An empirical study of relationship between FIFA world ranking and domestic football competition level: the case of Turkey

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Abstract

This research is aimed at establishing a bivariate long-run association between FIFA country ranking and domestic football competition level in the case of Turkey. To test this hypothesis empirically, coefficient of variation values are computed seasonally for Turkish Super League over 1994-2010. This variable along the FIFA ranking of Turkey in the same period are used in the framework of ARDL approach to cointegration. The empirical results suggest that a 1% increase in the domestic football competition level leads to 1.14% rise in the FIFA ranking of Turkey. The post-sample variance decompositions also confirm the long-run relationship.

Keywords: *football, FIFA ranking, cointegration, variance decomposition, Turkey*

1. Introduction

The pioneering study of Sloane (1971) provided the first detailed insight of football teams as competitive firms.The existing literature in sports economics is largely based on the issues related to the demand for sports, transfers market, market structure, broadcasting revenues, etc. For comprehensive discussions of these issues and different aspects of ever growing literature of the professional team sports, see for example, Kesenne (2000), Zimbalist (2001), Borland and Macdonald (2003), Sandy *et al*. (2004), Groot (2005), Andreff (2008), and Helmut *et al*.(2011).

This paper's major goal is to identify statistically the long-run association relationship between a country's FIFA (Federation of International Football Associations) world ranking and domestic level of football competition. Since August 1993, FIFA has been ranking more than two hundred member countries according to all international "A" level matches. The FIFA world ranking reflects the current comparative status of its member nations. The FIFA primarily evaluates matches played in the twelve months prior to the date on which the rankings are issued. Performances in previous years are also taken into account. The score obtained from the most recent twelve-month period is added to those of the preceding five years, with each previous year ranking being continuously devalued. The procedure awards points on the basis of the games' results, goals scored, strength of the opponents, and importance of the matches (home or away). FIFA and its five regional confederation ranking are produced on a monthly frequency; see the official web site of FIFA's world ranking at www.fifa.com.

This paper argues that there is a positive statistical association between the FIFA world ranking and the degree of domestic seasonal competitive balance. In other words, a country's FIFA ranking is largely influenced by the competitive balance in its top division football league. The main reason for this proposition is that the national squads are mainly derived from the domestic football teams, especially from the top division teams. Of course, some members of the national squads or possibly all of them could be playing abroad at the time or before they are selected for the national squad. It is however, assumed that those national football players who are selected for the national squad have already experienced some degree of domestic football competition. This point suggests that the countries with a higher degree of domestic football competition will have a higher possibility of winning international football matches and tournaments, providing that the other factors which influence the performance of success are constant for all the teams, which leads to an increase in the FIFA world ranking.

The concept of competitive balance is a central issue in professional team sports. Nevertheless, it is a very elusive phenomenon since it has several dimensions and interpretations. It is also closely related to the concept of outcome of uncertainty in matches and demand for the sporting contests. Basically, competitive balance refers to a league structure in which league members has relatively equal playing strength. Uncertainty of outcome is related a situation within a league structure that competition does not have a predetermined winner at the outset of the competition. Competitive balance is important, because, other things being equal, uncertainty of outcome generates interest from supporters and increases demand for uncertainty both at the stadiums and on television. Implications of competitive balance on sports demand are discussed and analyzed in the recent literature by several studies; see for example Helmut et al. (2011), Meehan et al. (2007), Siegfried and Sanderson (2003), and Zimbalist (2002).

As far this study is concerned this is the first attempt empirically to test the association between the FIFA world ranking and competitive balance.

The objectives of this study are as follows: i) to estimate elasticities of the FIFA world ranking with respect to seasonal competitive balance both in the short-run and long-run using time-series econometric techniques; ii) to establish the direction of causal relationships between the FIFA world ranking and competitive within and out of the sample period.

The remainder of this paper is organized as follows. Section 2 presents a short review on measuring competitive balance. Section 3 describes the study's model and methodology. Section 4 discusses the empirical results, and finally Section 5 concludes.

2. Measurement of Competitive Balance in Football

There is no clear-cut approach or technique to measure the competitive balance in a football league due to its ambiguity. There is an analogy that there are as many ways to measure competitive balance as there are to quantify the money supply as disccused in Zimbalist (2002). This study explains brieflly some of well known statistical competitive balance measurements without going into details of formulas. For a detailed survey and empirical results, see Cairns et al. (1986), Humphreys (2002), and Goossens (2006).

i. Win or point percentage approach

For the win percentage, the number of wins in one season are counted and divided by the total number of games played that team. Calculation of win percentage is equivalent to the use of points when two points are awarded to the winner and one for each team in a tie. This approach gives an average league winning percentage of 0.5. However, it is not an appropriate measurement for the European football since it has three points for a win and one for draws.

ii. Range approach

It is based on the difference between the highest and lowest win percentage. The biggest shortcoming in this approach is that it considers only two teams in a league.

iii. Standard deviation of winning percentage approach

Winning percentage in one season the measures the distance of the win percentages from the average. The large standard deviation indicates the less competitive balance.

iv. Standard deviation ratio approach

This approach employs the ratio of the actual standard deviation to an idealized standard deviation. These standard deviations are computed from the winning percentages. The ranges of these ratios are 1 and 0. The former represents the worst competition and the latter indicates the perfect competition. This approach provides better results in the point systems in which the winnner gets two points and one for draws.

v. Lorenz curvez and Gini coefficient approach

It measures the inequality of the distribution of win percentages. Utt and Fort (2002) proves that this approach understates the level of seasonal competitive balance.

vi. Competitive balance ratio approach

This ratio is based on two standard deviations. The first one is computed within-team-standard deviation and the latter is calculated within season-standard-deviation. The ratio lies between 0 and 1. However, this measurement is not easily applicable in the case of the European football due to promation and relegation battles, see Eckard (2003) for details.

vii. Herfindahl-Hirschman Index (HHI)

This index uses the number of championships titles won by football teams over a number of seasons which represents the shares. These shares are squared then summated overall the league members. This approach is more appropriate for measuring of the long-run dominance rather than the seasonal competitive balance..

viii. Top k approach

Buzzachi et al. (2003) suggested this approach. According to this approach, the number of different teams that entered the top k is counted. The more teams in the top *k* over a certain period of time, the less is competition by a few teams. The seasonal comparison of the competitive balance in across the European leagues is not possible due to different league sizes.

ix. National measure of seasonal imbalance approach

Goossens (2006) proposed this measurement of competitive balance and it is based on the ratio of two standard deviations. The first standard deviation is computed from the winning percentage with uncertainty and the second standard deviation is computed when the winning percenatge is known with certainty. The ratio ranges between 0 and 1.

x. Coefficient of variation approach

The coefficient of variation (CV) is obtained by dividing the standard deviation to mean value. The usefulness of the CV values for the competitive balance in a football league is based on the simple idea that dispersion of the final standing points is a direct result of the competitiveness that takes place between the football teams in seasons. This approach assumes that each football team has statistically got an equal chance of winning the championship at the beginning of a season. Therefore, the dispersion of total points at any time will follow a normal distribution. The CV values provide better plausible comparisons of the seasonal competitive balance levels than the absolute standard deviations of the end-of-season points in the case of possible changes in league structures over seasons, such as the number of teams in a contest or the points awarded for a win or draw. It is clear that this approach does not consider any other factor that may have an impact on the level of competitive balance for the sake of simplicity. The CV value for a season lies between 0 and 1. These values reflect the extreme competition points. If the CV value is 0, implying perfectly balanced competition and if the CV value is 1, suggesting monopolistic competition in a league. Different applications of the CV value is presented in Halicioglu (2009, 2006 and 2005).

3. Model and Methodology

Thi study proposes the following long-run relationship between the FIFA world ranking and seasonal competitive balance in football in double linear logarithmic form as:

$$r_t = a_0 + a_1 c_t + \varepsilon_t , \quad (1)$$

where r_t is the logarithm of FIFA ranking index of Turkey ; c_t is the logarithm of inverse of coefficient of variation index for Turkey and ε_t is the classical error term. This study proxies that the domestic competition level is also referred as competitive balance which is measured by the seasonal CV value.

The short-run dynamic adjustment process of the long-run relationship in equation (1) may provide useful policy recommendations. It is possible to incorporate the short-run dynamics into equation (1) by expressing it in an error-correction model as suggested in Pesaran *et al.* (2001).

$$\Delta r_t = \beta_0 + \sum_{i=1}^{n1} \beta_1 \Delta r_{t-i} + \sum_{i=0}^{n2} \beta_2 \Delta c_{t-i} + \beta_3 r_{t-1} + \beta_4 c_{t-1} + v_t \quad (2)$$

This approach, also known as autoregressive-distributed lag (ARDL), provides the short-run and long-run estimates simultaneously. Short-run effects are reflected by the estimates of the coefficients attached to all first-differenced variables. The long-run effect of the explanatory variable on the dependent variable is obtained by the estimate β_4 that is normalized on β_3. The inclusion of the lagged-level variables in equation (2) is verified through the bounds testing procedure, which is based on the Fisher (F) or Wald (W)-statistics. This procedure is considered as the first stage of the ARDL cointegration method. Accordingly, a joint significance test that implies no cointegration hypothesis, (H_0: β_3 and $\beta_4 = 0$), against the alternative hypothesis, (H_1: at least one of β_3 and $\beta_4 \neq 0$) should be performed for equation (2). The F/W test used for this procedure has a non-standard distribution. Thus, Pesaran *et al.* (2001) compute two sets of critical values for a given significance level with and without a time trend. One set assumes that all variables are *I*(0) and the other set assumes they are all *I*(1). If the computed F/W-statistic exceeds the upper critical bounds value, then the H_0 is rejected, implying cointegration. In order to determine whether the adjustment of variables is toward their long-run equilibrium values, estimate of β_4 is used to construct an error-correction term (EC). Then lagged-level variables in equation (2) are replaced by EC_{t-1} forming a modified version of equation (2) as follows:

$$\Delta r_t = \beta_0 + \sum_{i=1}^{n1} \beta_1 \Delta r_{t-i} + \sum_{i=0}^{n2} \beta_2 \Delta c_{t-i} + \lambda EC_{t-1} + \mu_t \qquad (3)$$

Equation (3) is re-estimated one more time using the same lags previously. A negative and statistically significant estimation of λ not only represents the speed of adjustment but also provides an alternative means of supporting cointegration between the variables. Pesaran *et al.* (2001) cointegration approach has some methodological advantages in comparison to other single cointegration procedures. Reasons for the ARDL are: i) endogeneity problems and inability to test hypotheses on the estimated coefficients in the long-run associated with the Engle-Granger (1987) method are avoided; ii) the long and short-run coefficients of the model in question are estimated simultaneously; iii) the ARDL approach to testing for the existence of a long-run relationship between the variables in levels is applicable irrespective of whether the underlying regressors are purely stationary *I*(0), purely non-stationary *I*(1), or mutually cointegrated; iv) the small sample properties of the bounds testing approach are far superior to that of multivariate cointegration, as argued in Narayan (2005).

The Granger representation theorem suggests that there will be Granger causality in at least one direction if there exists a cointegration relationship among the variables in equation (1), providing that they are integrated order of one. Engle and Granger (1987) caution that the Granger causality test, which is conducted in the first-differenced variables by means of a VAR, will be misleading in the presence of cointegration. Therefore, an inclusion of an additional variable to the VAR system, such as the error correction term would help us to capture the long-run relationship. To this end, an augmented form of the Granger causality test involving the error correction term is formulated in a bivariate *p*th order vector error correction model.

$$(1-L)\begin{bmatrix} r_t \\ c_t \end{bmatrix} = \begin{bmatrix} \theta_1 \\ \theta_2 \end{bmatrix} + \sum_{i=1}^{p}(1-L)\begin{bmatrix} \phi_{11i}\phi_{12i} \\ \phi_{21i}\phi_{22i} \end{bmatrix}\begin{bmatrix} r_{t-i} \\ c_{t-i} \end{bmatrix} + \begin{bmatrix} \delta_1 \\ \delta_2 \end{bmatrix}\left[EC_{t-1}\right] + \begin{bmatrix} \omega_{1t} \\ \omega_{2t} \end{bmatrix} \tag{4}$$

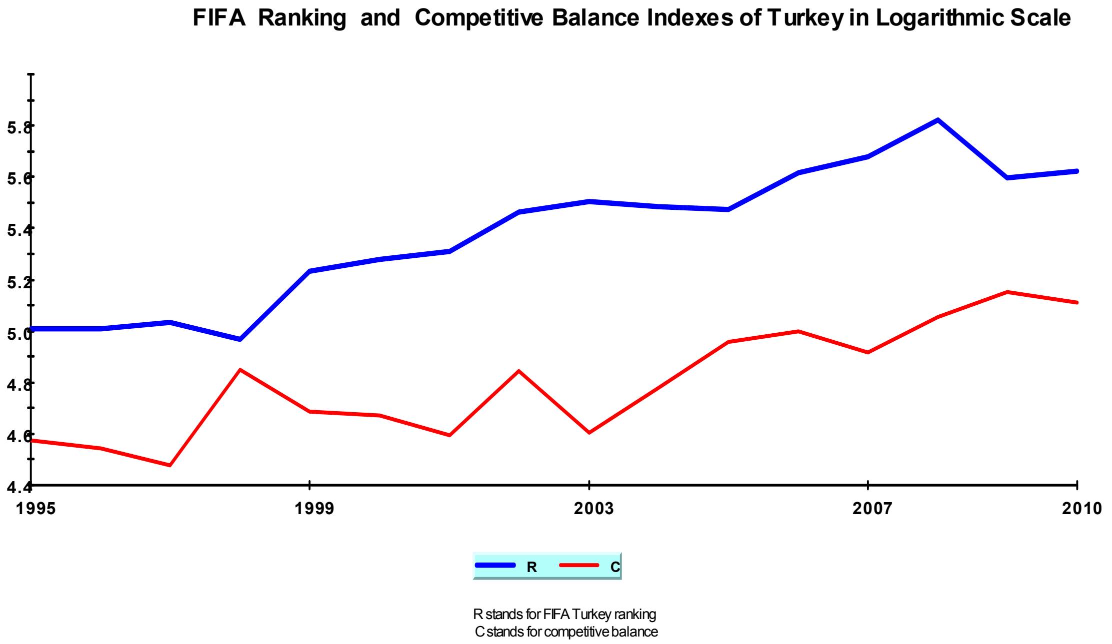
$(1-L)$ is the lag operator. EC_{t-1} is the error correction term, which is obtained from the long-run relationship described in equation (1), and it is not included in equation (4) if one finds no cointegration amongst the vector in question. The Granger causality test may be applied to equation (4) as follows: i) by checking statistical significance of the lagged differences of the variables for each vector; this is a measure of short-run causality; and ii) by examining statistical significance of the error-correction term for the vector that there exists a long-run relationship. All error-correction vectors in equation (4) are estimated with the same lag structure that is determined in unrestricted VAR framework.

Establishing Granger causality is restricted to essentially within sample tests, which are useful in distinguishing the plausible Granger exogeneity or endogenity of the dependent variable in the sample period, but are unable to deduce the degree of exogenity of the variables the beyond the sample period. To examine this issue, the decomposition of variance of the variables may be used. The variance decompositions (VDCs) measure the percentage of a variable's forecast error variance that occurs as the result of a shock (or an innovation) from a variable in the system. Sims (1980) notes that if a variable is truly exogenous with respect to the other variables in the system, own innovations will explain its entire variable's forecast error variance (i.e., almost 100%). By looking at VDCs policy makers gather additional insight as to what percentage (of the forecast error variance) of each variable is explained by its determinant.

4. Results

Annual data over the period 1994-2010 were used to estimate equation (2) and (3) by the ARDL cointegration procedure of Pesaran *et al*. (2001). Variable definition and sources of data are cited in Appendix. The visual graph in logartithmic scale for the FIFA world ranking and the competitive balance indexes of Turkey is displayed in Figure 1 indicates a clear positive association between the dependent and indepent variables.

[INSERT FIGURE 1]



To implement the Pesaran *et al*. (2001) procedure, one has to ensure the explanatory variable in equation (1) is not above *I*(1). Three tests were used to test unit roots in the variables: Augmented Dickey-Fuller (henceforth, ADF) (1979, 1981), Phillips-Perron (henceforth, PP) (1988), and Elliott-Rothenberg-Stock (henceforth, ERS) (1996). Unit root tests results are presented in Table 2 warrant for implementing the ARDL approach to cointegration as the variables are in the combination of *I*(0) and *I*(1). Visual inspections of the variables in logarithm show no structural breaks.

[INSERT TABLE 1 ABOUT HERE]

Table 1. Unit root results

Variables	ADF	PP	ERS
r_t	1.51	3.63*	1.79
c_t	2.08	3.26	2.07
Δr_t	3.38*	6.36*	3.27
Δc_t	4.67*	7.99*	4.64*

Notes: The sample level unit root regressions include a constant and a trend. The differenced level unit root regressions are with a constant and without a trend. All test statistics are expressed in absolute terms for convenience. Rejection of unit root hypothesis is indicated with an asterisk. Δ stands for first difference.

The presence of long-run relationship was established applying a bounds test to equation (2). Considering that this study is utilizing annual data with a small sample size including only 17 observations, the maximum lag lenght in the ARDL model was set equal to 1. The results of the bounds testing are reported in Table 2. Table 2 illustrates that the computed F/W statistics are above the upper bound values at all level of significances confirming the existence of a cointegration relationship between the variables of equation (1).

[INSERT TABLE 2 ABOUT HERE]

Table 2. The results of F and W tests for cointegration.

The assumed long-run relationship; $F/W(r|c)$

F-statistic	95% LB	95% UB	90% LB	90% UB
7.98	3.83	4.88	2.80	3.69
W-statistic				
15.97	7.67	9.77	5.61	7.38

If the test statistic lies between the bounds, the test is inconclusive. If it is above the upper bound (UB), the null hypothesis of no level effect is rejected. If it is the below the lower bound (LB), the null hypothesis of no level effect cannot be rejected.

On establishing a long-run cointegration relationship amongst the variables of equation (1), a two-step procedure to estimate the ARDL model was carried out. First, in search of the optimal lag lenght of the differenced variables of the short-run coefficients, Schwarz Bayesian Criterion (SBC) was utilized and in the second step, the ARDL model was estimated by the OLS technique. The results of SBC based ARDL model is displayed in Panel A, B, and C of Table 4. The results of long-run coefficients are presented in Panel A of Table 3, whereas the short-run estimates are reported in Panel B of Table 3. Finally, Panel C of Table 3 demonstrates the short-run diagnostic test results. The overall regression results are satisfactory in terms of diagnostic tests. The short-run diagnostics obtained from the estimation of equation (2) suggest that the estimated model is free from a series of econometric problems such as serial correlation, functional form, normality, and heteroscedasticity. The long-run elasticity of FIFA world ranking index, with respect to competitive balance index, is 1.14 suggesting that for each 1% increase in the domestic football competition level, the FIFA world ranking index of Turkey will rise by about 1.14 %. The speed of adjustment parameter is – 0.44, suggesting that when the long-run FIFA world ranking equation is above or below its equilibrium level, it adjusts by 44% within the first year. The full convergence to its equilibrium level takes a little more than two years.

[INSERT TABLE 3 ABOUT HERE]

Table 3. *FIFA Ranking Model* ARDL cointegration results based on SBC (1,1)

Panel A. Long-run results.			Panel B. Error correction representation results.		
Dependent variable r_t			Dependent variable Δr_t		
Regressor	Coefficient	T-ratio	Regressor	Coefficient	T-ratio
c_t	1.14*	7.59	Δc_t	0.07	0.35
Constant	0.03	1.51	EC_{t-1}	-0.44*	3.11

Panel C. Diagnostic tests.

R^2	0.47	F-statistic	11.53*	$\chi^2_{SC}(1)$	0.003	$\chi^2_{FF}(1)$	0.50
RSS	0.15	DW-statistic	1.87	$\chi^2_N(2)$	0.34	$\chi^2_H(1)$	1.39

*, **, and, *** indicate, 1%, 5%, and 10% significance levels respectively. RSS stands for residual sum of squares. T-ratios are in absolute values. χ^2_{SC}, χ^2_{FF}, χ^2_N, and χ^2_H are Lagrange multiplier statistics for tests of residual correlation, functional form mis-specification, non-normal errors and heteroskedasticity, respectively. These statistics are distributed as Chi-squared variates with degrees of freedom in parentheses. The critical values for $\chi^2(1) = 3.84$ and $\chi^2(2) = 5.99$ are at 5% significance level.

[INSERT TABLE 4 ABOUT HERE]

Table 4. Results of Granger causality

	F-statistics (probability)		
Dependent Variable	Δr_t	Δc_t	EC_{t-1} (*t*-statistic)
Δr_t	-	1.55 (0.25)	-0.17 (0.49)
Δc_t	0.006 (0.99)	-	
Causality inference : none.			

The probability values are in brackets. The optimal lag length is 1 and is based on SBC.

As can be seen Table 4, the Augmented Granger causality tests suggest that non-existence of a long-run causality amongst the variables.

[INSERT TABLE 5 ABOUT HERE]

Table 5. Decomposition of Variance

Percentage of forecast variance explained by innovations in:		
Years	FIFA ranking index	Competitive balance index
1	100.00	0.00
2	72.86	27.14
3	55.66	44.34
4	46.41	53.59
5	40.99	59.01
10	30.06	69.94

Notes: Figures in the first column refer to horizons (i.e., number of years). All figures are rounded to two decimal places. The covariances matrices of errors from all the VECMs appeared to be very small and approaching zero suggesting that the combinations of all the variables in these models are linear. Therefore, the ortohogonal case for the variance decompositions are applied.

Table 5 provides the summary results for the VDCs. As for the VDCs, a substantial portion of the FIFA world ranking index (72.86%) is explained by its own innovations in the short-run, for example, at two-year horizon. In the long-run, for example, at ten-year horizon, the portion of the variance of FIFA world ranking index substantially decreases to 30 % implying that other variables explains about 70 % of the shocks in the domestic football competition level. The post-sample VDCs also indicates that about 70% of the shocks in the FIFA world ranking index is due to innovations in domestic football competition level at ten year-horizon emphasing the fact that domestic football competition level is the main cause of the FIFA world ranking index.

5. Conclusions

This paper proposes that there is a positive statistical association between the FIFA world ranking and the degree of domestic seasonal competitive balance. In order to test this proposition empirically, a bivariate econometric model was estimated using the bounds testing approach to cointegration with Turkish data.

The results demonstrate the existence of a statistically significant long-run relationship between the FIFA world ranking and competitive balance indexes of Turkey indicating that a 1 % rise in the top football division competitive balance increases the FIFA world ranking of Turkey by 1.14%. The results did not reveal any long or short-run causality amongst the variables within the sample. However, the post-sample variance decompositions indicate that that the domestic football competition level is the cause of the FIFA world ranking in the long-run.

This study's results, however, have some limitations and therefore, the results should be cautiously evaluated. The econometric results drawn from a very small sample as the FIFA world ranking has been published since 1993. The econometric model includes only one explanatory variable as a consequence; omitted variable bias problem may arise in interpreting the results. Finally, this study should be extended to major football countries such as Spain, France, Germany, England and Italy to test the relationship between the FIFA world ranking and competitive balance.

Appendix

Data definition and sources

Data are collected from two different online sources, namely; source a) the web site of FIFA www.fifa.com and source b) the web site of Turkish football association, www. tff.com.

r : is the logarithm of the FIFA world ranking for Turkey. July rankings between 1994 and 2010 is selected as a proxy for annual ranking since the coefficeint of variation (CV) values for Turkey are computed as of May in the same data span. This variable is expressed as an index based on 1994=100. Source: a.

c : is the logarithm of inverse of the CV computed seasonally between 1994 and 2010 from the top football division of Turkey. This variable is expressed as index based on 1994=100. Source: b.

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