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A Market Efficiency Examination of the Islamic Stock Indices: Evidence from FTSE Shariah Indexes

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Abstract :

The aim of this study is to test the weak-form efficient market hypothesis for Islamic stock indices. The data consists of daily market prices FTSE Shariah Indexes expressed in US$ and cover the period from 14 October 2013 to 20 August 2018. The study is conducted by using different statistical tests to examine the weak-form market efficiency. All tests reject the null hypothesis of the weak form efficiency for any of the Islamic stock indices returns investigated. This implies that the succeeding price changes do not move in an independent manner and so these Islamic Stock Markets does not follow the random walk model, reveals that the future returns can be predicted by using the historical prices, and proves that they are an inefficient stock market.

Key words: *The efficient market; Random walk; Islamic stock indices.*
JEL classification codes: *C22, G14, G15.*

Résumé:

Le but de cet article est de tester l'hypothèse de l'efficience du marché boursier islamique. Nous allons tester empiriquement sa forme faible en analysant la série des rendements de l'indice boursier islamique FTSE Shariah par des approches paramétriques et non-paramétriques. Nous avons calculé les rendements quotidiens basés sur les cours de clôture de chaque jour sur la période allant d'octobre 2013 à août 2018. Divers outils économétriques traditionnels et modernes tels que le test de racine unitaire, le test d'autocorrélation, le "runs test" et le test du ratio de variance basé sur les rangs et les signes sont utilisés à cette fin. Les résultats obtenus ont démontré que l'hypothèse de l'efficience de la forme faible des marchés boursiers Islamiques sur la période de 2013 à 2018 ne peut pas être acceptée dans tous les cas. Avec une inefficience de marché faible, on peut donc utiliser le passé des performances d'une action pour prévoir son cours futur. L'analyse chartiste devient donc utile pour réaliser des profits anormaux et faire des prévisions sur sa variation future.

Mots clés : *l'efficience du marché; marche aléatoire; Les Indices Islamiques.*
Codes de classification JEL: *C22, G14, G15.*

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1. Introduction:

The efficient market hypothesis (EMH) has been a major research area in the previous studies for enhancing and developing the quality of capital markets. The concept of EMH linked to the informational efficiency in the capital markets. It refers to the incorporation of available information in setting up of current security prices and the investors would not be able to make abnormal profits based on previous prices as well as information accessed publicly or privately since all information is already incorporated in the price of the financial assets.

The EMH is connected to the notion of random walk (RW), which in finance literature represent random changes in prices of the financial assets such that the current prices cannot be expected from historical prices. The rationale of RW is that the series of prices trend has no memory and past prices cannot be used to predict the future in any meaningful trend.

As many financial markets become globalized, more deregulated, more liberalized, and the financial system was significantly impacted by the last financial crisis, investors found more opportunities for them to create a cross-border portfolio and diversify their investments in both Islamic and conventional instruments.

It is important to note that Shariah-compliant indexes and investment in Islamic markets have attracted a lot of interest in research last years, because of their more fair nature and profit-loss sharing. The fastest developing section of the global financial industry is Islamic investments, which is apparent to good earnings and is established on ethical principles preferred by some traders in Islamic countries.

During the last years, the world financial market has been characterized by the launch of Islamic indexes, which are created to screen the stocks in conventional indices that have confliction with the Islamic laws, by takes some of the ethical considerations for a stock to be ethically suitable. Some of those indexes are Financial Times Shariah Indexes Series (FTSE).

The emergence of the Islamic financial markets provides cross-border capital flow and funding for investment managers and/or companies who are seeking Shariah-compliant investments.

Shariah-compliant investments refer to financial assets that follow to Islamic doctrines. In short, Shariah-compliant companies must stay away from activities that include gambling, pork, liquor, and interest-based activities. Although most of the Islamic financial assets are situated in the Middle East and Asian region, conversely of late, there has been a sign of these assets focus moving to countries in Europe, the US and Latin America.

The debate on whether the stock market is efficient led to two schools. The first school advocates the arguments that markets are indeed efficient. The other school is certain of those financial markets are inefficient and consequently investors can benefit abnormal profits. However, a few studies in empirical finance have tried to test the efficiency of Islamic stock markets in comparison to the many studies in conventional developed stock markets.

Because of the great importance of financial market efficiency as a serious means for a good operative market, which contributes towards effective resource allocation, overall investment and growth in the economy, the principal purpose of this research is to investigate the weak-form efficient market hypothesis specific to Islamic indices and we test the following hypothesis:

H0: Islamic stock market indices returns follow a random walk and hence the market is efficient.

The rest of this study is structured as follows: Section 2 provides a brief background of the Islamic financial market. Section 3 discusses the related previous studies on Islamic stock market efficiency. Section 4 discusses the data and methodology. Sections 5 and 6 describe the empirical results and the conclusion of this study.

2. Theoretical Background on Islamic stock markets

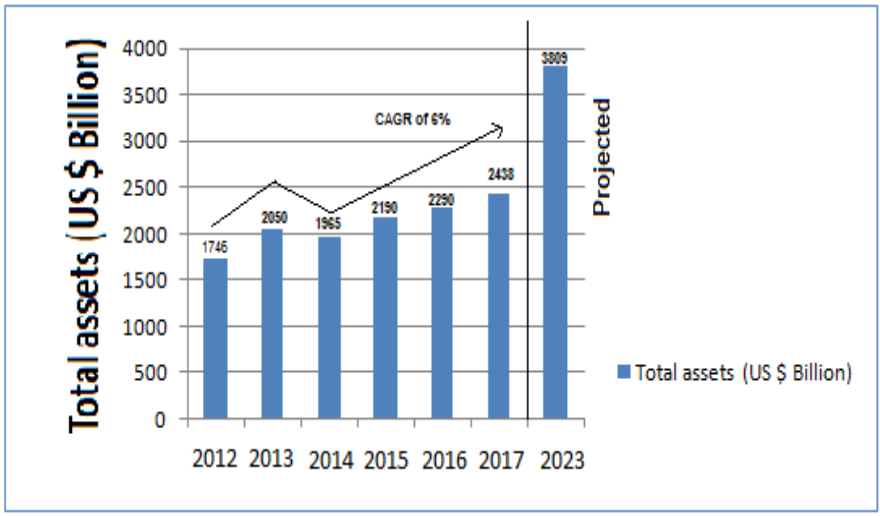
2.1 Islamic finance significance

Islamic finance refers to a set of legal organizations, financial tools, practices, trades and contracts that operate in accordance with the instructions of Islamic Low (Miglietta & Battisti, 2015, p: 334) and with a recommendation from the Shariah Board. Islamic investments also have to pass financial and operational screening (Merdad, H., et al., 2010, p: 164). Islamic financial system necessitates trades to be connected to the real sector, leading to successful activities that generate revenue and wealth and rejects that profit can be realized without taking a risk. The financing of the

corporate entity is authorized, but the yield must be linked completely to the effects of the use of the capital. This is the base of the Profit and Loss Sharing (PLS) that is a form of partnership, this is the basis of profit-loss-sharing (PLS), which is a form of partnership, where partners share returns or losses by looking to their contribution in the capital of the institution (Miglietta & Battisti, 2015, p: 334).

Islamic finance is one of the most rapidly growing segments of the global finance industry (Gait & Worthington, 2007, p: 1). It is now widely developed in several Muslim and non-Muslim countries. Islamic finance industry assets grew by a compound annual growth rate (CAGR) of 6% to US$ 2.44 trillion in 2017 from 2012. The 2017 total was contributed by 56 countries. Iran, Saudi Arabia and Malaysia remain the largest markets, contributing a static share of 65% of the total, or US$ 1.6 trillion. Saudi Arabia and Malaysia's total Islamic finance assets grew 8% and 16%, respectively. For Saudi Arabia, the growth was mainly driven by its domestic and international sukuk issuance. Iran Islamic financial institutions' assets grow 13% in 2017. Of all the 56 countries, Cyprus, Nigeria and Australia saw the fastest growth in Islamic finance assets in 2017 (Islamic finance development report, 2018, pp: 14-15).

Figure 1: Islamic Finance Assets Growth 2012-2017



Source: Islamic finance development report, 2018, p: 15

The Islamic finance industry's performance is measured through five sub-sectors: Islamic banking, takaful, other Islamic financial institutions (investment companies, micro-finance institutions etc.), sukuk, and Islamic funds.

Table 1. Global Islamic Finance Assets Distribution 2017

	Share of Islamic Finance assets	**Size Billion**	**Number of Institutions/ Instruments**	**Number of Countries Involved**
Sector / Asset Class	71%	1721	505 Islamic Banks	69
Islamic Banking	2%	46	324 Takaful Operators	47
Other Islamic Financial Institutions	6%	135	560 OIFIs	49
Sukuk	17%	426	2590 Sukuk Outstanding	25
Islamic Funds	4%	110	1410 Funds Outstanding	28

Source: Islamic finance development report, 2018, p: 15

Islamic finance, therefore, makes a safe investment environment, assuring reasonable risk and promoting equity and community justice, which, in theory, implies an effective financial industry. As demonstrated by the worldwide spread of Islamic financial organizations, Islamic financial markets have gained momentum in recent years; this extent has been associated by similar proliferation in Islamic financial products. Actually, in the aftermath of the recent financial crisis (2008–2009), some factors (equity market depressions, bank losses, and bankruptcies, Great Depression, etc.) and different studies pointed to the weakness and the high risk accompanied with conventional finance, Islamic finance seems to be a good substitute for investors (Jawadi, 2015, p: 1687).

Islamic stock markets are free from two major sources of instability, namely interest rates and un-backed money creation. High degrees of instability make a stock market inefficient, requiring large resource for trading and hedging risk, and dissuade savers from participation in the markets. Stock market crashes following stock market booms have often ruined household savings and caused economic disorders. A high degree of stability will encourage savers and enable stock markets to achieve maximum efficiency in financial intermediation, reduce trading costs and increase levels of participation (Askari & Krichene, 2014, p: 44).

2.2 What is an Islamic Stock Market?

Islamic stock markets are a fundamental part of the Islamic financial system for effective recruitment of funds and their optimum allocation. These markets complement the investment function of the Islamic banking sector (Ali, 2008, p:1). Islamic capital market refers to the capital market where all the transactions, operations and activities are carried as per Islamic laws. The question of promotion of Islamic stock market is attached to the concern of promotion of stock market in general. The stock market plays a leading role in the economic progress of a country. It not only boosts savings and investments but also improves institution governance and social responsibility (Rizvi & Arshad, 2014, p: 1-2).

The Stock Exchanges in an Islamic country would perform the following functions (Metwally, 1984, p: 21-22):

• enable savers to participate fully in the ownership of commercial institution; takes risks and benefit from its profits;

• enable shareholders to obtain liquidity by selling their shares according to the rules of the Stock Exchange;

• allow business enterprises to raise external capital for establishing and expanding their lines of production;

• separate business actions of the enterprise from short-term variations in the stock prices, which are the main characteristics of non-Islamic markets;

• Allow transaction to be conducted by the performance of business enterprise as reflected in share prices.

2.3 Characteristics of a stock exchange in Islam

To describe equity transactions from the Islamic view, we need to review the four rules that make a transaction acceptable (Kia, 2015, p: 184-185). These rules are as follows:

Rule 1: One must not obtain any property in vanities or unacceptable ways or illegally.

Rule 2: The trade must be founded on goodwill and purpose between participants.

Rule 3: Usury is prohibited. According to this rule, usury, contrary to trade, results in the reduction of the share prices from many effects.

Rule 4: One cannot sell a commodity less than what the seller claims or the label indicated.

From the rules 1 and 2, we comprehend that any transaction based on cheating, aggression, illegal, corruption, subject to the

asymmetric information, gambling, production of alcoholic beverages, weapons of mass destruction, is not acceptable from the Islamic view and the violation of these rules results in economic or individual destruction. The violation of Rule 4 results in what is identified as gharar and creates uncertainty. The transactions are accepted if the attributes and defects of the product (including stocks) treated were recognized to the buyers and sellers. Furthermore, the true price of the product should be acknowledged by transacting participants.

From these rules, we comprehend that the stock of a company that produces any product and is not accepted in Islam (explained above) cannot be traded. Stocks on conventional banks that pay/charge a predetermined interest rate are not Islamic. Furthermore, there should not be any asymmetric information in the market, i.e., equity issuing firms should clearly and accurately publish their balance sheet. Market participants must clearly know the market conditions and situations so that stocks are traded according to their true values.

2.4 Islamic stock indices

The Islamic stock market has attracted the attention of investors from several Islamic and non-Islamic countries, who are concerned in investing more money in socially responsible investments (Arshad & Rizvi, 2013, p: 1). This trend leads to many western financial institutions (such as Citibank, Barclays, Morgan Stanley, Merrill Lynch, and HSBC) to sell Islamic financial products (Girard & Hassan, 2010, p: 2), and to the establishment of Islamic indexes (such as FTSE Islamic Index Series, DJ Islamic Market Index, S&P Shariah Index and MSCI Islamic Index), which are aimed to screen out the stocks of corporations in conventional indices, whose business and activities are compatible with Islamic law (Catherine et al., 2014, p: 111). These developments provide a platform for the integration of Islamic finance with conventional finance (Girard & Hassan, 2010, p: 2).

The Shariah researchers who manage the Islamic index defined a set of qualitative (sector) screens and quantitative (financial) screens to identify Shariah-compliant equity investments (Derigs & Marzban, 2008, p: 287).

Qualitative screening: Qualitative screens are sector screens where corporations functioning inside precise business zones that are not acceptable under Islam and are excluded. Islamic low clearly defines some sides, which are not allowed for Muslims, such as the consumption of alcohol and pork, and thus compliant companies are not permitted to participate in business earning primarily or even partially from such activities.

Quantitative screening: The major quantitative screening criteria examine the financial structure of the corporate and benchmark it against some collectively agreed level of tolerance. Financial structures of companies are used to define the participation of these corporations in non-permitted practices. The relevance of this type of screening in the prohibition of riba and trading of money according to the Shariah (Catherine et al., 2011, p: 96).

2.5 The Efficient Market Hypothesis

According to Fama (1965), in an efficient market, competition between many smart participants leads to a condition where, at any point in time, current price of a single stock already reflect the effects of information founded on actions that have already happened and on actions, which as of present the market anticipates to take place in the future. In other words, in an efficient market at any point in time, the current price of a stock will be a good predictor of its intrinsic value (Fama, 1965, p: 56). Jensen (1978) argue that a market is efficient with respect to the information set θt if it is impossible to make economic profits (the risk-adjusted returns net of all costs) by dealing on the basis of information set θt (Jensen, 1978, p: 96).

The EMH is connected to the notion of random walk (RW), which in finance literature represent random changes in prices of the financial assets such that the current prices cannot be expected from historical prices. The rationale of RW is that the series of prices trend has no memory and past prices cannot be used to predict the future in any meaningful trend (Shamshir & Mustafa, 2014, p: 2).

Several forms of the EMH have been extensively debated and verified in the previous studies. The dissimilarities revolve mainly about the meaning of the information set θt used in those examinations. The three wide forms of EMH which have established are (Jensen, 1978, p: 96): The Weak Form of the EMH, in which the

information set θt is taken to be only the information checked in the historical prices of the market as of time t. The Semi-Strong Form of the EMH, in which θt is taken to be all information that is publicly available at time t. (containing the historical prices, so the weak form is just a regulated version of this form). The Strong Form of EMH, in which θt is taken to be all information recognized to everyone at time t.

The equivalence among prices and values of securities would be realized only when there is informational efficiency, which indicates that there are no lags in the diffusion and incorporation of information and is a precondition to pricing efficiency. Another precondition to pricing efficiency is operational efficiency, which indicates that transactions should be realized at minimal charges. High transaction charges avert price correction to take place immediately and precisely. It is clear that any change or instruction that decreases transaction charges, simplifies the dealing system, raises the accessibility and truthfulness of information, progresses information treating by markets contributors, is a step to promoting the allocation efficiency of the system (Obaidullah, 2001, p: 2-3).

3. Literature Review

The debate on whether the market is efficient has attracted the attention of many researchers and led to two schools. The first school advocates the arguments that markets are indeed efficient. The other school accepts as true that markets are not efficient and consequently traders can make abnormal profits. With the rising significance of the Islamic stock markets that work in parallel to the conventional stock markets, a question arises as to whether these Islamic markets are efficient or not. In fact, relatively limited researches have concentrated on the efficiency of these market. Most of the studies are qualitative in nature, focusing on the framework and Shariah principles of the Islamic stock markets.

Ali et al. (2018) directed a study on 12 Islamic and conventional stock markets counterparts using multifractal detrended fluctuation analysis (MF-DFA). The findings indicate that developed markets are quite more efficient, followed by the BRICS' stock markets. The comparative efficiency examination indicates that all Islamic stock markets excluding Russia, Jordan, and Pakistan are more efficient than their conventional counterparts. However, the

Shariah-compliant laws, the good governance and disclosure mechanisms make them more efficient. Further, the results indicate that the correction of the Islamic market to speculative action is greater than their conventional.

Noryati (2016) examined the weak form efficiency of the Islamic stock indices from China, India, South Africa, Malaysia, Dubai, Qatar, and Japan, using Autocorrelation Function (ACF) test and Variance Ratio (VR) test. The findings indicate that only the Islamic indexes for Malaysia and India are efficient while the results for Qatar and Kuwait are not. The other indexes studied are inconclusive.

Jawadi et al. (2015) investigate the weak-form of EMH for three main Islamic stock markets by using many tests. The analysis offers two interesting results. First, emerging Islamic stock markets appear to be less efficient than developed Islamic markets, providing motivating investment occasions and expansion profits from this area in the short term and the long term. Second, the acceptance of the cointegration hypothesis for developed Islamic markets and the world conventional stock market are indications to efficiency in the long run, even if it is inefficient in the short run.

Rizvi et al. (2014) conducted a comparative analysis for 22 broad market indices of Islamic and developed countries markets by widening the accepting of their multifractal nature. The results offer a profound knowledge of the markets in Islamic countries, where they have indices of a greatly efficient act, especially in crisis times. A key finding is the empirical indication of the effect of the phase of market growth on efficiency.

Khalichi et al. (2014) analyzed the weak-form efficiency form by examining the RW hypothesis using VR tests. The results show that Islamic indexes have a similar level of inefficiency as conventional ones, the indexes of MSCI and FTSE series are the less inefficient. The cointegration analysis test indicates that the Islamic indexes of DJ and S&P have no cointegrating relations with their respective benchmarks, which suggests the presence of long-run diversification opportunities.

Ardiansyah & Qoyum (2011) tested the EMH of the Islamic stock market which focuses on Jakarta Islamic Index as a case study. The first test that shows that dividend announcements are not

qualified to work as a concern in judgments as regards in the shares prices at the Jakarta Islamic Index. the study finds that the Jakarta Islamic market is inefficient in information.

Guyot (2011) examines the market quality and price dynamics of some Islamic indexes. The findings confirm that efficient investment allocation is not linked to the accomplishment of Shariah criteria in all times.

In summary, the previous studies connecting to Islamic stock market efficiency is limited and provides contradicting findings. This study, therefore, aims to contribute to the empirical literature on the efficiency of Islamic stock market indexes with the most recent data.

4. Data and Methodology

4.1 Description of the Data

The data consists of daily market prices FTSE *Shariah* Indexes expressed in US$ to avoid change risk (Table 2). Data were obtained from Investing.com Historical Data and cover the period from 14 October 2013 to 20 August 2018 resulting in total observations of 1263 excluding public holidays**.**

Table 2. FTSE *Shariah* Indexes

FTSE *Shariah* Indexes	Symbol
FTSE *Shariah* All World	FTSWORLDS
FTSE *Shariah* Developed	FTSWD
FTSE *Shariah* Emerging	FTSWALLE

Source: own processing

The daily market prices are transformed into continuously compounded returns as given in the following equation:

$$r_{i,t} = 100 \times ln\left(\frac{p_{i,t}}{p_{i,t-1}}\right)$$

Where: ($p_{i,t}$) is the Index Prices for the index (i) at time (t) and ($r_{i,t}$) is the stock market return.

4.2 Methodology

As highlighted in the previous section, a market is efficient if all existing information is reflected in the prices of the financial assets. Investors are not able to forecast the variation of prices if information arrives randomly. RW hypothesis stated that a change of financial price is independent of past financial price changes and therefore current financial prices are not related to its past prices. RW is classified as a weak-form of EMH. Therefore our prime

investigative look is to find the evidence on weak-form efficiency and we test the following hypothesis:

H_0: Islamic stock market indices returns follow a random walk and hence the market is efficient.

This study is conducted by using following different statistical tests to test the weak-form market efficiency of each Islamic stock indices studied including Unit Root test, Runs test, Serial correlation (autocorrelation) test and Variance Ratio (VR) test.

4.2.1 Unit Root test

It is a test to prove the existence of stationary characteristic in the time series data. Unit root test can be used for examining the efficiency of markets because market efficiency demands randomness (nonstationary) in the prices of the security. In this study, three alternative tests are employed namely the Augmented Dicky and Fuller (1979) (ADF), the Phillips and Perron (1988) (PP) and Kwiatkowski et al. (1992) (KPSS) tests were selected for the test of the unit root.

H0: The daily stock returns series has a "unit root", series is not stationary and it may follow a "random walk ."

If the result of the t-statistic test is higher than Mackinnon's critical value, for significance levels of 1% and 5%, the null hypothesis of unit root presence (data is not stationary and follow a random walk) within the daily stock returns series, cannot be rejected and, consequently, the Islamic stock market to be efficient in weak form.

4.2.2 The Runs Test

The Runs Test is a non-parametric test, which is used to check the randomness of the series which autocorrelation fails to do. Runs Test is a traditional technique used in the RW model that ignores the characteristics of the distribution. It has been used to judge the randomness in the behavior of the markets. It determines whether successive price variations are independent. It ignores the absolute value in a time series and takes into consideration the price variations of the same sign. In this test, the actual number of runs is being compared with the estimated number of runs. If the actual number of runs is not significantly different from the estimated number of runs, then the price variations are considered independent,

and if this difference is significant then the price variations are considered dependent.

In order to the exam of the significant difference between the actual number of runs and the estimated number of runs, the test statistics employed will be 'Z.'

H0: The observed series are random (The number of expected runs is about the same as the number of actual runs)

The Z-value is tested at 5% significant level. The null hypothesis is rejected if the calculated number of runs falls outside the 95% confidence interval (p-value<5%), the daily stock returns series do not follow a random walk and, consequently, the Islamic stock market to be inefficient in the weak form. The null hypothesis is accepted if the value lies in between ±1.96 (p-value>5%).

4.2.3 Serial correlation (autocorrelation) test

The weak form argues that there should be no correlation between the stocks prices or returns movements over time. This can be tested statistically. We apply the Autocorrelation Function (ACF) test to examine the significance of serial correlation coefficients and disclose the validity of the random walk hypothesis.

Autocorrelation sets out the case where the stock price movement for a day t is related to the price movements in a previous days t-1, t-2…. t-n. If the Islamic stock markets were efficient then there would be an insignificant relationship between return on day t with the return on day t-1, t-2…. t-n .

The Ljung–Box test is a type of statistical test of whether any of a group of autocorrelations of a time series are different from zero. Instead of testing randomness at each distinct lag, it tests the "overall" randomness based on a number of lags.

H0: correlation =0, no significant correlation exists between returns changes, there is randomness in return series.

If the stocks returns are serially correlated we will reject the null hypothesis which means that Islamic stock market is inefficient at weak form level.

4.2.4 Variance Ratio (VR) test

Lo and MacKinlay (1988) suggest the use of a variance-ratio (VR) statistic to test the random walk hypothesis. The VR procedure is inspired by the fact that the variance of a random walk increases linearly with time. The VR test statistics are used to test the random

walk under assumptions of heteroscedastic by using asymptotic distributional.

H0: VR(q) = 1, the daily stock returns series of the Islamic stock market follows a "random walk" and, the returns are not serially correlated.

If the variance ratio is equal to one then it means that stocks follow a random walk and null hypothesis will be accepted. When the random walk hypothesis is rejected and VR(q)>1 (VR(q)<1) returns are positively (negatively) serially correlated.

5. Results and discussion

5.1 Data Properties and the normal distribution test results

Before the application of different statistical tests for market efficiency, we have examined the descriptive statistics. Table 3 contains descriptive statistics and diagnostics of naturally logged computed daily returns for the three FTSE Islamic stock indices investigated. From these summary statistics, several traits can be identified. Firstly, the table shows that daily mean returns for all the series examined are close to zero. With the exception of the FTSWALLE, the rest of the Islamic stock indices reported in table 3 show positive mean returns behavior. Additionally, it can be seen that the Islamic stock markets analyzed series are characterized by higher levels of volatility given that the standard deviations are significantly higher than the mean.

Table 3. Descriptive statistic

	Mean	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Prob.	Obs.
FTSWORLDS	0.0084	0.2823	-0.6767	7.4003	1115.356	0.0000	1263
FTSWD	0.0093	0.2852	-0.7004	7.4648	1152.302	0.0000	1263
FTSWALLE	-0.0015	0.3743	-0.3868	5.8190	449.683	0.0000	1263

Source: Calculated by the researcher based on Eviews9

We also noted significant asymmetry and a negative skewed return distribution for all indexes. In addition, high excess kurtosis values suggest that all the stock return distributions are highly Leptokurtic relative to the normal distribution. This result is confirmed by the Jarque–Berra test statistics, which reject the hypothesis of a normal distribution for any of the Islamic stock index returns investigated at the 1% significance level. The rejection of the hypothesis of a normal distribution is an indication of inefficiency. The normality tests only provide a statistical analysis and may not be conclusive as the distribution of stock returns is not normal. For

greater accuracy, we tested efficiency using more developed approaches.

5.2 Unit Root test results

Table 4 reports conventional unit root and stationarity test results for time series of the Islamic stock index. Three alternative tests are employed namely the Augmented Dicky and Fuller (1979) (ADF), the Phillips and Perron (1988) (PP) and Kwiatkowski et al. (1992) (KPSS) tests.

Table 4. Unit root and stationarity tests

Index		ADF t-tests		PP t-tests		KPSS t-tests	
		tμ	tτ	tμ	tτ	Hμ	hτ
FTSWORLDS		-29.179	-29.170	-28.700	-28.688	0.0770	0.0570
FTSWD		-29.792	-29.782	-29.405	-29.393	0.0679	0.0540
FTSWALLE		-29.683	-29.689	-29.535	-29.532	0.1793	0.0864
critical values	1%	-3.435	-3.965	-3.435	-3.965	0.739	0.216
	5%	-2.863	-3.413	-2.863	-3.413	0.463	0.146

Notes: tμ and tτ are the standards augmented Dickey-Fuller (ADF) test statistics and Phillips–Perron (PP) test statistics when the relevant auxiliary regression contains (a constant) and (a constant and trend) respectively. ημ and hτ are the KPSS test statistics when the relevant auxiliary regression contains (a constant) and (a constant and trend) respectively.

Source: Calculated by the researcher based on Eviews9

As can be observed, the test value is inferior to the critical values, for both significance level (1% and 5%). Therefore, the test rejects the null hypothesis, which states that, the Islamic stock returns' series has a unit root. This indicates that the series are stationary and does not follow a "random walk" type of stochastic process, thus the market on which the prices had been recorded is informationally inefficient in the weak form.

5.3 The Runs Test

With the help of MS Excel, Runs test is applied on the series of data of the Islamic stock markets Indexes. The result of this test is reported on table 5.

In the all cases, it is noted that the z-value is computed as -2,420, -1,317 and -5,173 respectively. This values falls outside the 95% confidence interval and so we cannot accept the null hypothesis. This implies that the succeeding price changes do not move in an independent manner and so these Islamic Stock Indexes does not follow the random walk model, reveals that the future returns can be predicted by using the historical prices, and proves that they are a weak form inefficient stock market.

Table 5. The Runs Test result

	Mean	Obs.	Actual Runs	Obs. <Mean	Obs. >Mean	Exp. Runs	Sta. Dev.	Z-stat	Prob.
FTSWORLDS	0,0084	1263	589	613	650	631,95	17,747	-2,420	0,0077
FTSWD	0,0093	1263	609	623	640	632,39	17,759	-1,317	0,0939
FTSWALLE	-0,0015	1263	539	597	666	630,62	17,709	-5,173	0,0001

Source: Calculated by the researcher based on MS Excel

In order to get more evidence, runs test must operate on different frequency of time series. Financial theory analysts and academics argue that using only daily returns might cause spurious results because of the serial correlation.

5.4 Serial correlation (autocorrelation) test result.

The table 6 represents Ljung-Box test for higher order autocorrelations for stock return index. Tests for the absence of serial correlation over time between returns were implemented from lag 1 up to lag 10 for the all daily return indices series.

Table 6. Serial correlation (autocorrelation) test result.

Lags		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
FTSWORLDS	**AC**	0.193	-0.001	0.014	-0.081	-0.046	0.008	-0.011	-0.016	-0.003	-0.041
	Q-Stat	47.270	47.272	47.533	55.877	58.606	58.690	58.835	59.165	59.173	61.305
	P-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FTSWD	**AC**	0.173	-0.007	0.014	-0.076	-0.051	0.012	-0.008	-0.021	-0.003	-0.044
	Q-Stat	37.989	38.050	38.312	45.611	48.921	49.105	49.180	49.748	49.757	52.202
	P-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FTSWALLE	**AC**	0.177	0.020	0.024	-0.061	-0.030	-0.018	0.022	0.030	0.013	0.005
	Q-Stat	39.469	39.985	40.720	45.476	46.583	46.990	47.623	48.765	48.984	49.011
	P-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source: Calculated by the researcher based on Eviews9

Table 6 shows that for the all cases, there is highly significant autocorrelation (P-value<5%) for all lags at the 5% level, implying that the test rejects the null hypothesis, which states that, the Islamic stock returns' series has no significant correlation exists between returns changes. This indicates that the series does not follow a random walk and the market recorded is inefficient in the weak form.

5.5 Variance Ratio (VR) test result.

Table 7 shows the results of the variance-ratios test for the Islamic stock market returns indices. Columns 3 to 6 indicates the specific time period q, which is the number of interval days, where q = 2, 4, 8 & 16 days for each series. Columns 7 & 8 report the test statistics for each index return series examined. As reported in this

table, since joint probability value is smaller than 1% and z-statistic doesn't fall between ± 1.96, hence we reject the null hypothesis and concluded that return series of all Islamic stock markets don't follow random walk or VR ≠1 for any intervals of q tested in the study. However, because the reported values of the variance-ratio VR(q) are below 1, there appears to be negative serial correlation in the series.

Table 7. Variance Ratio (VR) test.

		q				Joint Tests	
		2	4	8	16	Value	Prob.
FTSWORLDS	**Var. Ratio**	0.6213	0.3356	0.1582	0.0798	8.4398	0.0000
	Z-Statistic	-8.4398	-8.0320	-6.8674	-5.4852		
	Probability	0.0000	0.0000	0.0000	0.0000		
FTSWD	**Var. Ratio**	0.6096	0.3259	0.1552	0.0779	8.6702	0.0000
	Z-Statistic	-8.6702	-8.1144	-6.8793	-5.5129		
	Probability	0.0000	0.0000	0.0000	0.0000		
FTSWALLE	**Var. Ratio**	0.5960	0.3232	0.1481	0.0755	9.1442	0.0000
	Z-Statistic	-9.1443	-8.4708	-7.2222	-5.5987		
	Probability	0.0000	0.0000	0.0000	0.0000		

Source: Calculated by the researcher based on Eviews9

6. Conclusion and summary

This research tries to investigate whether the Islamic stock indices are weak form efficiency. Three Islamic stock indices of World, Developed, and Emerging are used to achieve the objective of the research. For greater accuracy, we tested the efficiency of FTSE Shariah Indexes using many developed approaches. Unit Root test, Runs test, Autocorrelation Function (ACF) test and Variance Ratio (VR) test are used to attain this objective. Table 8 summarizes the results of the tests performed.

Table 8. Summary of test results

	Normal distribution test	Unit Root test	Runs test	Autocorrelation Function test	Variance Ratio test
FTSWORLDS	No	No	No	No	No
FTSWD	No	No	No	No	No
FTSWALLE	No	No	No	Yes	No

Source: own processing

All tests reject the null hypothesis of the weak form efficiency for any of the Islamic stock indices returns investigated. This suggests that the succeeding price changes do not move in an independent manner and so these Islamic Stock Markets does not follow the random walk model, reveals that the future returns can be

expected by using the historical prices, and proves that they are an inefficient stock market**.**

Several implications are inferred from the empirical evidence acquired from this study. For investors, weak-form inefficient Islamic stock markets do not suggest that short-term profits can be obtained but also huge losses can also be realized. In addition, inefficient Islamic markets also reflect the inability of the markets to offer efficient allocated and fairly priced equity capital that is fundamental to the national and regional development of Islamic financial institution (Noryati, 2016, p: 26)**.**

Due to the limited data, the author could not examine the semi and strong forms of market efficiency in Islamic indices. This study is also limited to only three FTSE Islamic indices over the period 14 October 2013 to 20 August 2018. And due to the scarcity of previous literatures related to the market efficiency of Islamic indices, this study faced limitation to compare and conclude if the empirical findings obtained are similar or dissimilar to previous studies. Furthermore, this study uses only Unit Root, Run, Autocorrelation, and Variance Ratio tests to answer the research questions and to examine the hypotheses.

In terms of academic research, it would be interesting to study more indices since our study is limited to global Islamic indices. Future works should go for in depth analysis to look into Islamic sub-indices of each Islamic index family (i.e. Standard and Poor's, Morgan Stanley Capital International and Dow Jones). These Islamic equity indices cover more global, regional and country levels. This study must be improved by using some different methodologies of testing the informational efficiency (such as vector autoregressive regression and impulse response function); different methodologies may also lead to different results. Among these we could mention a wider data set, as well of some variables that reflect the impact of institutional and functional changes that influence the capital market.

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