The Effect of Exogenous Shocks on Participation Index of Borsa Istanbul: Permanent or Temporary?

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Abstract

This study investigates the effects of exogenous shocks on Participation 30 Index that published by Borsa Istanbul using daily data during the period from 06.01.2011 to 31.08.2015. Using the Zivot-Andrews and Fourier unit root tests the stationarity of the series is tested. Since series is found to be non-linear KSS unit root test is applied. The results suggest that the series has unit root we conclude that in case there is an exogenous shock its impact on Participation 30 Index will be permanent.

Keywords: Participation Index, Fourier Unit Root Test, KSS Unit Root Test.

JEL Classification Code: G30, C22, C43.

Dışsal Şokların Katılım Endeksi Üzerindeki Etkisi: Kalıcı mı, Geçici mi?

Özet

Bu çalışmada Borsa İstanbul tarafından yayınlanan Katılım 30 Endeksi üzerinde dışsal şokların etkisi araştırılmıştır. Bu bağlamda 06.01.2011 – 31.08.2015 dönemine ait günlük verilerle çalışılmış ve serinin durağanlığı Zivot-Andrews birim kök testi ve Fourier birim kök testi ile test edilmiştir. Seri doğrusal olmadığından doğrusal olmayan seriler için geliştirilmiş KSS birim kök testi uygulanmıştır. Analizler sonucunda serinin durağan olmadığı, birim kök içerdiği sonucuna ulaşılmıştır. Katılım endeksi serisinin uğradığı dışsal şokların etkisinin kalıcı olacağı söylenebilir.

Anahtar Kelimeler: Katılım Endeksi, Fourier Birim Kök Testi, KSS Birim Kök Testi.

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Introduction

Globalization phenomenon gives rises to many and somewhat peculiar developments in economies of the modern world. Emergence and spread of interest free economic models and banking systems can be cited as examples. Similarly, Islamic indices are compiled to oversee the performance of the firms activities of which are Shariah compliant. The fact that innovations aiming to attract capital which is sensitive to being Islamic are on the rise even in the non-Muslim countries such as United Kingdom might be resulting from the vast accumulation of capital in Islamic world supposedly sensitive to instruments and models which are Shariah based or at least Shariah compliant and the search for alternative systems and instruments in financial world

Islamic indices are indices that are compiled to follow the changes in value of the stocks that belong to the firms whose activities are in line with the Islamic rules and principles. The weight of each company whose stocks are in the index might be determined in advance so that a change in the stock prices of the each firm would be different. In doing so the diminution of risk and minimization of loss would be achieved (Akten Çürük, 2013: 102).

There are a number of Islamic indices the first of which was compiled by RHB Unit Trust Management of Malesia in 1996. This was followed by Dow Jones Islamic Market (DJIM) Index in 1999. "FTSE Global Islamic Index Series" by FTSE Group, "the S&P 500 Shari'a Index", "the S&P Europe 350 Shari'a Index", the S&P Japan Sharia Index, "S&P/IFCI Large-MidCap Shari'" by Standard&Poors under the category of "Shari'a Compliant Index" are other Islamic indices one can cite (Mannan and Suisse, 2008: 115). STOXX Europe Islamic Index is another Islamic index compiled by STOXX (Aktaş et al., 2013: 139).

Borsa Istanbul of Turkey compiles "Participation 30" and "Participation 50" Indices. This study investigates the persistence of exogenous shocks on Participation 30 Index daily data over four years from 01.06.2011 to 08.31.2015.

In the first section of this study, "Participation 30 Index" is introduced. In the second section, econometric techniques and their findings are discussed. The paper ends with concluding remarks.

1. Participation 30 Index

Participation 30 Index (*PI*30) is an index comprised of stocks traded at Borsa Istanbul National Market which are in compliance with the principles of participation banking. The *PI*30 was launched by Bizim Securities on

December 31, 2008 and it decides on the admission and dismissal of shares subject to the approval of Index Advisory Board. Borsa Istanbul calculates and disseminates the data which started on 06.01.2011.

Its original name "Participation Index" has been changed to Participation 30 Index because some other participation indices were initiated in July 2014. The aim of the *PI*30 is to measure the price and return performances of the shares of the companies that comply with the principles of Participation Banks (Participation 30 Index Rules Booklet, p.1).

Since Index Rules are set up according to Participation Banking principles, the index excludes interest-based financing, trade, services intermediation (banking, insurance, financial leasing, factoring and other interest based activities), alcoholic drinks, pork and similar food, tobacco products, gambling, entertainment, futures (gold, silver, and currency trades) and so on.

Moreover, companies included in the *PI*30 are required to meet some financial ratios as summarized below:

(i) Both the rate of total interest-bearing debt of companies and that of interest-bearing cash and securities to their market value shall be lower than 30%;

(ii) The rate of income from aforementioned fields to total income shall be lower than 5%.

Participation 30 Index is comprised of top 30 companies, stocks of whose are quoted in BIST (Participation 30 Index Rules Booklet, p.1).

All participation banks are index sponsors and they also set minimum standards to be adhered in compilation of the index. Bizim Securities and Association of Participation Banks are index advisors. As mentioned above Bizim Securities is the index provider and Borsa Istanbul (BIST) is index calculator and also distributes data (Participation 30 Index Introduction Presentation).

The latest prices registered at Borsa Istanbul are used in index calculations. The *PI*30 is calculated with weighted market values of shares in actual circulation. The index calculation is done using the following formula (Participation 30 Index Rules Booklet, s.4):

$$E_t = \sum_{i=1}^{n} F_{it} x N_{it} x H_{it} x K_{it} / B_t$$

E_t : Value of the index at time t

n : Number of companies in the index

F_{it} : Price of the ith stock stock at time t

N_{it} : Total number of ith stock at time t

H_{it} : Rate of the part in actual circulation of the ith share at time t to the total number of shares.

K_{it} : Coefficient for ith share at time t

B_t : Dividing value of the index at time t

Corrections are made in the dividing value of the index in cases such as cash dividend payment, capital increase for cash by stock rights.

Table 1: Companies in Participation 30 Index

Company Names (Stock Code)		
Bim Mağazalar (BIMAS)	Aygaz (AYGAZ)	Good-Year (GOODY)
Ereğli Demir Çelik (EREGL)	Asya Katılım Bankası (ASYAB)	Mardin Çimento (MRDIN)
Türk Hava Yolları (THYAO)	Aksa (AKSA)	Soda Sanayii (SODA)
Enka İnşaat (ENKAI)	Akçansa (AKCNS)	Kartonsan (KARTN)
Ülker Bisküvi (ULKER)	Çimsa (CIMSA)	Nuh Çimento (NUHCM)
Ford Otosan (FROTO)	Albaraka Türk (ALBRK)	Bursa Çimento (BUCIM)
Petkim (PETKM)	Adana Çimento (A) (ADANA)	Bolu Çimento (BOLUC)
Koza Altın (KOZAL)	Selçuk Ecza Deposu (SELEC)	Teknosa İç ve Dış Ticaret (TKNSA)
Pegasus (PGSUS)	Pınar Süt (PNSUT)	Logo Yazılım (LOGO)
Türk Traktör (TTRAK)	Konya Çimento (KONYA)	Pınar Et ve Un (PETUN)

Source: Participation 30 Index Introduction Presentation, www.katilimendeksi.org [September 15, 2015]. Companies are ordered according to their weights in the index. First ten companies are in bold.

The list of the companies included in the Participation 30 Index is exhibited on Table 1. Companies in the list are ordered according to their

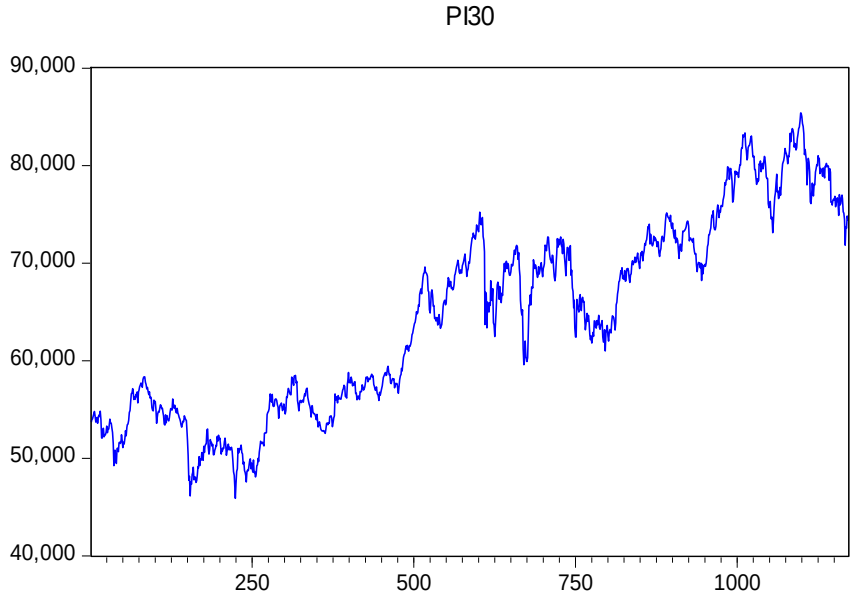
weights in the *PI*30. Needless to say that, due to the restrictions on company type and activity the companies included in the *PI*30 are reel sector companies and participation banks.

2. Data, Methodology and Analysis

2.1. The Data and the Methodology

This study uses the daily series of Participation 30 Index during the period from 01.06.2011 to 08.31.2015 to test its stationarity. Daily *PI*30 data is taken from BIST Data Store. Closing prices are used here.

Graph 1: The *PI*30 (01.06.2011-08.31.2015)



The *PI*30 series is exhibited in Graph 1 and some peculiarities with respect to linearity and structural breaks are observed. Of course the likely features need further formal statistical tests and this task is undertaken below.

2.2. Findings

To test the stationarity of the *PI*30 series some unit root tests will be applied. First Zivot-Andrews unit root test allowing only one structural break will be used. Another unit root test that is applied here is Fourier unit root test which is a relatively more flexible unit root test accounting jointly for the non-linear adjustments and structural breaks. Then we will check linearity of the series

and if it is non-linear then KSS unit root test will be used to see whether the series is stationary.

2.2.1. ZA Unit Root Test

Zivot and Andrews (1992) has developed a test (ZA test) allowing one structural break in the series[9]. ZA test is applied using Model *C* which accounts for breaks both in mean and trend.

Table 2: The Results of ZA Unit Root Test

	Model *C*– Break in Mean and in Trend	
Variable	t-stat.	TB
*PI*30	-4.19 (3)	23.11.2012

Table critical values for Model C are -5.57 (1%), -5.08 (5%), and -4.82 (10%). Optimal lag length has been chosen using Schwarz Information Criterion

ZA test result indicates that *PI*30 has unit root since the calculated t-statistics is lower than critical value in absolute value even at 10% significance level. The test predicts a structural break on 11.23.2012.

Here are some financial and economic developments on 11.23.2012 that might contribute to break in the PI30 series.

(i) Deputy Prime Minister Ali Babacan's talk about the gold headed to Iran (Milliyet- daily newspaper, 11.24.2012).
(ii) Interrupted relations between Turkey and Israel resumes via talks between diplomats (Sabah, daily newspaper, 11.24.2012).
(iii) Polemic between Lavrov and Davutoğlu over Patriots (Sabah, daily newspaper, 11.24.2012).
(iv) France after Spain and Greece might face financial crisis (Dünya, daily newspaper, 11.24.2012).

2.2.2. Fourier Unit Root Test

Christopoulos and Leon-Ledesma (2010) have developed Fourier unit root test that models relatively big changes in deterministic terms using Fourier function. When applied properly the test detects breaks whether they are sharp or mild. The timing, number, and form of the break would not affect the power of the test (Yilanci ve Eris, 2012: 210). The null and alternative hypotheses of the Fourier unit root test are as follows:

[9] For the details, see Zivot and Andrews (1992).

H_0: The series has unit root

H_1: The series is stationary

In the application of the Fourier unit root test, first step is to determine the appropriate frequency (minSSR). Then F-statistics for the model with appropriate frequency is calculated. If the calculated F-statistics is greater than critical value this implies that trigonometric terms are significant. Following step is to test the stationarity of the residual squared ($\tau_\mu(k)$). If the calculated τ is lower than critical value then the null hypothesis cannot be rejected[10].

Table 3: The Results of Fourier Unit Root Test

Variable	SSR	k	$F_\mu(k)$	$\tau_\mu(k)$
*PI*30	4.54E+10	1	906.03	-2.32

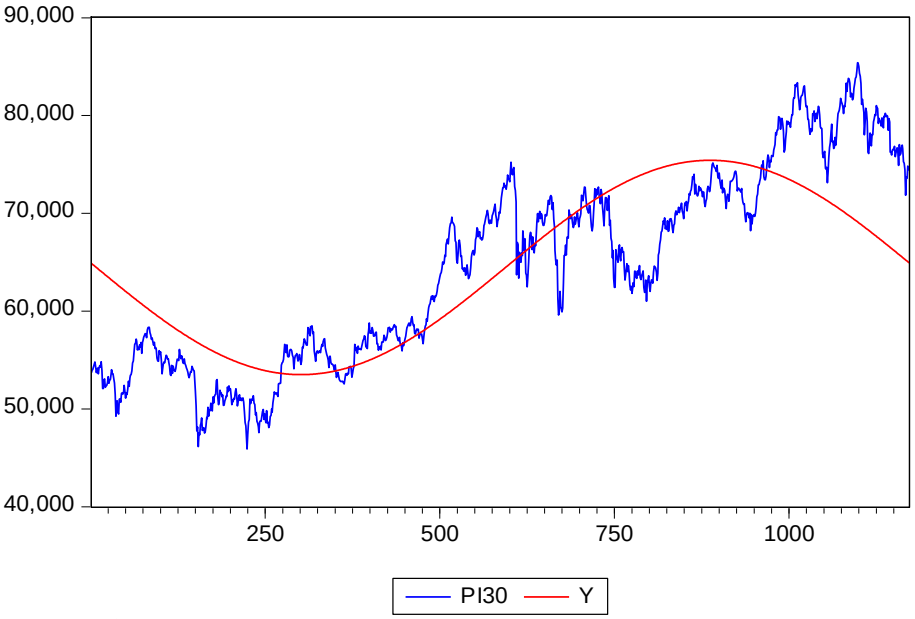
Not: Critical values for $F_\mu(k)$ are taken from Becker *et al.* (2006). The critical values are 3.928 (10%), 4.669 (5%), and 6.315 (1%). Critical values for $\tau_\mu(k)$ are taken from Christopoulos ve Leon-Ledesma (2010). They are 3.53 (1%), 2.93 (5%), and 2.59 (20%).

The test results for the Fourier unit root test are shown in Table 3. For *PI30* series appropriate frequency is found to be 1. *F*-statistics for the model that has been run with the appropriate frequency is found to be 906.03. When compared with the critical values we see that calculated F-statistics is greater than the table value even in 10% level and conclude that trigonometric terms used in the model are significant. Thus, unit root test result will lead to the result which is statistically significant.

The stationarity of the residual squared ($\tau_\mu(k)$) is tested and the calculated τ statistics is found to be -2.32. Since it is lower than the table values in absolute terms we fail to reject the null hypothesis. Thus we conclude that the series has unit root. Graph 2 exhibits how well Fourier functions capture the deviations.

[10] For the details, see; Christopoulos ve Leon-Ledesma (2010), Becker vd. (2006), Yilanci and Eris (2012).

Graph 2: Fourier Functions



The tests carried out and discussed above indicate that the series has unit root (nonstationary). However, these tests assume that the sires is linear, which is not always the case in many variables in economics. Especially, the financial market series are not in general linear. Thus, testing the linearity of the *PI*30 series and proceeding according to the result would be a good way to follow.

2.2.3. Harvey et al. Linearity Test

There might be many reasons for nonlinearity of economics and financial series stemming from their nature. For the variables of stock exchange, we can cite the followings: (i) agents are heterogonous (they act differently when new information becomes available), (ii) asymmetric information, and (iii) other market failures (Yılancı, 2013: 2).

Harvey et al. (2008) developed a linearity test with the alternative of nonlinearity. It provides two test one with assumption of stationarity, the other with the assumption of the existence of unit root. The weighted average of the two tests give us the calculated statistics for Harvey *et al.* linearity test (Yılancı, 2013: 6).

The null and alternative hypotheses of the test are as follows:

H_0: The series is linear

H_1: The series is nonlinear

The results of the Harvey *et al.* linearity test statistics is given in Table 4. As usual, to accept the null hypothesis we need to have calculated statistics lower than critical values. [11] The calculated test statistics is greater than the critical values even at 10% significance level. Thus, we reject the null hypothesis and conclude that the *PI*30 series in nonlinear.

Table 4: Harvey *et al.* Test of Linearity

	Calculated t-stat.	Critical Values		
Variable	t-stat	%1	%5	%10
*PI*30	17.56	16.12	16.30	16.61

This result *PI*30 series being nonlinear requires us to proceed with KSS unit root test which is used to test the existence of the unit root in nonlinear series.

2.2.4. KSS Unit Root Test

Kapetanios *et al.* (2003) developed a unit root test that has the null hypothesis that unit root exists (nonstationary) with the alternative that the series is nonlinear but globally stationary exponential smooth-transition autoregressive process[12].

Table 5: KSS Unit Root Test Results

	Calculated t-stat	Critical Values		
Variable	t-stat.	%1	%5	%10
*PI*30	-1.59	-2.82	-2.22	-1.92

Note: Table critical values are from Kapetanios *et al.* (2003).

As seen in Table 5, the calculated t-statistics is lower than table critical statistics in absolute value. Thus, we fail to reject the null hypothesis stating that the series has unit root.

Conclusion

We observe that new indices have been developed continuously in financial markets where many already exist. The indices developed to measure the

[11] For the details, see : Harvey *et al.* (2008)

[12] For the details, see: Kapetanios *et al.* (2003)

performance of the stock shares which comply with the standards developed according to Islamic principles. Borsa Istanbul (BIST) publishes Participation 30 Index and Participation 50 Index.

This study investigating whether exogenous shocks have temporary or permanent effects on Participation 30 Index (*PI*30) uses daily data for the period from 01.06.2011 to 08.31.2015. The research question basically requires tests to see whether the *PI*30 series has unit root. If it is then the effect of an exogenous shock would not die off in time. We run ZA test allowing a structural break in the series and find that the series is nonstationary and has a structural break on 11.23.2012. Fourier unit root test, too finds that *PI*30 has a unit root. Nonlinearity which is common in financial variables affects unit root tests and falsely give the result that series is nonstationary. For this reason we test the linearity using Harvey *et al.* (2008) test and find that the *PI*30 series is nonlinear. Thus, we proceed with KSS test which is developed testing unit root when the series is nonlinear. The KSS test also indicates that the series has unit root (nonstationary).

All of the unit root tests that are applied in this paper find that the Participation 30 Index is nonstationary, implying that the effect of an exogenous shock including a policy shock to *PI*30 Index would be permanent.

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