# Analyzing the Interactions between European Sport Indexes

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## Abstract

*Soccer is an important sector for the economies with the growing revenues. On the other hand, financing needs also increase based on the growing industry. Therefore, many of soccer clubs have started to issue stocks to meet their financing needs. Nowadays, the specific indexes like soccer indexes are investment alternatives for the investors. In this study, the unrestricted Vector Autoregressive (VAR) Model is used to analyze interaction between Borsa Istanbul (BIST) Sport Index and the STOXX Europe Football Index for the purpose of providing information to international investors. VAR model show that there is a relationship between the two indexes.*

**Keywords:** Soccer clubs, sport index, VAR models, interaction

## *1. Introduction*

In the sport industry which is a part of daily life, the biggest share belongs to soccer with its growing size. Besides being sports organizations, soccer clubs have started to turn into a structure that is similar to the global companies with their enormous transfer and investment expenses. Since the beginning of 1980s, soccer has started to settle as a brand-new industry by way of the European soccer clubs. European soccer clubs have built new stadiums that have helped the European soccer clubs to increase their revenues especially in England (Szymanski &Smith, 1997). During the period of time, commercials, broadcasting rights, sponsorship and merchandise (production) revenues, etc. have turned into such indicators which have showed that soccer has been an extensive business in the world (Andreff & Staudohar, 2000).

The budgets of Soccer clubs' budgets grow with the growth in soccer industry. Therefore, the growing expenses increase the financing needs of the clubs. In general, corporations which have financing needs, meet these needs with debt and equity financing. At the same time, the improvements in financial markets and the increase in the diversity of financial instruments increase the financing opportunities. This situation canalizes the soccer clubs to the capital markets. Though quite a few soccer clubs meet their financing needs from capital markets by issuing stocks and these stocks are to be traded in exchanges (Buraimo, Simmons &Szymanski, 2006).

The stock indexes can be calculated on international, national and sectorial basis (Jackson, 1994). In addition to these indexes, there are specific indexes like soccer club indexes that only include soccer clubs' stocks.

Specific indexes, like sport indexes give investors the opportunity of investing in different areas in direction of their risk and return expectations. In this context, the issues of soccer clubs give alternative investment opportunities to investors alongside of satisfying soccer clubs' financing needs.

On the other hand, the increase in liberalization between the financial markets and the rapid evolution in technology and communication channels have brought out the truth that financial markets are affected by each other. For this reason, in evaluating the soccer clubs' stock indexes, it will be more realistic to take into account the developments in the other stock indexes along with the index's internal dynamics.

## *2. Literature Review*

In the literature, studies about the financial dimension of the soccer clubs generally focus on the performance of stocks, sponsorship and the effects of scores on the stock prices and indexes.

Berument and Ceylan (2012) investigated the effects of domestic soccer clubs' performances against foreign clubs on stock market returns and return-volatility relationship. In their study, they focused on analyzing Chile, Spain, Turkey and the United Kingdom's soccer clubs and markets through using EGARCH model. According to the research results, it was concluded that international match scores effect stock market returns and return-volatility relationship.

Hanke and Kirchler (2013) examined the effect of jersey sponsorship on sponsor firm's stock with panel regression model. Important soccer tournaments between January 1996-December 2006 were included in the study. Also DAX30, S&P 500 and CDAX daily index data were used as representatives of Adidas, Nike and Puma respectively. They found that match scores affected sponsor firm's stock value.

Benkraiem, Louhichi and Marques (2009) analyzed the effects of European listed soccer clubs' match results on the stock markets. 745 data were used and empirical results showed that the results affected both the abnormal returns and the trading volume around and the direction of the movement changed based on the nature of result.

Berument, Ceylan and Eker (2012) investigated the effects of soccer clubs' wins against foreign rivals on Borsa Istanbul (BIST100) index returns. The major soccer clubs' wins and the index's daily data between 1987-2006 were analyzed with transfer function analysis and regression analysis. The findings showed that there was a relationship between wins and high returns.

Edmans, Garcia and Norli (2007) analyzed the relationship between stock markets returns and investor mood. As the representative of investor mood they used soccer out comes because there is a psychological evidence of a strong link between soccer outcomes and investors mood. The data of 41 countries' daily national index returns were used to analyze the stock market reactions to international soccer matches. According to the regression analysis and GARCH models results, it was concluded that there was a relationship between losses and negative returns. The results also showed that the loss effect was stronger for the small stocks and for the more important games.

Klein, Zwergel and Heiden (2009) studied the relationship between the results of soccer matches and the specific national stock index returns. In their study, soccer results between 1990-2006 and daily national index returns were analyzed with the constant mean model and a two-state Markov-switching market model. In contrast to many studies in the literature, it was concluded that there was no relationship between losses and negative returns.
When considered from the point of intercountry relationships between stock markets and indexes, it has been seen that there are too many other studies focusing on this subject with different variables and with different econometric models.

King, Sentana, and Wadhwani (1994) assessed the time-varying co-movements of 16 countries' stock markets. In their, study a multivariate factor model was estimated and it was concluded that co-movements of the markets increased over time.

Berben and Jansen (2005) examined the co-movements of Germany, Japan, the UK and the US stock markets at the market level as well as the industry level. Weekly market index returns and ten industries' stock index returns were used and bivariate STC-GARCH model was applied to determine whether there was a structural change in co-movements or not. Their empirical findings indicated that the correlation between Germany, the UK and the US increased more than two times, while the correlation between Japan and the other countries did not change.

Hatemi-J (2012) tested the integration between the United Arab Emirates and the US stock markets with the asymmetric causality test. In the study weekly stock price index data between 2005-2011 were used and in contrast to the symmetric causality tests, it was concluded that the United Arab Emirates stock market was integrated with the US stock market and the integration was stronger when the markets were falling.

Köseoğlu and Çevik (2013) assessed the casual relationships between stock market and the foreign exchange market for Czech Republic, Hungary, Poland and Turkey. The causality-in-mean and the causality-in-variance test were applied to daily data between 2002-2011. Their empirical results showed that the stock market was Granger cause due to the foreign exchange market in all the countries.

When the studies in the literature are considered all together, it is seen that there are very few studies about the specific sport indexes of soccer and the relationships between these indexes. In this context, it will be useful to present information about these indexes to the investors, especially who are willing to invest in these stocks and indexes.

## *3. Data and Methodology*

In the study, which aims to provide information to international investors who are willing to invest in sport indexes, weekly return series of STOXX Europe Football Index (RSTOXX) and BIST Sport Index (RXSPOR) are used. Due to 2008 Global Crisis destructive effects, the analyzing period is limited to the dates 9/18/2008 and 2/14/2013 and which make up 231 data, are used.

STOXX Europe Football Index which is one of the indexes to be analyzed in this study presents the European soccer clubs and the other index which is, BIST Sport Index consists of the Turkish soccer clubs whose stock are traded in Borsa Istanbul. Data are obtained from the following two websites, www.stoxx.com and www.borsaistanbul.com and Eviews 7.1 is used for the data analyses.

Unrestricted VAR model is used to examine the relationships between the stated indexes. Vector auto regression (VAR) is an econometric model that is used to analyze the interactions and interdependencies in multiple time series. VAR model eliminates the problem of endogenous variable-exogenous variable segregation by treating all the variables as potentially endogenous. In addition to this, using lagged values of dependent variable enables to forecast future values robustly (Kumar, Leona & Gasking, 1995).

VAR models are used to analyze the transmission of shocks across countries, sectors, or industries. Models can also be used to examine the contagion of financial crises and globalization. Because of matching up with the purpose, VAR model is used in the study.

Bivariate VAR model can be written as follows:

$$y_t = a_1 + \sum_{i=1}^{p} b_{1i} y_{t-i} + \sum_{i=1}^{p} b_{2i} X_{t-i} + v_{1t} \quad x_t = c_1 + \sum_{i=1}^{p} d_{1i} y_{t-i} + \sum_{i=1}^{p} dX_{t-i} + v_{1t} \quad (1)$$

Where, p is the lag length, v is the error term that has zero-mean, constant variance, normal distribution and zero-covariance with its lagged values (Gujarati & Porter, 2009).

In VAR methodology, firstly the stationary of the series must be investigated in order to determine the proper VAR model. After the stationary tests are performed, information criterias are used to select the proper lag length. The information criterias which can be used in selecting the lag length are sequential modified LR (Likelihood Ratio) test statistic, final prediction error (FPE), Akaike Information criterion (AIC), Hannan and Quinn criterion (HQC) and Schwarz criterion (SWC). But after deciding the proper model with the information criterias it must be checked that whether the model satisfy the stability condition and there is an autocorrelation problem.

VAR methodology gives three outcomes; Granger causality test, impulse-response functions and variance decomposition.

**Granger Causality Test**

Granger causality test is a statistical test to be used to determine whether one time serie is useful in forecasting another. According to Granger causality test, if the variable $X_1$ "Granger causes" of variable $X_2$, then past values of $X_1$ should contain more information than past values of $X_2$ to predict the future values of $X_2$ (Granger, 1969).

**Impulse-Response Function**

Impulse-response function measure the effect of a one-standard-deviation shock that occurs in one of the error terms on endogenous variable's present and future values (Kirchgässner & Wolters, 2007). In this context, impulse-response function has crucial importance in determining the dynamic relations between the variables.

**Variance Decomposition**

Variance decomposion separates the changes in one of the endogenous variable as individual shocks that effect all of the endogenous variables (Hamilton, 1994).Also, variance decomposion shows that how much of the changes in dependent variable's variance resulted from the independent variable's variance.

## *4. Empirical Analysis and Findings*

In this study, first of all, the stationary of time series are tested with Augmented Dickey-Fuller and Philips-Perron unit root tests and the results are shown in Table 1.

**Table 1: Unit Root Tests Results**

| | **Augmented Dickey- Fuller Test** | | | **Philips-Perron Test** | | |
|---|---|---|---|---|---|---|
| **Variables** | **Test Statistic** | **Prob.** | **Result** | **Test Statistic** | **Prob.** | **Result** |
| **RXSPOR** | **-14.04967** | **0.0000** | **I(0)** | **-14.04867** | **0.0000** | **I(0)** |
| **RSTOXX** | **-12.89325** | **0.0000** | **I(0)** | **-12.87451** | **0.0000** | **I(0)** |

Information criterias are used to select the proper VAR model after the stationary tests, except Schwarz information criteria, all the other criterias indicated VAR(2) model. VAR(2) model satisfied the stability condition and model had no autocorrelation problem. Therefore, VAR(2) model is selected to analyze the relationships between STOXX Europe Football Index and BIST Sport Index. Stability conditions of VAR(2) model are shown in Table 2.

**Table 1: VAR (2) Model - Stability Conditions**

| **Modulus** | **Autocorrelation LM test** | | | **VAR Residual Heteroscedasticity Test** | |
|---|---|---|---|---|---|
| | **Lag** | **Lm-stat** | **p-value** | **Chi-sq** | **p-value** |
| **0.464802** | **1** | **5.356340** | **0.2526** | **10.77604** | **0.9905** |
| **0.367750** | **2** | **2.501802** | **0.6443** | | |
| **0.311681** | **3** | **5.527953** | **0.2373** | | |
| **0.311681** | **4** | **3.058805** | **0.5480** | | |
| | **5** | **2.398961** | **0.6628** | | |

No root lies outside the unit circle (Modulus <1)
No serial correlation
VAR(2) Satisfies the stability condition.

Secondly, after selecting the proper lag length of VAR model as (2), granger causality test, impulse-response function and variance decomposition steps are applied in the study.

**Table 3: Granger Causality Test Results**

| Granger Causality | | | Prob. |
|---|---|---|---|
| RSTOXX | → | RXSPOR | 0.0117 |
| RXSPOR | → | RSTOXX | 0.3644 |

Granger causality test result indicates that STOXX Europe Football Index is Granger cause of BIST Sport Index. But there is no causality from BIST Sport Index to STOXX Europe Football Index. In other words changes occurring in the STOXX Europe Football Index returns affect BIST Sport Index returns. In the view of the soccer club numbers and the sizes of the indexes, it is an expected result that changes in STOXX Europe Football Index is the reason of changes in BIST Sport Index.

For the purpose of supporting the results of Granger causality test, the impulse-response function analysis issued and the results are shown in Figure 1.

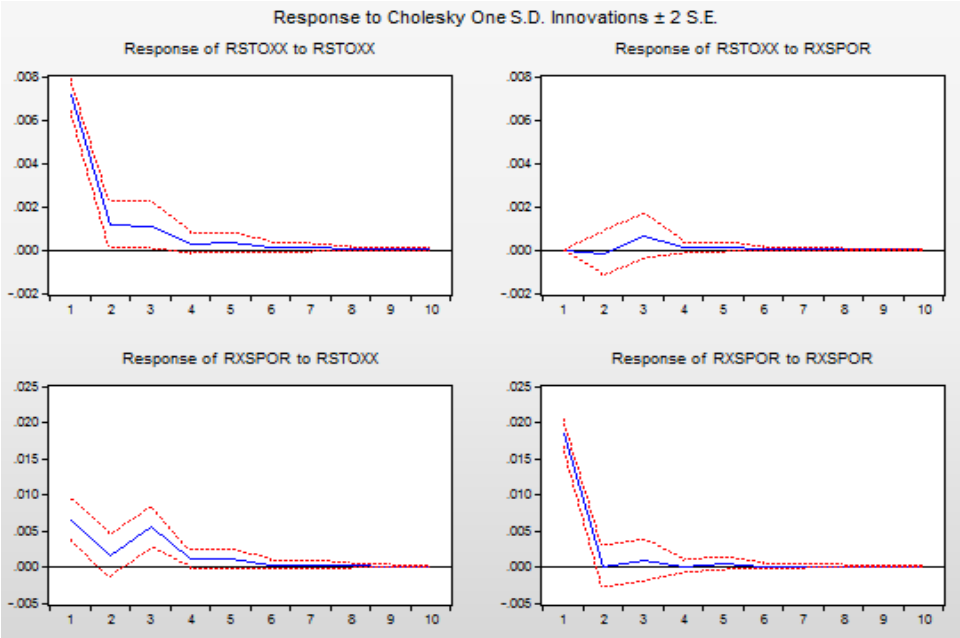


**Figure 1: Impulse-Response Function Results**

Figure 1 shows the impulse-response functions of the model. According to impulse-response function results when a standard error shock occurs in the STOXX Europe Football Index, BIST Sport Index reacts positively to that shock in the same week. On the other hand, both of the indexes react positively to the shocks which occurs in indexes themselves.

Thirdly; for the purpose of measuring the degree of the indexes' effects on each other, variance decomposition is used and the results are shown in Table 4.

**Table 4: Variance Decomposition Results**

| | Variance Decomposition of RXSPOR | | | Variance Decomposition of RXSTOXX | | |
|---|---|---|---|---|---|---|
| Period | S.E. | RSTOXX | RXSPOR | S.E. | RSTOXX | RXSPOR |
| 1 | 0.019830 | 15.28789 | 84.71211 | 0.006968 | 100.0000 | 0.000000 |
| 2 | 0.019906 | 15.88536 | 84.11464 | 0.007046 | 99.82147 | 0.178529 |
| 3 | 0.020338 | 19.40428 | 80.59572 | 0.007109 | 99.25904 | 0.740957 |
| 4 | 0.020355 | 19.54226 | 80.45774 | 0.007111 | 99.24665 | 0.753348 |
| 5 | 0.020365 | 19.59577 | 80.40423 | 0.007114 | 99.24196 | 0.758038 |
| 6 | 0.020366 | 19.60057 | 80.39943 | 0.007114 | 99.24192 | 0.758076 |
| 7 | 0.020366 | 19.60376 | 80.39624 | 0.007114 | 99.24161 | 0.758390 |
| 8 | 0.020366 | 19.60416 | 80.39584 | 0.007114 | 99.24158 | 0.758418 |
| 9 | 0.020366 | 19.60427 | 80.39573 | 0.007114 | 99.24157 | 0.758428 |
| 10 | 0.020366 | 19.60429 | 80.39571 | 0.007114 | 99.24157 | 0.758429 |

According to variance decomposion results which is shown in Table 3, for a weekly period, on the average, 18.78 percent of the changes in the BIST Sport Index are explained by the STOXX Europe Football Index and 81.22 percent of the changes are explained by the index itself. Changes in STOXX Europe Football Index are almost completely explained by itself. These results tally with the results from other tests performed. In this context, it can be seen that BIST Sport Index is affected from STOXX Europe Football Index.

## *5. Conclusion*

In this study, which aims to investigate the relationship between BIST Sport Index and STOXX Europe Football Index, unrestricted VAR model is applied. According to the model's outcome, there is a significant relationship between BIST Sport Index and STOXX Europe Football Index.

Empirical findings indicate that STOXX Europe Football Index is Granger cause of BIST Sport Index and it explains partly the changes in the BIST Sport Index. All of the empirical findings indicate this relationship and they support each other.

When all the results considered together, it can be said that there is a relationship between analyzed indexes and the direction of the relation is from STOXX Europe Football Index to BIST Sport Index. In this context, it can be also said that investors especially who are willing to invest in BIST Sport Index should keep abreast of the changes occuring in STOXX Europe Football Index.

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