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Are Islamic and Conventional Stock Indices Temporally Related? Evidence from Pakistan

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This paper investigates the co-movement of the two stock market indices of Pakistan, i.e., the KSE 100 Index and the KSE Islamic All Share Index. Daily data was taken for both the indices and the Johansen Cointegration test was applied to test for any long run linkage between the two variables. Moreover, the Granger Causality test / Block Exogeneity Wald test was also employed to explore whether any of the two indices could be used to forecast the other. Results revealed that long run associations, or Cointegration, did exist between the two indices at the lag length of 365 specified through the Akaike Information criterion. The Vector Error Correction Model showed that the two indices were strongly and positively associated with each other. The Wald test further indicated that the two variables were temporally related with the KSE Islamic All Share Index predicting changes in the KSE 100 Index. However, since the two time-series variables were found to be closely and positively associated specifically in the long-run, creating a portfolio of the two indices in an attempt to achieve diversification benefits may not serve the purpose.

Keywords: *Stationarity, Cointegration, Granger Causality Test, VECM, KSE 100 Index, KSE Islamic All Share Index*

Introduction

A co-movement between any two financial or economic time series variables is a common phenomenon. And if the two time-series are theoretically related, their co-movement becomes even more likely. This co-movement, or spill over as it is sometimes called in the financial literature, can be very interesting when there are shocks in one of the variables, positive or

negative. It has been found out that a spill over normally can, and does, happen in both good and bad times. In fact, sometimes a spill over is defined as the co-movement of shocks, which is commonly exemplified by the herding behaviour. Some studies have also found out that a spill over, or contagion, is more pronounced during periods of more shocks/crises and less pronounced during tranquil periods.

The current study is an attempt to examine the long- and short-term association between two important stock indices of Pakistan - the KSE 100 Index and the KSE Islamic All Share Index. Whether the two indices have common macro factors that influence them or each of the indices has its own set of driving forces is a question out of the scope of the current study. However, the cointegration test and the Granger Causality test employed in the study will let us know whether there does exist any underlying relationship between the two time series variables or not.

The primary objective of the study is to know to what extent the two stock indices, namely the KSE 100 Index and the KSE Islamic All Share Index, are related to each other specifically in the long-run. Besides, another important objective of the study is to explore any possible benefits of diversification one may obtain by investing in both the indices. This would, of course, be only possible if the two stock indices are found to be reasonably negatively correlated which, keeping in view that the two indices belong to the same country and are expected to be closely related, does not seem to be very likely. Whatever the outcome of the current work may be, anyhow, the study is expected to guide stock investors in creating a portfolio that would be better in line with their desire to have a given level of risk and/or return.

Review of Literature

The drive for this research is to find whether a long-termrelationship exists between the KSE 100 Index and the KSE Islamic All Share Index or not. For portfolio diversification, the co-movement of stocks serves as an important factor, and this is the reason researchers have shown a great interest in this issue. Academicians like Levy and Sarnat (1970), Lessard (1974), Agmon (1972), Agmon and Lessard (1977), Solnik (1991), and Grubel (1968) have a great popularity for their work on international portfolio diversification in international finance. It has been generally observed that long-term relationships among international markets often co-integrate in a positive linear fashion and, hence, the benefit of portfolio diversification vanishes. Taylor and Tonks (1989) also opine that the advantage of international diversification will disappear in the long run when markets share the same stochastic trend or when they are impeccably correlated. Noteworthy consequences of integrated markets are that assets with alike degrees of risk are shown to have alike degrees of return in many countries (Masih and Masih, 1997, 1999, 2001). Hence, it is important to investigate the co-movement of stock market values for international portfolios in the long-term as well as in the short-term.

Examination of significant aspects of interdependencies of international stock market indices serves as a great interest for economists and financial experts.

The main drive behind finding the association between the two stock indices is to know whether there are some common factors that show long run co-movement or each individual index is compelled by its own unique factors. This long-term relationship and dependence of stock market factors can be identified by what is known as the co-integration analysis. This co-integration analysis among international market indices has been observed by many researchers like Engle and Granger (1987), Johansen (1988), and Johansen and Juselius (1990) and afterwards by Masih and Masih (1997, 2002), Chowdhry (1994), and Chowdhry *et al* (2007).

Researchers mainly used two techniques to find the integration of stock market indices. Taylor and Tonks (1989), Jeon and Chiang (1991), Kasa (1992), Chung and Liu (1994), Corhay *et al*. (1995), and Floros (2005) used common stochastic tests for the said purpose while Masih and Masih (1997, 1999, 2001), and Ratanapakorn and Sharma (2002) used the time series technique in which they conducted co-integration tests, vector auto regression (VAR) modelling, vector error correction modelling (VECM), Granger causality, variance decomposition and impulse response analysis to find the co-movement of the stock indices. Not only had they observed co-movement of stock index prices but also witnessed the short- and long-term structural associations like rapidity and determination of the collaboration among the two indices.

In the past researchers have brought Asian stock markets more under the spotlight due to high economic growth rates and due to the financial crises of 1997. According to Masih and Masih (1997), the Asian Newly Industrializing Countries (NIC) of Hong Kong, Singapore, South Korea, and Taiwan showed long-term associations with recognised markets like Japan, USA, UK and Germany. However, little work has been done to explore the co-movement of the conventional versus Islamic stock indices specifically in the context of Pakistan. The current study, therefore, attempts to check whether there is any long-term linkage between the ways the two stock indices of the country move.

Methodology

To measure the extent to which KSE 100 Index co-moves in the long run with KSE Islamic All Share Index, the Johansen Cointegration test is employed. And in order to check what is known as the predictive causality between the variables, the Granger Causality test is used.

Initially, both the variables are subjected to a unit root test to ascertain their levels of stationarity and it is ensured that both the variables are stationary at the same order so as to meet the assumptions of cointegration. After that, the optimal length of the lags is selected using the various information criterion values such as the Akaike information criterion, and the Schwarz Criterion value among others. After that, cointegration between the variables is checked over the lag length specified by AIC. Finally, the Vector Error Correction Model

(VECM) is applied to estimate the long-term relationship and then the Granger Causality / Block Exogeneity Wald test to explore the capability of the variables to forecast each other.

Daily figures of stock index are collected for both the indices. For the KSE 100 Index the data has been collected from January 01, 2010 to September 24, 2020 leading to 2,660 observations. For the KSE Islamic All Share Index, however, the data is taken from November 18, 2015 to September 24, 2020 leading to 1,201 observations.

Analysis and Findings

The analysis of cointegration requires that both the variables must be stationary at the same level. Since most of the economic and financial time series are integrated of order 1, we expect the same from our variables as well. We start by subjecting both of our variables for a unit root test.

Unit Root Test

We first check our variable KSE 100 Index for its stationarity. Table 1 presents the unit root test of KSE 100 Index checked at level.

Table 1: *Unit root test for KSE 100 Index at Level*

Null Hypothesis: KSEINDEX has a unit root		
	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.199	.677

As can be seen in Table 1, the t-statistic of the ADF test is -1.199 with a probability value of 0.6769 showing that the KSE 100 Index is a non-stationary variable when taken at level. We therefore, take its 1st difference and then check for its stationarity again.

Table 2: *Unit root test for KSE 100 Index at 1st Difference*

Null Hypothesis: D(KSEINDEX) has a unit root		
	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-43.685	.000

Table 2 presents the results of the unit root test of the KSE 100 Index after taking its first difference. The Augmented Dickey-Fuller test has now a huge t-statistic of -43.685 with obviously a high level of significance. Hence, out variable the KSE 100 Index becomes stationary when taken at first difference. We now also check for the stationarity position of our second time series, the KSE Islamic All Share Index.

Table 3: *Unit root test for KSE Islamic All Share Index at Level*

Null Hypothesis: ISLAMICINDEX has a unit root		
	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.076	.727

The results of the unit root test for KSE Islamic All Share Index are presented in Table 3. A t-statistic of -1.076 for the ADF test with a probability value of 0.727 is indicative of the fact that this variable also has got trends and is non-stationary. We hope it is stationary at the first level.

Table 4: *Unit root test for KSE Islamic All Share Index at 1st Difference*

Null Hypothesis: D(KSEINDEX) has a unit root		
	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-9.354	.000

After taking the first difference, the results of the unit root test of the KSE Islamic All Share Index reveal that the variable has achieved stationarity. The ADF test now has a t-statistic of -9.35, which, in absolute terms, is of course much larger than the absolute critical value for t-statistic of 1.96. Hence, the variable KSE Islamic All Share Index also appears to be perfectly stationary at the first difference.

Since both of our variables are stationary at the first difference, or at the same order, we therefore, may apply the cointegration analysis in order to explore the long-run association, if any, between these two indices.

Optimal Lag Selection

The next step is to select the optimal lag length based on the frequency of the data. Most of the researchers use a lag length of 1 to 4 for annual or quarterly data, and a lag length of 12 to 36 for a monthly data. Since the data used in the current study is collected on a daily basis, it may not be surprising to take the lag length as big as 365. However, in an attempt to use the minimum possible lag length, we initially chose the lag length to be 4. At a lag length of 4, the three main information criteria values, namely the *Akaike Information Criterion* or the "AIC", the *Schwarz Information Criterion* or the "SC", and the *Hannan-Quin Information Criterion* or the "HQ", all had their minimum values in table at lag 2, connoting that the optimal lag length probably was 2. However, at a lag length of 2, the two variables, that is, the KSE 100 Index and the KSE Islamic All Share Index, were found *not* to be cointegrating with each other at all. Since, intuitively, the two variables should show at least some level of integration, therefore, the lag length was gradually increased in the process of finding a lag length that is even more optimal. It was not until the lag length was increased to 365 that the optimal lag length for AIC increased from '2' to '365'. For the other two information criterion values,

however, the optimal lag length remained to be '2' even at the lag length of 365. Upon further increasing the lag length to 400, it was observed that the optimal lag length was exactly '400' as per the three criteria, i.e., the AIC, the SC, and the HQ. However, keeping in view that daily figures of both the stock indices were taken for the study, it was decided to include only 365 lags for checking the optimal lag length.

Table 5: *Optimal lag length --- 365 lags included*

Information criterion	Minimum value	Minimum value at lag
AIC	28.052	365th
SC	28.715	2nd
HQ	28.680	2nd
LR	19.436	361st

AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion
LR: sequential modified LR test statistic (each test at 5% level)

Table 5 presents the optimal lag length as per the four criteria used for the study that are mentioned in the table. As discussed, 365 lags were included based on the fact that the daily data was used for the study. The AIC criterion suggests 365 lags to include for the cointegration analysis. The SC and the HQ criteria both suggest, on the other hand, only 2 lags to include in the study. However, at 2 lags selected, no cointegrating equations are found between the two variables which is primarily against intuition and rationale. The LR statistic recommends including 361 lags for the model.

Since AIC is normally preferred over other information criteria, we, therefore, consider 365 lags for our analysis.

Checking for Cointegration

In this third step of the analysis, we explore whether the two variables of our study, that is, the KSE 100 Index and the KSE Islamic All Share Index are cointegrating or not. The results of the Johansen Cointegration test are presented in Table 6. Both the trace test and the maximum-eigenvalue test used for tracking cointegration between the variables indicate two cointegrating equations at the 0.05 level. In fact, the trace statistic of 55.66 and the maximum eigenvalue of 47.84 represent that the cointegrating equations are significant even at 0.001 level. Hence, in the next step, we apply the Johansen Cointegration test to explore the extent to which the two variables are related to each other in the long-run.

Table 6: *Checking for Cointegration at a Lag Length of 365*

Included observations: 837 after adjustments
Series: ISLAMICINDEX KSEINDEX
Lags interval (in first differences): 1 to 365

Unrestricted Cointegration Rank Test (Trace)

Hypothesised No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	.055	55.664	15.495	.000
At most 1 *	.009	7.820	3.841	.005

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	.056	47.843	14.265	.000
At most 1 *	.009	7.820	3.841	.005

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level

Vector Error Correction Model (VECM)

After the cointegrating relationship has been identified between our variables of interest, we proceed by running the vector error correction model. The proceeding table presents results of the VECM. The first part of the result shows the long-term relationship between the KSE 100 Index and the KSE Islamic All Share Index. As can be seen, the coefficient of the estimate is -0.837 with a t-statistic of -12.71 indicating a highly significant relationship between the two. Since the signs of the coefficients are always changed, or reversed, in the estimates of VECM the coefficient -0.837 may be read as a positive 0.837. It can, therefore, be interpreted that a 1-unit increase in the KSE 100 Index leads to 0.837 units of increase in the KSE Islamic All Share Index, all other things being the same.

The second part of the VECM given in Table 7 displays the cointegrating equation in the error correction term. This equation must have a negative coefficient with a significant value of the t-statistic in order for cointegration to exist. This is because the error correction speaks about the pace with which our proposed model returns to equilibrium after some shock. If it is negatively signed, it indicates a movement back to the equilibrium. On the other hand, a positive sign of the cointegration equation reflects a movement away from the point of equilibrium.

Table 7: *Vector Error Correction Estimates*

Vector Error Correction Estimates		
Sample (adjusted): 1825 2661		
Included observations: 837 after adjustments		
Standard errors in ( ) & t-statistics in [ ]		
Cointegrating Eq:	CointEq1	
ISLAMICINDEX(-1)	1.000	
KSEINDEX(-1)	-.837 (.066) [-12.714]	
C	13873.66	
Error Correction:	D(ISLAMICINDEX)	D(KSEINDEX)
CointEq1	-1.407 (.569) [-2.474]	-.001 (.087) [-.006]
D(ISLAMICINDEX(-1))	1.587 (.647) [2.453]	2.056 (.099) [20.647]
D(KSEINDEX(-1))	-1.658 (.705) [-2.353]	.073 (.108) [.675]

The estimates of the cointegration equation in the error correction section of our model presented in Table 7 also reflect a negative sign of the coefficient which is significant at 5% level. Hence, we may safely hold that there is a long-term causality between our variables of interest.

Further down the table in the second section, one may also find that in the long-term the KSE Islamic All Share Index is also dependent upon its own lagged value as well as the lagged value of the KSE 100 Index. As per the results, the variable under consideration seems to be positively related to its lagged value and negatively associated with that of the KSE 100 Index.

Granger Causality / Block Exogeneity Wald Test

In this segment of the analysis, we check for the Granger Causality, or what Granger (1977) himself later claimed, the temporal relatedness, between the KSE 100 Index and the KSE

Islamic All Share Index. This is done through the Granger Causality test, the results of which are presented next.

Table 8: *Granger Causality / Block Exogeneity Wald Test*

VEC Granger Causality/Block Exogeneity Wald Tests
Sample: 1 2661
Included observations: 837

Dependent variable: D(ISLAMICINDEX)

Excluded	Chi-sq	Df	Prob.
D(KSEINDEX)	329.262	365	.910
All	329.262	365	.910

Dependent variable: D(KSEINDEX)

Excluded	Chi-sq	Df	Prob.
D(ISLAMICINDEX)	8061.620	365	.000
All	8061.620	365	.000

Table 8 paints a unique finding. It tells that the short-term causality runs from the KSE Islamic All Share Index to the KSE 100 Index meaning that the former significantly forecasts a change in the latter. The larger and more important, KSE 100 Index, on the other hand, does not predict the smaller KSE Islamic All Share Index.

Impulse Responses

In the final segment of the analysis, impulse response functions are presented to measure the time profile of the impact of an impulse, or a shock, on the expected future values of the variable. By looking at the graphs below, one can prospectively understand the dynamic association between the two stock indices studied in the paper.

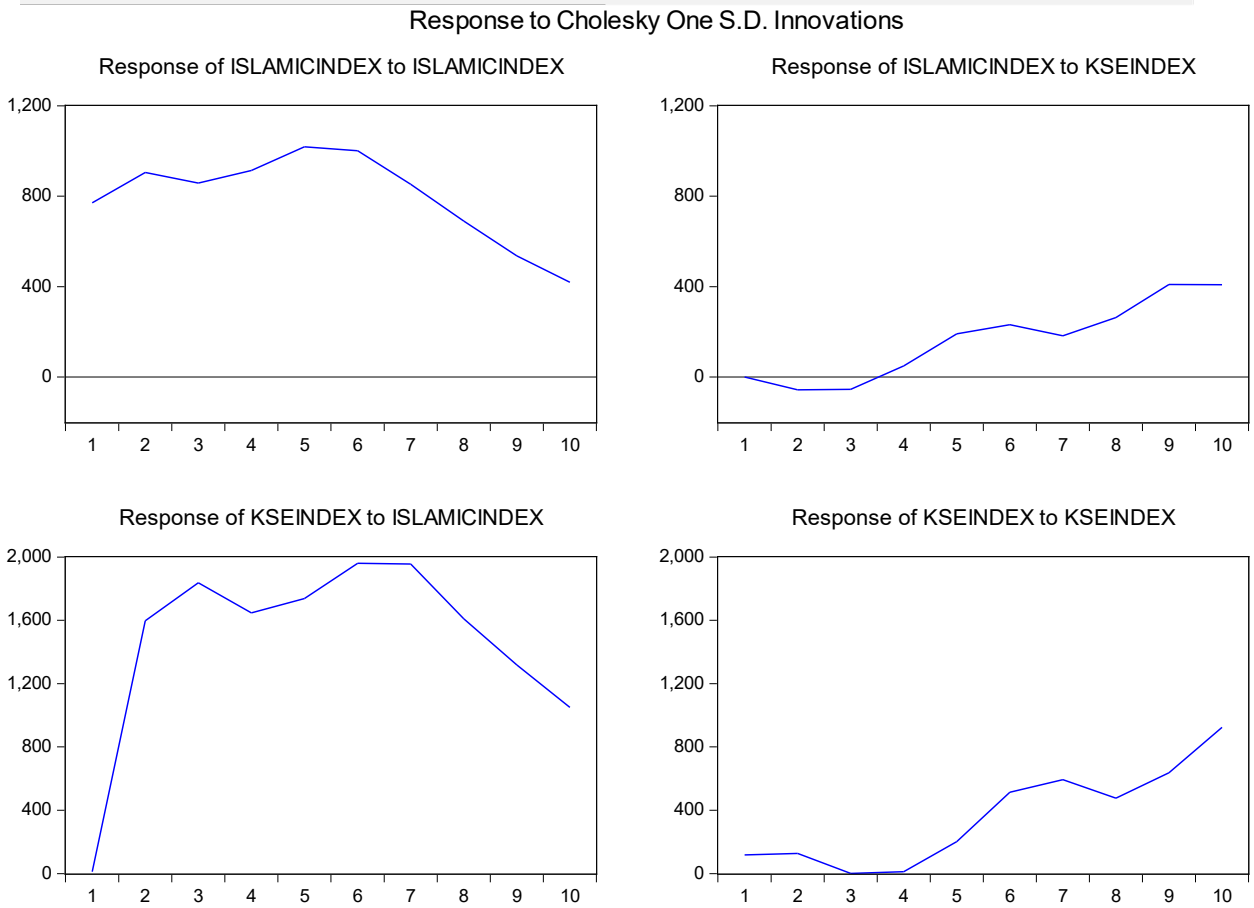

Figure 1: Impulse Responses for KSE 100 Index and KSE Islamic All Share Index

Conclusion

The current study was intended to explore the long- as well as the short-term relationships between the KSE 100 Index and the KSE Islamic All Share Index. The Johansen Cointegration test was used to explore the long-term relationship whereas the Granger Causality test was employed to reveal the predictive causality between the two variables. It was found that the two indices were very closely related to each other in the long run. Both the trace test and the maximum eigenvalue test indicated at least two highly significant cointegrating equations between the two variables. The vector error correction model revealed a strong positive association between the variables. It was also found that the KSE Islamic All Share Index was positively related with its own lagged value and negatively related with the lagged value of the KSE 100 Index. Finally, the Granger Causality test depicted that the KSE Islamic All Share Index did Granger cause KSE 100 Index; however, it was not the case vice versa. Nonetheless, as the Granger Causality test is better described as the 'precedence', it can be inferred that KSE Islamic All Share Index cannot, of course, *cause* a change in the KSE 100 Index; it rather can *forecast* the change in it.

References

Agmon, T. (1972). The relationships among equity markets: A study of share price comovements in the United States, United Kingdom, Germany and Japan. *Journal of Finance, 27*(4), 39-855.

Agmon, T., & D. Lessard. (1977). Investor recognition of corporate international diversification. *Journal of Finance*, *32*, 1049-55.

Chowdhry, A.R. (1994). Stock market interdependencies: evidence from the Asian NIEs. *Journal of Macroeconomics*, *16*(4).

Chowdhry, T., & K. Peng. (2007). Common stochastic trends among Far Eastern stock prices: Effects of Asian financial crisis. *International Review of Financial Analysis*, *16*.

Chung, P.J. & D.J. Liu. (1994). Common stochastic tends in Pacific Rim stock markets. *Quarterly Review of Economics and Finance*, *34*, 241-259.

Corhay, A., A. Tourani Rad & J.P. Urbain. (1995). Long run behaviour of Pacific-Basin stock prices. *Applied Financial Economics*, *5*, 11-18.

Engle, R., & Granger, C. (1987). Co-integration and Error Correction: Representation, Estimation and Testing. *Econometrica, 55*, 251-276.

Floros, C. (2005). Price linkages between the US, Japan and UK stock markets. *Financial Markets and Portfolio Management*, *19*(2), 169-78.

Grubel, H. (1968). Internationally Diversified portfolios: Welfare gains and Capital Flows. *American Economic Review*, *58*, 1299-1314.

Jeon, B.N. & T.C. Chiang. (1991). A system of stock prices in world stock exchanges: common stochastic trends for 1975-1990? *Journal of Economics and Business*, *43*, 329-38.

Johansen, S. & K. Juselius. (1990). Maximum likelihood estimation and inference on cointegration with applications to money demand. *Oxford Bulletin of Economics and Statistics*, *52*, 169-210.

Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control*, *12*, 231-54.

Kasa, K. (1992). Common stochastic trends in international stock markets. *Journal of Monetary Economics*, *29*: 95-124.

Lessard, D.R., (1974). World, National, and Industry Factors in Equity Returns. *Journal of Finance*, 29(2), 379-91.

Levy, H. & M. Sarnat, (1970). International Diversification in Investment Portfolios. *American Economic Review*, *60*, 668-675.

Masih, A.M.M. & R. Masih. (1997). A comparative analysis of the propagation of stock market fluctuations in alternative models of dynamic causal linkages. *Applied Financial Economics*, *7*(1), 59-74.

Masih, A.M.M. & R. Masih. (2001). Long and short term dynamic causal transmission amongst international stock markets. *Journal of International Money and Finance*, *20*(4), 563−587.

Masih, A.M.M. & R. Masih. (2002). Propagative causal price transmission among international stock markets: evidence from pre- and post- globalization period. *Global Finance Journal*, *13*.

Masih, A.M.M. and R. Masih. (1999). Are Asian stock market fluctuations due mainly to intra-regional contagion effects? Evidence based on Asian emerging stock markets. *Pacific-Basin Finance Journal*, *7*, 251-282.

Ratanapakorn, O. & S.C. Sharma. (2002). Interrelationships among regional stock indexes. *Review of Financial Economics*, *11*, 91-108.

Solnik, B. (1991). *International Investments.* Addison Wesley, New York.

Taylor, M. & I. Tonks. (1989). The internationalization of stock markets and the abolition of U.K. exchange control. *Review of Economics and Statistics, 71*, 332-336.