markets is affected by the validity of efficient market hypothesis and such kind of policies should be implemented.

Keywords: *Efficient Market Hypothesis, Linear and Nonlinear Unit Root Tests, Bootstrap Causality Approach, Global Islamic Stock Markets*

JEL Codes: *C12, C23, D53, E44, G14*

Öz

Bu çalışmanın amacı, literatürde yer alan yeni ekonometrik yöntemler kullanılarak seçilmiş İslami endekslerde etkin piyasa hipotezinin zayıf ve yarı-güçlü formlarının geçerli olup olmadığını test etmektir. Bu amaçla, zayıf form etkinliği doğrusal ve doğrusal olmayan birim kök testleri kullanılarak, yarı-güçlü form etkinliği ise bootstrap nedensellik testi kullanılarak

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incelenmiştir. Birim kök testleri, zayıf form etkinliğinin İslami endekslerin çoğu için desteklendiğini ve hisse senedi fiyatlarının tüm tarihsel bilgileri tam olarak yansıttığını göstermiştir. Bootstrap nedensellik sonuçları, yarı güçlü formun FTSEBMI, KATLM ve ACWI olmak üzere üç borsada geçerli olduğunu göstermiştir. Genel olarak sonuçlar yatırımcının İslami borsalarda normalüstü kar elde etme şansının olmadığını göstermektedir. Borsaların etkinliklerinin artırılması sermaye tahsisi, hisse senedi fiyat öngörülebilirliği ve uluslararası portföy çeşitlendirilmesi üzerinde önemli bir etkiye sahip olacaktır. Dolayısıyla, finansal piyasaların performansı etkin piyasa hipotezinin geçerliliğinden etkilendiği ve bu yönde politikaların geliştirilmesi gerektiği düşünülmektedir.

Anahtar Kelimeler: *Etkin Piyasa Hipotezi, Doğrusal ve Doğrusal Olmayan Birim Kök Testleri, Bootstrap Nedensellik Testi, Küresel İslami Borsalar*

JEL Kodları: *C12, C23, D53, E44, G14*

1. Introduction

The stock market plays an important role in the functioning of the economy by providing a trading platform for buyers and sellers and mobilization of financial resources. It is one of the most dynamic sectors which helps the development of the industry and commerce of the country. While the firms with a funding need turn towards stock markets to obtain long run funds they need, the investors turn towards the stock market to earn more or investing (Gemici and Polat, 2018: 139). As a result of globalization and technological advancements, it is possible for the financial funds to circuit around the world's markets easily and cheap thanks to the increase in the integration levels of the financial markets. However, the performance of the financial markets largely depends on market efficiency. Therefore, the efficiency of buying and selling of shares and to allocate the capital through appropriate pricing are closely related to the efficiency of the markets. The efficient markets enable the reliability of the market to increase for the investors and can also support the development of economic activities. Conversely, the less information efficiency in a financial market causes easier manipulations on the prices of the securities, the market becomes distant from the reliable economy, the unfair profits become between the investors (Ozmen, 1997: 1). Accordingly, testing the efficiency of the market is an important topic for economies especially emerging markets.

Rational investors or buyers try to estimate the value of the firm before purchasing a financial asset or making an investment. Therefore, it is important for the investors to previous prices of the financial assets and to obtain information that can affect the future price of the relevant financial assets. The way for the investors to obtain this kind of information fast and with the lowest cost possible can be held through the validity of the efficient market hypothesis (Bodie et al., 2009: 345). The efficient market hypothesis (EMH), was introduced by Fama in 1970, is a hypothesis important for explaining the price movements on the financial assets and investor behaviors in the finance literature. According to this hypothesis; when new information is disseminated in the market, the financial assets will react fast and accurately. The EMH states that a market cannot be outperformed because all available information is already built into all stock prices (Bouchaud et al., 2009). The prices within an efficient market follow a random process and the current information related to the prices is reflected in the participants of the market completely (Fama, 1970: 383). In an efficient market, the prices for the financial assets cannot be estimated through technical analysis. Hence, the investors can't make a profit by arbitraging in an efficient market and to earn abnormally through basic and technical analysis.

According to Fama, in a 1970 paper, information efficiency in a financial market is studied through three groups: weak-form efficiency, semi-strong efficiency and strong efficiency. When the financial assets follow prices appropriate for the random walk hypothesis (RWH), the weak-form efficiency is valid. Therefore, weak-form efficiency is related to testing the RWH. According to the RWH, the prices of the financial assets in a market take their form random and independent of the information from the previous periods, thus the price movements are also independent of the price movements of another period statistically (Kiyilar, 1997: 17). Depending on this efficiency, current prices of the financial assets reflect all kinds of information involved

historical prices of the financial market, rates of return and trading volumes. The markets were the weak-form efficiency where any of the investors cannot earn more than the ones following a simple purchase and sale strategy through information related to previous prices. Semi-strong form efficiency is the markets where not only previous information indicated in the weak-form related to the financial assets but also all kind of public information reflects the financial assets (Atakan, 2008: 99). The abovementioned information, which is declared to the public, is related to the balance sheets and income tables of the firms, information related to capital increases, political and economic announcements. Therefore; when the information related to the financial assets is explained in the market, semi-strong market efficiency is valid if there is a fast change in parallel with the explained information (Reilly, 1989: 215). In this case, the investors cannot be more advantageous through the basic or technical analysis of the public information, and thus they cannot earn abnormally than the normal investors. The strong efficiency suggests that the prices for financial assets reflect all kinds of public and non-public information. In other words, if it is not possible to estimate the prices and earn abnormally through the private information provided by a few investors or people from inside in addition to all kind of public information including the new announcement of dividends, annual revenues of firms, share splits and the previous price data, it is accepted that this market is efficient in a strong form (Fama, 1970: 388; Miah and Banik, 2013: 220). Therefore, it is not possible for the ones to learn from inside to earn abnormally and providing information from inside is not an advantage. However, since obtaining non-public information is difficult, it is also difficult to test the strong efficient market.

Islamic stock markets have involved national and international stocks of firms only operating in compliance with the Sharia laws (Ocel and Kaban, 2019: 378). Islamic stock markets aim to enable Muslim investors to make a profit without interest and benefit from invest. In Turkey and many other countries, the Islamic stock markets have experienced phenomenal rapid growth in the last three decades. The practices of Islamic finance are increasingly in both the number of market participants and capitalization because it is more acceptable to pious Muslims (Tunali and Pekcoskun, 2019: 1594). Nowadays, Islamic stock markets allure capital from around the world and it continues to develop in the financial sector day by day currently. Therefore, it is necessary to focus on Islamic finance and Islamic stock markets, which will have a great impact on economic and social development in emerging markets. However, since the information asymmetry and speculations do not correspond with the Islamic principles, the transactions within the stock markets are not considered as permissible. For this reason, the investors and firms bound to the Islamic rules stay away from the stock markets. This case causes the mattress funds not to be brought into the economy and makes those funds to remain inactive. Accordingly, it is very important to find out if the EMH is supported by the Islamic market, as the Islamic market has proved itself as a decent alternative for the conventional market (Jawadi et al., 2015). From this point, this paper aims to explore whether prices from the previous periods and public information are efficient for the prices of the equity shares traded in the Islamic stock markets, (2) to test whether the weak and semi-strong market efficiencies are valid for those indexes within the scope of the EMH, and (3) to make policy suggestions related to them. Since Islamic stock markets attract investors from the international markets, they create added value for their national economies, and they dominate the world's economies; the Islamic indexes which are active globally were preferred for the study. It can be said that this is the first research that investigates the validity of weak-form and semi-strong form market efficiencies in global Islamic stock markets by using current econometric methods. Therefore, this study is important in terms of this study provides evidence on the validity of the EMH in the global Islamic stock markets. It is expected that this research contributes to the existing literature on the weak-form and semi-strong efficiencies of the global Islamic stock markets for investors and company managers.

Information about the EMH and the degree of market efficiency is presented in Section 1. The remainder of this paper is organized as follows. A brief review of studies of the available empirical literature on the subject is provided in Section 2. Section 3 indicates the data, research design and methodology. Section 4 presents the research findings. Conclusion, policy recommendations and directions for future studies are provided in Section 5.

2. Literature Review

The EMH has attracted the attention of many researchers for the last several decades and not yet on consensus. Hence, the EMH, an issue discussed for a long time, has been empirically analysed with econometric techniques in the finance literature. Despite the rising relevance in Islamic finance, few works explore the validity of weak-form and semi-strong form efficiencies of Islamic stock markets in the finance literature. Even the few studies carried out the validity of both weak and semi-strong form efficiencies in Islamic stock markets. Thus, this paper attempts to supplement the literature by providing new evidence from Islamic markets and fills a gap in the finance literature by determining whether the validity weak-form and semi-strong form evaluating comprehensive unit root tests and causality analysis approach applied to global Islamic stock markets.

Some of the studies on the validity of the weak-form market efficiency and their results are summarized below.

Obaidullah (2001) focused to determine the degree of efficiency of the Dow Jones Islamic Market. Results provided evidence for Dow Jones Islamic Market as a weak-form of the EMH. The author also concluded that the Islamic index reveals a high level of efficiency but also increased volatility. Hassan (2004) emphasized market inefficiency for the DJIM and volatility of the DJIM index by employing unit root test, serial correlation, variance ratio, and the GARCH model from 1996 to 2000. Further, the results revealed that Islamic equity of the DJIM is more efficient than the conventional stock markets. The author affirmed that Islamic stock markets consistent with weak-form efficiency. Hoque et al. (2007) explored weak-form efficiency in eight Asian countries and found that the crisis did not have any significant impact on the degree of efficiency in Asian emerging stock markets; hence, the inefficiency persisted even after the Asian financial crisis. Girard and Hassan (2008) tested the market efficiency and integration of Islamic equity of FTSE Islamic and conventional stock markets employing data from 1999 to 2006. Results provided evidence for both stock markets weak-form efficiency but integrated. Munir and Mansur (2009) studied the weak-form of stock markets in the Malaysian stock market for the period 1980 to 2008 employing two regime threshold autoregressive model and autoregressive unit root tests. Their study indicated that the Malaysian stock market contains a unit root; hence it is consistent with the weak-form. Hamid et al. (2010) focused the RWH in the Asian Pacific market including the Malaysian market utilizing monthly returns from January 2004 to December 2009. They applied the unit root tests, parametric and non-parametric tests. They found that all the stock markets did not follow the random process and weak-form efficiency. Guyot (2011) provided evidence that the global Islamic Dow Jones Islamic Market has higher informational efficiency than their counterparties. Guidi and Gupta (2011) emphasized the weak-form of some of the Asian markets including the Malaysian Composite Index for the period 2000 to 2011. The author applied the unit root test, parametric and non-parametric tests. The findings rejected weak-form for all the stock markets. Rizvi et al. (2014) examined the weak-form of global stock markets and their Islamic counterparts and they concluded that conventional countries' stock markets are more efficient in comparison to Islamic stock markets. Employing different unit root tests, Savasan et al. (2015) tested whether the effect of shocks on the participation index is permanent. The results suggest evidence that such an effect is permanent. Jamaani and Roca (2015) analysed the weak-form in the gulf area market from 2003 to 2013. The unit root test, parametric, non-parametric test, and Johansen co-integration test were employed in their study. Their results provided evidence that the stock markets of the gulf area are valid in the weak-form. Jawadi et al. (2015) studied the weak-form in Saudi Arabia and Kuwait stock market by using unit root tests. They found that the Dow Jones Islamic World and Dow Jones Islamic World Emerging stock market is inefficient, while the Dow Jones Islamic World Developed stock market is efficient. Setianto and Manap (2015) explored the weak-form in the Jakarta Islamic stock market by focusing on the random process from 1995 to 2013 based on the monthly stock price indexes. Employing structural breaks and nonlinear ESTAR type unit root tests, the results stated that the Jakarta Islamic stock market consistent with weak-form. Lean et al. (2015) emphasized the Dow Jones Islamic Market Index and Dow Jones Industrial Average by analysing whether the market is

efficient. They used the unit root tests and heteroscedasticity and found the evidence of weak-form of EMH for both stock markets. Using the different econometric tests, Al-Khazali et al. (2016) empirically explored the weak-form and random process from 1997 to 2012. The findings revealed that three conventional indices are efficient, but that none of the Islamic indices are efficient in these markets. They implied that Islamic stock markets were less efficient than non-Islamic stock markets. Kabbani (2016) investigated the weak-form of stock markets in the FTSE Bursa Malaysia including EMAS Shariah and HIJRA Shariah from 2007 to 2014. They concluded that both stock markets are not valid in the weak-form and the prices did not follow random walks. Ben Rejeb and Arfaoui (2017) analysed the weak-form in 10 global Islamic stock markets. They applied the unit root test with a structural break for the period 1996 to 2016. The study concluded that global Islamic stock markets contain a random process and the weak-form is supported. Fusthane and Kapingura (2017) emphasized the weak-form in 4 global Islamic stock markets from 2005 to 2016. They applied some tests which include unit root, autocorrelation, and variance ratio. All the tests except for a few instances provided against weak-form efficiency and did not follow the random process. Sakarya et al. (2018) investigated the efficiency of the Participation-50 index using a time-varying unit root test. Their results indicate that the Participation-50 index is consistent with the weak-form. Using multifractal detrended fluctuation analysis, Ali et al. (2018) tested 12 Islamic and conventional stock market counterparts. They concluded that the developed markets are relatively more efficient. Rehman et al. (2018) analysed whether equity prices follow a random process by using unit root tests, runs tests for Islamic stock markets. Their findings affirm that the stock prices of the KSE 100 Index, S&P BSE 500 Index, and CSE All Share Index do not contain a random process and the weak-form in these stock markets is not supported. Ben Rejeb and Arfaoui (2019) examined whether global Islamic stock markets precede conventional stock markets, in terms of informational efficiency. Their results revealed that Islamic stock markets are more efficient than conventional stock markets.

Some of the studies on the validity of the semi-strong market efficiency and their results are summarized below.

Hakim and Rashidian (2004) investigated the relationship between Dow Jones Islamic Market Index Wilshire 5000 index using cointegration and causality analysis from 1999 to 2002. They concluded that the Dow Jones Islamic Market Index was not correlated with the Wilshire 5000 index. Simpson and Evans (2004) found that Bahrain Granger causes Oman while Saudi Arabian markets and Bahrain Islamic stock markets Granger cause each other. Therefore, they suggested that both stock markets are not consistent with the semi-strong form. Girard and Hassan (2008) revealed that both FTSE Islamic and conventional stock markets are not only integrated but also efficient from the year 1999 to December 2006. Albaity and Ahmad (2008) studied the semi-strong form validity for the Malaysian market composite index and the Shariah index employing the causality test and Johanson co-integration. Their findings revealed the presence of short-long term relationships between both stock markets. Hence, the results indicate that both stock markets are consistent with the semi-strong form of EMH. Beik and Wardhana (2011) focused on Indonesia's Islamic stock market. They tested the relationship between the Jakarta Islamic Index and other Islamic and conventional stock markets in Malaysia and the United States. Employing the VAR model, they concluded that there was no cointegration between the Jakarta Islamic Index and other stock markets during the subprime crisis. Ardiansyah and Qoyum (2011) investigated the semi-strong form of EMH for the Jakarta Islamic stock market. Results suggested that the Jakarta Islamic market is inefficient at the semi-strong form level. El Khamlichi et al. (2014) emphasized whether Islamic stock markets are more efficient than conventional stock markets. For this purpose, they evaluated the EMH for 8 global Islamic stock markets using the variance ratio test. Their study revealed that both Islamic and conventional market has the same level of inefficiency. Also, the results suggested that the Islamic stock markets of Dow Jones and S&P exhibit no cointegration. Employing the stochastic dominance approach, Al-Khazali et al. (2014) tested the performance of the DJIMI with the performance of the DJ conventional index. They found that Islamic stock markets outperformed better than conventional stock markets only in crisis times, while conventional stock markets outperformed better than Islamic stock markets in all other times. Nurrachmi (2018) analysed the movement of Islamic stock indices in selected

countries. The study revealed that there is evidence of cointegration among the Islamic stock markets hence investors can earn portfolio diversification benefits across these countries.

3. Data and Methodology

This section determines the sources of our data and presents the econometric analysis to examine the validity of weak-form and semi-strong form of EMH. Dow Jones Islamic Market, FTSE Shariah China Index, FTSE Bursa Malaysia Index, FTSE NASDAQ Qatar 10 Index, S&P Global BMI Shariah Index, Jakarta IDX Composite, Katılım 30, MSCI ACWI Islamic Index and Saudi Arabia Tadawul Index were used as the selected Islamic stock markets. Weekly data of the January 2011-June 2019 period are used in this study that investigates EMH in the Islamic stock markets. The data were obtained from the investing.com database. All of the stock markets were employed in the analyses by taking their natural logarithm. The Islamic stock markets were selected based on the studies of Obaidullah (2001), Guyot (2011), Arouri et al. (2013), El Khamlichi et al. (2014), Jawadi et al. (2015), Sarili and Yildirtan (2016), Nurrachmi (2018).

The stock markets, data periods, abbreviations and the number of observations of the stocks of the selected global Islamic markets were reported in Table 1.

Table 1: Description of Islamic stock markets

Stock Markets	Abbreviations	Period Covered	Observation
Dow Jones Islamic Market	DJIM	02/01/2011-30/06/2019	444
FTSE Shariah China Index	FTSESCI	02/01/2011-30/06/2019	444
FTSE Bursa Malaysia Index	FTSBMI	02/01/2011-30/06/2019	444
FTSE NASDAQ Qatar 10 Index	FTSEQAT	02/01/2011-30/06/2019	444
S&P Global BMI Shariah Index	S&P	02/01/2011-30/06/2019	444
Jakarta IDX Composite	JKSE	02/01/2011-30/06/2019	444
Katılım 30	KATLM	02/01/2011-30/06/2019	444
MSCI ACWI Islamic Index	ACWI	02/01/2011-30/06/2019	444
Saudi Arabia Tadawul Index	TASI	02/01/2011-30/06/2019	444

Source: investing.com

Before the unit root analysis, linearity tests were performed to determine the characteristics of the series. For this purpose, Harvey and Leybourne (2007) (henceforth called the HL) and Harvey et al. (2008) linearity tests, widely used in the finance literature, were applied to investigate whether the stock market series are linear. Kwiatkowski et al. (1992) (henceforth called the KPSS) and Phillips-Perron (1988) (henceforth called the PP) and Zivot and Andrews (1992) (henceforth called the ZA) and Lee and Strazicich (2013) (henceforth called the LS) unit root tests with one break were applied for the linear series while Kapetanios et al. (2003) and Kruse (2011), a newly developed version of Kapetanios et al. (2003) unit root tests were applied for nonlinear series. To test the existence of the causality relationship between the series of Islamic stock markets, in other words, the causality test developed by Hacker and Hatemi-J (2006) (henceforth called the HJ) was used to explore the semi-strong market efficiency of the index series. In the study of HJ (2006), since using the bootstrap simulation techniques to obtain critical values in the bootstrap Granger causality test can cause to obtain more certain critical values and therefore decrease the potential deviations, this method was used in this analysis. HL (2007), Harvey et al. (2008) linearity test, Kapetanios et al. (2003) and Kruse (2011) tests were performed by using R for windows. The standard unit root tests were applied by using Eviews 10.0; the unit root tests with the breaks and HJ (2006) bootstrap causality test were applied by using Gauss 10.0. In the following parts of the research, the abbreviations of the Islamic stock markets in Table 2 will be used.

The financial series cannot be linear due to the reasons caused by the characteristics of the series. For example, the reasons for the non-linearity in the stock exchange indexes can be the existence

of the heterogeneous players, different evaluations of the market players on the new information in the market and deficiencies in the market (Yilanci, 2013: 2). The recent studies reveal the effects of being non-linear in the time series econometrics (Guris and Yasgul, 2015: 2552). Therefore, before carrying out unit root analysis on the financial series, the linearity of the series should be analysed through the linearity tests. In this study, they were analysed through the linearity tests developed by HL (2007) and Harvey et al. (2008). The reason to prefer those tests is that they are thought to be suitable for the economic structure since they are based on the transitive model structure and they are stronger than the previous tests (Guris et al., 2016: 134).

4. Analysis and Empirical Findings

The descriptive statistics related to the index series and time series were presented here. Then, to study the validity of the weak market activities of the index series first HL (2007) and Harvey et al. (2008) linearity tests, then classic unit root tests considering single breaks for the linear index series and finally ESTAR-type unit root tests were applied for the index series which are not linear, and they were provided with their results. In the other econometric analysis of the study, the validity of the semi-strong market activities of the index series was studied. For this, the bootstrap causality test was applied for the determination of the existence of the causality between the Islamic indexes and it was presented with its results.

The observations are weekly closing prices of stock markets for 9 global Islamic market indices. The weekly returns of the stock markets are calculated by the formula $R_t = \ln(P_t/P_{t-1})$. Here, by taking their natural log, P_t and P_{t-1} denote the closing to closing market price at time t and market price movement at time $t-1$, respectively. Descriptive statistics for the stock markets in the 2011-2019 sampling period are presented in Table 2.

Table 2: Descriptive Statistics of the Stock Markets

Stock Markets	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jar-Ber
ACWI	57.92336	57.93500	77.54000	39.12000	9.410323	0.109557	2.090740	2.866353*
DJIM	2,647.268	2,875.250	4,041.260	1,496.050	763.6845	-0.016148	1.585847	37.01611*
FTSEQAT	5,910.542	5,800.855	7,817.460	4,285.880	770.7066	0.456453	2.186150	59.54476*
FTSEBMI	13,273.32	13,725.67	15,348.04	9,556.020	1,331.095	-0.892646	2.822880	59.54476*
FTSESCI	2,548.071	2,875.250	4,041.260	1,496.050	763.6845	-0.016148	1.585847	37.01611*
JKSE	4,980.979	4,925.775	6,660.620	3,379.540	829.6839	0.128315	2.048701	17.96031*
KATLM	76,717.39	75,544.19	113,510.9	47,345.09	17,224.18	0.248735	2.096546	19.67855*
S&P	1,524.556	1,516.570	2,007.560	1,039.580	238.8701	0.211978	2.181916	15.70651*
TASI	7,618.300	7,247.440	11,068.83	5,325.270	1,182.561	0.709690	2.866353	37.60128*

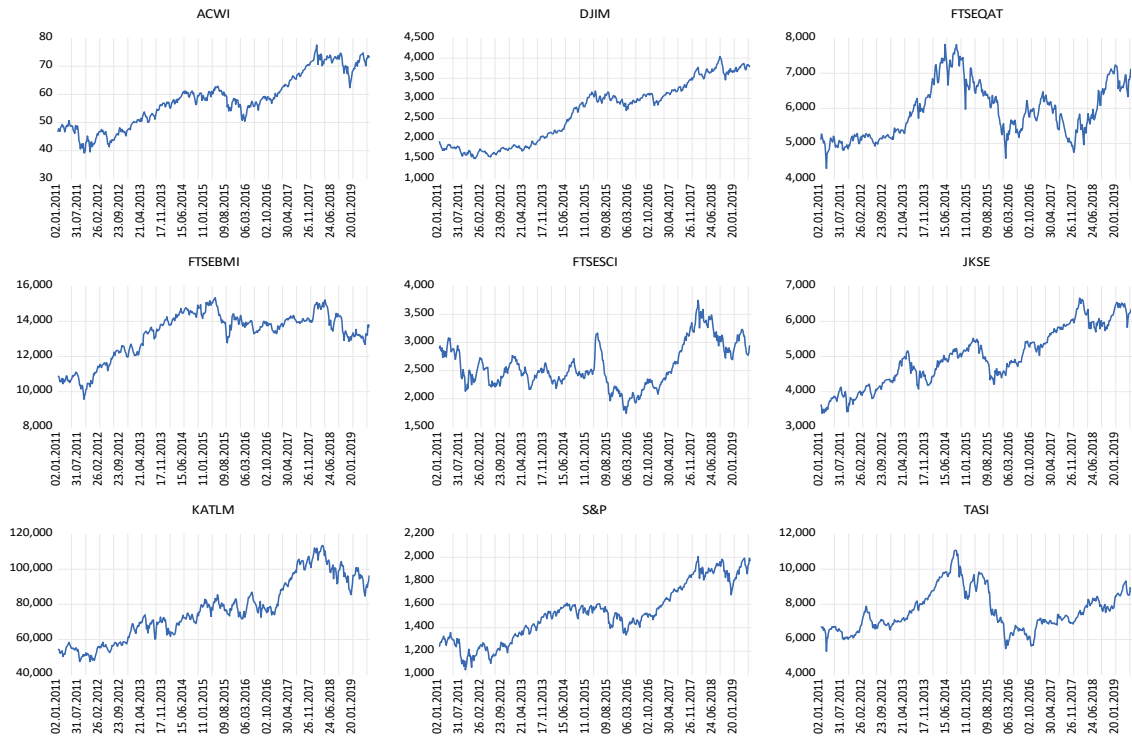
Source: Research data.

Note: * $p < 0.01$. * denotes that the series are non-normality distribution test of Jarque-Bera.

In Table 2, the descriptive statistics of the stock markets discussed in this study were illustrated. Based on the descriptive statistics, stock return averaged for ACWI, DJIM, FTSEQAT, FTSEBMI, JKSE, KATLM, S&P, and TASI, which are calculated as 57.923, 2,647.268, 5,910.542, 13,273.32, 2,548.071, 4,980.979, 76,717.39, 1,524.556, 7,618.300 with standard deviation of 9.41, 763.68, 770.7, 1,331.095, 763.68, 829.68, 17,224.18, 238.87, and 1,182.56 respectively. Table 3 suggests that the maximum value of the stock markets is KATLM and the minimum value of them is the ACWI. Furthermore, the maximum standard deviation of the stock markets is KATLM and the minimum standard deviation of them is the ACWI. Furthermore, it is understood that the maximum market for volatility is KATLM's stock market. Besides, the negative and near-zero Skewness values and high Kurtosis coefficients indicate the existence of the typical financial characteristics of the series for the variances. According to the Jarque-Bera which has a normal distribution for its null hypothesis, it was concluded that the series does not distribute normally when the contingent values are considered. The skewness and kurtosis statistics also confirm the same.

The following section indicates the evolution of global Islamic stock markets used for this attempt.

Figure 1: Evolution of stock markets from 02/01/2011 to 30/06/2019



Source: Research data

Figure 1 illustrates the plots of stock markets over time in movements for the 9 Islamic stock markets. It can be observed that the progress of the stock markets, which monotonically display a mixture of upward and downward sloping trends in terms of the existence of possible structural regimes. It can be also observed that there were some structural changes in all of the series involved in the analysis. It is seen that from the movements in prices that all indices experienced negative growth. It is affirmed that these structural changes reflect the impact of the 2008 global financial crisis, corresponding to the post mortgage crisis.

The linearity of the stock market series is determined in the first stage. In place of the series are tested as linear or non-linear, determining the linearities with a linearity test is more convenient approach (Zeren and Konuk, 2013: 65). In this regard, the experimental results of HL (2007) and Harvey et al. (2008) in Table 3 are shown.

Table 3: HL (2007) and Harvey et al. (2008) Linearity Tests

Stock Markets	W_{λ}	$W^{*10\%}$	$W^{*5\%}$	$W^{*1\%}$	Results
ACWI	0.717	4.020	4.097	4.238	Linear
DJIM	0.679	2.328	2.415	2.578	Linear
FTSEQAT	7.781**	4.216	4.226	4.245	Nonlinear
FTSEBMI	33.441***	26.502	26.686	27.016	Nonlinear
FTSESCI	1.740	4.172	4.196	4.241	Linear
JKSE	2.197	2.480	2.504	2.546	Linear
KATLM	4.077	3.062	3.092	3.146	Linear
S&P	1.402	6.165	6.265	6.447	Linear
TASI	38.242***	34.141	34.176	34.237	Nonlinear

Notes: The W_λ statistic follows the χ^2_2 distribution and the relevant critical values are 9.21 (1%), 5.99 (5%) and 4.60 (10%). The W^* statistic follows the χ^2_2 distribution and the relevant critical values are 13.27 (1%), 9.48 (5%) and 7.77 (10%). The estimations were carried out utilizing a program code written in GAUSS that was developed by Harvey et al. (2008). *** and ** indicate the rejection of the null of linearity at the 1% and 5% significance levels, respectively. The order of lags for the computation of the test was chosen according to the SIC

Source: Research data (R for Windows).

Table 3 reports the results of both the W^* linearity test statistics of HL (2007) and the W_λ linearity test statistic of Harvey et al. (2008). Regarding the stock market series, FTSEBMI and TASI W_λ and W^* statistics reject the null of linearity significance level at the 1% significance level, but the W_λ statistic rejects the null of linearity at any reasonable significance level for FTSEQAT while W^* statistics are unable to reject the null of linearity at any reasonable significance level for FTSEQAT. Because the Kruse (2011) method is the most suitable since it has higher power than the HL (2007) test, the FTSEQAT is accepted nonlinear structure. Both tests are unable to reject the null of linearity at any reasonable significance level for ACWI, DJIM, FTSESCI, JKSE, KATLM, and S&P. The test results suggest that 3 of 9 stock markets series have a nonlinear structure, namely, FTSEBMI, FTSEQAT, and the TASI. Based on the linearity results, we perform nonlinear unit root tests for the FTSEBMI, FTSEQAT, and TASI that exhibit nonlinearities. The hypothesis of linearity is, hence, rejected in 3 cases of 9 selected the Islamic stock markets. Therefore, the linear unit root tests (PP, KPSS, ZA, and LS) will be employed for ACWI, DJIM, FTSESCI, JKSE, KATLM, and the S&P indices and the nonlinear unit root tests will be employed for FTSEBMI, FTSEQAT, and the TASI stock markets. According to the results, to study the validity of the weak-form for the FTSEBMI, FTSEQAT and TASI stock markets, using non-linear unit root tests instead of the linear unit root tests can provide more reliable results.

Table 4 presents the results of the PP and KPSS unit root tests with intercept, ZA (1992) and LS (2013) one break unit root tests for the stock market series. In these tests, in case of stock returns are not stationary, they may follow weak-form market efficiency.

Table 4: Results of the Unit Root Tests

	ACWI	DJIM	FTSESCI	JKSE	KATLM	S&P
<i>Unit root tests without structural break</i>						
PP (1988)	-0.836652	-0.147008	-2.060518	-1.336626	-1.315858	-0.760998
KPSS (1992)	2.322307	2.548826	0.797248	2.358169	2.460105	2.262867
<i>Unit root tests with one structural break</i>						
ZA (1992)	-4.318	-4.377	-4.030	-4.593	-4.244	-4.318
LS (2013)	-3.202	-1.659	-2.226	-3.789	-3.232	-3.352

Source: Research data (Eviews 10.0 and Gauss 10.0)

Notes: Both unit root tests denote intercept model results. The optimal length lag is based on the SIC. KPSS and PP tests are determined automatically by Newey and West (1987) Band with using Bartlett Kernal Spectral estimation method. The asymptotic critical values of PP statistic for intercept; -3.444 (1%), -2.867 (5%), -2.57 (10%), the asymptotic critical values of KPSS statistic for intercept; 0.739 (1%), 0.463 (5%), 0.347 (10%), the critical values for ZA (1992); -5.34 (1%), -4.80 (5%), -4.58 (10%), The critical values for LS (2013); -4.239 (1%), -3.566 (5%), -3.211 (10%).

According to the PP and KPSS unit root tests, all stock markets have a unit root, in other words, they are found to be level nonstationary for all stock markets. The results indicate that the weak-form efficient market hypothesis holds in the other six stock markets, namely, ACWI, DJIM, FTSECHN, JKSE, KATLM, and S&P hence this can be regarded as proof of the random process in these stock markets. Accordingly, the prices of the equity shares in those indexes reflect the whole information and they follow the random walk and predicting the future values of the equity shares is possible through the previous prices of the equity shares. In this case, it is not possible to earn above the average of the markets with those indexes. A shock on the prices of the equity shares in those stock markets is permanent and the prices do not tend to return to the trend. In

addition to this, ZA (1992) and LS (2013) unit root tests evidence that all the selected linear stock markets have a unit root, in other words, are not stationary in the presence of structural breaks. Accordingly, ZA (1992) and LS (2013) unit root tests confirm the same results. The overall results of both unit root tests suggest that weekly stock price for ACWI, DJIM, FTSECHN, JKSE, KATLM, and S&P stock markets exhibit weak-form. Hence this can be regarded as proof of the random process in these stock markets by showing that investors can generate abnormal profits. It means that investors have not a chance to make an abnormal gain by technical analysing and predicting the historical data. Hence, one should not be able to make a profit from using something that everybody else knows. It is understood from unit root tests that these were some historical information at the international level, which not influenced the stock market of ACWI, DJIM, FTSECHN, JKSE, KATLM, and S&P stock markets.

Table 5 presents the results of the Kapetanios et al. (2003) and Kruse (2011) test applied to the raw, demeaned and detrended stock markets.

Table 5: Results of the ESTAR Type Unit Root Tests

Stock Markets	KSS (t_{NL})			tau (τ)		
	Raw Data	Demean	Detrend	Raw Data	Demean	Detrend
FTSEBMI	0.7800017	-1.696887	-2.533370	4.5992020	4.938742	6.404095
FTSEQAT	0.4017908	-3.34131**	-2.984482	4.5111259	14.0590***	14.156688**
TASI	0.4089691	-2.871432*	-2.377105	3.1352506	15.130918***	11.135067*
<i>Critical Values</i>						
% 1	-2.82	-3.48	-3.93	13.15	13.75	17.10
% 5	-2.22	-2.93	-3.40	9.53	10.17	12.82
% 10	-1.92	-2.66	-3.13	7.85	8.60	11.10

Source: Research data (R for Windows).

Notes: KSS and tau values denote the Kapetanios et al. (2003) test of the original series and Kruse test (2011) of the original series, respectively. Asymptotic critical values of the t_{NL} statistic are obtained from Kapetanios et al. (2003); asymptotic critical values of the tau (τ) statistic are taken from Kruse (2011). The optimal lag length selected by the SIC. The critical values obtained from Kapetanios et al. (2003) and Kruse (2011). The estimations were carried out utilizing a program code written in 'R' that was presented by Kruse. ***, ** and * indicate the rejection of the null of a unit root at the 1, 5 and 10% significance level, respectively.

Non-linear unit root tests evidence that the FTSEBMI stock market has a unit root, in other words, are non-stationary while FTSEQAT and TASI are not, hence following an asymptotic distribution. Kapetanios et al. (2003) and the Kruse (2011) tests provide enough evidence that the stock prices of FTSEQAT and TASI stock markets do not follow the random walk process and the weak-form inefficiency in the return series. It means that any shock to market return is likely to be transitory and such policies will have a temporary impact on FTSEQAT and TASI stock markets. This result suggests that there is a systematic way to exploit the trading opportunities in the FTSEQAT and TASI stock markets and the investors can earn abnormal profits by exploiting this opportunity. Here, it is possible to say that these were some historical information at the international level, which influenced the stock market of FTSEQAT and TASI. However, the unit root null hypothesis is rejected for FTSEBMI where the market return is a non-stationary process. Hence, the results indicate that the FTSEBMI stock price series follow a random walk; in other words, that FTSEBMI stock market is a weak-form efficient market. Hence, it can be said that the market return will have a permanent impact on the FTSEBMI market. It means that the use of historical prices and technical analysis is not beneficial for the investors and the investors cannot earn an excess return by employing technical analysing and predicting the historical data. It is shown that it is possible to say these were some historical information at the international level, which not influenced the stock market of the FTSEBMI stock market. As a result, it is understood from empirical evidence that the results of weak-form efficiency have implications on capital allocation, stock price predictability and large and diversified of competing investors.

After determining whether the weak-form market efficiency of the stock markets is valid, the semi-strong form market efficiency is examined whether returns earned by investors who purchase equities in global Islamic stock markets.

Table 6: The results of HJ (2006) Test

Stock Markets	Test Value (MWALD)	Bootstrap Critical Value (0.01)	Bootstrap Critical Value (0.05)	Bootstrap Critical Value (0.10)	Semi- Strong Form
ACWI \nrightarrow DJIM	0.626	6.745	3.903	2.721	✓
DJIM \nrightarrow ACWI	0.019	6.601	3.887	2.755	✓
ACWI \nrightarrow FTSEQAT	2.853	9.131	6.095	4.689	✓
FTSEQAT \nrightarrow ACWI	3.732	12.480	8.172	6.497	✓
ACWI \nrightarrow FTSEBMI	0.087	7.260	4.006	2.814	✓
FTSEBMI \nrightarrow ACWI	1.926	6.850	3.930	2.717	✓
ACWI \nrightarrow FTSESCI	0.080	6.796	4.026	2.725	✓
FTSESCI \nrightarrow ACWI	3.857	6.625	3.846	2.742	✓
ACWI \nrightarrow JKSE	1.692	7.036	3.865	2.753	✓
JKSE \nrightarrow ACWI	1.015	7.050	3.847	2.719	✓
ACWI \nrightarrow KATLM	11.137	27.174	21.257	18.812	✓
KATLM \nrightarrow ACWI	12.506	26.914	21.281	18.708	✓
ACWI \nrightarrow S&P	9.315	22.055	16.815	14.505	✓
S&P \nrightarrow ACWI	17.428	22.913	17.972	14.506	✓
ACWI \nrightarrow TASI	11.102	21.467	16.123	13.584	✓
TASI \nrightarrow ACWI	5.702	20.147	14.688	12.503	✓
DJIM \nrightarrow FTSEQAT	2.068	10.019	6.344	4.813	✓
FTSEQAT \nrightarrow DJIM	8.637	10.092	6.467	4.916	✓
DJIM \nrightarrow FTSEBMI	9.253	7.646	4.104	2.824	✓
FTSEBMI \nrightarrow DJIM	0.109	7.180	3.941	2.727	✓
DJIM \nrightarrow FTSESCI	3.024	11.690	7.933	6.396	✓
FTSESCI \nrightarrow DJIM	2.999	11.214	7.726	6.243	✓
DJIM \nrightarrow JKSE	4.813**	7.237	3.920	2.759	✗
JKSE \nrightarrow DJIM	3.533*	6.422	3.939	2.734	✗
DJIM \nrightarrow KATLM	8.996	26.693	21.340	18.853	✓
KATLM \nrightarrow DJIM	6.742	26.850	21.269	18.741	✓
DJIM \nrightarrow S&P	0.009	6.491	3.881	2.771	✓
S&P \nrightarrow DJIM	0.332	6.799	3.881	2.723	✓
DJIM \nrightarrow TASI	0.001	7.102	3.833	2.741	✓
TASI \nrightarrow DJIM	8.356***	6.620	3.908	2.817	✗
FTSEQAT \nrightarrow FTSEBMI	3.878	9.351	6.034	4.649	✓

FTSEBMI ⇌ FTSEQAT	0.406	9.205	6.042	4.649	✓
FTSEQAT ⇌ FTSESCI	5.017*	9.125	6.004	4.621	✗
FTSESCI ⇌ FTSEQAT	1.790	9.086	6.022	4.589	✓
FTSEQAT ⇌ JKSE	5.865*	9.349	5.929	4.510	✗
JKSE ⇌ FTSEQAT	4.944*	9.444	6.026	4.623	✗
FTSEQAT ⇌ KATLM	3.028	9.384	6.088	4.638	✓
KATLM ⇌ FTSEQAT	1.712	9.162	6.068	4.649	✓
FTSEQAT ⇌ S&P	14.698	11.731	8.025	6.281	✓
S&P ⇌ FTSEQAT	3.069	11.638	7.958	6.293	✓
FTSEQAT ⇌ TASI	1.867	11.492	8.017	6.354	✓
TASI ⇌ FTSEQAT	2.359	11.600	7.886	6.268	✓
FTSEBMI ⇌ FTSESCI	0.002	6.550	3.732	2.638	✓
FTSESCI ⇌ FTSEBMI	0.018	6.516	3.813	2.742	✓
FTSEBMI ⇌ JKSE	0.146	6.470	3.818	2.732	✓
JKSE ⇌ FTSEBMI	3.483	13.961	9.703	7.296	✓
FTSEBMI ⇌ KATLM	2.109	9.357	5.993	4.558	✓
KATLM ⇌ FTSEBMI	2.693	9.162	6.056	4.693	✓
FTSEBMI ⇌ S&P	2.437	9.197	6.078	4.630	✓
S&P ⇌ FTSEBMI	4.049	9.221	6.070	4.688	✓
FTSEBMI ⇌ TASI	10.970**	11.559	7.999	6.434	✗
TASI ⇌ FTSEBMI	6.417	13.894	9.696	7.795	✓
FTSESCI ⇌ JKSE	0.261	9.572	6.123	4.698	✓
JKSE ⇌ FTSESCI	1.520	9.617	6.136	4.574	✓
FTSESCI ⇌ KATLM	2.720	12.128	7.867	6.376	✓
KATLM ⇌ FTSESCI	3.626	11.260	7.975	6.373	✓
FTSESCI ⇌ S&P	3.287	9.492	6.205	4.797	✓
S&P ⇌ FTSESCI	0.371	9.516	5.862	4.573	✓
FTSESCI ⇌ TASI	0.413	9.343	6.075	4.608	✓
TASI ⇌ FTSESCI	8.666***	6.936	3.899	2.713	✗
JKSE ⇌ KATLM	5.295	13.788	9.801	7.894	✓
KATLM ⇌ JKSE	1.218	13.711	9.612	7.886	✓
JKSE ⇌ S&P	8.137**	11.748	7.822	6.296	✗
S&P ⇌ JKSE	7.486*	11.386	7.825	6.229	✗
JKSE ⇌ TASI	1.723	9.013	5.892	4.602	✓
TASI ⇌ JKSE	7.697***	6.838	4.002	2.782	✗
KATLM ⇌ S&P	10.531	27.080	21.366	18.764	✓
S&P ⇌ KATLM	10.134	27.085	21.345	18.873	✓

KATLM \nrightarrow TASI	11.653	24.298	18.868	16.227	✓
TASI \nrightarrow KATLM	13.523	23.575	18.441	16.211	✓
S&P \nrightarrow TASI	0.001	6.983	3.890	2.701	✓
TASI \nrightarrow S&P	20.023 ^{***}	6.562	3.837	2.665	✗

Source: Research data (Gauss 10.0).

Notes: ^{***}, ^{**} and ^{*} indicate the rejection of the null hypothesis of absence of causality at the 1%, %5 and %10. (✓) denotes the semi-strong market efficiency is valid; (✗) denotes the semi-strong market efficiency is not valid. Gauss codes provided HJ (2006) were employed for forecasting the causality test results; ACWI \nrightarrow DJIM means that there is no bootstrap causality from MSCI ACWI Islamic Index stock exchange to Dow Jones Islamic Market stock exchange. The optimal lag length in the VAR(p) model was determined based on SIC. Additional lags (d_{max})=1 was added to the model. The bootstrap critical values were calculated based on 10,000 replications.

According to these results in Table 6, when the Granger causality results are considered, it was observed that the causality relationships between the Islamic stock exchange pairs were selected from the analysed periods. Because of the value of MWALD test statistic are smaller than bootstrap critical values, the null hypothesis of no Granger causality cannot be rejected for ACWI, FTSEBMI, and KATLM, while it is rejected for DJIM, FTSECHN, FTSEQAT, JSKE, S&P, and, TASI. In the period analysed, the semi-strong form of EMH for ACWI, FTSEBMI and KATLM are valid, in other words, the semi-strong form holds in ACWI, FTSEBMI, and KATLM stock markets. Accordingly, it can be said that portfolio diversification benefits exist among these stock markets. Therefore, the finding reveals there is no diversification opportunity between them and the movement of one stock market. It is shown that it is possible to say these were some news and public announcements at the international level, which not influenced the stock market of ACWI, FTSEBMI, and KATLM. However, the semi-strong efficiency of the stock market of DJIM, FTSECHN, FTSEQAT, JSKE, S&P, and TASI has fallen. It is concluded that the causality relationship indicates that investors can earn abnormal gains portfolio by diversification benefit across these six stock markets.

Here, it is shown that it is possible to say these were some news and public announcements at the international level, which influenced the stock market of DJIM, FTSECHN, FTSEQAT, JSKE, S&P, and TASI. When we evaluated all the causality analysis, the results provide some evidence of semi-strong form in the Islamic stock markets. Hence, the results suggest that international portfolio benefits exist among ACWI, FTSEBMI, and KATLM stock markets. Furthermore, it has been found that some firms in stock markets were influenced positively and some other firms have been influenced negatively after the public announcements. According to these results, any investor who takes a position for Islamic stock markets, if they make an investment decision, they have the opportunity to minimize portfolio risks. It can be mentioned that the risk reduction offered by investment in Islamic funds. These results from the theoretical background regarding the impact of public announcements on stock prices.

5. Conclusion and Policy Recommendations

If the prices of the securities exchange reflect the current information completely and those prices react suddenly or near to it and accurately to the new information, it means that the market is efficient. Fama (1970) introduced three types of market efficiency: (1) the weak-form, (2) semi-strong form, and (3) strong form. The weak-form remarks that stock prices follow a random walk, meaning that investors cannot estimate future prices through the prices of the equity shares from the previous periods. For the semi-strong form, the public information in addition to the information from the previous periods reflects the prices of the equity share and it is not possible to earn abnormally. For the strong form; the prices from the previous periods, public information and the information which can be obtained from the inside of the companies are not applicable to make abnormal profits. Eventually, in the event of market efficiency, nobody can get abnormal gains in the market. Furthermore, available knowledge can be reached by all investors and the knowledge is reflected in prices.

This paper aims to examine empirically the validity of weak-form and semi-strong form of EMH in the context of unit root tests based on linear and non-linear models and bootstrap causality test

of the global Islamic stock markets, namely, Dow Jones Islamic Market Index, FTSE Shariah China Index, FTSE Bursa Malaysia Index, FTSE NASDAQ Qatar 10 Index, S&P Global BMI Shariah Index, Jakarta IDX Composite, Katılım 30 Index, MSCI ACWI Islamic Index and Saudi Arabia Tadawul Index. Thus, this paper aims to determine the historical information and all publicly available information for the 9 global Islamic stock markets for the period from 2010 to 2019. To test the weak-form market efficiency of the Islamic stock exchanges; the linear and non-linear unit root tests and bootstrap causality test for the semi-strong market efficiency were used and the data were analysed in weekly frequency. To this end, firstly the linearity test developed by HL (2007) and Harvey et al. (2008) are applied to determine the characteristics of the series. Afterward, PP and KPSS as standard unit root tests are applied to linear series and ZA (1992) and LS (2013) to support the standard unit root test and obtain more detailed results and then Kapetanios et al. (2003) and Kruse (2011) unit root tests were applied to nonlinear series. Aftermaths, the validity of the semi-strong form of EMH in global Islamic stock markets is analysed with weekly data from July 1998 to June 2019 by applying the bootstrap causality approach of HJ (2006).

The results indicate that the series with linear characteristics are ACWI, DJIM, FTSESCI, JKSE, KATLM, and S&P those with non-linear characteristics are FTSEBMI, FTSEQAT, and the TASI. The linear unit root tests reveal that the stock markets are non-stationary for ACWI, DJIM, FTSESCI, JKSE, KATLM, and S&P, and the non-linear unit root tests evidence that FTSEBMI is non-stationary. The informational efficiency is failed to be rejected to all stock markets except FTSEQAT and TASI. In the period analysed, the results reveal support for the validity of the weak-form of EMH in only seven of the nine stock markets. Therefore, the findings affirm that the weak-form of EMH and RWH holds in the other seven countries, namely, ACWI, DJIM, FTSESCI, JKSE, KATLM, S&P, and FTSEBMI. That is to say, current prices of each emerging stock markets cannot be predicted from past price changes in that market. And finally, investors can't gain excessive returns in these stock markets via trading stocks. Afterward, it performed the bootstrap causality test in paired stock markets and the results reveal support for the validity of the semi-strong form of EMH in only 3 of the 9 stock markets, namely ACWI, FTSEBMI, and KATLM while the semi-strong form is failed to be accepted to DJIM, FTSECHN, FTSEQAT, JSKE, S&P, and TASI. And finally, it is seen that any investor who takes a position for Islamic stock markets cannot gain excessive gain by evaluating historical data and any new publicly available information and also the result can be reached that international portfolio benefits exist among Islamic stock markets.

It is of great importance that the Islamic economy has a strong financial structure and that businesses and investors turn to this field. Many studies have recently focused on examining the level of market efficiency in Islamic stock markets. This process is closely related to the efficiency levels of the markets. Accordingly, testing the efficiency of the market is an important concept for the economies particularly in developing markets because it allures many investors who obtain market dynamism. Hence, generate a solution to the inefficient market's problem is one of the most significant issues of the search for policymakers. Accordingly, it is important to determine the effect of transitory shocks on markets to provide EMH to solve the problem of inefficient markets. It is believed that the study contributes to the literature by understanding markets and investors will provide that can help market with being the informational efficiency affects. Accordingly, an efficient market can play a major role in an economy's advance through resource allocation and capital accumulation, seeking investment opportunities above-average risk-adjusted rates of return, as well as ensuring channels to hand out wealth. Thus, enabling a stock market which is efficient, and which performs its duties will contribute to the development of the economies and financial markets undoubtedly. Further, it is observed from the studies carried out that the rates of savings increase and the investment opportunities for financial instruments are presented to the national economy in the countries where the EMH is provided. Within this context, providing the market efficiency is crucial for the Islamic stock markets which have fragile structures in terms of increasing the rates of savings and providing investment opportunities for financial instruments.

The results of this study have important policy implications for government policymakers and participants of the Islamic stock market. Finding a solution to the validity of the EMH problem that induces substantial economic and financial problems is one of the field missions for policymakers. The effect of a well-working developed and efficient financial structure to establish a stable economic structure is obvious for all countries. Therefore, the countries should develop strategies supporting the existence of the innovative financial markets in their growth policies and they should provide incentives because market information efficiency provides incentives for potential investors to enter into new investment initiatives and companies. Hence, it may be proposed that the policymakers should take all possible measures for improving transparency in trading activities and removing informational asymmetry to attract more firms and establish a convenient efficient market in the country. Given the EMH of the Islamic stock markets, increased stock market activities will undoubtedly lead to the recovery in the allocation of funds because an efficient stock market plays a role in the efficient allocation of a nation's financial funds. Hence, policymakers must develop long-run policies for their financial markets to be efficient. Furthermore, to increase information efficiency, financial authorities, as well as Shariah boards could advance the transparency degree and implement internationally acceptable standards. Therefore, the policymakers can form the basic development of sound Islamic stock markets. Finally, the study offers several policy implications for market participants, determining the risk perception and portfolio preferences of them, and policymakers as a source of reference. It is proposed that further research such as based on Islamic stock markets, other econometric models such as asymmetric and nonlinear models and applying different unit root tests to examine and compare with current findings. Since most of the economic time series contain unit roots, using the Harvey test for the linearity studies to be carried out in the future will be beneficial for the reliability of the results. Also, the World Health Organization (WHO) on March 11, 2020, has declared the coronavirus disease (Covid-19) outbreak a global pandemic. The outbreak of Covid-19 has impacted the political, social, economic religious and financial fields. As the global markets still grappling with the Covid-19 pandemic, it is essential to see the powers in the financial sector. Accordingly, the Covid-19 crisis should be evaluated and focused on their impact on the Islamic global markets in future studies.

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Araştırma Makalesi

Examining the Validity of the Weak and Semi-Strong Market Efficiencies at the Global Islamic Stock Markets: Evidence Linear and Nonlinear Unit Root Tests and Bootstrap Causality Approach

Küresel İslami Borsalarda Zayıf ve Yarı-Güçlü Piyasa Etkinliklerinin Geçerliliğinin Araştırılması: Doğrusal ve Doğrusal Olmayan Birim Kök Testleri ve Bootstrap Nedensellik Yaklaşımı ile Kanıtlar

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Genişletilmiş Özet

1. Giriş

Finans literatüründe piyasa etkinliği ve rasyonel beklentiler teorisi finansal varlık fiyatlarının ve yatırımcı davranışlarının belirlenmesi açısından önemli iki konu olarak karşımıza çıkmaktadır (Atakan, 2008: 99). Rasyonel bir yatırımcı finansal varlık satın almadan ya da yatırım kararı almadan önce firmanın değerini tahmin etmek isteyecektir. Yüksek rekabetin ve bilginin herkes tarafından ulaşılabilir düzeyde olduğu finansal piyasalarda, yatırımcılar tasarruflarını yatırıma yönlendirerek, beklentilerini yani karlarını maksimize etmek isterler. Bu nedenle yatırımcıların çoğu yatırım yapmadan önce piyasaların bilgi etkinliğine odaklanırlar. Dolayısıyla, yatırımcılar açısından finansal varlıkların fiyatını etkileyebilecek bilgilere ulaşmak oldukça önemlidir. Fama'ya göre bir piyasada alınıp satılan menkul kıymetlerin fiyatları, mevcut tüm bilgiyi tamamen yansıtıyorsa ve bu fiyatlar yeni bilgiye ani ve doğru bir biçimde tepki veriyorsa, bu piyasanın etkin olduğu anlamına gelir. Fama (1970) zayıf tipte etkinlik, yarı güçlü tipte etkinlik ve güçlü tipte etkinlik olmak üzere piyasa etkinliğini üç çeşit olarak belirtmiştir. Zayıf tipte etkin olan piyasalarda hisse senetlerinin geçmiş dönem fiyatları kullanılarak gelecekteki fiyatlar tahmin edilememektedir. Yarı güçlü tipte etkinlikte ise, geçmiş dönem bilgilerinin yanı sıra kamuya açıklanan bilgilerde hisse senedinin fiyatında anlık olarak fiyatlanmaktadır ve aşırı kar elde etmek mümkün değildir. Güçlü tipte etkin piyasalar ise, geçmiş dönem fiyatları, kamuya açıklanan bilgiler ve aynı zamanda firma içinden ulaşılacak bilgilerin dahi aşırı kar elde etmede etkili olmadığı piyasalardır (Fama, 1970).

Küreselleşme ve teknolojinin gelişmesiyle birlikte, son yıllarda borsalara ilgi giderek hız kazanmaktadır. Dünyanın herhangi bir yerinde meydana gelen bir olayın borsaları hızlı bir şekilde etkilemesi, bu gelişmelerin bir sonucu olarak karşımıza çıkmaktadır. Teknolojinin gelişmesiyle birlikte, birçok yatırımcı finansal bilgilere kolay ve ucuz bir maliyetle elde etme imkanına sahip olmuştur. Bu imkan ise piyasaların etkinlik düzeyleri ile yakından ilişkilidir. Fona ihtiyaç duyan ya da yatırım yapmayı planlayan yatırımcılar finansman ihtiyaçlarını karşılamak için borsalara yönelirken, yatırımcılar da tasarruflarını değerlendirmek ve daha fazla kazanç sağlamak için borsalara yönelmektedirler. Dolayısıyla, yastık altı tasarrufların ekonomiye kazandırılmasında ve ülke sermayesinin tabana yayılmasında borsalar aktif bir rol üstlenmektedir. Fonların ve finansal

varlıkların serbest, hızlı ve güvenli bir biçimde ulusal ve uluslararası piyasalarda dolaşması piyasaların bütünleşme düzeylerindeki gelişmeler sonucunda gerçekleşebilmektedir. Bu uyum süreci piyasaların etkinlik dereceleri ile doğrudan ilişkilidir. Dolayısıyla finansal piyasaların en önemli kuruluşlarından biri olan borsaların etkin ve verimli çalışması da piyasaların etkinlik düzeyleriyle yakından ilişkilidir. Piyasalarının etkin olması bir yandan yatırımcıların piyasaya olan güvenin artmasını sağlarken diğer yandan da finansal gelişmeye bağlı olarak ekonomik faaliyetlerin gelişmesini teşvik etmektedir. Bununla birlikte, eğer bir piyasada bilgi etkinliği ne kadar az ise, finansal varlıkların fiyatları o kadar kolay manipüle edilir, piyasa serbest ekonomiden uzaklaşır, piyasalara olan güven azalır, haksız kazançlara ortam hazırlar. Bu durum ise ülkelerin sermaye birikimini ve ekonomik gelişmesini olumsuz yönde etkileyecektir (Ozmen, 1997: 1). Dolayısıyla piyasaların etkinlik düzeyi ekonomik ve finansal istikrarın sağlanması açısından önemli bir rol oynamaktadır.

Finansal piyasalarda bilgi asimetrisinin varlığı, manipülasyon ve spekülasyon gibi finansal saldırılar, İslami ilkelerle örtüşmemektedir. İslami açıdan bu tip olaylar caiz olmadığı için İslami kurallara göre hayatını tanzim eden yatırımcıların, bu tip borsalarda işlem yapmadıkları ve bu piyasalardan uzak kaldıkları gözlemlenmiştir. İslami kurallara bağlı kalan bireylerin ya da firmaların mevcut fonları atıl kalmakta birlikte ihtiyaç duyulan fonlara ulaşmada zorluklarla karşı karşıya kaldıkları görülmüştür. Dolayısıyla, piyasalardaki bilgi asimetrisi problemi, spekülasyon ve manipülasyon gibi finansal saldırılar piyasaların etkinlik düzeylerinden etkilendiği için bu yönde politikaların geliştirilmesi gerekmektedir. Buradan hareketle, bu çalışmanın amacı, İslami endekslerde işlem gören hisse senetlerinin fiyatlarında geçmiş dönem fiyatlarının ve kamuya açıklanan bilgilerin etkili olup olmadığını araştırmak, etkin piyasa hipotezi kapsamında bu endekslerde zayıf ve yarı-güçlü piyasa etkinliklerinin geçerli olup olmadığını test etmek ve bu yönde politika önerilerinde bulunmaktır. Son yıllarda İslami endekslerin uluslararası piyasalardan yatırımcı çekmesi ve ülke ekonomilerine katma değer yaratmaları ve dünya ekonomilerine yön vermeleri nedeniyle çalışmada küresel bazda faaliyet gösteren İslami endeksler seçilmiştir. Seçilen İslami endeksler literatürden yola çıkılarak tercih edilmiştir.

2. Veri ve Yöntem

Bu çalışmada küresel bazda faaliyet gösteren İslami endekslerin en yüksek değere ve işlem hacmine sahip endekslerinin haftalık kapanış getiri değerleri kullanılmıştır. Endeks serilerinin zayıf piyasa etkinliklerinin geçerliliğini araştırmak için ilk olarak Harvey ve Leybourne (2007) ve Harvey et al. (2008) doğrusallık testleri, sonrasında doğrusal endeks serileri için standart ve tek kırılmayı dikkate alan birim kök testleri ve son olarak doğrusal özellik göstermeyen endeks serileri için ESTAR tipi birim kök testleri uygulanmış ve sonuçları ile verilmiştir. Çalışmanın diğer ekonometrik analizde ise, endeks serilerinin yarı-güçlü piyasa etkinliklerinin geçerliliğini araştırılmıştır. Bunun için İslami endeksler arasındaki nedensellik varlığının tespiti için bootstrap nedensellik testi uygulanmış ve sonuçları ile birlikte sunulmuştur. Bir değişkenin uzun dönemde sergilediği karakteristik özelliğinin belirlenebilmesi için, değişkenin her dönemde aldığı değerler daha önceki dönemdeki değerleriyle regresyonunun bulunması gerekmektedir. Literatürde bunun için farklı metodlar geliştirilmiş olmakla birlikte, ekonometride birim kök analizi olarak bilinen yöntemle, değişkenlerin birim kök içerip içermedikleri tespit edilebilmektedir (Tari, 2008: 393). Etkin piyasa hipotezi zayıf formunun geçerliliğinin araştırılmasında yaygın olarak tercih edilen yöntemlerden biri birim kök testleridir. Hisse senedi piyasası serisinin yapısına uygun birim kök testlerinin kullanılması elde edilecek sonuçların güvenilirliği açısından önem arz edecektir. Bu nedenle ele alınan İslami borsa serilerinin durağan olup olmadığını araştırmadan önce serilerin doğrusal olup olmadığını araştırılması sonuçların sağlıklı bir biçimde yorumlanabilmesi açısından önemlidir. Bu çalışmada ise serilerin doğrusallık testinin sınanması için Harvey vd. (2008) tarafından geliştirilen test yöntemi kullanılmıştır. Analiz sürecinde ilk olarak değişkenlerin doğrusal olup olmadıkları belirlenmekte ve elde edilen sonuçlara göre doğrusal olmayan birim kök testleri kullanılmıştır. Doğrusal özellik gösteren endekslerde zayıf formun geçerliliğinin testi için Philips-Perron (1988) ve Kwiatkowski et al. (1992) birim kök testleri ve tek kırılmayı dikkate alan Zivot ve Andrews (1992) ile Lee ve Strazicich (2013) birim kök testleri uygulanmıştır. Doğrusal olmayan endekslerde zayıf formun geçerliliğinin sınanması için Kapetanios vd. (2003)

ve Kruse (2011) tarafından önerilen doğrusal olmayan ESTAR birim kök testleri uygulanmıştır. Etkin piyasa hipotezi yarı-güçlü formunun geçerliliğinin araştırılmasında yaygın olarak tercih edilen yöntemlerden biri ise nedensellik testleridir. Ele alınan İslami endeks çiftleri arasında bir nedensellik ilişkisinin olup olmadığının incelenmesi için Hacker ve Hatemi-J (2006) tarafından literatüre kazandırılan bootstrap nedensellik yaklaşımı kullanılmıştır. Serilerin doğrusallık analizi için Harvey vd. (2008) testi, Kapetanios vd. (2003) ve Kruse (2013) doğrusal olmayan birim kök testleri testi için *R for Windows* programı kullanılmıştır. Philips ve Perron (1988) ve Kwiatkowski et al. (1992) birim kök testleri için Eviews 10.0 paket programı, Zivot ve Andrews (1992) ve Lee ve Strazicich (2013) tek kırılmalı birim kök testi ve Hacker ve Hatemi-J (2006) nedensellik testi için Gauss 10.0 paket programı kullanılmıştır.

3. Bulgular ve Öneriler

Eğer hisse senedi piyasası durağan diğer bir ifadeyle birim kök içermiyorsa, şoklar geçici etki gösterecek, bu durum etkin piyasa hipotezinin geçerli olmadığı; durağan değilse yani birim kök içeriyorsa şoklar kalıcı etki gösterecek, bu durum etkin piyasa hipotezinin zayıf formda geçerli olduğu anlamına gelecektir. İlk olarak İslami endekslerin doğrusallık özelliklerinin belirlenmesi için Harvey vd. (2008) doğrusallık testi uygulanmıştır. Uygulanan doğrusallık testi FTSEBMI, FTSEQAT ve TASI endeks getirilerinin doğrusal olmayan özellik sergiledikleri bu nedenle bu endeks getirilerine durağan olup olmadıklarının belirlenebilmesi için doğrusal olmayan birim kök testleri uygulanmıştır. Diğer taraftan ACWI, DJIM, FTSESCI, JKSE, KATLM ve S&P endeks getirilerinin doğrusal bir yapıda olduğu sonucuna ulaşılmıştır. Standart birim kök testlerinden Philips ve Perron (1988) ve KPSS (1992) birim kök testleri ile tek kırılmalı birim kök testlerinden Zivot ve Andrews (1992) ve Lee ve Strazicich (2013) birim kök test sonuçları ACWI, DJIM, FTSESCI, JKSE, KATLM ve S&P endeks getirilerinin birim kök içerdikleri yani durağan olmadıkları belirlenmiştir. Bu endekslerde yer alan hisse senedi fiyatları mevcut tüm bilgiyi yansıtmakta ve rassal yürüyüş hipotezini desteklemektedir. Dolayısıyla hipoteze göre, piyasa katılımcılarının hisse senetlerinin geçmiş fiyatlarını kullanarak, hisse senedi fiyatlarının gelecekte alacağı değerleri tahmin etmesi imkansız olacaktır. Bu durumda da bu endekslerde piyasa ortalamasının üzerinde getiri elde etmek mümkün olmayacaktır. Bu endekslerdeki hisse senedi fiyatlarına gelecek bir şok kalıcı olacaktır. Bu nedenle, hisse senedi fiyatları trende dönme eğilimi göstermeyecektir. Hacker ve Hatemi-J (2006) bootstrap nedensellik sonuçları dikkate alındığında incelenen dönemlerde seçilmiş İslami borsa endeks çiftleri arasında nedensellik ilişkilerinin farklılaştığı gözlemlenmiştir. Hacker ve Hatemi-J (2006) bootstrap nedensellik sonuçları, yarı güçlü formun FTSEBMI, KATLM ve ACWI olmak üzere üç borsada geçerli olduğunu göstermiştir. Dolayısıyla yatırımcılar bu endekslerde yer alan hisse senetlerinin geçmiş verilerinden ve kamuya açıklanmış mevcut tüm bilgilerden yararlanarak, tahminler yapması ve normalüstü kazanç elde etmesi mümkün olmayacaktır.

Bu sonuçlara göre ilgili ülkelerin piyasalarının zayıf formda etkin olduğu ve rassal yürüyüş hipotezinin geçerli olduğu sonucuna ulaşılmıştır. Dolayısıyla bu hipoteze göre, bu ülkelerin seçilmiş borsa endekslerinde piyasa katılımcıları tarafından tercih edilen ve tarihi fiyat bilgilerini baz alan teknik analiz yönteminden başarılı sonuçlar elde edilmesi diğer bir ifadeyle normalüstü kazanç sağlanması mümkün olmayacaktır. Genel olarak sonuçlar yatırımcının İslami borsalarda normalüstü kar elde etme şansının olmadığını göstermektedir. Borsaların etkinliklerinin artırılması sermaye tahsisi, hisse senedi fiyat öngörülebilirliği ve uluslararası portföy çeşitlendirilmesi üzerinde önemli bir etkiye sahip olacaktır. Dolayısıyla, bu makalenin bulguları politika yapıcılar için bazı faydalı bilgiler sunmaktadır. Dolayısıyla, finansal piyasaların performansı etkin piyasa hipotezinin geçerliliğinden etkilendiği ve bu yönde politikaların geliştirilmesi gerektiği düşünülmektedir. Analizimizde, etkin piyasa hipotezinin zayıf ve yarı-güçlü formların geçerliliği küresel bazda faaliyet gösteren ve yüksek işlem hacmine sahip İslami endeksler için analiz edilmiştir. Buradan hareketle, İslami endekste yer alan ve en düşük değere sahip borsa endeksleri için etkin piyasa hipotezinin zayıf ve yarı-güçlü formlarının geçerliliği test edilerek, en yüksek ve en düşük borsa endeksleri arasında piyasa etkinliği karşılaştırılarak politika önerilerinde bulunabilir. Ayrıca Dünya Sağlık Örgütü tarafından 11 Mart 2020 tarihinde pandemi olarak ilan edilen koronavirüs (Covid-19) krizinin ekonomiye ve finansal piyasalara etkileri

incelenerek, pandemi krizinin İslami ülkelerin borsalarında rejim deęişikliği yaratıp yaratmadığı araştırılabilir ve bu yönde politika önerilerinde bulunulabilir.