The Puzzle of Informational Efficiency & Macroeconomic Variables: A Comparative Evidence in Shari'ah Stock Markets of Pakistan viz-a-viz Malaysia

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ABSTRACT

The present study examines the weak-form informational efficiency of the Shari'ah stock market of Pakistan and Malaysia. For this purpose, the study uses the daily index price data of the KSE Meezan Index (Pakistan) & FTSE Malaysia EMAS Shariah Index (Malaysia) for the time span starting from 1st July 2009 to 30th June 2019. By employing a more robust test namely Automatic Portmanteau Test (AQ Test) through testing the Martingale Difference Hypothesis, this study finds that KSE Meezan Index (KMI-30) was informationally efficient (weak-form) whereas FTSE Malaysia EMAS Shariah Index was not weak-form of efficient. Further, this research investigates the long-run relationship viz-a-viz short-run relationship among the returns of both Islamic stock markets and three macroeconomic variables (Exchange Rate, Inflation Rate, Interest Rate) of both said countries. In this connection, this study employs the Philips-Perron Test for stationary analysis, Johansen co-integration test, Vector Error Correction Model on the monthly time series data for the same said sample period. The statistical findings show that returns of both Shari'ah stock markets have a long-run association with said macroeconomic variables and have the co-integration or long-term association with long-run causality running from macroeconomic variables to the return of the Islamic stock market in both sample countries but the short-run association viz-a-viz short-run causality is not found.

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1.   Introduction

The Financial System of a country has a vital significance for the smooth functioning of the economy as well as to allocate savings efficiently to ultimate users. The main pillars of a Financial System are Financial Instruments, Financial Markets, and Financial Institution. In this regard, a stock market has been one of the linchpin financial markets which play an important role as a secondary market for different buyers and sellers of equity. Many researchers found that the stock market, as well as the investing behavior, can be affected by different factors like informational

efficiency, microeconomic variables, macroeconomic variables, company-specific factors, and many other factors (Bahloul, Mroua, & Naifar, 2017; Imdadullah & Hayatabad, 2012). So, due to the significance of the equity market in the economy and continuous developments in the field, it will be of prime significance to explore multiple policies & factors that may potentially put impact upon the performance & decisions of the investors, managers, shareholders, lenders, policymakers, etc in coming times as well as to provide solutions for different challenges faced by the world today.

Market efficiency or informational efficiency is a momentous feature of any market which makes the pricing and accessibility of funds better and induces foreign investors as well as domestic investors. So, in this connection, the present study cannot ignore the importance of the Efficient Market Hypothesis (EMH). EMH has been one of the linchpin theories of standard finance since 1970 which was founded by Eugene Fama (Fama, 1970). But the contribution of some other researchers cannot be forgotten who gave their precious input for the gradual development of the basic notion of market efficiency i.e. (Bachelier, 1900; Cowles 3rd, 1933; Cowles, 1944; Kendall & Hill, 1953; Osborne, 1959; Pearson, 1905; Roberts, 1959; Samuelson et al., 1965). (Fama, 1970) stated that a market is considered to be efficient when the prices of all market's assets accurately & speedily incorporate entire prevailing information (public & private) and any person will not be able to make the irregular returns since everyone possesses the same information at same moment of while due to the speedy flow of information. So, if an investor thinks that he is smarter than the market and can beat the market on the basis of some information gap then he thinks wrong because the market is smarter than him. Further, (Fama, 1970) segregated the market efficiency in three sub-level namely "weak-form, semi-strong form, and strong-form." The current study also shows its interest to investigate the weak form informational efficiency of two Asian shariah indices as (Belaire-Franch & Opong, 2005; Kuan & Lee, 2004; Lo & MacKinlay, 1988), and many other researchers mentioned that to make better circumstances causing for market efficiency is the prime interest of regulators, traders always look for the inefficiencies to earn the abnormal, and no one can beat the market by using the technical analysis when the return process is a martingale and random walk.

Besides informational efficiency, macroeconomic variables also affect the equity market and investing behavior since macroeconomic variables have great importance in the economy. The macroeconomic factors can be the interest rate, inflation rate, money supply, exchange rate, industrial production index, etc. In this regard, many researchers conducted different researches to examine the influence of macroeconomic variables upon the stock market for instance (Bahloul et al., 2017; Baranidharan & Alex, 2020; Eldomiaty, Saeed, Hammam, & AboulSoud, 2019; Imdadullah & Hayatabad, 2012; Pantas, Ryandono, Munir, & Wahyudi, 2019); etc. So, keeping in view the importance of macroeconomic variables as well as their significant impact on the equity market, the present research also focuses on the co-integration among macroeconomic variables and the equity market.

For said objectives, the present study selects Shari'ah indices of two Asian countries due to unimaginable growth and development in the Islamic Finance sector during the last some decades specifically after the subprime mortgage crises (2007-2009) (Chapra, 2008; Siddiqi, 2008). As Global Islamic Finance Report 2021 (GIFR) reported that the Global Islamic Financial Assets are climbed up to US$ 3 trillion till the last month of 2020 with a growing rate of 200% in comparison with US$ 1 trillion in 2009. The Shari'ah Financial System is implemented by following the ideologies & rules of Shariah (Muslim's code of conduct based on the religion Islam). All investments are said to be Shariah-compliant when there is no speculation & uncertainty in investments or transactions, and no revenue is earned through Riba (interest), gambling, the sales of alcohol, pork products, pornography, and so on (O. M. Al-Khazali, Leduc, & Alsayed, 2016). Further, researchers began to study the performance and efficiency of different Shariah-based investments, products & services like Shari'ah indices, Shari'ah equity funds, and Islamic bonds

like (O. Al-Khazali, Lean, & Samet, 2014; O. M. Al-Khazali et al., 2016; Ali, Shahzad, Raza, & Al-Yahyaee, 2018; Badeeb & Lean, 2018; Charles, Darné, & Kim, 2017; El Khamlichi, Sarkar, Arouri, & Teulon, 2014; Hassan, Miglietta, Paltrinieri, & Floreani, 2018; Hassan, Paltrinieri, Dreassi, Miani, & Sclip, 2018; Hassan, Unsal, & Tamer, 2016; Ho, Abd Rahman, Yusuf, & Zamzamin, 2014; Setianto & Abdul Manap, 2015), and many others. So, it is very important to study about different characteristics of the Islamic markets, Islamic institutions, and the products used therein to facilitate investors to make best the possible investment decisions. So, there is a necessary factor for Shari'ah equity indices to remain informational efficient. Despite the quick growth of the Shariah-compliant products, limited studies are done to provide knowledge on the market efficiency of Shariah indices.

Thus, keeping in view the importance of the Islamic financial system as well as market information for investors, practitioners, and policy makers to make optimal decisions, the present research examines the weak-form efficiency of the Shari'ah stock market of Pakistan and Malaysia by testing the Martingale Difference Hypothesis as well as investigates the long-run & short-run association viz-a-viz long-run & short-run causality among the returns of both Islamic stock markets and three macroeconomic variables (Exchange Rate, Inflation Rate (CPI), and Interest Rate) of both said countries.

The present study is very significant from a theoretical perspective as well as practical perspective as instant study participates in the limited prevailing literature of empirical studies by determining the informational market efficiency (weak-form) through testing the Martingale difference Hypothesis (MDH) in two Asian Islamic indices of Pakistan and Malaysia as well as present research examines the long-run relationship & causality viz-a-viz short-run relationship & causality among the returns of both Islamic stock markets and three macroeconomic variables. Second, the present research uses the more robust statistical tests which are mentioned hereinafter; Automatic Portmanteau Test, Johansen co-integration test, VECM, etc. Third, the sample size & period of the present study is also bigger than the previous studies that have been done to investigate the market efficiency of Asian Islamic indices. Lastly, most importantly, many of the previous research examined the weak-form efficiency, by selecting the Dow Jones indices or MSCI indices which do not show the true results. But this study uses the countries' own native Islamic indices of two Asian countries which show the true picture of a country's capital market and economy. Therefore, this study motivates researchers for further research on Islamic investing. Hence, the present study will be useful for financial analysts to better evaluate the Islamic investments. The present study will also be helpful for investors and regulators to get better knowledge about the behavior and efficiency level of the Shari'ah equity markets for optimal decision-making.

The remaining part of this study is structured in the following way. The Literature review section critically discusses the literature of empirical studies. Thereafter, Data and Methodology part as well as the Results and Discussion part. The final part is Conclusion and Implications which includes the study's conclusion, limitation, implication, and recommendation for future research.

2. Literature Review

In the present section, numerous research has been debated who added their part in the prevailing literature by, testing the informational efficiency in the Shari'ah indices and conventional indices viz-a-viz, determining the macroeconomic variables' effect on the equity markets. Researchers and academicians have given little consideration to Shari'ah markets as compared to their conventional counterparts. So, keeping in view the importance of remarkable growth/continuous developments in Shari'ah finance, it would be of prime significance to explore multiple factors & characteristics of the Islamic market that may potentially affect its

performance in coming times and provide solutions for different challenges faced by the world today to make an optimal decision. In such regard, this present study shows its interest to inspect the informational efficiency (weak-form) of two Asian Islamic indices of Pakistan & Malaysia and also determines the short-term and long-term association along with causality amongst three macroeconomic variables and said equity market's returns.

2.1 Empirical Literature

For investors, regulators, and policymakers, the level of efficiency in information is always momentous. Foregoing in view, little research is done specifically in the vicinity of Asia. For instance, (Guyot, 2011) claimed that Islamic indices have shown greater efficiency (weak-form) in comparison with conventional counterparts. Further, (Jawadi, Jawadi, & Cheffou, 2015) also investigated the weak-form efficiency of three Shariah stock markets by employing numerous tests in respect of short span viz-a-viz long span to measure the efficiency and they recommended making an investment in this area for optimal decision making. Another study focused to inspect the informational efficiency of ten sectors by employing Multifractal De-trended Fluctuation Analysis and concluded that throughout the short-run, the Shariah viz-a-viz conventional indices possess the analogous efficiency intensity (Alam, Arshad, & Rizvi, 2016). Further, (Khan, Khan, Khan, Khan, & Rahman, 2021) investigated the existence of the weak form of informational efficiency, and also tried to predict the short run prices of equity in the USA Dow Jones Shari'ah index viz-a-viz socially responsible index. Their study could not find the existence of weak efficiency during the period of 2010 to 2018 by employing several parametric as well as non-parametric tests.

In the Asian region, various studies are conducted to determine the weak-form of efficiency along with a particular focus on conventional markets. A few studies have been conducted in this regard like (Ardiansyah & Qoyum, 2011) did the study to determine the semi strong-form efficiency of the Jakarta Islamic Index (JII) and claimed that JII was not in the capacity of efficiency. Similarly, (Ali et al., 2018) also investigated the informational efficiency through comparing the Shari'ah and conventional indices of BRICS countries and their findings showed that developed markets have shown more efficiency. It is also found that excluding Pakistan, Jordon, and Russia, the remaining Shariah Indices showed more efficiency as compared to their conventional. By inspiring from the above studies, this study also takes interest in Shari'ah indices.

Besides above, some studies are also conducted to inspect the risk, returns, and performance of both Shari'ah and conventional indices, banks, mutual funds, etc around the world specifically in the Asian region, and found Islamic ones outperform the conventional counterparts (Al-Zoubi & Maghyereh, 2007; Alam & Rajjaque, 2016; Hakim & Rashidian, 2004; Hassan, Paltrinieri, et al., 2018; Ho et al., 2014; Hoepner, Rammal, & Rezec, 2011; Hussein & Omran, 2005). So, viewing the better performance of Islamic indices, funds, banks than conventional counterparts, this present study also attempts to focus on Islamic markets by examining the informational efficiency in the weak form of two Asian Shari'ah indices.

Moreover, some studies also took the interest to examine the impact of different macroeconomic variables (likewise interest rate, exchange rate, inflation, GDP, money supply, etc) on the stock market (both conventional & Shari'ah). For instance, (Li & Huang, 2008) employed the Engle-Granger test and discovered no relation between Chinese stock market prices and exchange rate in the long run while their research witnessed the existence of a short run association between Chinese stock market prices and exchange rate. In the same way, (Pantas et al., 2019) focused on determining the long term association among Jakarta Islamic Index, Composite stock price index, & exchange rate in Indonesia by employing the Johansen cointegration test and statistical results could not find long term association. But (Adjasi, Harvey,

& Agyapong, 2008) claimed an inverse relation between equity market prices as well as exchange rate by employing the EGARCH model. Thus, investors will get a loss or less return due to increasing exchange rate if they already possess the stocks. Further, they also found that in the short run, stock market prices decrease, and domestic currency increases but in long run, stock market prices increase and domestic currency decreases. Parallelly, (Baranidharan & Alex, 2020) also found a significant association as well as inverse causality between Johannesburg Stock Exchange & exchange rate by employing cointegration test as well as Granger Causality test for the time of 2009-2020. Moreover, another study by (Imdadullah & Hayatabad, 2012) found a negative association between the KSE-100 index's prices as well as exchange rate in Pakistan by using multiple regression models on the data of ten years.

Moreover, another study witnessed a direct effect of inflation upon equity returns by employing the EGARCH model in Turkey (Kutan & Aksoy, 2003). (Nkoro & Uko, 2016) employed the GARCH model and discovered the negative effect of inflation upon equity returns in Nigeria. Parallelly, another study by (Eldomiaty et al., 2019) inspected the effect of interest rate & inflation upon the non-financial firms registered in DJIA-30 & NASDAQ-100 and by employing the stock duration model, Johansen cointegration test, VECM model for the period starting from 1999 to 2016, their study found the existence of association among variables in question. Their study also concluded that interest rate & stock returns have a positive association while inflation & stock returns have a negative.

Moreover, (Bahloul et al., 2017) employed the MS-VAR model on the monthly data of twenty Shari'ah equity indices to examine any association between the Shari'ah equity market's returns and interest rate but could not find. So, the above studies contributed a vital part to the literature but despite the quick growth of the Shariah-compliant products, very limited studies have been done so far regarding Islamic indices and overlooked the imperative realm of Shari'ah indices, that is market efficiency and impact of macroeconomic variables on Shari'ah markets, which is very vital for regulators & investors to make good decisions. Further, many of the previous research examined the weak-form efficiency by selecting the Dow Jones indices or MSCI indices, which do not show the true results, rather than countries' native Islamic indices which show the true picture of a country's capital market and economy. Most importantly, most of the prior studies employed less advanced tests e.g. "Unit Root test, Run test, DW test, LM test, Ljung Box-Q Statistics, Variance ratio, Box-Pierce", etc. Therefore, instant research examines the weak-form informational efficiency of the Shari'ah equity market of Pakistan and Malaysia by testing the MDH as well as investigates the long-run relationship via-a-viz short-run affiliation among the returns of both Islamic stock markets and three macroeconomic variables of both said countries. Hence, the present study will be useful for financial analysts to better evaluate the Islamic investments. The present study will also be helpful for investors and regulators to get better knowledge about the behavior and efficiency level of the Shari'ah equity markets for optimal decision-making.

3.   Data and Methodology

For the present quantitative study of research, a panel secondary data of the daily & monthly closing index prices of two Shari'ah indices of Asia were obtained for the tenure ranging from 01-07-2009 to 30-06-2019 through "Datastream". Further, the monthly data of all three macroeconomic variables, (Exchange Rate (ER), Inflation Rate (Consumer Price Index as proxy), Interest Rate (IR)), is obtained from the state banks of selected sample countries' official websites. For sample selection, by choosing a purposive sampling method, present research selected the two Asian countries i.e. Pakistan and Malaysia. In Pakistan, KMI 30 Index has been chosen and in Malaysia, FTSE Malaysia EMAS Shariah Index has been chosen. To analyze the market efficiency (weak-form), this study calculated the everyday returns as:

$$R_{i,t} = \log(P_{i,t}) - \log(P_{i,t-1}) \qquad (1)$$

In equation 1, $R_{i,t}$ symbolizes the "daily return for index i for the time t", $(P_{i,t})$ is the "closing index price of index i at time t", and $(P_{i,t-1})$ refers to the "closing index price on index i at time t-1".

Further, to investigate the long-run and short-run association amongst said Shari'ah equity markets' returns and three economic variables, the following multiple regression model is formulated:

$$LOGSMR_t = \beta_0 + \beta_1 LOGEXC_t + \beta_2 LOGCPI_t + \beta_3 IR_t + \varepsilon_t \qquad (2)$$

In above equation 2, LOGSMR denotes the Natural Log of Stock Market Returns on monthly basis, LOGEXC denotes the Natural Log of Exchange Rate on monthly basis, LOGCPI denotes the Natural Log of Consumer Price Index on monthly basis, IR denotes Interest Rate on monthly basis, and t is considered as 2009 to 2019.

3.1 Methodology

To determine the informational efficiency (weak-form) of two Asian Shari'ah indices, this study tested the MDH through employing the "Automatic Portmanteau Test (AQ)" and the weak-form efficiency is witnessed when shares' prices rapidly and precisely reflect the entire past information and technical analysis is futile due to absence of trend & serial correlation in stock prices & returns (Fama, 1970).

3.1.1 Automatic Portmanteau Test (AQ)

AQ Test, developed by "Escanciano and Lobato" in 2009, is employed to check the MDH by determining the serial correlation. It is very vital to mention here that "AQ Test's null distribution follows chi-square distribution along with one degree of freedom since its optimal value of lag order is 1 and a bootstrap procedure is not necessary to forecast the critical values but into alternative hypothesis, AQ test automatically selects the optimal lag order focusing upon the serial correlation prevailing in data". The (Escanciano & Lobato, 2009) statistic "AQ" is as under:

$$AQ = Q_P^* \qquad (3)$$

And Q_P^* is:

$$Q_P^* = n \sum_{j=1}^{p} \acute{\rho}_j^2, \qquad (4)$$

In the above model of equation 4, Q_P^* is the robustified portmanteau statistic (Escanciano & Lobato, 2009). Where n denotes sample size, P denotes the number of autocorrelations/lag order, and $\acute{\rho}$ refers to the sample autocorrelation of Y_t of order j.

Further:

$$\acute{\rho}_j^2 = \frac{\gamma_j^2}{\tau_j} \qquad (5)$$

If "Y_t be a stationary process, and $\bar{Y}$ be the empirical average of the sample $\{Y_t\}_{t=1}^n$. For j =0,…, $n-1$, set as a consistently estimated estimator of the auto-covariance of order j."

$$\gamma_j = \frac{1}{n-j}\Sigma_{t=j+1}^{n}(Y_t - \bar{Y})(Y_{t-j} - \bar{Y}) \tag{6}$$

Here "Y_t is the sample's returns at time t, $\bar{Y}$ is the average returns, and γ_j is the estimator for the autocovariance of Y_t.

$$\gamma_j = Cov(Y_t, Y_{t-j}) \tag{7}$$

Further, τ_j (autocovariance of Y_t^2) can be calculated as:

$$\tau_j = \frac{1}{n-j}\Sigma_{t=j+1}^{n}(Y_t - \bar{Y})^2(Y_{t-j} - \bar{Y})^2 \tag{8}$$

In above equation 8, τ_j is the sample analog of the jth order autocorrelation of $(Y_t - \mu)^2$. As per the Escanciano and Lobato (2009), under the null-hypothesis,

$$H_0 = \rho_j = 0 \text{ for } j \geq 1 \tag{9}$$

Moreover, the AQ is consistent against the alternative H_1^k for $k \leq d$, with"

$$H_1^k \neq \rho_1 \neq 0, \rho_2, \dots., \rho_k \neq 0 \tag{10}$$

AQ test automatically selects optimal lag order value by using the advantages of both AIC and BIC satisfying the condition explained hereinafter:
$$nAQ = Q_{\acute{P}}^* \tag{11}$$

Where

$$\acute{P} = \min\{P: 1 \leq P \leq d; L_P \geq L_h, h = 1,2,\dots\dots,d\} \tag{12}$$

Where
$$L_P = Q_P^* - \pi(P,n,q) \tag{13}$$

Here d refers to the fixed upper bound of natural number i.e. 75, q is a fixed positive number i.e. 2.4 (to get the advantages of both AIC & BIC) and $\pi(P,n,q)$ is a penalty term (which is used to get the combine advantages of both AIC & BIC) that may take the value as:

$$\pi(P,n,q) = \begin{cases} P\log n, & \text{if } \max \sqrt{n}|\acute{\rho}_j^v| \leq \sqrt{q\log n,} \\ 2P, & \text{if } \max \sqrt{n}|\acute{\rho}_j^v| > \sqrt{q\log n,} \end{cases} \tag{14}$$

3.1.2 Phillip Perron Test

For the motive of examination, the long-term co-integration viz-a-viz short-run co-integration, stationary of data must be known first since in the situation of non-stationarity in the time series data, various problems happen but cointegration can exist in two non-stationary time series. To run the Johansen cointegration test, it is necessary that data must be non-stationary at the level form and becomes stationary at 1st difference or 2nd difference. So, to check the stationarity of data, Phillip Perron (PP) Test is used. The Augmented Dicky Fuller (ADF) Test can be utilized as well to inspect the stationarity of time series data but due to some weaknesses in the ADF test, the PP test is used (Asmy, Rohilina, Hassama, & Fouad, 2009; Tan, Lee, Tan, Wan, & Wong, 2016). In the PP test, if data is not stationary at level form then we can take 1st difference or 2nd difference. The need of getting the first and second differences of the

time series data occurs when the series display a non-stationarity result (Talla, 2013). We have the null-hypothesis that the variables are non-stationarity, and we will reject the null-hypothesis if the probability value is lower than the significance levels of .01, .05 and .10 which means the series of data is stationarity. If the p value is more than the significance level which means it cannot reject the null-hypothesis and there is the need of getting first difference of the series.

3.1.3 Johansen Juselius Cointegration Test

For the goal of checking the cointegration or long-term association, the present study used the Johansen cointegration test. If the data does not witness non-stationary at level-form and becomes stationary at 1st difference or 2nd difference in PP test then there is no issue to run the Johansen cointegration test (Johansen & Juselius, 1990). Here the null-hypothesis is formulated as there is cointegration among variables as well as an alternative hypothesis is formulated as there is no cointegration among variables. If the p value is greater than the threshold of .01, .05, and .10 then we accept the null-hypothesis or otherwise. Johansen test is based upon two statistics namely i) Trace Statistic & ii) Max-Eigen Statistic. Further, Akaike Information Criterion is taken into consideration for choosing the maximum Lag length i.e.1.

It is necessary to cite that if the cointegration or long-term association is found in Johansen cointegration test then VECM is employed for the motive of examination of the long-term and short-term causality and in case of absence of cointegration, Granger Causality test and unrestricted VAR (Vector Auto-Regressions) is utilized to examine the long-term viz-a-viz short-term causality.

3.1.4 Vector Error Correction Model

When the cointegration or long-term association is found in the Johansen test then Vector Error Correction Model (VECM) is utilized to determine the long-term viz-a-viz short-term causality. It is also known as restricted VAR (Vector Auto-Regressions) (Asari et al., 2011). VECM is an estimation model with complete information and all possibilities, which enable researchers to analyze variables cointegration with no need to normalize them. VECM has the ability to point out the broad changes among independent and dependent variables and equilibrium them for a longer time.

For diagnostic checking, this study has used the Jarque-Bera Test (for Normality), Breusch-Pagan-Godfrey Test (for Heteroscedasticity), and LM Test (for Autocorrelation).

4.   Results and Discussion
4.1   Descriptive Statistics

The descriptive statistics of the daily index's returns data are mentioned in Table 1. In descriptive statistics, the daily mean return examines the average return of the two Islamic indices, the standard deviation shows the dispersion of the index's return, and to find the normality of data, skewness, kurtosis, and Jarque-Bera test have been employed. Table 1 clearly shows that Pakistan's KMI 30 index has more daily mean return than FTSE Malaysia EMAS Shariah Index. Further, KMI 30 index has more standard deviation & risk as compared to FTSE Malaysia EMAS Shariah Index. Jarque-Bera results expose that the null-hypothesis of normality of returns is failed to accept and the daily index returns data of both indices are not normally distributed since P-value is smaller than .05. So, Shari'ah indices & shares are a good option for investment, and the Pakistan Shari'ah index has more returns but high risk.

Table 1
Descriptive statistics of daily returns for Islamic Indices

Index	Pakistan KMI-30 Index	Malaysia FTSE Malaysia EMAS Shariah Index
Mean	0.00041	0.0002
Sdt. Dev.	0.00413	0.00301
Skewness	-0.601	-0.51001
Kurtosis	25.001	7.001
Jarque-Bera	39012.40	1280.02
Prob.	0.0000	0.0000

Further, in Table 2, the statistical results of descriptive statistics of sample macroeconomic variables of Pakistan & Malaysia are stated for the period 01-07-2009 to 30-06-2019. The time-series data of three macroeconomic variables mentioned hereinafter are utilized on monthly frequency: Exchange Rate (EXC), Consumer Price Index (CPI) being the proxy of inflation, and Interest Rate (IR). All the macroeconomic variables have been incorporated in log form except Interest Rate. So, it is viewed in Table 2 that Pakistan's mean exchange rate (5.10149) is more than Malaysia's mean exchange rate (1.67042). Moreover, the Malaysian exchange rate has more deviation (0.14013) as compared to Pakistan (0.10011).

Table 2
Descriptive Statistics of Pakistan's & Malaysia's Macroeconomic Variables

Variables	Pakistan	Malaysia
LOGEXC		
Mean	5.10149	1.67042
Sdt. Dev.	0.10011	0.14013
LOGCPI		
Mean	6.1123	5.01101
Sdt. Dev.	0.197	0.06052
IR		
Mean	0.00848	0.00291
Std. Dev.	0.00201	0.00048

As far as the Consumer Price Index is involved, it can be concluded that Pakistan has more inflation (6.1123) as compared to Malaysia (5.01101). Moreover, it can be stated that Pakistan's inflation (0.197) has more deviation than Malaysia's (0.06052). Furthermore, keeping in view the reported values of Interest Rate (IR), it is easy to state that Pakistan has more interest rate (0.84%) than the Malaysian interest rate (0.29%). Moreover, Pakistan's interest rate has more deviation (0.00201) than Malaysia's (0.00048).

4.2 Results for MDH
4.2.1 The AQ Test

To measure the weak-form of informational efficiency, AQ Test is employed by testing the MDH. The results of the AQ Test of two Asian Islamic indices for the entire period (1st July 2009 to 30th June 2019) are mentioned in Table 3.

Table 3
MDH results over the entire period (2009-2019)

Islamic Index	Pakistan KMI-30 Index	Malaysia FTSE Malaysia EMAS Shariah Index
AQ	0.0511	13.22**
P-Value	0.191	0.00022

*Note: *Significance at 10%. **Significance at 5%*

As per the reported AQ Test's results, it is stated that Pakistan's KMI 30 Index failed to reject the MDH as well as therefore, was weak-form of efficient because P-value is greater than the threshold of .025 & .05 (two tail) at .05 & .10 significance level correspondingly. But Malaysia's Shari'ah index, i.e. FTSE Malaysia EMAS Shariah Index, rejected the MDH because Probability-value is smaller than the threshold of .025 & .05 (two tail) at .05 & .10 significance level correspondingly. Moreover, as compared with previous studies' results, some studies are aligned with the results of the instant research, and some are not (discussed at the end of the Results section).

4.3 Results for Stationary Analysis & Cointegration Test
4.3.1 Phillip Perron Test

To execute the cointegration test, firstly there should be known regarding the stationarity of data. So, to examine the normality or stationarity, the present study employed the Phillip Perron (PP) test, on the dependent variable (LOGSMR) i.e. monthly returns of Pakistani & Malaysian Shari'ah indices viz-a-viz, on independent macroeconomic variables (Exchange Rate, Consumer Price Index, & Interest Rate). Further, here PP Test considers Newey-West Estimate through utilizing the Barlett Kernel. Moreover, the PP test has been executed with trend & intercept and in this regard, optimal Lag length has been chosen through employing the Akaike Information Criterion i.e.1.

Table 4
Results of PP Test for the entire period (2009-2019)

Variables	Pakistan		Malaysia	
	Level	**1st Diff**	**Level**	**1st Diff**
LOGSMR	-2.025	-9.121*	-1.308	-9.921*
	(0.401)	(0.000)	(0.890)	(0.000)
LOGEXC	-2.135	-9.112*	-3.121	-7.631*
	(0.415)	(0.000)	(0.113)	(0.000)*
LOGCPI	-1.321	-10.54*	-2.231	-9.012*
	(0.848)	(0.000)	(0.445)	(0.000)
IR	-1.401	-10.19*	-2.431	-8.981*
	(0.821)	(0.000)	(0.401)	(0.000)

Numerical values of PP Test with their relevant probability values (in parentheses) are stated in Table 4 which depicts that at level form or real form, all said variables, in both countries, are non-stationary and therefore, null-hypothesis could not be rejected since probability values are greater than the critical P-values of 10%, 5%, & 1%. While taking the 1st difference of the above variables made them stationary since probability values are less than the critical P-values of 10%, 5%, & 1% and therefore, null-hypothesis could not be accepted. So, variables did not witnesse non-stationarity at level form whilst variables witnessed stationarity at same order I (I).

4.3.2 Johansen Juselius Cointegration Test

As the data of dependent variable viz-a-viz independent variables is found non-stationary at level-form and became stationary at the 1st difference, so there is no issue to run cointegration test aiming to examine the cointegration or long-term association among dependent variable and independent variables. So, in the above regard, the present study employed the Johansen cointegration Test by taking the monthly return data (level-form) of dependent variable viz-a-viz independent variables stated in Table 4.

The values of the Johansen cointegration test by running on all sample dependent as well as independent macroeconomic variables of Pakistan have been stated in Table 5. It is easy to interpret that in Pakistan dependent variable (stock return of KMI-30) and independent macroeconomics variables (Exchange Rate, Inflation Rate, Interest Rate) are co-integrated or long-term associated since the probability value of Trace Statistic viz-a-viz Max-Eigen Statistic is less than the threshold of .05, .01 and first null-hypothesis (none) could not be accepted while remaining three null-hypothesis have been accepted as the probability value is greater than the threshold of .05, .01. So, it can be concluded that there is at most one co-integrated equation which means all four variables (stock return of KMI-30, Exchange Rate, Inflation Rate, Interest Rate) are long-run associated and co-integrated.

Table 5
Result of Johansen Juselius Test on Sample Variables of Pakistan

Ho	Trace Statistic	P-Value	Max-Eigen Statistic	P-Value
None	80.02123*	0.0000	49.1234*	0.0000
At Most 1	26.11702	0.1201	16.2341	0.2204
At Most 2	11.45011	0.2413	7.0212	0.4902
At Most 3	4.132658	0.1031	4.32591	0.0408

As far as Malaysia is concerned, the values of the Johansen cointegration test by running on all sample dependent as well as independent macroeconomic variables have been stated in Table 6. It is easy to interpret that in Malaysia dependent variable (stock return of KMI-30) and independent macroeconomics variables (Exchange Rate, Inflation Rate, Interest Rate) are co-integrated or long-term associated since the probability value of Trace Statistic viz-a-viz Max-Eigen Statistic is less than the threshold of .05, .01 and first null-hypothesis (none) could not be accepted while remaining three null-hypothesis have been accepted as the probability value is larger than the threshold of .05, .01. So, it can be concluded that there is at most one co-integrated equation which means all four variables (stock return of KMI-30, Exchange Rate, Inflation Rate, Interest Rate) are long-run associated and cointegrated.

Table 6
Result of Johansen Juselius Test on Sample Variables of Malaysia

Ho	Trace Statistic	P-Value	Max-Eigen Statistic	P-Value
None	71.1091*	0.0000	56.1134*	0.0000
At Most 1	18.1011	0.5919	17.2191	0.6014
At Most 2	6.67212	0.7123	6.34732	0.7215
At Most 3	0.002212	0.8289	0.002101	0.8932

In the nutshell, this study can claim, as per the results reported in Table 5 viz-a-viz Table 6, that that stock returns of both Shari'ah indices (Pakistan & Malaysia) are long-term associated as well as co-integrated for the sample time i.e. 2009 to 2019.

4.4 Results for Vector Error Correction Model (VECM)

Since the cointegration was found in the Johansen cointegration test, therefore, present research utilized the VECM to examine the long-term causality viz-a-viz short-run causality. In VECM, the existence of long-term causality running from independent macroeconomic variables towards dependent variable i.e. returns of Shari'ah index based upon the Error Correction Term i.e. C(1) which is also considered as the pace of adjustment towards equilibrium. If the coefficient of C(1) has a negative sign and is significant then it can be concluded that there is long-term causality running from independent variables towards dependent variable or otherwise So, null-hypothesis is that there is no long-term causality and alternate hypothesis is that there is long-run causality.

While short-term causality running from independent variables to the dependent variable will exist if the remaining coefficients of VECM i.e. C(3), C(4), C(5) are found significant. Here, the null-hypothesis is that there is no short-term causality [C(3)=C(4)=C(5)=0] and the alternate hypothesis is that there is short-run causality running from independent variables towards dependent variables.

Table 7
VECM's Results on Variables of Pakistan

Ho	Coefficient	Std. Error	t-Statistic	P-Value
C(1)	-1.4111*	0.1601	-9.1124	0.0000
C(2)	0.0511	0.1023	0.6652	0.5075
C(3)	-0.7301	0.4331	-0.4023	0.6883
C(4)	-0.5312	0.7102	-0 .5617	0.5756
C(5)	-5.1021	13.021	-0.7916	0.4306
C(6)	0.0045	0.0061	0.3593	0.7202

* Null Hypothesis for long term causality is C(1)=0 and for short term causality is C(3)=C(4)=C(5)=0

Considering the statistical results reported in Table 7, it has been found that in Pakistan, a long-term causality is witnessed running from LOGEXC, LOGCPI, IR towards LOGSMR. While in the perspective of short-term causality, it is found that there is no short-run causality, in Pakistan for the time of 2009-2019, running from LOGEXC, LOGCPI, IR towards LOGSMR.

Further, the VECM results on variables of Malaysia are reported in Table 8. Considering the below-mentioned statistical results, it has been found that in Malaysia, there is a long-term causality running from LOGEXC, LOGCPI, IR towards LOGSMR.

Table 8
Results of VECM on Variables of Malaysia

Ho	Coefficient	Std. Error	t-Statistic	P-Value
C(1)	-1.451120*	0.21251	-8.1231	0.0000
C(2)	0.07132	0.11232	0.4104	0.6824
C(3)	-0.06176	0.14613	-0.8209	0.4138
C(4)	-0.48134	0.77123	-0.1710	0.8646
C(5)	1.98496	29.2102	0.4954	0.6214
C(6)	0.0034	0.00301	0.4636	0.6440

* Null Hypothesis for long term causality is C(1)=0 and for short term causality is C(3)=C(4)=C(5)=0

But, in the perspective of short-term causality, short-term causality is not found, in Malaysia for the time span of 2009-2019, running from LOGEXC, LOGCPI, IR towards LOGSMR. So, keeping in view all statistical findings of VECM, it is added that there is a long-term causality running from independent variables (LOGEXC, LOGCPI, IR) towards the dependent variable (LOGSMR) in said countries i.e. Pakistan & Malaysia. On the other side, short-run causality is not found running from LOGEXC, LOGCPI, IR towards the LOGSMR in both countries.

As far as the diagnostic checking is concerned, the instant study employed: Jarque-Bera Test and found that error term is normally distributed; LM Test and existence of autocorrelation is not found in error term; Breusch-Pagan-Godfrey Test and heteroscedasticity is not found in error term.

5. Conclusion and Implications

Firstly, through investigating the Martingale Difference Hypothesis, the present research examined the informational efficiency (weak-form) of two Shari'ah indices i.e. KMI 30 index & FTSE Malaysia EMAS Shariah Index. For this purpose, daily price index data for the period from

01-06-2009 to 30-06-2019 was obtained through Datastream. Automatic Portmanteau Test is employed which shows that Pakistan Islamic index (KMI30) was efficient in weak-form while Malaysian Islamic index (FTSE Malaysia EMAS Shariah Index) was not weak-form of efficient as it rejected the MDH. Keeping in the above results as well as compared with previous studies' results, it can be stated that some studies are aligned with the present study's results and some are not e.g. (Habibah, Ghumro, & Mirani, 2017) found analogous results that KSE-100 index (Pakistan) rejected the RWH. Similarly, the following studies' results are also associated with the findings of the instant study e.g. (Haque, Liu, & Nisa, 2011; Kabbani, 2016; Lingaraja, Selvam, & Vasanth, 2014; Shaik & Maheswaran, 2017). Parallelly, the following studies' results are not aligned with the instant study's results e.g. (Ali et al., 2018; Rabbani, Kamal, & Salim, 2013; Worthington & Higgs, 2006), etc.

Further, to measure the short term viz-a-viz long-term association & causality among the monthly returns of said both Islamic indices and three said macroeconomic variables (Exchange Rate, CPI, Interest Rate), this research employed the Phillip Perron (PP) Test, Johansen Juselius Test, and Vector Error Correction Model (VECM). As per the statistical findings, it can be concluded that returns of both Islamic indices and said three macroeconomic variables have long term association and causality but there is no short-term causality amongst them.

By viewing the entire statistical findings of the present research, it can be concluded that the Pakistani Islamic index has more returns as compared to the Malaysian Islamic index. It shows that in the Pakistan Shari'ah equity market, securities' prices incorporate the past information more rapidly & precisely. Although, market efficiency is a time-varying phenomenon and different results can be found due to different periods with the same sample. In this context, investors can use this knowledge of informational efficiency for good decision-making by relating & using the information of different states of the economy (boom, bullish, bearish, recovery, etc.) and it can be assumed that different periods of the same state of the economy will have the same level of informational efficiency. Further, it is also found that there is a long-term association and causality among both Islamic indices' returns and three said macroeconomic variables but there is no short term association.

In spite of the developing phase of Shari'ah indices, they have remarkable potential and are a good alternative to conventional stocks for investment and to earn profit. Therefore, the present study is very significant in both aspects theoretically viz-a-viz practically. According to the authors' information & knowledge, this is the maiden comprehensive study to establish equilibrium association among the Islamic stock indices & the macroeconomic variables in Asia. Keeping in view the above results, present research added to the current literature since, in spite of the growing stage of Shari'ah indices, they have remarkable potential and are a good alternative to conventional stocks for investment. From a practical perspective, this study will be important and useful for all investors & policymakers in Asia especially Pakistan, Malaysia, and the rest of the world to get better knowledge about the informational efficiency as well as long-term & short-term relationship among the Shari'ah equity indices and the macroeconomic variables and in this way they can forecast the movement of Shari'ah equity market in the long-run, Further, this study may be helpful for the financial analysts in Pakistan as well as in Malaysia to better investigate & evaluate the Islamic Stocks for good decision making. The present research is helpful too for investors & regulators in Pakistan and Malaysia for better knowledge about the performance of the Shari'ah equity markets in Asia as findings witnessed that "exchange rate, inflation and Interest rate have an effect upon the Shari'ah equity market's return in the long-term".

Nevertheless, the research on Shari'ah equity markets is at an infancy phase, and further development is needed. This study faced some restrictions as this study could not expand the

sample size by adding other Islamic indices of the entire world as well as could not expand period and could not include other macroeconomic variables like money supply, industrial production, GDP, etc. For future research, this study recommends that the impact of structural changes on efficiency as well as correlation in the existence of various breaks invariance (Jeong, Kim, Kim, & Moon, 2017) can be examined and beneficial for investors to make their investment more profitable. Moreover, researchers must require to get knowledge regarding the presence of more anomalies in Shari'ah markets through determining the semi-strong and strong-form of informational efficiency of Shari'ah markets viz-a-viz the presence of Capital Asset Pricing Model in Shari'ah Indices. Furthermore, it is also recommended that Shari'ah shares may be augmented to portfolio along with conventional shares to diversify the systematic risk after examining the association between Shari'ah & conventional shares (Nasreen & Anwar, 2017). Further, the impact of monetary shocks on Shari'ah indices (Zhang, Hu, Jiang, & Guo, 2017) and the impact of competition on the efficiency of Shari'ah banks & conventional banks (Nguyen & Nghiem, 2020), and the effect of terrorist attacks on Shari'ah equity markets can be examined (Aslam, Rafique, Salman, Kang, & Mohti, 2018). Furthermore, the investors can make their investment more profitable viz-a-viz risk free through examining the part of Shari'ah markets in Systemic Risk.

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