

# Linkages between TASI and S&P CNX NIFTY Shariah Index – A Co-integration & Causal Approach

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**Abstract:** This paper investigates the long run relationship and short term causal dynamic linkages between Saudi Arabia Tadawul stock market index (TASI) and Shariah index of Indian National Stock Exchange (S&P CNX Nifty Shariah). The daily time series data for 5 years are used (i.e. from May 1, 2010 to April 30, 2015) for empirical analysis. Augmented Dickey-Fuller unit root test has been applied to determine the stationarity of time series. Johansen Co-integration test is used to investigate the long run relationship while Granger Causality test is used to check the short term causality linkages. The study concludes that all series are integrated of first order i.e.  $I(1)$  and there is no long run relationship between TASI and S&P CNX Nifty Shariah indices. Also, the results of Granger Causality show that there are no causal linkages

between the two indices. Hence, there exist portfolio diversification opportunities for long terms as well as short term investors in these two stock markets.

**Keywords:** Causality, CNX Nifty Shariah, Co-integration, Shariah Portfolio, TASI

## 1. INTRODUCTION

Since the late 20th century, trade and financial liberalization enhanced the process of globalization; with increased trade ties, technological changes and economic synchronization leading to more integration of international stock market indices. To restore growth and stability by raising savings and improved economic efficiency; governments permitted foreigners to invest in country's stock markets (Saiti et al, 2014). Financial investment standards are categorised into ethical and non-ethical in the financial world. The ethical one is broadly called Shariah compliant investment (Shariah index) and the second one is conventional index.

Over the past years, the global capital market scenario has witnessed the introduction of Islamic indices; for instance, DJIM in 1999, S&P Islamic Index Group in 2007, MSCI in 2007, RJI in 2009 from USA, FTSE in 2004 and RBSI in 2008 of

UK, BSE of India in 2008, JII of Indonesia in 2003, KLSI of Malaysia in 2000 and SGI of France in 2008. Islamic stock market indices comprising of companies practicing Islamic finance are increasing due to great potential of growth and profitability (Haroon, 1999). According to Siddiqui (2011) Islamic indexing will turn into high profile Shariah-based indices by 2022. The recent boost of Islamic indices around the world will provide a common platform for investors in the Islamic world (Zamzmir et. al, 2013).

Islamic (Shariah) equity markets have strong potential for market penetration. Currently, Muslim population is roughly 1.6 billion (23% of world population) and is estimated to be 1.9 and 2.1 billion (24.9% and 26.3% of world population) in 2020 and 2030 respectively (Pew, 2013). However, Islamic mutual funds had only 5.6% share among all Islamic financial service industry (Ernst & Young, 2011).The opportunity

could be lost if the diversification strategy is not applied. As an old adage says, “*Don’t put all your eggs in one basket!*”

In the case of sudden bearish market, investors may get bankrupted overnight if they have one pool of investment. In the current scenario of investment, this will not be profitable to invest in co integrated markets as if one market deteriorates; others follow the same trend (Wahid, 2014). A number of researches have been conducted in order to measure the return and mitigate risk at the given time in the conventional investment world (see Arouri and Nguyen, 2010; Rizwan and Khan, 2007; Ali and Afzal, 2012). By reviewing recent literature, we found that majority of studies focused on a single Shariah index (Hakim and Rashidian, 2004; Girard and Hassan, 2008; Hussein, 2004; Ahamad and Ibrahim, 2002; Albaity and Ahamad, 2008; Dharani and Natarajan, 2011) while the comparison among country’s Shariah compliant stock index studies is still scarce.

We have chosen two international Islamic indices, namely Saudi Arabia Tadawul stock market index (TASI) and Shariah index of Indian National Stock Exchange (S&P CNX Nifty Shariah). The purpose of our study is

two-fold. First one is to provide evidence on whether these two indices offer an opportunity in the long run and the second is to investigate the investment opportunities in the short term. Johansen Co-integration test is used to investigate the long run relationship while Granger Causality test is used to check the short term causality linkages. These results will be helpful in reaping the benefits of portfolio diversification opportunities held by investors of these countries.

## **2. LITERATURE REVIEW**

Ample studies have been done to investigate equity markets’ co-integration. Most of the studies analysed the conventional markets’ long run and short term linkages. Within the context of developed countries, Chong et al (2003), Ansari (2009) and Dhanaraj et al (2013) discovered cointegration vectors by applying cointegration and VAR-GARCH models. Perera and Wickramanayake (2012), Batareddy et al (2012), Majid et al (2009) and Majid and Kassim (2009) argued the cointegration among emerging equity markets. Besides this, Islamic finance has drawn the attention of Muslim investors as well as non-Muslim investors due to its

outperformance relative to conventional stocks during financial crisis (Moeljadi, 2012; Ashraf, 2013). The remainder of this section will focus on the literature closely related to the Islamic equity indices and the methodologies applied therein.

The articles which explored the returns and characteristics of Islamic indices are limited. Hussein (2004) evaluated the performance of the FTSE Global Islamic Index and the FTSE All-World Index during 1996 to 2003 period and suggests that the Islamic Index outperforms the conventional counterpart during the bull market. The author concludes that the use of ethical filters does not have a negative impact on the performance of the FTSE Global Islamic Index. El-Khamlichi et al (2014) in his study compared the four Islamic indices namely Dow Jones (Dow Jones Islamic Market Index - DJIMI), Financial Times (FTSE Shariah World), Standard & Poor's (S&P 500 Shariah) and Morgan Stanley (MSCI World Islamic) to their respective conventional counterparts' conventional indices. The authors' findings by applying co-integration analysis suggest that there exists diversification opportunities related to the Islamic indices of Dow Jones and S&P

and their conventional counterparts. By contrast, the Islamic indices of the FTSE and MSCI do not verify this argument.

Majid and Kassim (2010) found that Islamic stock markets in developed and developing countries (i.e., Japan, US and UK & Malaysia and Indonesia) are cointegrated among themselves but in dissimilar group, no long-run equilibrium was found. Karim et al (2010) found that there is no cointegration of Islamic stock markets in Indonesia, Malaysia, UK, US and Japan. Moeljadi (2012) found that in the pre-2007 global financial crisis period, Indonesian and Malaysian Islamic stock markets are cointegrated with American, UK and Japan Islamic indices.

Majid, Yusof, and Razal (2007) investigated the degree of cointegration among stock markets of eight Islamic countries, such as Oman, Egypt, Turkey, Kuwait, Pakistan, Bangladesh, Malaysia and Indonesia by analyzing daily data in the time span of 1 January 2002 to 31 May 2006. The study concluded that stock markets of Oman, Turkey, Egypt, and Kuwait (OIC stock markets in North African (MENA) region and the Middle-East) are not cointegrated; however the stock markets of Bangladesh

Malaysia, Indonesia, and Pakistan (OIC stock markets in the Asian region) are integrated. Achsani, Effendi, and Abidin (2007) found that there exists strong correlations between the Islamic stock indices of Indonesia and Malaysia, the US and Canada, and Japan and Asia Pacific. The US Islamic stock index has strong influence on the other Islamic stock markets and their Indices.

The evidence from these studies confirms the importance of taking into account the investment horizon of the investor in co-movement of Shariah stock markets. In this study, we apply a methodology that takes into account both cointegration and causality. Lack of dependence between the Saudi Arabia Tadawul stock market index (TASI) and the Indian Shariah stock market index (S&P CNX Nifty Shariah) would offer international portfolio diversification benefits. The empirical results presented in this paper have several practical implications for risk assessment of portfolios and asset allocation decisions across these two markets.

The whole analysis of this paper is presented in the following order. In Section 3, we discuss the methodology used to analyse the

stock market cointegration and causality. Section 4 presents the empirical findings on stock market integration of the TASI and S&P CNX Nifty Shariah and Section 5 concludes the findings.

### **3. DATA AND METHODOLOGY**

This empirical study is based on daily closing values of Saudi Arabia Tadawul stock market index (TASI) and Shariah index of Indian National Stock Exchange (S&P CNX Nifty Shariah). Daily time series data for 5 years are used (i.e. from May 1, 2010 to April 30, 2015) for empirical analysis.

There are several methods for testing the co-movement of prices across the different financial markets. In this study the emphasis is given to test the long run relationship and short term dynamics between Tadawul stock market index (TASI) and Shariah index (S&P CNX Nifty Shariah) through (i).Descriptive Statistics, (ii) Correlation Matrix, (iii) Co integration Tests, and (iv) Granger Causality Test.

#### **A. Unit Root Test**

Cointegration analysis requires that time series should be integrated of same order. Stationarity of time series has been examined by using unit root tests.

Augmented Dickey-Fuller Test has been employed for said purpose. The Augmented Dickey Fuller test examines the presence of unit root in an autoregressive model. A simple AR (1) model is

$$y_t = \rho y_{t-1} + u_t,$$

Where,  $y_t$  is the variable of interest,  $t$  is the time index,  $\rho$  is a coefficient and  $u_t$  is the disturbance term.

The regression model can be written as

$$\Delta y_t = (\rho - 1) y_{t-1} + u_t = \delta y_{t-1} + u_t,$$

Where  $\Delta$  is the first difference operator. This model can be estimated and testing for a unit root is equivalent to testing  $\delta = 0$ . A financial time series is said to be integrated of one order i.e.,  $I(1)$ , if it becomes stationary after differencing once. If two series are integrated of order one, there may be a linear combination that may be stationary without differencing. If the said condition fulfils then these are called cointegrated.

### B. Johansen Cointegration Test

Johansen (1988) and Johansen and Juselius (1990) procedures test the presence of long run relationship between the variables. Johansen and Juselius propose two likelihood ratio tests for the determination of the number of cointegrated

vectors. One is the maximal eigenvalue test which evaluates the null hypothesis that there are at most  $r$  cointegrating vectors against the alternative of  $r+1$  cointegrating vectors. The maximum eigenvalue statistics is given by:

$$\lambda_{\max} = -T \ln(1 - \lambda_{r+1})$$

Where  $\lambda_{r+1}, \dots, \lambda_n$  are the  $n-r$  smallest squared canonical correlations and  $T =$  the number of observations.

The second test is based on the trace statistics which tests the null hypothesis of  $r$  cointegrating vectors against the alternative of  $r$  or more cointegrating vectors. This statistics is given by:

$$\lambda_{\text{trace}} = -T \sum \ln(1 - \lambda_i)$$

In order to apply the Johansen procedure, a lag length must be selected for the VAR. A lag length is selected on the basis of the Akaike Information Criterion (AIC).

### C. Granger Causality Test

According to representation of Granger theorem, if two variables are co-integrated, then there will be at least one direction or unidirectional granger causality must exist. Granger causality test is used to determine causality relation among variables and direction for the short term. So employing pair-wise Granger causality test technique is

helpful to identify each factor's causal relationship. Lag is selected to get appropriate results which are user specific. The time series variables are not stationary at I (0) and no cointegration exists among variables, consequently it would then be converted by taking first difference I (1) and applied as follows (Granger, 1969).

$$Q_{\text{prob}} (W_{t+n} | \theta_t) = Q_{\text{prob}} (W_{1+n} | \omega_t)$$

$Q_{\text{prob}}$  is conditional probability,  $\theta_t$  information set at time t, on past values of  $W_{t+n}$  and  $\omega_t$  information set containing values for both  $w_t$  and  $U_t$  for the t period. This is an unrestricted regression equation while by running this will help to find out the unrestricted residual sum of square (RSSUR) and also eliminate the lagged values of particular macroeconomic variables (MV) at first difference to find the restricted regression and restricted sum of square (RSSR), then I (1) should be zero for all values of I. F test is considerable to testify the null hypothesis as follows:

$$F = \frac{\text{RSSR} - \text{RSSUR} / k - k_0}{\text{RSS} / N - k}$$

If the F-Statistics exceeds the critical value

at the selected level of significance or the p-value associated to F Statistics is  $< 0.5$  then null hypothesis is rejected.

#### 4. EMPIRICAL ANALYSIS

The empirical analysis has been done in three parts. The first part comprises descriptive statistics and simple correlations between Nifty Shariah Index and Tadawul Index are analysed. In second part Bivariate Johansen Cointegration technique is applied to answer the question regarding the long run co movement between the two series. In third part we use Granger Causality test to analyse the short term dynamic linkages between the two stock market indices.

Figure 1 shows the graphs of daily close price of Nifty Shariah and Tadawul stock indices. It appears that both the series in the graphs follow a random walk movement. The graphical analysis gives a first indication that the two series are seem to be non-stationary. Descriptive statistics for Nifty Shariah index and Tadawul index returns are given in Table 1. These include the distribution of mean, standard deviation, skewness and kurtosis etc.

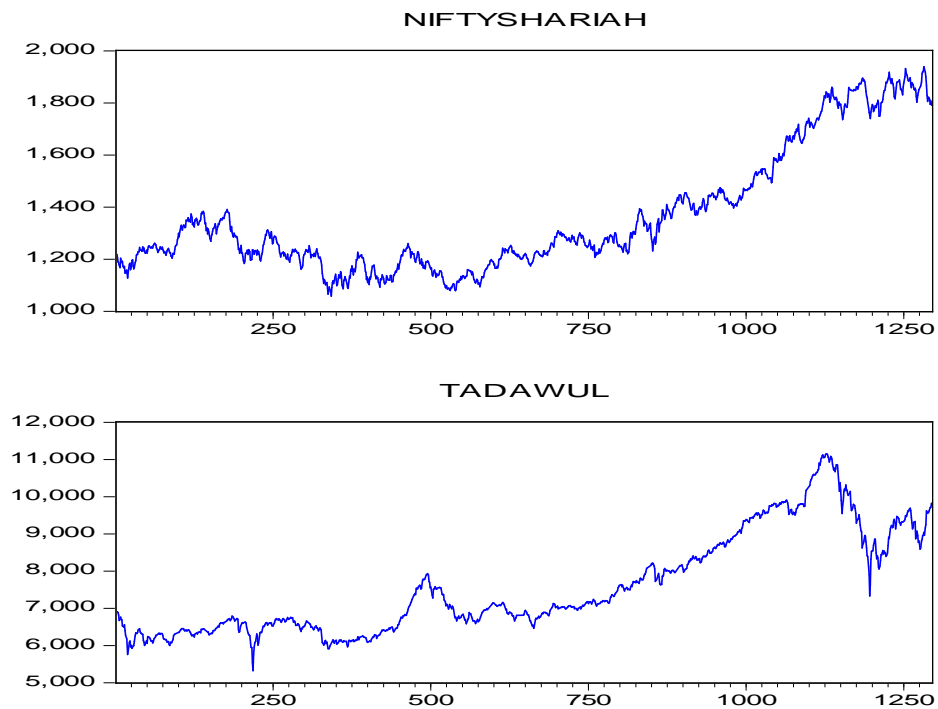


Fig 1: Daily Close Price Movement of Nifty Shariah Index and Tadawul Index

A careful examination reveals that the Tadawul stock index offers higher return as compared to Nifty Shariah index; however greater risk is associated with Tadawul index due to the large value of standard deviation. Tadawul Index is negatively skewed while Nifty Shariah index is positively skewed. The negative and positive values for skewness indicate that the series' distributions are skewed to the left or right. Tadawul index exhibits a relatively high kurtosis ( $>3$ ) indicating price indices is not normally distributed while in case of Nifty Shariah index prices are close to the normal distribution.

In Table 2 correlation matrix shows that Nifty Shariah Index is strongly positively correlated with Tadawul Index which means both are moving in same direction in short term. Table 3 shows the results of the Augmented Dickey-Fuller (ADF) test. It shows that the series of Nifty Shariah Index and Tadawul Index are non-stationary at the level form as the absolute T statistic values are less than the absolute critical values at 1% level of significance. Moreover, p-values associated to their corresponding T-values are greater than 0.05. Hence the null hypothesis of presence of a unit root in the series cannot be rejected. However, they become stationary series in their first difference, as the absolute T statistic values are greater than the absolute critical values



at 1% level of significance, rejecting the null hypothesis of a unit root. Thus, all of our data is integrated of order one i.e. I (1)

Table 1: Descriptive Statistics for Nifty Shariah Index and Tadawul Index Returns

	RTN &P CNX NIFTY SHARIAH	RTN TADAWUL
Mean	0.000456	0.011243
Median	0.000181	0.069965
Maximum	0.030395	8.547474
Minimum	-0.03792	-7.54676
Std. Dev.	0.009424	1.09938
Skewness	0.069305	-0.39453
Kurtosis	3.575589	18.60748
Jarque-Bera	12.0928	8425.456
Probability	0.002366	0
Sum	0.377383	9.308983
Sum Sq. Dev.	0.07345	999.5427
Observations	828	828

Table 2: Correlation Matrix

	S&P CNX NIFTY SHARIAH	TADAWUL
NIFTYSHARIAH	1	0.846018
TADAWUL	0.846018	1

Table 3: Augmented Dickey-Fuller Test

Variables	Augmented Dickey-Fuller Test Intercept			
	T Statistic		T Statistic	
	Level	Probability	1st Difference	Probability
Nifty Shariah	-0.00249	0.9572	-31.3024	0
Tadawul (TASI)	-1.44178	0.5625	-17.5194	0

\*Critical values of ADF & PP test statistics for 1%, 5% and 10% level of significance are -3.4385, -2.86503, and -2.56868 respectively

Table 4: VAR Order LAG-Length Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	329.5597	NA	9.56E-05	-3.57989	-3.54481	-3.56567

1	1147.235	1608.541	1.31E-08	-12.4725	-12.3673	-12.4299
2	1158.227	21.38257*	1.22E-08	-12.5489	-12.37354*	-12.47783*
3	1162.614	8.440113	1.21e-08*	-12.55316*	-12.3076	-12.4536
4	1164.365	3.32818	1.24E-08	-12.5286	-12.2129	-12.4006
5	1166.636	4.270599	1.27E-08	-12.5097	-12.1239	-12.3533
6	1167.815	2.189347	1.31E-08	-12.4789	-12.0229	-12.294
7	1172.797	9.147896	1.29E-08	-12.4896	-11.9634	-12.2763
8	1176.504	6.724662	1.30E-08	-12.4864	-11.8901	-12.2447

\* indicates lag order selected by the criterion, LR: sequential modified LR test statistics (each test at 5% level),  
 FPE: Final prediction error  
 AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion

Table 5: Bivariate Johansen Co-Integration T-Statistic Test

Hypothesized	Trace	0.05		
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None	0.027278	10.77912	18.39771	0.4084
At most 1	0.004897	1.624817	3.841466	0.2024

\*Trace test indicates no cointegration at the 0.05 level

Being satisfied with the results of ADF stationarity test, we proceed to conduct the Bivariate Johansen's Co-integration test for which the order of the Vector Autoregressive Model (VAR) should be determined by either the Akaike Information Criteria (AIC) or the Schwarz Information Criteria (SIC). The AIC is selected in this paper. The result in Table 4 shows that 3 lag lengths are chosen for the two series.

Table 5 reports the result of Bivariate Johansen Cointegration T-Statistic test. It shows that the T-Statistic values are less than their Critical value at 5% level of significance. Moreover, p-values associated to their corresponding T-values are greater than 0.05. Hence the Nifty Shariah index series is not cointegrated with Tadawul Index series.

Table 6: Max-Eigen Value Co-Integration Test

<b>Hypothesized</b>		<b>Max-Eigen</b>	<b>0.05</b>	
<b>No. of CE(s)</b>	<b>Eigenvalue</b>	<b>Statistic</b>	<b>Critical Value</b>	<b>Prob.**</b>
<b>None</b>	0.027278	9.154302	17.14769	0.4797
<b>At most 1</b>	0.004897	1.624817	3.841466	0.2024

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Table 6 reports the result of Max-Eigen value test. It also confirms the presence of no co-integrating eqn(s) as Maximum Eigen values are less than the critical values at 5% level of significance. Hence, there is no long run relationship between Nifty Shariah and Tadawul index series.

Table 7: Granger Causality Test

<b>Null Hypothesis</b>	<b>F-Statistic</b>	<b>Prob.</b>
TADAWUL Index (TASI) does not Granger Cause	1.64596	0.178
NIFTYSHARIA does not Granger Cause TADAWUL	1.2982	0.2744

Table 7 indicates the result of Pair wise Granger Causality test for Nifty Shariah and Tadawul index series. We find that there is no causality running between Nifty Shariah index series and Tadawul index series as their corresponding p values are greater than 0.05 which means both indices are running independently and any change in Nifty Shariah does not affect the Tadawul in the short run.

## 5. CONCLUSION

This study empirically investigates the long run relationship and short term dynamic linkages between of Saudi Arabia Tadawul stock market index (TASI) and Shariah index of Indian National Stock Exchange (S&P CNX Nifty Shariah). Based on the results of Descriptive Statistics we conclude that Tadawul Index offers higher return at high risk level as compared to Nifty Shariah Index return. We conclude from

correlation matrix that the two series tend to move in the same direction in the short term. By applying Augmented Dickey-Fuller unit root test and Johansen cointegration test, the study concludes that all series are integrated of first order i.e. I(1) and there is no long run relationship between the two series. Hence, for long term equity market investors there exists portfolio diversification opportunities in these two stocks market indices. Also, the results of Granger Causality provide no

evidence of short term linkages between the two series which means that any change in one market does not affect the index of other market.

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