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Performance of Islamic and conventional stock indices: empirical evidence from an emerging economy

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Abstract

Background: This study aims to investigate the extent to which the conditional volatilities of both Shari'ah compliant stock and conventional stock are related to those of interest rate and exchange rate in the emerging economy of Pakistan.

Methods: We used KMI 30 and KSE 100 indices for Islamic and conventional stock for the period of July 2008 to November 2013. 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.

Results: 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 relationship of risk coefficient (γ) and stocks returns, as expected, is positive and statistically significant for both KMI-30 and KSE-100. This result is consistent with the theory of risk-return trade-off. The results of parametric t-test show significant difference between returns of both indices. This implies that Shari'ah compliant stock index (KMI-30) of Pakistan underperforms its conventional counterpart.

Conclusion: By using different performance measures (Sharp ratio, Jensen alpha, Treynor ratio), this study also investigates the hypothesis that Islamic stock index has inferior performance compared with unscreened conventional counterparts due to availability of a smaller investment universe, increased monitoring costs, and limited diversification.

Keywords: KMI-30, KSE-100 Index, Shari'ah, Exchange rate volatility, Interest rate volatility, Stock Performance etc

Background

The *Shari'ah* screenings criteria applied by the Islamic scholars have enabled *Shari'ah* Complaint Stock Indices to distinguish themselves from conventional stocks indices. In general, there are two *Shari'ah* screening criteria – positive and negative. Positive screenings allow an Islamic index to include those companies that meet certain Islamic ethical indicators (both quantitative and qualitative) whilst negative screenings delete stocks which are unable to meet such requirements. The common stock guidelines,

accepted by *Shari'ah* scholars, have become a key factor in the growth of Islamic funds all over the world. Majority of the *Shari'ah* scholars are agreed that buying and selling of stocks &shares adhere to *Shari'ah* laws because shares & stocks represent real assets. In addition, the dividend payments are also in accordance with *Shari'ah* indicators since receipt/payment of interest (*Riba*) is unlawful (*Haraam*) in Islam. Hence, equities, mutual funds, and government bonds are considered more compatible with *Shari'ah* screenings criteria of profit and risk sharing than fixed income assets.

The researches in Islamic finance have always been interested in investigating the question whether returns earned by the investors of Islamic funds/indices are different from conventional funds investors. In addition, the researchers are also examining whether adhering to *Shari'ah* law creates any impact on the performance of Islamic funds /indices because such funds suffer from restricted assets selection, limited investment practices, and smaller investment universe, Hassan (2001). Fundamentally, there are essentially two opposing views regarding *Shari'ah* screening effects on returns earned by Islamic indices. Opponents of Islamic ethical investing argue that implementing Islamic screening may result in limited investment universe due to potential increase in volatility, reduced diversification, and monitoring costs. In particular, due to Islamic screening, stable blue chip and larger firms may be excluded (due to high leverage) from Islamic index and as a result, remaining firms tend to be smaller and prevent investors to have other attractive investment opportunities from further consideration, Guyot (2011).

On the other hand, advocates of Islamic investing argue that financial and Islamic ethical screens propose a good economic and social sense to evaluate potential investments. Islamic ethical investors can align their potential investments with their religious & ethical beliefs that will not only give them peace of mind but also a lawful (*Halaal*) monetary reward. In addition, the empirical findings of Myers (1993), Fama and French (1998 and 2002), Shyam-Sunder and Myers (1999) argue that most profitable firms borrow least, therefore there exist a negative relationship between profitability and leverage. Hence, Islamic index can outperform its conventional counterpart because all firms included in the any Islamic Index have low leverage ratios.

Although 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 *Shari'ah* screened funds/Indices compared to their un-screened counterparts. For example, Hakim and Rashidian (2002) 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 and Omran (2005). This study documents that during entire bull period DJIM index has outperformed its counterpart, but has underperformed during the bear market period. On the other hand, Hoepner et al. (2011) 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, Dharani and Natarajan (2011) find no significant differences between the performance

of Indian *Shari'ah* compliant stocks and conventional stocks indices during the period of 2007 to 2011. They report that average return earned by *Shari'ah* compliant stocks is similar to conventional stocks returns.

To the best of our knowledge, our study is the first attempt towards analyzing the performance of Islamic index with its conventional counterpart in an emerging economy which is struggling to Islamize its monetary and financial system of the country Pakistan is one of those few emerging economies who started Islamization of monetary and financial system of the country in early 80s. As a result of Islamization efforts, Supreme Court of Pakistan, on 14 November 1991, declared bank interest as "*Riba*" and prohibited all types of interest prevailed in monetary and financial system of Pakistan. In July 2008, an Islamic Index (KMI 30) is launched with a view 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 *Shari'ah* compliant stocks and strategic assets allocation procedure. In this regard, it is really need of the hour to assess the performance of Islamic index. This performance analysis will tell us whether Islamization of stocks index rewards its investors or not. In addition, it will also help us to know whether objectives of establishing Islamic index are fulfilled or not. This will also give us insight whether an emerging economy like Pakistan is better at offering ethical investment universe for its local and international investors as well. Therefore, our study is the first attempt of not only analyzing the performance of Islamic stock index of Pakistan but also its response to volatility effects caused by other macroeconomic variables such as interest rate and exchange rate.

Therefore, 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 *Shari'ah* screening on the performance of Karachi Meezan Index (KMI-30), traded at Karachi Stock Exchange (Pakistan), against its conventional counterparts Karachi Stock Exchange index (KSE-100). The study examines whether returns earned by ethical investors who trade *Shari'ah* compliant stocks (KMI-30) are different from conventional investors. Second, to examine the effects of volatilities of interest rate and exchange rate on KMI-30 index and its counterparts, 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.

Literature review

Contrary to the literature of Islamic banks and Islamic mutual funds, Islamic indices have not received high level of empirical research due to their shorter histories (El Khamlichi and Laaradh 2012). In addition, the performance comparison of Islamic indices against conventional counterparts is also complicated owing to different factors such as differences in size and industry-weighting (Fowler and Hope 2007). Therefore, earlier studies such as Naughton and Naughton (2000) use qualitative approach to discuss the initial stage of Islamic stock indices in terms of regulations, financial principles, and market framework.

However, previous studies on the performance analysis of Islamic indices provide somewhat mixed results. This difference among the results can be attributed to different performance measures, sample data, and different benchmarks used by these studies. For example, Atta (2000) analyzed the performance of Dow Jones Islamic Index (DJIM) against market index and risk-free rate. He reports that DJIM has not only outperformed its conventional counterparts, but also offered more returns than risk-free rate. Same results are reported by Hassan (2001) where he investigated the performance of 6 Dow Jones Islamic indices. His results also confirm superior efficiency of Islamic indices against counterparts. On the contrary, Girard and Hassan (2005) do not find any significant performance differences between of Dow Jones Islamic indices and 7 Morgan and Stanley conventional indices. They use different performance measures to check the robustness of the results. From single factor CAMP to four factor conditional CAMP; they report that results remain same for the period of 1996–2005. They also report that growth and small stocks are core drivers of the positive performance for Islamic indices. The same results are reported by Dabeerru (2006) about the performance of Saudi Arabian Islamic indices. He reports that *Shari'ah* screenings do not lead to good performance of Saudi Islamic indices.

The family of Dow Jones Islamic Market Index got attention of most earlier empirical studies and include the work of Atta (2000), Hassan (2001), Tilva and Tuli (2002), Hakim and Rashidian (2002; 2004). These studies compared the performance of Dow Jones Islamic market index (DJIM) against a conventional benchmark. However, the choice of performance measures and benchmark remain different from one researcher to another. Atta (2000) used market conventional index and 3 month risk-free rate as benchmark against DJIM and concluded superior performance of DJIM than risk-free rate and conventional index. His results are further supported by Hassan (2001) who used same benchmark with different data set (1996–2000). He documents that 6 DJIM indices are more efficient than conventional index. On the other hand, Tilva and Tuli (2002) used different conventional benchmark (S&P 500) with different performance measure of Fama and French 3 factor model. His results show that Islamic and conventional indices are highly correlated and have no significant performance difference. Hakim and Rashidian (2000) analyzed the performance of DJIM with Wilshire 5000 and 3 moths T-Bill with weekly data set. They conclude less performance of Islamic index. Hakim and Rashidian (2004) again analyze the performance of DJIM but with different benchmark (Green Index, DJ World, Libor) with different data set (2000–2004). Islamic index earned inferior returns as compared to Green index (socially responsible index).

On the other hand, family of Financial Times Stock Exchange Islamic Index (FTSE Islamic Index) analyzed by Hussein (2004), Miglietta and Forte (2007), Girard and Hassan (2008) who also employed different empirical models, benchmarks and performance measures to examine the FTSE Islamic Index. Hussein (2004) uses FTSE all world and FTSE4-good as benchmark against FTSE Islamic Index to compare the performance difference. He comes up with somewhat complicated results. He analyzed performance of these indices over three different intervals; bullish, bearish and entire time horizon over the period of 1996–2003. During bullish period, Islamic index outperformed its conventional counterpart, whereas during whole time period both indices perform same. Since Islamic investing is a part of socially responsible investing (SRI), Elgari (1993) and Miglietta and

Forte (2007) compared FTSE Global Islamic index to FTSE socially responsible index by employing Sharpe's analysis (Sharpe, 1946) and co-integration techniques. They report that although Islamic index looks similar to SRI, however both are quite unique in terms of both assets allocation and econometric profile. SRI indices are exposed financial sectors whereas Islamic indices are invested in Oil & Gas sectors. Also, there exists co-integration between 3 months Euribor and FTSE Islamic index. Another study (Hashim, 2008) compares FTSE Islamic index and SRI (FTSE 4 Good). By employing CAMP and other traditional performance measures such as Jensen's Alpha, Sharpe, and Treynor, he concludes that FTSE Islamic index is more efficient, even though more riskier than the market, and yields positive abnormal returns as compared to SRI index.

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. In addition, Charhart (1997) four-factor model is used to examine the performance persistence of Islamic indices. They report insignificant performance differences between FTSE Islamic indices and their counterparts due to style and timing ability of fund managers. The results remain same even after controlling for other factors like market risk, size, book-to-market, momentum, and local and global factors. Also, there exists co-integration between Islamic and non-Islamic indices for overall period.

In addition, some studies have analyzed the performance of Islamic indices of particular countries instead of examining the performance of world's famous Islamic indices. These studies include (Ahmad and Ibrahim 2002; Nishat 2004; Dabeerru 2006; Yusof and Majid 2007; Albaity and Ahmad 2008; and Fahmi et al. 2009). For example, in Malaysia, the performance of Kuala Lampur *Shari'ah* Index (KLSI) have been analyzed by Ahmad and Ibrahim (2002), Yusof and Majid (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 performing against its conventional counterparts. Albaity and Ahmad (2008) report similar results for Kuala Lampur *Shari'ah* Index (KLSI) and Kuala Lampur Composite index (KLCI). They also examined causality between both indices and find bidirectional causality.

Recent studies on performance analysis of global Islamic indices include Guyot (2011), El Khamlichi and Sarkar (2012), Jouaber-Snoussi et al. (2012), and Arouri et al. (2013). Guyot (2011) analyzes nine Dow Jones Islamic indices (DJIM) and finds no co-integration between Islamic and non-Islamic indices. He also reports that both indices have no performance difference and efficiency & liquidity of both indices is similar during the study period. Another study that examines efficiency of 4 Dow Jones Islamic indices is El Khamlichi and Sarkar (2012). These results about efficiency level of Islamic and non-Islamic indices are similar to those of Guyot (2011). They document that Islamic indices are as efficient as conventional MSCI and FTSE indices are. In addition, Dow Jones Islamic index and S&P Islamic index are not co-integrated with their conventional counterparts.

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 down-turns. 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. Moreover, to ensure the best resource allocation, they develop portfolio simulation and optimal portfolio strategies (Proportional investment for both Islamic and conventional funds). 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.

Methods

Based on review of existing literature and prime objective of this study, we are going to test following hypothesis:

H_o: *The return of KMI-30 index is not significantly different from its conventional counterpart (KSE-100 index)*

For this purpose, four different risk-adjusted performance measures (explained below) have been used to analyze the performance differences between KMI-30 index (*Shari'ah* compliant index) and its conventional computer partKSE-100,for examining volatility effects of interest rate and exchange rate on these two indices, we have used GARCH-M model (explained below). In addition, long run performance of both Islamic and non-Islamic indices has also been analyzed.

Daily closing values of KMI-30 and KSE-100 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 weighted average 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 weighted average exchange rate, measured as simple basket of equally weighted currencies (US $, GBP, EURO), 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

For both Islamic and conventional indices risk-adjusted performance and risk measures have been computed to assess the performance of both. These risk-adjusted performance and risk measures are very common in ethical investment & mutual fund literature. A number of notable studies, Merdad et al. (2010); Girard and Hassan (2008); Khalid Hussein (2004), have used these performance measures to compare the performance of different indices and mutual funds. Therefore, in our study we also use these performance measures to assess the performance of our indices to compare with each other. Four Performance measures are explained below:

a. Jensen's Alpha

   The first performance measure used in this study is Jensen's Alpha, known as absolute risk-adjusted measure of returns. Based upon Sharpe (1964), and linter

(1965) CAPM, Michael Jensen used Jensen's Alpha in 1970 to estimate excess returns earned by a security or a fund. 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.

b. Sharpe Ratio

The second performance measure is Sharpe Ratio, also known as relative risk-adjusted measure of returns, 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.

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.

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. 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.

Volatility measure (GARCH-M) for *Shari'ah* screened index and conventional indices

To analyze the volatility effects of interest rate and exchange rate on *Shari'ah* screened 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 both indices. The general GARCH-M (p,q) model is described below from equations (7)–(9):

$$R_{i,t} = \pi x_t + \gamma h_t + \varepsilon_t, \tag{1}$$

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

$$\varepsilon_t \sim N(0, h_t). \tag{3}$$

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

$$R_{m,t} = \pi_0 + \sum_{i=1}^{n} \pi_i R_{m,t-i} + \theta_1 \Delta FX_t + \theta_2 \Delta INT_t + y log(h_{m,t}) + \varepsilon_{m,t} \qquad (4)$$

$$h_{m,t} = \alpha_0 + \alpha_1 \varepsilon_{m,t-1}^2 + \beta h_{m,t-1} + \delta_1 FX_{t-1} + \delta_2 INT_{t-1}, \qquad (5)$$

$$\varepsilon_{m,t} \sim N(0, h_t). \qquad (6)$$

Where $R_{m,t}$ is the stocks returns of mth Index (KMI-30, KSE-100), ΔFX_t is the changes in foreign exchange rate, 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, $and\ \delta_2$ are parameters. Representation of volatility (h_t) in logarithmic form is consistent with Elyasiani et al. (1995) and Lloyd and Shick (1977).

The above model is more practical than basic ARCH and GARCH models. First, it examines the impact of volatility on risk premium. Second, the inclusion of (h_t) will examine the fundamental relationship of risk and return. If (h_t) is significant, then there exists a relationship between risk (volatility) and returns. The sign and magnitude of this relationship, measured by γ, may be positive, negative, and zero.

Results and discussion

The daily returns earned by both Islamic and conventional indices have been depicted in Fig. 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. In accordance with previous studies of Chorhay and Tourani (1994), Mookerjee and Yu (1999), and Hussein and

Fig. 1 The daily returns for KMI-30 and KSE-100 (2008–2013)
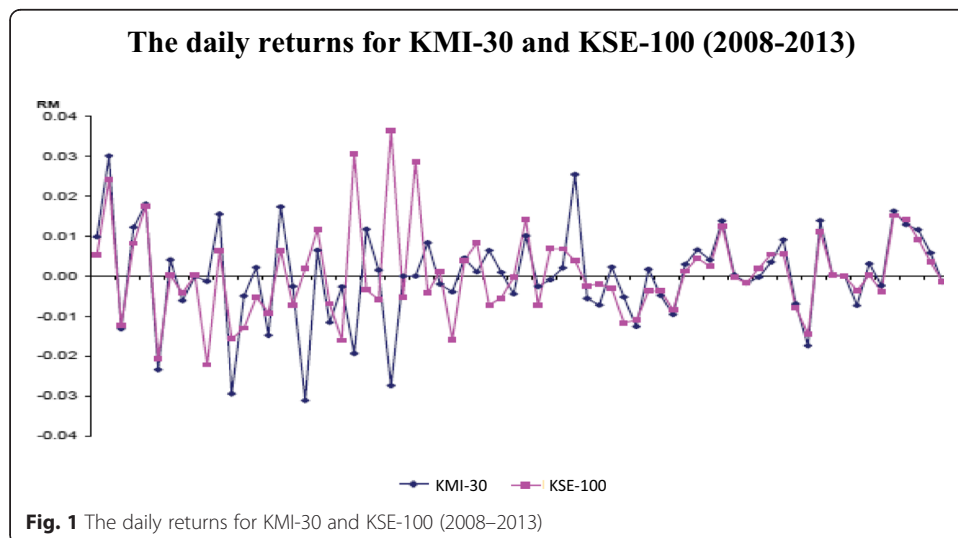
Table 1 Descriptive Statistics

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*
INT (Interest Rate)	13.12	10.32	15.3	1.45	1.94	0.752	2.87	4721.12*
FX (Foreign Exchange)	69.813	62.71	86	59.71	10.48	0.391	1.31	1573.05*

Correlation between the indices (0.86324)
Note: *Significant at 1 % level; **Significant at 5 % level; ***Significant at 10 % level

Omran (2005), our indices exhibit skewness to the left (negatively skewed) and non-symmetric, whereas Kurtosis show positive or platy kurtic values.

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 (35.17) than KSE-100 return (67.004), 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 Fig. 1.

OLS Estimation (CAPM)

For further comprehensive analysis of indices' performance, risk-adjusted CAPM model is estimated (as described in equation 1) and results of CAPM estimation are presented in Table 2. It is clearly evident from the Table 2 that Jensen's Alpha is positive for both indices but statistically significant only for conventional index (KSE-100) at 1 % level. This implies that KMI-30 yields lower returns (0.02311) against fully diversified unrestricted portfolio (0.04325). This result is consistent with the results of Hussein and Omran (2005), Girard and Hassan (2008). The results about market risk (beta) of both indices are also presented in column 3. Beta coefficients are 0.9235 and 0.9837 for KMI-30 and KSE-100, respectively. Consistent with Jouaber-Snoussi et al. (2012), this implies that KMI-30 is less risky than KSE-100, therefore KMI-30 reflects risk-return trade-off since it yields lower returns with less risk. It is also notable that beats of both indices are less than unity that implies that the two indices are less risky than the benchmark (KSE-All Shares). Further, the coefficient of determination (R^2) of KMI-30 and KSE-100 is 82.30 and 89.37 %, respectively. These high percentages imply that both the indices move in line with market benchmark and much of the changes in both indices are explained by market benchmark.

Table 2 CAPM Regression (t-values in parenthesis)

Index Name	Alpha	Beta	R^2
Conventional index (KSE-100)	0.04325 (0.0325)**	0.9837 (0.0000)*	0.89
Islamic Index (KMI-30)	0.03911 (0.1321)	0.9235 (0.0000)*	0.82

Note: *Significant at 1 % level; **Significant at 5 % level; ***Significant at 10 % level

Mean difference

Now we further proceed to test whether abnormal returns (excess daily returns) of KMI-30 are equal to zero. To test whether there is a difference between the means of both indices we have employed parametric t-test. The results are presented in Table 3, which clearly shows that the null hypothesis can be rejected and there is a significant difference in the mean of both indices. This result is in line with results of Girard and Hassan (2008) and Adelr and Kritzman (2008) that returns of Islamic index are significantly different from its conventional counterparts. Therefore, KMI-30 bears an extra cost on its returns due to *Shari'ah* screening process.

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 4 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 those of Cummings (2000) and 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 *Shari'ah* compliant stocks. Therefore, according to Cleassens, Dasgupta and Glen (1995), there is a positive relationship between returns on investment and the size of investment for less developed economies including Pakistan.

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 5 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 *Shari'ah* screens do have an adverse impact on the performance of KMI-30. Hence, KMI-30 yields lower returns as compared to KSE-100 and t-test of mean returns of both indices is statistically significant.

Estimated conditional returns with GARCH (1, 1) Model

This section explains the empirical results about parameters of conditional returns based on the empirical models, equation 4 to 6. Panel A of Tables 7 and 8 presents the

Table 3 Differences in Mean between KMI-30 and KSE-100 (t-test)

Mean Difference	t-value	P-value for t-test
0.0001	5.58	(0.0423)**

Note: Numbers in parentheses are P-values. **shows significance at 5 % level

Table 4 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

results of conditional mean equation (4) with GARCH (1, 1), whereas, panel B shows the results of conditional variance equation (5) 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) and 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 Tables 7 and 8 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.

It can be seen from Panel "A" of Tables 7 and 8 that conventional index (KSE-100) is significantly affected by the changes in interest rate and exchange rate. The estimated parameters for exchange rate and interest rate are 0.659 and 0.0033, respectively. This result fits well with stock valuation model that argues that discounted present values of a firm's future cash flows are represented in stock prices. The stock prices usually reduce with an increase in interest rate and eventually the returns. Therefore, it can be safely said that changes in interest rate is a major factor behind the instability of conventional stock index and, accordingly, investors are also more sensitive towards fluctuations in interest rate. Perhaps, the conventional stock market must be stabilized by the government by controlling interest rate. This finding is consistent with the study Yusof and Majid (2007) who document that Malaysian conventional market is affected by higher interest rate.

On the other hand, 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

Table 5 Long-Run Performance of KMI-30 and KSE-100

Index Name	Cumulative Returns	Buy-and-Hold Returns
Conventional index (KSE-100)	0.4886 (2.53)**	0.6985 (3.93)**
Islamic Index (KMI-30)	0.2641 (-0.036)	0.5543 (0.041)

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

Table 6 Unit-Root Analysis

	Augmented Dickey Fuller			Phillips-Peron	
Index Name	At Level	At Difference	At Level	At Difference
Conventional index (KSE-100)	−2.132 (0.2319)	−48.251 (0.0001)	−2.120 (0.2366)	−49.54 (0.0001)
Islamic Index (KMI-30)	−0.6051 (0.8670)	−47.1839 (0.0001)	−0.6437 (0.858)	−47.187 (0.0001)
FX (Foreign Exchange)	0.3045 (0.9785)	−11.4329 (0.0000)	−0.5389 (0.9880)	−32.8513 (0.0000)
INT (Interest Rate)	−1.3531 (0.6065)	−22.2255 (0.0000)	−3.2041 (0.0199)	−133.068 (0.0000)

Note: Numbers in parentheses are *P*-values

predictive power of both interest rate and exchange rate volatility is increased from 22 to 29 %. Muslim investors around the globe do not want to maximize their profits but are also concern whether stocks are *Shari'ah* compliant.

Over the last decade, there has been immense growth in literature that investors go beyond maximizing results and that they are concern with ethical dimensions of their investments. 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. Hence changes in volatility of returns of KMI-30is significantly produced by the changes in macroeconomic conditions like exchange rate. In addition, interest rate alone is not responsible for stock market volatility but also the exchange rate. Both conventional and Islamic stock indices must be stabilized by the government agencies by designing and implementing suitable policies.

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 Majid (2007). In simple words, whenever there is higher risk assumed by the investors, there is higher return. The implication of the positive relationship is that investors do consider risk associated with individual stock index and expect to be compensated with higher returns when higher risk is assumed. Although every investor has different risk preferences, some are risk-averse and others are risk-seekers, however, every investor expects higher return when he assumes higher risk.

Panel B of Tables 7 and 8 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 α_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 ARCH parameter α_1 describes the impact of last period's shock on volatility, whereas GARCH parameter β shows the impact of previous period's variance on both indices' stock return's volatility. Although both the parameters, ARCH

Table 7 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 (2.342)*	9.2404 (12.765)***	0.082 (23.983)*	0.659 (-21.265)**	0.0033 (24.76)***	1.682 (21.87)**	0.2973
Islamic Index (KMI-30)	34.8262 (12.84)*)	4.2196 (-1.543)**	0.0049 (41.874)*	0.6619 (17.65)**	0.6619 (2.543)	2.4321 (1.042)*	0.2234

Where $R_{m,t}$ is the stocks returns of mth Index (KMI-30, KSE-100), ΔFX_t is the changes in foreign exchange rate, 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 ($h_{m,t}$), and $\pi_0, \pi_i, \theta_1, \theta_2, \theta_3, \gamma$ are parameters. Representation of volatility (h_t) in logarithmic form is consistent with Elyasiani et al. (1995) and Lloyd and Shick (1977)

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

Table 8 Volatility estimates

$$h_{m,t} = a_0 + a_1\ \varepsilon^2_{m,t-1} + \beta h_{m,t-1} + \delta_1 FX_{t-1} + \delta_2 INT_{t-1}$$

Panel B (Conditional variance Equation)

Index Name	a_0	a_1	β	$a_1 + \beta$	δ_1	δ_2
Conventional index (KSE-100)	39.7251	0.93999	0.0044	0.2499	0.51419	0.36302
	(1.322)*	(9.412)*	(-23.74)*	(19.52)	(64.921)*	(28.32)*
Islamic Index (KMI-30)	53.9856	0.7996	0.2247	0.0486	6.3333	0.5941
	(1.180)*	(1.850)*	(13.854)*	(0.520)	(18.95)*	(0.2391)

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 $a_0, a_1, \beta, \delta_1$ and δ_2 are parameters

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

α_1 and GARCH β, are statistically significant for both indices, however, in magnitude, ARCH parameter a_1 is smaller than the GARCH parameter β. This implication shows that volatility of both indices are more sensitive to its own lagged value than it is to new surprises. In other words, the impact of previous period's forecast variance is more persistence on the stock return's volatility of both indices. The volatility persistence is measured by the sum of ARCH and GARCH parameters $(a_1 + \beta)$. The sum $(a_1 + \beta)$ is less than unity, in all cases, which implies the stationarity of the models. The larger value of the sum $(a_1 + \beta)$ shows that shocks to stock returns of both indices persist for a longer time period and its effects remain highly persistent in the following periods.

Consistent with Elyasiani et al. (1995) and Kasman et al. (2011) this finding implies that results regarding volatility effects on returns of both indices. 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 δ_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. Pakistan is an import-oriented country and always exposed to the risk of foreign exchange fluctuations due to the globalization of banking sector. Therefore, higher exchange rate volatility leads towards higher fluctuations in the stocks returns of both indices. Another possible reason for higher fluctuations in the stock returns, due to exchange rate volatility, is the change in Pakistani political setup in 2008 (from dictatorship to democracy), after which exchange rate increased rapidly Hence, overall, KMI-30 and KSE-100 stock return's volatility is increased in response to exchange rate volatility. The impact of interest rate volatility on stock return's volatility is measured by the coefficient δ_2. Consistent with Kasman et al. (2011) the parameter of interest rate volatility δ_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.

Conclusion

Some of the financial and academic experts around the globe still hold a question mark on the economic viability of the ethical investing. Prime arguments given by the opponents of ethical investing include restricted diversification, availability of smaller

investment universe, and additional screening and monitoring cots are. Hence, ethical investing criteria may adversely impact the performance of an investment. On the other hand, advocates of socially responsible investment come up with an argument that a competitive advantage can be achieved with good corporate responsibility practices, which can offer firms a range of opportunities. Accordingly, there is scarcity in the empirical literature on ethical investing and somewhat inconsistent results are provided by the available empirical papers.

The prime objective of this study was to investigate the extent to which the conditional volatilities of both *Shari'ah* 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 ofKMI-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 *Shari'ah* 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. Moreover, KSE-100 has higher returns and higher beta (systematic risk) as shown by the results of risk-adjusted returns for four performance measures. Opposite is true for KMI-30that confirms the theory of finance where higher risk assumed by investors will yield higher returns and vise verse. Muslim investors might have lower returns in the short run; however, such investments yield some other rewards in the world hereafter. *Shari'ah* investors want maximize their investment returns but they also want peace of mind by aligning their investments with their religious beliefs. 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 important information& policy implications for individual &institutional investors, regulatory authorities, academic community, 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.

Competing interests

Authors' contributions

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