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Three-Point Rule, Average Goals Per Game and Predictability in Football: A Long-Term Analysis with The Markov-Regime Switching Approach

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Abstract

In the mid-1990s, FIFA decided to give the winning team three points instead of two points in football matches. The purpose of FIFA is to increase the points given to the winning team and to encourage the teams to play more aggressively to win this extra point, and thus to score more goals in the matches and to increase the attractiveness of the matches. The aim of this research is to analyze the effects of the three-point rule on the Turkish Football League teams using an econometric methodology (Markov-Regime Change Model). For this purpose, first of all, a general econometric model was created in which we can observe the effects of the three-point rule application on the number of goals scored and the predictability of the matches in the example of the Turkish First Football League teams. Then, it was determined which versions of this general econometric model were suitable for each team. Finally, statistical estimations were made for each team separately. It has been observed that the estimations made give statistically significant results. In the example of the Turkish First Football League, these results covering 61 seasons and three teams showed that the three-point rule increased the number of goals in the matches. However, the effects of the three-point rule on the predictability of matches are different for each team. This difference can be explained by the team specific factors.

***Keywords*:**Football, Three-Point Rule, Predictability

Futbolda Üç Puan Kuralı, Gol Sayısı ve Öngörülebilirlik: Markov-Rejim Değişim Modeli ile Uzun Dönemli Bir Analiz

Öz

FIFA 1990'lı yılların ortalarında futbol karşılaşmalarında kazanan takıma iki puan yerine üç puan verilmesi kararını almıştır. FIFA'nın bu kararı almasındaki amaç, kazanan takıma verilen ödülü arttırarak takımları bu ödülü kazanmak için daha atak oynamaya teşvik etmek ve bu sayede maçlarda daha çok gol olması ve maçların seyir zevkinin arttırılmasıdır. Bu araştırmanın amacı üç puan kuralının Türkiye Birinci Futbol Ligi takımları üzerindeki etkilerini ekonometrik bir yöntem (Markov-Rejim Değişim Modeli) kullanarak analiz etmektir. Bu amaçla öncelikle Türkiye Birinci Futbol Ligi takımları örneğinde üç puan kuralı uygulamasının atılan gol sayısı ve maçların öngörülebilirliği üzerindeki etkilerini gözlemleyebileceğimiz bir genel ekonometrik model oluşturulmuştur. Daha sonra her bir takım için bu genel ekonometrik modelin uygun versiyonlarının hangileri olduğu tespit edilmiştir. Son olarak da her bir takım için ayrı ayrı istatistik tahminler yapılmıştır. Yapılan tahminlerin istatistiksel olarak anlamlı sonuçlar verdiği görülmüştür. Türkiye Birinci Futbol Ligi örneğinde 61 sezonu ve üç takımı kapsayan bu sonuçlar üç puan kuralının maçlardaki gol sayısını arttırdığını göstermiştir. Ancak üç puan kuralının maçların öngörülebilirliği üzerindeki etkileri her takım içi farklıdır. Bu farklılık her bir takımın kendine özgü faktörler ile açıklanabilir.

***Anahtar kelimeler*:** *Futbol, Üç Puan Kuralı, Öngörülebilirlik*

Introduction

The output of sporting events is sportive performance. Especially for team sports, the output is the game that the teams produce together in a league depending on the rules of the league (Brook, 2005). Fans come to the matches to watch the game. Paying spectators to watch the game or performance generates income for the teams. It is important to increase the visibility of the game for the teams aiming at higher income and the leagues in which these teams take part. That's why decision makers (federations, unions and etc.) change the rules of the game, league or tournament from time to time. The application of the three-point rule in football is the most important example of a change in the rules of the game.

The purpose of the three-point rule is to increase the score given to the win and keep the score given to the draw constant, to encourage football teams to play more offensive-based football and to increase the enjoyment of the spectators from football matches. The rule of giving three points to a victory in football was first applied in England in 1981. The International Football Federation (FIFA) adopted the three-point rule with the World Cup held in the USA in 1994, and then the three-point rule was established in almost all major leagues.

This paper aims to contribute to the literature by considering whether the three-point rule reveals the expected effects in the Turkish First Division Football League, which is one of the first countries to apply the three-point rule starting from the 1986-87 season, with a method different from those used before Markov regime-switching (MS) approach. For this purpose, the data of the Turkish First Division Football League for the 1959/60-2019/20 seasons (61 seasons) were compiled from the Turkish Football Federation website. It was determined that only three teams are constantly in the first league, so the analysis is limited to Galatasaray, Fenerbahçe and Beşiktaş.

The rest of the paper is organized as follows: In Section 2, the literature is presented. Section 3 describes the estimating equation. The empirical analysis is presented in Sections 4. Section 5 concludes.

Literature and Hypotheses

Although the main argument of the three-point rule seems quite plausible, the results of the rule are not clear in the empirical literature. We can group the studies in the empirical literature into three groups. In the first group of research, it was concluded that the three-point rule revealed the expected effects from various aspects. For example, Dilger and Geyer (2009), in their analysis on the German league (Bundesliga), concluded that the three-point rule reduces the number of matches that result in a draw and increases the results of matches with close scores. Moschini (2010), in his study covering 35 countries and 30 years, concluded that the number of goals per match increased

and the probability of a draw decreased. Varela-Quintana et al., (2018) used the Italian and French leagues as a treatment group, and the German and Spanish leagues as a control group. They concluded that the three-point rule increased the forwards/defenders ratios in both groups. In a recent study on the Italian league (Serie-A), Alfano et al., (2021) found that the three-point rule was successful in revealing the expected results. With the three-point rule, it has been shown that the teams adopt a winning strategy rather than a draw.

Apart from the studies that we have exemplified above and which show that the three-point rule produces the expected results, negative results were obtained in the second group of studies regarding the effectiveness of the rule. For example, Palacious-Huerta (2004) in his analysis for the English Premier League concluded that the three-point rule increases match variability, but does not affect the average number of goals. Lee and Parinduri (2016) concluded in their analysis for the Bundesliga that the three-point rule does not have any effect on various variables such as average goals and goal difference of teams.

In a third group of studies in the literature, mixed evidence emerged on the effects of the three-point rule. For example, Aylott and Aylott (2007), in their research on seven countries (Albania, Brazil, England, Germany, Poland, Romania, and Scotland) with the "excitingness index" they developed, showed that the index value initially increased for six. But they also observed that index value returned to the same level again, an average of five years. Another example of mixed results is the research on the Portuguese first league by Guedes and Machado (2002). Guedes and Machado (2002), concluded that the three-point rule has a statistically significant positive effect only on the number of attacking moves by the underdog teams and the number of goals scored by the favorite teams in the Portuguese league.

When the literature is evaluated, we see that different dimensions of the three-point rule application are discussed in studies. However, the driving force behind the three-point rule, which can be considered one of the most important regulatory changes in football history, is the decrease in the number of goals after the 1950s (Varela-Quintana et al., 2018). Therefore, the first hypothesis in this study was determined as "the three-point rule increased the average goals per game".

Another aspect of the three-point rule that will be addressed in this study is the effect of the three-point rule on the predictability of the matches. The three-point rule is intended to encourage teams to reach three points for a win, rather than one for a draw, in football matches. Theoretically, the fact that both teams have to score in order to win in a match where the three-point rule is applied will not only increase the total number of goals, but also increase the uncertainty of the outcome of

the match. For this reason, the second hypothesis that we will test in this study was determined as "the three-point rule reduced the predictability of the matches" (Haugen, 2008).

Methods

Modelling Average Goals per Game

Consider the following simple model of average goals per game1. There are s possible states or regime. We assume that each regime follows an autoregressive (AR) process like AR (p).

$$\hat{y}_t = \alpha_{s_t} + \beta_{1_{st}} \hat{y}_{t-1} + \beta_{2_{st}} \hat{y}_{t-2} + ... + \beta_{p_{st}} \hat{y}_{t-p} + \varepsilon_t^{s_t} \quad (1)$$

$$\varepsilon_t^{s_t} \approx i.i.d.N(0, \sigma_{st}^2) \quad (2)$$

In equation 1, $\hat{y}_t$ and s_t show the average goals per game at time *t* and the regimes as $s_t \in \{1, 2, ..., S\}$ for each *t*. They follow a simple AR (*p*) process in which the average goals per game within a regime are determined by regime-specific coefficients and shocks. Therefore, different long-term average goals per game can be predicted for different regimes.

For example, for *p*=1, it can be obtained as $\alpha_s / (1 - \beta_{1s})$ the long-term average goals per game. In addition, the AR coefficient will be a measure of the persistence of the shock in the regime and the σ_{st}^2 variability of this shock. A decrease σ_{st}^2 among regimes will mean an increase in predictability, and an increase σ_{st}^2 will mean a decrease in predictability (Gaviria, 2000).

The average goals per game may evolve randomly between regimes. The dynamics of this transformation is determined by a Markov process with probability distributions in which *s* as many states and each state depend on the previous state as follows:

$$p\{s_t = j / s_{t-1} = i, s_{t-2} = k, ...\} = p\{s_{t=j} / s_{t-1} = i\} \equiv p_{ij} \quad (3)$$

For example, a *p*12 probability calculated for *s*=2 will show the probability that the current state is 2 if the past state is 1. It is also possible to calculate as $1/(1 - p_{ij})$ the average duration of each state.

[1]This study's model follows Hamilton (1989) and Gaviria, (2000).

Results

Empirical Analysis

In the Markov-Regime Switching Model, it is important to determine the most suitable number of regimes for the series. In the literature, common tests such as likelihood ratio, Wald and Lagrange Multiplier are used in some studies to determine the number of appropriate regimes, while in some studies AIC (Akaike information criterion), BIC (Bayesian Information Criterion); Information criteria such as SIC (Schwarz Information Criterion) are used. However, it is controversial which way should be followed in the selection of the appropriate number of regimes in the Markov-Regime Switching Model (Psaradakis and Spagnolo, 2003). In addition, when the number of suitable regimes is obtained according to the information criteria, a different number of regimes may emerge according to each criterion. Therefore, in this study, the log-likelihood ratio was preferred to determine the most suitable Markov-Regime Switching Model for the teams.

Table 1

Appropriate Model Selection for Teams

Galatasaray		**Fenerbahçe**		**Beşiktaş**	
Model	**log-likelihood**	**Model**	**log-likelihood**	**Model**	**log-likelihood**
MS (3)-AR (1)	-22,987	MS (3)-AR (1)	-22.335	MS (3)-AR (1)	-16.285
MS (2)-AR (1)	-24,438	MS (2)-AR (1)	-26.790	MS (2)-AR (1)	-23.403*
MS (2)-AR (0)	-26,187*	MS (2)-AR (0)	-29.44*	MS (2)-AR (0)	-19.057

Note: ***** indicates the appropriate model selected according to the log-likelihood value.

Table 1 shows the log-likelihood ratios for different models. The model with the highest log-likelihood ratio was determined for each team. Accordingly, the highest log-likelihood ratio for Galatasaray and Fenerbahçe was obtained in the MS (2)-AR (0) model. The suitable model for Beşiktaş has been determined as MS (2)-AR (1).

Table 2 shows the estimated parameters of the selected models for each team and the long-term average goals per game calculated based on these parameters and regime classification based on smoothed probabilities.

Table 2

Results Obtained for Galatasaray, Fenerbahçe and Beşiktaş

s	α_s	β_s	σ_{st}^2	$\alpha_s/(1-\beta_s)$	Regime Classification Based on Smoothed Probabilities
Galatasaray					
s=1	3,013*** (0,055)	-	0.320 (0,039)	3,013	Between 1987/88-2019/20 seasons
s=2	2,134*** (0,073)	-	0.381 (0,052)	2,13	Between 1960/61–1986/87 seasons
Fenerbahçe					
s=1	3,093*** (0,077)	-	0,397 (0,050)	3,093	Between 1987/88- 2019/20 seasons
s=2	2,05*** (0,091)	-	0.303 (0,040)	2,05	Between 1960/61 – 1986/87 seasons
Beşiktaş					
s=1	1,883*** (0,471)	0,342** (0,163)	0,334 (0,040)	2,861	Between 1985/86-2019/20 seasons
s=2	1,135*** (0,367)	0,404** (0,191)	0.286 (0,041)	1,904	Between 1960/61-1984/85 seasons

Notes: Standard errors are given in parentheses. *** 1% and ** 5% indicate statistically significant estimates.

As seen in table 2, all estimates are statistically significant. Regime classification based on smoothed probabilities; on the other hand, show that the average goals per game in each season can be evaluated as two different regimes for Galatasaray and Fenerbahçe before and after the 1987/88 season, and for Beşiktaş before and after the 1985/86 season. The implementation of the three-point system in Turkey started in the 1987/88 season. In that case, we can think of the first regime (s=1) as a three-point regime, and the second regime (s=2) as a two-point regime for all three teams. When the other results are evaluated in this way, we can list the findings as follows:

-When the long-term average goals per game are compared between the regimes, substantial increases in goals in the matches of the three teams (approximately 50%) are striking. The average goals per game, which was 2.13 in the matches played by Galatasaray in the two-point regime, increased to 3.013 in the three-point regime. While the average goal per game in the matches played by Fenerbahçe in the two-point regime is 2.05, it is 3.09 in the three-point regime. For the matches played by Beşiktaş, the average goal per game that was 1.90 in the two-point regime became 2.86 in the three-point regime. In the matches played by all three teams in the three-point regime, there were more goals per match than in the matches played in the two-point regime. These findings confirm the hypothesis that the transition to the three-point system will increase the average goals per game.

-The findings obtained in terms of variance, which we see as an indicator of predictability, differ between teams (especially Galatasaray). For Fenerbahçe, the estimated variance in the three-point regime increased by approximately 30% compared to the two-point regime. For Beşiktaş, the estimated variance in the three-point regime increased by approximately 18% compared to the two-point regime. These results show that, for the matches played by Fenerbahçe and Beşiktaş, the predictability decreased in the three-point regime compared to the two-point regime, albeit at different rates.

In terms of Galatasaray, the estimated variance in the three-point regime decreased by approximately 15% compared to the two-point regime. This result shows that the predictability increases in the three-point regime compared to the two-point regime in the matches played by Galatasaray. This difference can be explained as follows. Galatasaray won 15 league championships between 1987/88 and 2019-2020 seasons. In addition, Galatasaray won the UEFA and UEFA Super Cup Championship of 2000. This extra high performance of Galatasaray, which coincides with the three-point regime period, maybe a factor explaining the increase in predictability.

When the estimated variance results are evaluated in general, it does not support our hypothesis that the three-point system will reduce the predictability compared to the two-point system.

Conclusion and Recommendation

Many sports have had to change their rules and scoring systems over time. Most of these fundamental changes are to make the game more exciting and watchable. The rule of three points to victory in football started in England in the 1981-82 season and spread all over the world.

In this study, the effects of the three-point rule on the average goal per game and the predictability of the matches were investigated in the sample of three teams in the Turkish First Division Football League in all seasons between 1959-60 and 2019-20, using the markov regime-switching approach. In the light of the findings, we can list the results of the research as follows:

-The number of goals in the matches played by all three teams is divided into two separate regimes, before the three-point rule and after the three-point rule.

-In the matches played by all three teams in the three-point regime, more goals were scored than in the two-point regime. Therefore, it can be concluded that the transition to the three-point system increases the number of goals in the matches, as expected.

-In the matches played by two teams (Fenerbahçe and Beşitaş), predictability decreased in the three-point regime compared to the two-point regime, while predictability increased for

Galatasaray in the three-point regime compared to the two-point regime. Therefore, the effect of switching to the three-point regime on the predictability of matches is different from each other. This difference depending on the estimated variance can be explained by team-specific factors.

Author Contributions

The study design, data collection, text preparation and literature review of the research were carried out by one and the second author, statistical analysis and data analysis were carried out by the second author, and the translation of the entire article into english was carried out by the third author.

Conflict of Interest

There is no conflict of interest between the authors regarding the publication of this article.

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