Performance of Islamic and Conventional Stock Indices: Empirical Evidence from an Emerging Economy

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Abstract

This study aims to investigate the performance of Islamic and Conventional stock index in Pakistan. i.e. KSE Meezan Index (KMI-30) and Karachi Stock Exchange (KSE-100). We employed Generalized Autoregressive Conditional Heteroskedastic in the mean (GARCH-M) model. The findings show positive and statistically significant effect of interest rate volatility on KSE-100, whereas KMI-30 remains unaffected by the same. Exchange rate volatility is found to be significant for both conventional and Islamic indices. The results of parametric t-test show no significant difference between returns of both indices. This implies that Shariah screens do not have an adverse impact on the KMI-30 performance.

Key words: *KMI-30, KSE-100 Index, Shariah, Exchange Rate Volatility, Interest Rate Volatility, Stock Performance etc.*

1. Introduction

Given the fact that Islamic funds have shown a massive growth over the past few decades, the empirical literature on the performance analysis of such funds is still at its initial stage. The limited literature provides somewhat mixed results regarding performance of *Shariah* screened funds / Indices compared to their un-screened counterparts. For example, Hakim and Rashidian (2004) analyzed the performance of Dow Jones Islamic Index (DJIM) against its conventional counterparts; Dow Jones world index (DJW) and Dow Jones Sustainability World index (DJS). They applied capital asset pricing model (CAPM) and reported that DJIM index has outperformed DJW but has underperformed DJS index. The same results are reported by Hussein (2005). On the other hand, Hoepner, Rammal, and Rezec (2009) examine performance differences of 62 Islamic equity funds collected from 20 different countries. They report that Islamic funds from 8 western nations are unable to outperform their equity benchmarks, whereas only 3 funds have, somehow, performed relatively well against their market benchmarks. In addition, Dharami and Natarajan (2012) find no significant differences between the performance of Indian *Shariah* compliant stocks and conventional stocks indices during the period of 2007 to 2011.

The primary objective of this study is two-fold: first, by using different risk-adjusted performance measures such as Jensen's Alpha (1968), Sharp ratio (1966), Treynor Ratio (1965), and MM (1977), this study investigates the potential impact of *Shariah* screening on the performance of KSE – Meezan Index (KMI-30), traded at Karachi Stock Exchange (Pakistan), against its conventional counterparts Karachi Stock Exchange index (KSE-30) and KSE-100 index. The study examines whether returns earned by ethical investors who trade *Shariah* compliant stocks (KMI-30) are different from conventional investors. This study employs Generalized Autoregressive Conditional Heteroskedastic in the mean (GARCH-M) model. This framework relaxes constancy assumption of classical linear regression (CLRM) model and allows exchange rate volatility and interest rate volatility to evolve over time. The GARCH-M framework also reveals results about risk-return trade-off in the context of returns earned by Islamic and conventional investors.

Overview of KMI-30 Index

In order to meet the ever increasing demand for Islamic equity investments, KSE-Meezan Index (KMI-30) was launched in September 2008. The primary objective behind the inception of such *Shariah* compliant stock index is to provide a platform for ethical investors who seek to align their financial objectives with their religious beliefs and value systems. Beside increasing investor trust and enhancing their participation, KMI-30 index also serves as research tool for measuring performance of *Shariah* compliant stocks and strategic assets allocation procedure.

The Karachi Stock Exchange is currently running 3 major indices (KSE-All Shares Index, KSe-100 Index, and KSE-30 Index). KMI-30 index comprises 30 *Shariah* compliant stocks, listed at KSE. KMI-30 is rebalanced biannually and, for index construction, "Free – float market capitalization" methodology is followed since this methodology is used by world's prominent index providers (FTSE, S&P, MSCI, STOXX, and SENSE). Every individual stock is capped at 12% on weights and KMI-30 index is governed by *Shariah* Advisory board of Meezan Bank.

Shari'ah Screenings Filters for KMI-30 Index

This section briefly explains six *Shariah* filters that must be fulfilled by any stock to be *Shariah* complaint. Every company listed at Karachi Stock Exchange can be called "*Shariah* Complaint Company" if:

1. Its core business does not violate any *Shariah* principles. For example, the companies engaged in the business of alcohol, pork, conventional banking, tobacco, gambling, biotechnology using aborted embryos, pornography, and weapon production etc. are excluded from Islamic index.

2. Its interest bearing debt to total assets ratio is less than 37% because interest is prohibited in Islam.

$$\frac{\textit{Interest Bearing Debt}}{\textit{Total Assets}} < 37\%$$

3. Its ratio of non-complaint investments to total assets is less than 33%. PIBs, TFCs, DSCs, conventional money market instruments and commercial papers are considered non-compliant investments.

$$\frac{\textit{Non-Compliant Investments}}{\textit{Total Assets}} < 33\%$$

4. Its ratio of non-compliant income to total revenue is less than 5%. Insurance claim reimbursements, gambling income, income from interest-related activities, transactions based on *Gharar*, and penalty charges etc. are considered non-compliant income.

$$\frac{\textit{Non-Compliant Income}}{\textit{Total Revenue}} < 5\%$$

5. Its ratio of illiquid assets to total assets is greater than 25%. Plant & equipment, inventories, all fixed assets etc. are considered illiquid assets.

$$\frac{\textit{Illiquid Assets}}{\textit{Total Assets}} < 25\%$$

6. It's per share market price is greater than net liquid assets per share. Formula to calculate net liquid assets per share is:

Net liquid assets per share = ***Total Assets – Illiquid Asset – Long Term Liabilities – Currents Liabilities***

No. of Shares Outstanding

In addition to aforementioned *Shariah* filters, a company must also meet "Technical Screenings Filters" to be eligible for *Shariah* complaint Stock Index (KMI-30)[1].

2. Literature Review and Hypothesis Development

The study of Girard and Hassan (2008) is considered as a gateway into the empirical literature of Islamic indices. By employing sharp Ratio, Treynor Ratio, and Jensen's Alpha, they compared 5 FTSE Islamic indices and 5 conventional benchmarks MSCI. They also employ Fama's selectivity, net selectivity, and diversification to examine the style and timing ability of fund managers. Before that, some studies analyzed the performance of Islamic indices of particular countries. For example, in Malaysia, the performance of Kuala Lampur Shariah Index (KLSI) have been analyzed by Ahmad and Ibrahim (2002), Yusof and Mazid (2007), and Albaity and Ahmad (2008). No significant performance differences between Islamic and Non-Islamic indices have been reported by Ahmad and Ibrahim (2002). Also, during the bull market period, Islamic index is less performant against its conventional counterparts. Albaity and Ahmad (2008) report similar results for Kuala

[1] For detailed information regarding *Shariah* Screening filters the brochure of KMI-30 Index is available at web site of Karachi Stock Exchange. www.kse.com.pk

Lampur *Shariah* Index (KLSI) and Kuala Lampur Composite index (KLCI). They also examined causality between both indices and find bidirectional causality.

A comprehensive study by Jouaber Snoussie et al. (2012) compared the performance of 23 Dow Jones Islamic indices to 23 selected conventional indices. While employing traditional performance measures such as Sharpe and Jensen Alpha, they also employ extreme returns model and spanning test. They find relative performance differences of Islamic indices and different features of Islamic indices as compare to conventional indices. They also find significant differences in risk and excess returns of Islamic screened indices.

Arouri et al. (2013) examines the impact of current global financial crisis on 3 Dow Jones Islamic indices to see whether Islamic finance constitute a potential solution in reassuring investors and stabilizing financial systems to escape from financial downturns. They employ Multivariate Vector Autoregressive (VAR) and Granger Causality test to test the interaction between Islamic and conventional financial products and specify the dependence orientation of feedback between screened and unscreened stock prices, respectively. They find that inverting in Islamic financial products yields higher returns and systemic risk of such portfolios, which includes Islamic financial products, is reduced significantly.

Based upon results of previous literature and due to limited diversification, *Shariah* compliant stocks index is expected to yield lower returns than its conventional counterparts. There for, our hypothesis to be tested is:

H_1: *The return of KMI-30 index is significantly different from conventional indices (KSE-30, KSE-100)*

3. Data and Methodology

This section has been divided into two parts; (1) four different risk-adjusted performance measures to analyze the performance differences between KMI-30 index (*Shariah* compliant index) and its conventional computer parts (KSE-30 and KSE-100), (2) volatility effects of interest rate and exchange rate on these 3 indices by employing GARCH-M model. In addition, long run performance of both Islamic and non-Islamic indices has also been analyzed.

Daily closing values of KMI-30, KSE-30, KSE-100, and KSE-All shares have been collected from database of Karachi Stock Exchange for the period of July 2008 to November 2013. Daily closing value of interest rate and exchange rate is also taken from July 2008 to November 2013. The daily yield of 3 months T-Bills is used as proxy of short term interest rate and is taken from web site of State Bank of Pakistan (SBP). The daily closing value of exchange rate, measured as daily US $/Rs exchange rate is obtained from State Bank of Pakistan (SBP). Conditional variance of interest rate series and exchange rate series represent the volatility of both series.

Risk-Adjusted Performance Measures

First, the logarithmic returns for each of our indices have been computed by using the formula R_t = In $\left(\frac{P_t}{P_{t-1}}\right)$ in which return is difference of prices between time period t and t-1. Then four different performance measures, which are explained below, are used to examine performance difference between 3 indices.

Four Performance measures are explained below:

a. Jensen's Alpha

The first performance measure used in this study is Jensen's Alpha. The basic advantage of Jensen's alpha is that it explains whether the null hypothesis of neutral performance of an Islamic index, i.e. no screening effect or alpha is equal to zero, is statistically significant by employing t-statistics. A positive or negative value of alpha reflects superior or inferior performance of an index, respectively. Jensen's Alpha is computed from following one factor CAPM model:

$$\{(R_{i,t} - R_{f,t}) = a_{i,t} + \beta_{i,t}(R_{m,t} - R_{f,t}) + \varepsilon_{i,t}\} \ldots\ldots\ldots\ldots (1)$$

$R_{i,t}$: Returns earned by a stock index i at time t (in our case KMI-30, KSE-30, KSE-100)

$R_{f,t}$: Risk-free rate measured by 3 months T-Bills rate

$a_{i,t}$: Jensen's Alpha (constant term in CAPM) that measures abnormal performance

$\beta_{i,t}$: Beta (Systematic Risk, estimated by CAPM) of an index i at time t

$R_{m,t}$: Returns earned by a benchmark index (KSE-All shared) at time t

$\varepsilon_{i,t}$: The disturbance term.

b. Sharpe Ratio

The second performance measure is Sharpe Ratio developed by Sharpe in 1966 and derived from Capital Market Line. The basic advantage of Sharpe measure is that it provides additional returns per unit of total risk (both systematic and un-systematic) for a security / index. Since risk is measured by standard deviation of the index, this measure gives us trade-off between risk and return. Therefore, this ratio explains how well an investor is compensated for assuming additional risk. Higher Sharpe ratio reflects superior performance of an index.

$$SHARPR_{i,t} = \frac{R_{i,t} - R_{f,t}}{\sigma_{i,t}} \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

$SHARPR_{i,t}$: Sharpe ratio for index i (KMI-30 or KSE-30, KSE-100) at time t

$R_{i,t}$: The return earned by an index i at time t

$R_{f,t}$: The risk-free rate measured by 3 months T-Bills rate

$\sigma_{i,t}$: Standard deviation (Total risk = Systematic + Un-Systematic) of an index i at time t.

c. Treynor Ratio

The Treynor ratio (TR) also measures the additional returns per unit of risk, but contrary to Sharpe ratio, TR Considers only systematic risk instead of both systematic and non-systematic risk. A benchmark is required for computing this relative risk-adjusted measure. TR is considered better performance measure as compared to SR since TR provided better picture of a large diversified portfolio's beta that is computed from CAPM equation. TR is computed as follows:

$$TREYR_{i,t} = \frac{R_{i,t} - R_{f,t}}{\beta_{i,t}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

$TREYR_{i,t}$: The Treynor ratio for index i (KMI-30, KSE, 30, KSE-100) at time period t.

$R_{i,t}$: The average returns of index I at time t.

$R_{f,t}$: The average risk-free rate as measured by 3 months T-Bills.

$\beta_{i,t}$: Beta (Systematic Risk, estimated by CAPM) of an index i at time t.

d. MM Performance Measure

MM is an extension to Sharpe Ratio and developed by Modigliani and Modigliani in 1977. This relative risk adjusted performance measure provides an index's performance to the market in percentage terms by taking same standard deviation. MM is computed as follow:

$$MM_{i,t} = (S_{i,t} - S_{m,t})\ \sigma_{m,t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

$MM_{i,t}$: Modigliani & Modigliani measures for an index i (KMI-30, KSE-30, KSE- 100) at time period it.

$S_{i,t}$: Sharpe ratio for index I at time t.

$S_{m,t}$: Sharpe Ratios for benchmark index m (KSE- All Shares) at time t and is calculated in same way as in equation (2)

$\sigma_{m,t}$: The Standard deviation of benchmark index m and t is time Period.

Moreover, to investigate the long-run performance of all indices, this study uses two most commonly used methods; Cumulative Returns (CRs) and Buy-and –Hold Returns (BHRs), since literature shows no agreement on the appropriate methodology for computing long run returns (i.e.Brav and Gompers, 1997, Barber and lyon, 1977). The Jensen's risk-adjusted return model is used to compute CRs and BHRs. The method to compute CRs is as follows:

$$CR_{i,s,e} = \sum_{t=s}^{e} R_{i,t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

$CR_{i,s,e}$: The cumulative returns of an index *i* from time *s* (Starting day of sample period) to time *e* (ending day of sample period)

To calculate BHRs, following formula is used:

$$BHR_{i,T} = \left[\prod_{t=1}^{T}(1 + R_{i,t}) - 1\right] \ldots\ldots\ldots (6)$$

$BHR_{i,T}$: Buy and Hold return of index *i* and *t* is time period.

Volatility Measure (GARCH-M) for *Shairah* Screened Index and Conventional Indices

To analyze the volatility effects of interest rate and exchange rate on *Shariah* scrrened index (KMI-30) and its conventional counterparts (KSE-100), GARCH-M model is utilized. This model shall also explain the risk-return trade-off for all 3 indices. Model specifications are explained below:

In the recent times, for investigating stock market behavior, a large number of research scholars have shifted their analysis from OLS and GLS estimation models to conditional variance models also known as volatility models (i.e. ARCH type models). Unlike classical regression model, the main feature of ARCH type model is that it relaxes the constancy assumption and it specifies the conditional variance as a function of the past shocks allowing volatility to evolve over time and permitting volatility shocks to persist. These volatility models are GENERALIZED AUTOREGRESSIVE CONDITIONAL HETROSKEDASTIC (GARCH) and GARCH in mean equation (GARCH-M). The GARCH-M (p,q) model is described below from equations (7) – (9):

$$R_{i,t} = \pi x_t + \gamma h_t + \varepsilon_t , \qquad (7)$$

$$h_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i \varepsilon_{t-i}^2 + \sum_{i=1}^{q} \beta_i h_{t-i} , \qquad (8)$$

$$\varepsilon_t \sim N(0, h_t) . \qquad (9)$$

Where $R_{i,t}$ is the return of stocks index *i* (Islamic or non-Islamic), x_t is the vector of independent variables, ε_t is disturbance term, h_t is conditional variance of disturbance term, where ε_t is normally distributed, $\pi, \alpha_0, \alpha_i, \beta_i \, and \, \gamma$ are parameters and t is time index. The above model described by the system of equations (7) – (9) reflects that conditional variance of stocks returns (h_t) and vector of independent variables (x_t) will determine the stock returns R_t. The current conditional variance (h_t) is to be determined by the long term average volatility α_o, volatility information from last time period $(\alpha_i \varepsilon_{t-i}^2)$ known as ARCH effect, and conditional variances of past period $(\beta_i h_{t-i})$ known as GARCH effect. For using GARCH estimation model $\alpha_0, \alpha_i, and \; \beta_i$ must be positive to comply with non-negativity constraint. Furthermore, $\alpha_i + \beta_i$ must be less than 1 for conditional variance to be stationary. The sum $\alpha_i + \beta_i$ measures the degree of persistence in shocks to volatility.

The general GARCH (p,q)-M model is extended below with additional variables:

$$R_{m,t} = \pi_0 + \sum_{i=1}^{n} \pi_i R_{m,t-i} + \theta_1 \Delta FX_t + \theta_2 \Delta INT_t + \gamma log(h_{m,t}) + \varepsilon_{m,t} \quad (10)$$

$$h_{m,t} = \alpha_0 + \alpha_1 \varepsilon_{m,t-1}^2 + \beta h_{m,t-1} + \delta_1 FX_{t-1} + \delta_2 INT_{t-1} \; , \qquad (11)$$

$$\varepsilon_{m,t} \sim N\,(0, h_t)\,. \qquad (12)$$

Where $R_{m,t}$ is the stocks returns of m^{th} Index (KMI-30, KSE-30, KSE-100), ΔFX_t is the changes in foreign exchange, ΔINT_t is the changes in 3 months T-Bills yield and subscript *t* is time index for all variables. The index volatility (risk) is measured by variable ($h_{m,t}$), INT_{t-1} is short term interest rate volatility, FX_{t-1} is foreign exchange volatility, and π_0, π_i, θ_1, θ_2, θ_3, γ, α_0, α_1, β, δ_1, and δ_2 are parameters.

Results and Discussion

The daily returns earned by both Islamic and conventional indices have been depicted in figure 1, which clearly shows that both indices seem to move together for the time period under analysis. This trend in return series, as shown in graph, is suggesting no apparent differences in returns. However, this trend of returns is only an arbitrary deduction and requires further detailed analysis for verification.

More descriptive details on the properties of the daily returns of both indices are provided in table 1. The test of normality clearly shows that both return series are not normally distributed and null hypothesis of normality of data is rejected at 1% significance level by employing Jarque-Bera (JB) test statistics

The average returns (mean) of both indices are also shown in table 1. It is clearly evident from mean values that KMI-30 earns less return (0.003214) than KSE-100 return (0.005431), which suggests that that we cannot reject our null hypothesis of lower returns earned by Islamic index. The lower returns earned by KMI-30 is also supported by its standard deviation (0.36754), a measurement of risk, which shows that KMI-30is less risky. Moreover, KSE-100 also shows superior long-term returns (measured by sum of all returns). Table 1 also shows correlation coefficients for both series that suggest a positive relationship between both indices. The correlation coefficient is 86%, which is as strong as reported by Ahmad and Ibrahim (2002). One possible explanation of such strong correlation between both indices is that most of the stocks listed under KMI-30 are also listed under KSE-100. Therefore, both indices move together as also depicted in figure 1.

Figure 1. **The daily returns for KMI-30 and KSE-100 (2008-2013)**

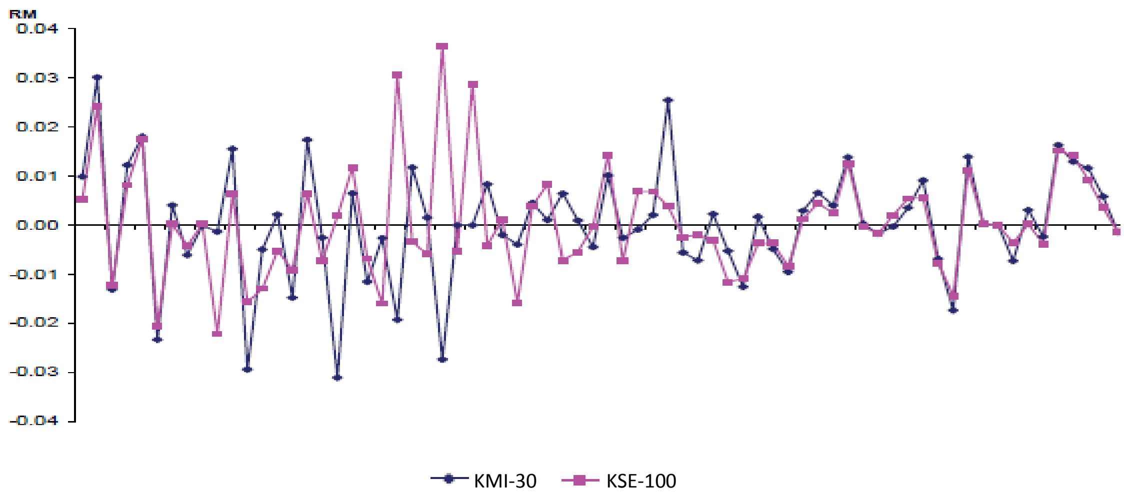

Table 1

Descriptive Statistics

Index Name	Mean	Median	Maximum	minimum	S.D.	Skewness	Kurtosis	Jarqiue-Bera
Conventional index (KSE-100)	67.004	62.01	134.7	20.88	22.01	-0.882	3.29	3322.32*
Islamic Index (KMI-30)	35.17	28.71	77.33	8.76	20.55	-0.547	1.974	3886.09*
Correlation between the indices	(0.86324)							

Risk-Adjusted Performance Evaluation

To further examine the robustness of aforementioned results, the performance of both indices is re-estimated by employing other performance measures. The results are shown in Table 2 in which both indices have been ranked according to their performance. The first performance measure is Sharpe ratio that shows that KMI-30 yields lower returns (0.00401) than KSE-100 (0.00694). The next performance measure is Treynor ratio, which confirms the lower returns earned by KMI-30. The Treynor ratio takes into consideration only systematic risk (beta), whereas Sharpe ratio incorporates both systematic and unsystematic risks. In both performance measures KMI-30 is ranked behind KSE-100. The Jensen's Alpha and MM performance measures further confirm the results found by other measures. MM shows that KMI-30 earns lower returns (0.0387) than KSE-100 (0.0532). These results are consistent with the study of Ahmad and Ibrahim (2002). One possible explanation that can be attributed to the fact that KMI-30 earns lower returns is the inclusion of large market capitalization in KSE-100, which consists of 100 securities, whereas KMI-30 includes only 30 *Shariah* compliant stocks. Therefore, there is a positive relationship between returns on investment and the size of investment for less developed economies, including Pakistan.

Table 2

Risk-Adjusted Performance Evaluation

Index Name	Sharpe Ratio	Treynor Ratio	Jensen's Alpha	MM
Conventional index (KSE-100)	0.00694	0.00076	0.0156	0.0387
Islamic Index (KMI-30)	0.00401	0.00002	0.0032	0.0532

Table 3

Long-Run Performance of KMI-30 and KSE-100

Index Name	Cumulative Returns	Buy-and-Hold Returns
Conventional index (KSE-100)	0.4886	0.6985
Islamic Index (KMI-30)	0.2641	0.5543

In addition, by employing Cumulative Returns (CR) and Buy-and-Hold returns (BHR) methods, long-run performance of both indices is examined. Consistent with our previous findings of short-run performance, Table 3 shows that KSE-100 outperforms its Islamic counterpart in the long-run. The parameters of long-run performance (CR: 0.334 and BHR: 0.193) for KSE-100 shows superior long-run performance. To sum up, the findings of this study show that application of *Shariah* screens does not have an adverse impact on the performance of KMI-30. Although KMI-30 yields lower returns as compared to KSE-100, however, t-test of mean returns of both indices is not statistically significant.

Estimated Conditional Returns with GARCH (1, 1) Model

This section explains the empirical results about parameters of conditional return based on the empirical models, equation 10 to 12. Panel A of Table (4) presents the results of conditional mean equation (10) with GARCH (1, 1), whereas, panel B shows the results of conditional variance equation (11) that exerts the impact of conditional volatilities of both exchange rate and interest rate on conditional volatilities of both KSE-100 and KMI-30. Table 6 shows the result of Augmented Dickey Fuller test (ADF) Phillips-Peron test (PP) for each stock return series and other variables. The series are non-stationary at level but becomes stationary at first difference. Therefore, we use first differenced series in our analysis.

The first column of Table (4) reports the results of ARCH effect for each stock return series. Both Islamic and conventional index show significant results at 1% level of significance. Therefore, we reject H_o of no heteroskedasticity which is the evident of ARCH effect. The squared residual series of both Islamic and conventional index show presence of residual autocorrelation, which shows failure of classical constancy assumption about constant variance of error term. Therefore, the classical OLS coefficients cannot be estimated efficiently and standard errors could also be wrong and only the ARCH type models are appropriate for analyzing such type of series.

Table 4

Estimated Conditional Returns with GARCH (1, 1)

$$R_{m,t} = \pi_0 + \sum_{i=1}^{n} \pi_i R_{m,t-i} + \theta_1 \Delta FX_t + \theta_2 \Delta INT_t + \gamma log(h_{m,t}) + \varepsilon_{m,t}$$

Panel A (Conditional Mean Equation)

Index Name	ARCH (1)	π_0	π_i	θ_1	θ_2	γ	Adjusted R^2
Conventional index (KSE-100)	63.2085* (0.0000)	9.2402*** (0.0765)	0.082* (0.0000)	0.782** (0.0265)	0.0043*** (0.0676)	1.682** (0.04654)	0.2973
Islamic Index (KMI-30)	34.8262* (0.0000)	4.2196*** (0.0872)	0.0049** (0.0480)	0.6619** (0.0465)	0.0032 (2.5432)	2.4321** (0.0342)	0.2234

Volatility estimates

$$h_{m,t} = \alpha_0 + \alpha_1 \varepsilon^2_{m,t-1} + \beta h_{m,t-1} + \delta_1 FX_{t-1} + \delta_2 INT_{t-1}$$

Panel B (Conditional variance Equation)

Index Name	α_0	α_1	β	$\alpha_1 + \beta$	δ_1	δ_2
Conventional index (KSE-100)	39.7251* (0.0000)	0.93999* (0.0000)	0.0044* (0.0000)	0.2499 (0.0000)	0.39737* (0.0000)	0.36302* (0.0000)
Islamic Index (KMI-30)	53.9856* (0.0001)	0.7996* (0.0000)	0.2247* (0.0000)	0.0486 (0.0000)	6.3333* (0.0000)	0.5941 (0.2391)

Note: Numbers in parentheses are P-values * Significant at 1% level; ** Significant at 5%; level *** Significant at 10% level

As shown in Panel A, for Islamic index (KMI-30), interest rate is not a significant factor to predict the excess returns. The tenet of Islamic principles is highlighted by the findings that interest rate is not a determining variable in explaining KMI-30's volatility. Whereas, KIM-30 is significantly affected by the changes in exchange rate whose estimated parameter is 0.6619. On the whole, it is found that 22% of the volatilities in exchange rate and interest rate can predict the volatility of KMI-30 with volatility in exchange rate remain the most significant. Whereas, for KSE-100, the predictive power of both interest rate and exchange rate volatility is increased from 22% to 29%. Therefore, interest rate is not a decisive factor in the context of Pakistani investors who seek to invest in KMI-30. Moreover, the exchange rate is found to be a determining factor for volatility of KMI-30. The last column of Panel A shows the result for theory of risk-return trade-off. The relationship of risk-return trade-off is measured by the coefficient Gamma (γ). The relationship of risk γ and stocks returns, as expected, is positive and statistically significant for both KMI-30 and KSE-100. This result is in line with the theory of risk-return trade-off and is consistent with previous results of Yusof and Abd. Majid (2007). In simple words, whenever there is higher risk assumed by the investors, there is higher return.

Panel B of Table 4 reports the results about conditional variance equation in which impact of exchange rate volatility & interest rate volatility on both indices' stock returns volatility is examined. In conditional variance equation, α_0 is intercept term. The time-invariant component in the stock returns of both conventional and Islamic index volatility is shown by the result of intercept term (α_0). The positive and statistically significant value of α_0, in both cases, show that stocks returns of KMI-30 and KSE-100 are highly volatile in nature and contain time-invariant component. This implication further strengthens the choice of using ARCH type models to analyze volatility of both indices' returns. In conditional variance equation, both $\alpha_1$and β represents ARCH and GARCH terms, respectively. Both the ARCH and GARCH parameters are positive, which satisfies the non-negativity condition, and are statistically significant for KMI-30 and KSE-100. The impact of exchange rate volatility on the stock returns is measured by the coefficient δ_1. The results show that parameter of exchange rate volatility $\delta_1$is positive and statistically significant for both KMI-30 and KSE-100. This implies that, whenever exchange rate volatility increases, stock returns of both indices become more volatile in following periods. The impact of interest rate volatility on stock return's volatility is measured by the coefficient δ_2. The parameter of interest rate volatility $\delta_2$is positive and statistically significant only for KSE-100. This implication shows that, in response to increased interest rate volatility, the stock return's volatility of KSE-100 becomes more volatile in the subsequent periods. Pakistani financial markets lack financial derivatives instruments that can prevent stock returns becoming more volatile in response to interest rate volatility. This result further support our previous result of conditional mean equation which shows that, for Islamic index (KMI-30), interest rate is not a determining factor behind conditional volatilities of KMI-30.

4. Conclusion

The prime objective of this study is to investigate the extent to which the conditional volatilities of both *Shariah* compliant stock index (KMI-30) and conventional stock index (KSE-100) in Pakistan are related to the conditional volatility of interest rate and exchange rate. We employed Generalized Autoregressive Conditional Heteroskedastic in the mean (GARCH-M) model. This framework relaxes constancy assumption of classical linear regression (CLRM) model and allows exchange rate and interest rate volatility to evolve over time. The GARCH-M framework also reveals results about risk-return trade-off in the context of both Islamic and conventional stock indices. The findings show positive and statistically significant effect of interest rate volatility on KSE-100, whereas KMI-30 remains unaffected by the same. The relationship of risk coefficient (γ), measured in conditional mean equation (GARCH-M), and stocks returns is positive and statistically significant for both KMI-30 and KSE-100, as expected. This result is consistent with the theory of risk-return trade-off.

In addition, this study also aims at investigating performance of KMI-30 and KSE-100 using popular risk-adjusted performance measures. KMI-30 is marginally underperforming KSE-100 as indicated by our statistical results on risk and returns, measured by mean and standard deviation, respectively. KMI includes 30 *Shariah* compliant stocks, while, KSE-100 includes 100 securities that represent large market capitalization. One possible reason of marginal underperformance of KMI-30 might be because of its relative newness (since it was launched in 2008) and other reason might be because in less developed countries, size and returns are positively related. Therefore, Islamic investors are not substantially worse-off than conventional investors who seek to invest in un-screened stocks. On the whole, this study finds no significant performance differences and movements of both indices. Both indices are behaving in a similar direction for short and long run as well.

The empirical findings of this study reveal that *Shariah* screens do not have an adverse impact on the KMI -30 index performance. The study has important implications for individual & institutional investors, regulatory authorities and particularly for those who wish to make alignment between their investments and religious & ethical beliefs through ethically responsible investments. Expected or unexpected movements in exchange rate and interest rate must be analyzed closely, by the portfolio managers and other stakeholders, for developing risk management strategies. Further research must be initiated by examining impact of other macroeconomic factors, such as inflation and GDP, on the risk-return characteristics of both KMI-30 and KSE-100.

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