Hazardous Attributes: Survival Analysis of Soccer Clubs in Turkish Super League

Tehlikeli Özellikler: Türkiye Süper Ligdeki Futbol Kulüplerinin Sağ Kalım Analizi

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ÖZ

Avrupa futbolu toplu sporlar arasında en popüler olanıdır. En üst seviye ligde sağ kalmak kulüpler için hayati önem taşımaktadır. Bu çalışma, 1990'dan 2017'ye kadar olan veri setine tekrarlayan olaylarda sağ kalım modelini uygulayarak Türkiye Süper Ligindeki kulüplerin sağ kalımını etkileyen faktörleri incelemektir. Çalışmanın en önemli sonucu ligde yeni olmanın yükümlülüklerinin bulunmasıdır. Yeni kulüpler var olan kulüplere göre ligden düşme konusunda daha yüksek bir risk ile karşılaşırlar. Takımların Süper Ligdeki ilk yılında küme düşme riski ligde var olan takımlardan 20.7 kat daha fazladır. Bu nedenle, Süper Lige yeni çıkan takımlar yeni olmanın cezasını çekmektedirler. Bunun haricinde, her bir yıllık tecrübe artışı risk oranını %10 azaltmaktadır. Bununla beraber, her bir yabancı oyuncu riski azaltırken, kulüp tarihindeki daha önceki her bir küme düşme sayısı riski artırmaktadır. Son olarak, kulüp merkezinin bölgesel konumunun ve aynı şehirde başka kulüplerin varlığının Türkiye Süper Ligde sağ kalım üzerinde anlamlı bir etkisi yoktur.

Anahtar Kelimeler: Yeni olmanın yükümlülükleri, Sağ kalım analizi, Türkiye Süper Ligi

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ABSTRACT

European football is the most popular sports among the ball sports. Survival in the top-tier league is vital for the clubs. This study analyzed the factors that effected the survival of the clubs in Turkish Super League by employing a survival analysis for recurrent event model on the data set from 1990 to 2017. The most important finding was the existence of the liability of newness. The risk of relegation for the teams in their first year in the Super League was 20.7 times higher than existing teams. The new teams in the Super League suffered from being fresh to the league. New teams faced a higher risk of relegation than older ones. Other than that, the number of prior relegations in the club history increased the risk, while each additional foreign player decreased the risk. In addition, each year of experience decreased the hazard ratio by 10%. Briefly, regional location of the club base and existence of another team in the same city did not have significant effects on their survival in Turkish Super League.

Key Words: Liability of newness, Survival analysis, Turkish Super League

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INTRODUCTION

The modern version of European football, known as soccer in the US, developed in England in the 18th century and then spread into Europe. Today, it is the most popular sport among the ball sports. For instance, the International Federation of Association Football (FIFA), the governing body of soccer, has 211 member countries, whereas United Nations (UN) has 193 members. European soccer leagues are the most elite leagues among national leagues and followed by billions of people. The top five national competitions in the soccer world are the English Premier League, Spanish LaLiga, Italian Serie A, German Bundesliga and French Ligue 1. The top-tier soccer league in Turkey, called Turkish Super Lig since 2002, ranked sixth in Europe in many ways. In terms of the total market value, Turkish Super League is worth €864.28 million, according to the website transfermarkt.com, which places Super League sixth immediately after the aforementioned five most important European soccer leagues (See Table 1). Super League is also ranked sixth in highest revenue generating national competition in Europe. In addition, according to Deloitte Football Money League report in 2015, Galatasaray SK from Turkish Super League was the only club, other than clubs from the top five European soccer leagues which ranked in the top 20 highest earning clubs.

Table 1. Total market values of players in top seven European soccer leagues

League	Country	Total Market Value
Premier League	England	€5.54 billion
LaLiga	Spain	€3.61 billion
Serie A	Italy	€3.12 billion
1. Bundesliga	Germany	€2.73 billion
Ligue 1	France	€1.80 billion
Super Lig	Turkey	€864.28 million
Premier Liga	Russia	€697.48 million

*Data retrieved from transfermarkt.com on August 25, 2017.

European soccer leagues are open leagues, where there are relegations and promotions. At the end of each season, the lowest ranked clubs in the table are demoted to the lower division, and the best performing clubs are promoted to the higher division. Since revenues from different sources are much higher in higher divisions, relegation is costly for the clubs. Therefore, it is important to know the determinants of relegation. In other words, determinants of duration in a sports competition is important for managers and club owners in developing clubs' sports and financial strategies, and for administrators of soccer at the national level in governing and regulating the league. This study attempts to reveal the attributes that affect the hazard rate of relegation in Turkish Super League.

Determinants of relegation in these top five European soccer leagues are heavily investigated and compared by researchers using various data sets and models. To the best of our knowledge, there is no study on the survival of the teams in the highest tier league in Turkey- the Turkish Super League. Current work empirically studies the duration time of professional soccer clubs in Turkish Super League by employing event history analysis on a data set that covers 27 seasons from the 1990-1991 to the 2016-2017 season. As Dherbecourt and Drut (2009) say, "…the drivers of promotion

and relegation are time-varying and further research could cover their evolution across time." So, we believe that exploring the determinants of relegation in Turkish Super League will also shed light on the differences among top European soccer leagues.

Moreover, there is no club owned and funded directly by a billionaire or a big company in Super League. Therefore, club income comes only from sports related activities and sponsors. This is an important distinction of Super League from other important European Leagues. Manchester City and Chelsea from Premier League, Malaga from La Liga, Paris Saint Germain and AS Monaco from Ligue 1, AC Milan from Serie A, and Bayer 04 Leverkusen and VfL Wolfsburg from Bundesliga are owned by a billionaire, an investor, or a multinational company. The most striking example is Chelsea FC in the Premier League. Until 2003, the club went back and forth between Premier League and lower divisions without any major success. In 2003, Roman Abramovich, a Russian billionaire, took over the club, and since then, Chelsea FC has won five Premier League titles, one UEFA Champions League Cup, one UEFA Super Cup along with many others. Similarly, Paris Saint Germain is also dominating French Ligue 1, since the ownership changed in 2011, winning four out of the last five league titles. Flow of easy money from out-of-sports sources allows those clubs to increase their team quality; hence their competitiveness eventually decreases the risk of relegation for those clubs. Since it is a zero-sum game, risk of relegation increases for the remaining clubs which in return generates revenues only from sports activities. For this reason, existence of such an ownership may change the determinants of success and failure in the league. Hence, this study focuses on Turkish Super League, where clubs generate revenue only from soccer and sports related activities and spend that money on sports.

Recently, researchers have been interested in applying event history analysis in many areas of European soccer from the survival analysis of players, coaches, and referees (Barros et al., 2008; Barros et al. 2009; Frick et al., 2007; Frick, 2012) to that of teams in a sports competition, mostly national league competitions (Dherbecourt and Drut, 2009; Frick and Walbrecht, 2012; Oberhofer et al., 2015).

Dherbecourt and Drut (2009) employed logit regression to determine the drivers of promotion and relegation in the aforementioned top five European leagues for a short period of time, from the 2004-05 season to the 2008-09 season. When relegation is considered, along with a few economic determinants, they found negative and significant effects of experience in the first division and qualification to the international European club competitions. Surprisingly, the average age of players, link with a billionaire, stadium capacity, and being listed on the stock market are insignificant factors.

Oberhofer et al. (2015) tested if there exists "liability of newness" in professional soccer by employing duration analysis using data on German Bundesliga from the 1981-82 to the 2009-10 seasons. They argue that the relegation and promotion system in football leagues is similar to firm exits and entries in traditional goods and service markets. They found that liability of newness applies to German football teams.

It is possible that the long-term strategy of developing young players is punished by failure (i.e., relegation to the second division), while the short-term strategy of signing experienced (and, therefore, expensive) players is rewarded by avoiding failure (relegation) (Frick and Wallbrecht, 2012). Hence, clubs at the risk of relegation have strong incentives to invest heavily in more experienced players to avoid relegation.

Frick and Wallbrecht (2012) investigated four European soccer leagues (Germany, England, Spain, Italy), and basketball, ice hockey, and handball leagues in Germany to explore the determinants of relegation. Significant variables are the years of experience (as a measure of liability of newness), the number of championship titles and average

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attendance (as measures of liability of size), and the year of first appearance in the league and Bosman Rule dummy (as measures of founding conditions), while the number of prior relegations and TV revenues are insignificant.

Revenues from broadcasting rights constitute 50-60% of a professional soccer club in the Turkish Super League. A club in the first division of the Turkish soccer league gets at least $10 million annually from broadcasters while each club in the second division receives only $1.3 million. An average club's total income in the second division is one third of an average club's total income in the top division. Hence, it is financially vital for Super League clubs to survive at the end of the season to avoid greater loss in income.

METHODOLOGY

Dataset: Data set covers 27 seasons from 1990 to 2017. If a team is relegated and then promoted to Super League, it is taken as recurrence of the same event for the same subject. In this period, 53 teams have competed in Turkish Super League. Total time at risk is 479, where there are 81 failures and 15 right censored observations.

Data Collection: Information on the teams was gathered from the official website of the Turkish Football Federation (www.tff.org.tr) and sports bet website mackolik (www.mackolik.com).

Dataset Analysis: Event history analysis is used to analyze the length of time until the occurrence of a specific event or hazard, such as death, mechanical or technical failure, surgery, divorce, purchasing a specific product, finding a job. The dependent variable is the duration time until the occurrence of the specified hazard. Event history analysis is also known as survival analysis or duration analysis. In our case, hazard is defined as being relegated from Super League to a lower division. Hence, occurrence of the hazard means failure for Super League teams. Therefore, the survivor function, S (t), is the probability that the team survives until the time t.

$$S(t) = \Pr(T \geq t)$$

Hazard function, h (t), is defined as,

$$h(t) = \lim_{\Delta t \to 0} \frac{\Pr(t \leq T < t + \Delta t | T \geq t)}{\Delta t}$$

where the numerator in the limit function is the probability that an event occurs within the interval of time [t, t + Δt), given that no event occurred before time t. To get the hazard rate h(t), divide by the width of the interval, Δt.

In proportional hazard models, the effect of a factor on the hazard rate is assumed to be multiplicative. For this reason, the proportional hazard model is written as

$$h_i(t) = h_0(t)\exp(\beta x_i)$$

where h_0 (t) is the baseline hazard function, x_i is the vector of independent variables for individual i, and β is the vector of parameters. Depending on the assumption made on the shape of the baseline hazard function h_0 (t), the proportional

hazard model takes different names. Cox regression model makes no assumption on h_0 (t) (Cox, 1972). Therefore, the proportional hazard rate for individual i to individual j with different x values can be written as,

$$Hazard\ Ratio\ (HR) = \frac{h_i(t)}{h_j(t)} = \frac{\exp(\beta x_i)}{\exp(\beta x_j)}$$

It can easily be seen that the hazard ratio does not depend on time in the proportional hazard models. Then, the hazard ratio is interpreted as, the instantaneous failure at time t of an individual with covariate xi is HR times as likely as an individual with covariate xj. Generally speaking, if the estimated hazard ratio is greater than one, then the risk of failure is higher for individual i than for individual j when all other covariates are held constant. If the estimated hazard ratio is less than one, then the risk of failure is lower for individual i than for individual j, ceteris paribus. If the ratio is equal to one, then the covariate x has no effect on the hazard, i.e., both individuals have the same risk of failure.

In the case of Super League, since relegation can occur more than once to a team and failure times are correlated within the subject, the independence of failure times assumption required in traditional survival analysis is violated (Cleves, 1999). Therefore, survival analysis for recurrent events is the most appropriate approach for the analysis. Moreover, relegations are ordered for the same subject, meaning that the second relegation cannot happen before the first relegation. Hence, the data set is stratified by the failure order, which makes the conditional risk set model, proposed by Prentice et al. (1981), more appropriate for the analysis of Super League clubs. The assumption made in this model is that a subject is not at risk of a second event until the first event has occurred and so on. Duration time is measured as the time from the previous event. Stata/SE 11.2 software package is used for the statistical analysis.

The liability of newness was first defined and discussed by Stinchcombe in 1965. He argued new organizations face higher risk of failure than older ones. We also wanted to test if new teams suffer from being new to the league. In this study, being promoted last season and past experience in Turkish Super League are used as measures of the liability of newness. The dummy variable is used for being promoted from the lower division in the previous season. Team experience is the total number of years the team competed in Super League at the beginning of the last season.

Prior relegations are the number of relegations from Super League in club history at the beginning of the season. League size represents the number of the teams in the league. Squad size and the number of foreign players are also introduced into the model in order to capture the effects of these factors on failure. There is a long term debate on the teams from the same city. It is argued that if there is more than one team in the Super League from the same city, the risk of relegation is higher for these teams. In order to test this hypothesis, a dummy variable is used for the teams from the same city. Finally, clubs are grouped according to their location to capture the effects of economic, geographic, and demographic differences. Seven regions in Turkey are used, where Marmara region is taken as the reference group. The description of the variables is shown in Table 2.

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Table 2. Description of the variables

Variable	Definition
Duration Time	Survival time
Relegated	1 if the team is relegated (censor variable)
Promoted	1 if the team is promoted from the lower division at the end of the last season
Team Experience	Total number of seasons the team has competed in Super Lig at the beginning of the current season
Prior Relegations	Number of prior relegations
Squad Size	Number of players in the team roster
Foreign Players	Number of foreign players in the team roster
League Size	Number of teams in the league
Same City Teams	1 if there is another team located in the city
Region	Dummy variable for the team's geographic region
Marmara (Ref. group)	1 if the team's base in Marmara region
Aegean	1 if the team's base in Aegean region
Mediterranean	1 if the team's base in Mediterranean region
Central Anatolia	1 if the team's base in Central Anatolia region
Black Sea	1 if the team's base in Black Sea region
Eastern Anatolia	1 if the team's base in Eastern Anatolia region
South-Eastern Anatolia	1 if the team's base in South-Eastern Anatolia region

RESULTS

First, to be able to apply proportional hazard models, the assumption that the hazards are proportional should be valid. The test of proportional-hazards assumption based on Schoenfeld residuals produces a p-value equal to 0.9154. This means we do not reject the null hypothesis that the hazards are proportional at 5% significance level. Hence, the survival regression models can be applied. Kaplan-Meier survival estimate in Figure 1 reveals that, in the first two years in Super League, the number of failures, that means relegations, are the highest. Half-life in Super League is about two years. That is, at the end of their second year, half of the teams in Super League are relegated to the lower division. Similarly, Wallbrecht (2010) also reports that half of the clubs in Bundesliga are relegated to the lower division in a period of three years. Mean time to failure in Super League is 4.99 years, meaning a team survives in Super League 4.99 seasons on average.
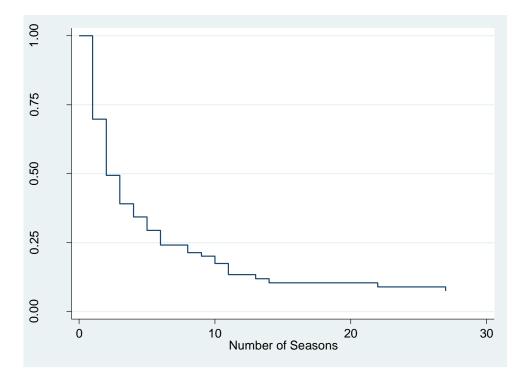
Figure 1. Kaplan-Meier survival estimate

Hazard ratio estimation results from the stratified Cox proportional hazard regression are presented in Table 3. First, as a measure of liability of newness, being promoted in the previous season is the most influential factor on the survival of teams. A team in its first season in Super League has 20.66 times higher risk of relegation than an existing team. The other measure for liability of newness, team experience, is also a significant factor in the model. Each year of experience in Super League decreases the risk of relegation by 10%. These results prove that the liability of newness exists in Turkish Super League.

The number of previous relegations increases the risk for the team. Each number of prior relegation increases the risk of relegation by 42%. Each additional player to the team roster increases the risk by 5.9% while each additional foreign player decreases the risk by 12.3%. Larger squad size makes it more difficult for coaches to manage and train players, hence, affecting the performance and harmony in the team negatively.

When the league size is considered, each increase in the number of teams decreases the hazard ratio by 25.1%. From the regression results, one can see that there is no reason to believe that the teams sharing the same city are at higher risk of relegation. Dummy variable for the same city teams is found to be insignificant. Finally, the location of the club has no significant effect on the risk of relegation. None of the region dummies is found to be significant.

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Table 3. Hazard ratio estimation results from stratified Cox regression

Dependent Variable: Duration Time	Hazard Ratio	P-value
Promoted	20.662*** (8.943)	0.0001
Team Experience	0.9*** (0.024)	0.0001
Prior Relegations	1.42** (0.213)	0.019
Squad Size	1.059** (0.024)	0.011
Foreign Players	0.877*** (0.032)	0.0001
League Size	0.749** (0.109)	0.047
Same City Teams	1.301 (0.319)	0.284
Region (Reference: Marmara)		
Aegean	1.272 (0.408)	0.452
Mediterranean	0.547 (0.335)	0.325
Central Anatolia	0.657 (0.175)	0.115
Black Sea	0.689 (0.254)	0.312
Eastern Anatolia	1.252 (0.413)	0.496
South-Eastern Anatolia	0.64 (0.274)	0.298
Total Number of Subjects	96	
Total Number of Failures	81	
Total Time at Risk	479	

*Significant at 10%, **Significant at 5%, ***Significant at 1%

DISCUSSION

Compared to the studies in the existing literature, this study has one of the largest data sets on a single league that covers the longest time period. Existence of teams that are relegated and promoted several times forces us to use different methodology, namely survival analysis of recurrent events, than prior studies.

The most important finding of Dherbecourt and Drut (2009) is that the seniority in the first division decreases the relegation probability significantly. In line with this result, this study also finds that each year of experience in Turkish Super League decreases the risk of relegation by 10%. Another interesting point in Dherbecourt and Drut (2009) is that presence of another team in the same city in the first division significantly decreases the promotion probability. They argue that the majority of resources in terms of attendance and match day revenues already belongs to the principal football club of the city and is unable to develop durably. On the contrary, in this study, the presence of another team in the same city is found to have no significant effect on the survival of a Super League team.

Oberhofer et al. (2015) find ambiguous results for being new to the league and the number of pre-exits. However, being new and the number of prior relegations unambiguously decrease the survival time of the club in Super League. They also find that teams with a larger share of non-German players tend to be relegated more quickly but this variable is significant only in two of four models discussed. In the case of the Turkish Super League, each foreign player decreases the risk of relegation by 12.3%. For the seasons under investigation in this study, the number of foreign players allowed for clubs was limited. For this reason, club managers are cautious when adding a foreign player to their squad. Most of the time, managers transfer a foreign player only if they believe that the player is better than the existing players in the team. Thus, each additional foreign player increases the quality of the team and decreases the risk of relegation.

According to the estimation of shape parameter in their study, the liability of newness exists in German Bundesliga. Frick and Wallbrecht (2012) also statistically prove the existence of the liability of newness in German Bundesliga, English Premier League, Spanish LaLiga and Italian Serie A. They argue that the clubs that have just been promoted have to adapt to the higher standards in their new environment and they often lack the financial resources to keep up with the more established clubs, hence, increasing the probability of immediate relegation after their first season in the higher division. Significance of the variables experience and promoted in our model also confirms the existence of liability of newness in Turkish Super League. The teams that promoted in the previous season have the risk of relegation in their first season twenty times more than the existing teams. Finally, Noll (2002) mentions yo-yo teams that move up and down regularly in English football leagues. Since each number of prior relegation increases the risk by 42% in Super League, this study statistically confirms his argument of existence of yo-yo teams as well.

CONCLUSION

The factors that affect the survival of the teams in Turkish Super League are investigated in this study. The most important finding of this study is the existence of the liability of newness in Turkish Super League. The teams in their first season in Super League have 20.66 times higher risk than their competitors. In addition to this, each year of experience decreases the hazard ratio by 10%.

The author is aware of the importance of the financial situation of the club, and it is likely to affect the risk of failure for the soccer clubs. Since there is no available data on the budgets of all the teams in Super League, it was not possible to test the effect of financial factors. For a more detailed analysis of the budget size, one can extend the discussion above,

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once the financial figures become available for the clubs in Super League. In literature, it is known that population and income are significant variables that determine success in mega sports events. Data on the population and income of the team's base city were not enough to cover the time period under investigation. Unfortunately, it remains as a missing part of the analysis presented here. Once these numbers become available, one can extend this study for a more detailed analysis.

REFERENCES

1. **Barros CP, del Corral J, Rodriguez JP.** (2008). The determinants of soccer player substitutions: A survival analysis of the Spanish soccer league. *Journal of Sports Economics,* 9, 160-172.

2. **Barros CP, Frick B, Pasos J.** (2009). Coaching for survival: The hazards of head coach careers in the German 'Bundesliga'. *Applied Economics*, *41*(25), 3303-3311.

3. **Cleves M.** (1999). Analysis of multiple failure-time data with Stata. *Stata Technical Bulletin, 9*(49), 30-39.

4. **Cox DR.** (1972). Regression models and life-tables. *Journal of the Royal Statistical Society, Series B, 34*(2), 187-220.

5. **Dherbecourt JB, Drut B.** (2009). Who will go down this year? The determinants of promotion and relegation in European soccer leagues. *CEB Working Paper*, No: 09/038.

6. **Frick B.** (2012). Career duration in professional football: The case of German soccer referees. *The Oxford Handbook of Sports Economics: The Economics of Sports*. 1. Oxford Handbooks Online.

7. **Frick B, Pietzner G, Prinz J.** (2007). Career duration in a competitive environment: The labor market for soccer players in Germany. *Eastern Economic Journal, 33*(3), 429-442.

8. **Frick B, Wallbrecht B.** (2012). Infant Mortality of Professional Sports Clubs: An Organizational Ecology Perspective. *Jahrbücher für Nationalökonomie und Statistik/Journal of Economics and Statistics*, *232*(3), 360-389.

9. **Noll RG.** (2002). The economics of promotion and relegation in sports leagues. *Journal of Sports Economics, 3*(2), 169-203.

10. **Oberhofer H, Philippovich T, Winner H.** (2015). Firm Survival in Professional Sports: Evidence from the German Football League. *Journal of Sports Economics*, *16*(1), 59-85.

11. **Prentice RL, Williams BJ, Peterson AV.** (1981). On the regression analysis of multivariate failure time data. *Biometrika,* 68, 373–379.

12. **Stinchcombe AL.** (1965). Social structure and organizations. *Handbook of Organizations*. Chicago: Rand McNally.

13. **Wallbrecht B.** (2010). *Location and Success in German Bundesliga Soccer*. Mimeo, Department of Management, University of Paderborn.