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Sport Results and Footballer's Performance Rights' Valuation

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Abstract: One of the most important group of assets in the balance sheet of an enterprise is the group of intangible assets. The asset situation of a sport enterprise is particularly complicated as such a company has an unusual type of intangible assets — players' performance rights. There are many problems with the valuation of such assets. This article presents the econometric approach to solving a valuation problem. Much research takes into account the possibilities of using econometric tools for valuation of the economic value of a professional football player's performance rights. The most important methods were presented in the paper of Trequattrini, Lombardi and Nappo (Trequattrini et al., 2012). The main goal of this article is to build econometric spatial models to explain the market value of footballer's performance rights according to players' sports results divided into homogeneous groups: goalkeepers, defenders, midfielders and forwards. The hypothesis of this research is that sports results influence the market value of footballers' performance rights. Hence, there are four additional hypotheses. For example, one of them concerning forwards will be as follows — the market value of a footballer's performance rights is dependent on the number of goals, the number of assists and the market value of the team. The following independent variables will be used: goals, assists, performance, yellow cards, red cards, club position in the league and the market value of the club in the whole research. Linear and non-linear models are used to test these hypotheses. The data set includes information about all players' game activity, taken from the Bundesliga (professional association football league in Germany) from the 2013/2014 season. The result of the analysis will identify variables closely tied to the market value of the football player's performance rights (footballers) and measure the goodness of fit of a statistical model. The study refers to the research conducted in 1999 and indicates new possibilities for the use of common tools, such as spatial econometric models. It is also a contribution to further research on the properties of the models.

Key words: economics of sport; football; intangible assets; valuation; econometrics
JEL codes: G02, G12, L83

1. Introduction

A football enterprise has its own character, but as many other firms in unique branches it also has unique assets. Every company has a problem with the valuation of its intangible assets, but a football one has particularly unique assets — football players' performance rights. Athletes play a main role for such a firm — without them success on the market would be impossible. It means that effective business has to be run using valuable

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intangible assets. For example, the sum of the market value of football players of the Borussia Dortmund club (11th place in the TOP20 rating in season 2013/2014 (Deloitte, 2015)) at the end of the season equalled 285.15 million Euro, whereas the sales of company BVB KGaA GmbH & Co. on 30th June 2014 was 223.785 million Euro [BVB Annual Report 2013/2014]. The intangible assets in BVB's company consist of a purchased player registrations and the computer software. The value of player registrations on 30th June 2014 equalled 61.485 million Euro (cost — 111.63 million and depreciation, amortization and write-downs — 50.145 million Euro). It means that this group of assets is more than 27% of all the assets. Another interesting issue is that the market value of players is more than 100% higher than intangible assets in company's report. Such a fact causes the necessity of valuation of players' performance rights to set a fair value.

The aim of the article is to find an econometric model describing well the market value of football players' performance rights on the example of German Bundesliga players at the end of the season 2013/2014. The original approach to the econometric modelling is to estimate models for separate homogenous groups according to players' positions on the football pitch. The main hypothesis of this research is that sports results of footballers influence their market value. Sports results are understood as such variables as: number of goals, number of assists, number of yellow and red cards, performance and a club's position in the league table. Additionally, another variable will be used in modelling process — the market value of the club. Particularly, there are seven homogenous groups: goalkeepers, right-backs, left-backs, center backs, central midfielders, wings and center forward. Each group has its own function on the football pitch, which causes the necessity of building eight econometric models with different independent variables. Different analytical forms of models (linear and non-linear) were verified in the research, according to existing theory concerning this problem.

The observed data set includes information about all players' game activity taken from the Bundesliga (professional association football league in Germany) for the 2013/2014 season. The source of data set is the professional web page transfermarkt.de.

2. Literature Review

2.1 Football Club as an Element of Modern Industry

Sloane (1971) was the first to write about football as an industry. According to Sloane's article, it is possible to indicate some characteristics of such a company. They are, inter alia (Sznajder, 2007):

- profit maximization, despite the fact that the profit is not a priority of its activity;
- security of functioning;
- creation of sports event atmosphere, which attracts clients-spectators;
- sport success — the priority of a company's activity.

But there are also some differences, which result in a specific character of football companies:

- supply is limited by organizational regulations of football leagues;
- lack of one ultimate goal;
- untypical competitiveness, which can not eliminate company from the market;
- strong relationship with the media;
- unique products — football matches;
- untypical clients — spectators;
- strong market regulations–FIFA, UEFA and national association rules.

Just now football clubs function like big international corporations. According to the last Deloitte's report (Deloitte, 2015), the revenue of twenty biggest clubs in the world equal 6.1614 billion Euro. Three from TOP20 clubs are from German Bundesliga, whose market value at the end of the season 2013/2014 was approximately 2.39 billion Euro. The German league is well organized, it consists of eighteen clubs with 501 professional players. The average attendance at Bundesliga matches in the season 2013/2014 was 43.5 thousand spectators — nearly 13.3 million people watched matches at the stadiums. The whole capacity of Bundesliga stadiums in the analyzed season was 47.6 thousand of spectators. It means that the average frequency during this time equalled 91.39% and it was one of the highest in Europe. It was the main reason for choosing such an example for this analysis.

2.2 The Valuation of Football Players' Performance Rights

The presence of intangible assets, such as players' performance rights, in the accounting of an enterprise causes the necessity of proper valuation and control. One of the many tools used in the valuation process is econometric modelling. It is possible to find many approaches to such an estimation. Literature's review indicates five general approaches to this estimation:

(1) The model of Carmichael, Forrest and Simmons (Carmichael et al., 1999):

$$F_i = X_i\beta_i + Y_i\gamma_i + Z_i\delta_i + e_i$$

Where the symbols used mean:

Fi–the value of the transfer;

Xi–the vector of measurable characteristics and player's productivity indicator;

Yi–the vector of non-measurable characteristics of a player;

(2) The model of Gerrard and Dobson (2000):

$$F_i = \alpha_0 + \alpha_1 X_i + \alpha_2 Y_i + \alpha_3 B_i + u_i$$

Where Bi means the vector of characteristics of the selling player club.

(3) The model of player's performance rights valuation (Lucifora & Simmons, 2003):

$$\ln(F_i) = \alpha_0 + \alpha_1 X_{1i} + \alpha_2 X_{2i} + \alpha_3 X_{3i} + \alpha_4 Z_i + e_i$$

This model has another set of variables:

ln(Fi)–natural logarithm of revenues connected to the player's football performance;

X1i–the vector of characteristics describing game experience of the player;

X2i–the vector of characteristics describing game performance of the player;

X3i–the the vector of characteristics describing game reputation of the player;

Zi–the vector of characteristics describing quality of the club selling the player.

(4) The trinomial tree and option pricing models as players' valuation tools (Turnau et al., 2005).

(5) DCF model (with the assumption, that the value of the player is a function of the whole team (Trequattrini et al., 2012)).

(6) The power function model (Majewski S., 2014):

$$F_i = \alpha_0 \cdot X_{1i}^{\alpha_1} \cdot X_{2i}^{\alpha_2} \cdot X_{3i}^{\alpha_3} \cdot Z_i^{\alpha_4} \cdot e^{\zeta \cdot i}$$

It needs to be emphasized that econometric models analyzed in points 1-2 have a linear form. The models presented in points 3 and 6 are non-linear — both are well transformed to linear form. In this research model 6 will be extended, but linear and exponential models will also be estimated to compare results. The general difference between the first proposition using model with power form to valuation and this research is to use more homogenous groups of players to estimation. It will be also possible to compare results obtained in these two approaches. The

basis for the analysis will be linear transformation of the equation shown in the point 6:

$$\ln(F_i) = \ln\alpha_0 + \alpha_1 \ln(X_{1i}) + \alpha_2 \ln(X_{2i}) + \alpha_3 \ln(X_{3i}) + \alpha_4 \ln(Z_i) + u_i$$

Particularly, the set of independent variables will be composed of numbers of: goals, assists, yellow and red cards, performance in the football match, entrance on the football pitch during the match (substitutes in), exits from the pitch (substitutes out) and age of the player, the total time on the pitch (in all matches in the season), a position of the club in the league table, the market value of the club. Only the variables having the greatest influence on the market value of the player were taken into account in the estimation process.

The estimation of models' parameter was carried out by using OLS method with GRETL program.

2.3 Research Framework

According to the earlier research results, where it was showed that more efficient is to divide original group of objects into a small but homogenous samples, this time such a division took into account more detailed game functions of players. So, in the Table 1 we have several models to compare. In the first table, all models are presented generally. In the second step, the best models will be presented more precisely.

Table 1 The Summary of Estimation for Homogenous Group of Bundesliga Football Players

The name of the group	The form of the model	Significant independent variables	Adjusted R^2
Goalkeepers	linear	- performance; - the team value;	0.638
	power (M)	- performance; - age; - the team value;	0.783
	exponential (L&S)	**performance; the team value;**	**0.838**
Backs (in general)	linear	age; goals; a total time on the pitch; the team value;	0.612
	power (M)	**age; a total time on the pitch; the team value;**	**0.651**
	exponential (L&S)	age; the team value; performance;	0.591
Center Back	linear	the team value; performance;	0.624
	power (M)	**age; performance; a team position in a league table;**	**0.725**
	exponential (L&S)	performance; the team value; age;	0.678
Left Backs	linear	goals; assists; the team value;	0.738
	power (M)	**goals; assists; the team value;**	**0.801**
	exponential (L&S)	assists; a total time on the pitch;	0.533
Right Backs	**linear**	**red cards; the team value;**	**0.773**
	power (M)	age; a team position in a league table;	0.497

	exponential (L&S)	the number of position in the first line-up; a total time on the pitch; the team value; age;	0.764
Midfielders (in general)	linear	goals; assists; double yellow cards; the team value;	0.705
	power (M)	**age;** **the number of position in the first line-up;** **goals;** **a total time on the pitch;** **a team position in a league table;**	**0.738**
	exponential (L&S)	the number of position in the first line-up; performance; goals; double yellow cards; the team value; a team position in a league table;	0.708
Wings	linear	age; goals; assists; the team value;	0.784
	power (M)	**age;** **goals;** **a total time on the pitch;** **the team value;**	**0.830**
	exponential (L&S)	performance; the team value;	0.648
Forwards (in general)	**linear**	**performance;** **goals;** **substitutes in;** **substitutes out;** **the team value;**	**0.674**
	power (M)	goals; the team value;	0.621
	exponential (L&S)	performance; goals;	0.554
Center Forwards ("Nines")	**linear**	**age;** **goals;** **the team value;**	**0.663**
	power (M)	goals; the team value;	0.591
	exponential (L&S)	goals;	0.489

Source: own calculations

There are many models presented in the Table 1. Most of them are in the power form, but there are also some simple and linear. It is very interesting to notice that if a group of players does not have any variants of dividing, then the econometric results are better. The best approximations are presented in the form of econometric equations with the statistical significance. All results are presented in the Table 2.

As we could see in the Table 2, almost all the presented models have a high level of fitting model to empirical data (high level of fitting model to empirical data expressed by adjusted R-square coefficient). A very popular independent variable, irrespective of the analytical form of the equation, is the market value of a team. It means that a value of a player, in many cases depends on a value of the whole club. Goals play an important role as an econometric regressor in every offensive group of players. A footballer's performance during the season always has

a positive impact on the value of each player and the age of athletes has every time a negative impact.

Table 2 Results of Footballers' Performance Rights Valuation for the Best Models Bolded in the Table 1 (Numbers in the Column 1 Mean a Group of Football Players in Order of Table 1)

No.	Equation	Statistics				
		Adj. R^2	X_i	std. error	t-stat	p-value
1	$Y_i = e^{-1.3558+0.0762 \cdot X_2+0.0021 \cdot X_{12}}$	0.838	**const.**	**0.1710**	**-7.9280**	**< 0.00001**
			2	**0.0064**	**11.9814**	**< 0.00001**
			12	**0.0007**	**3.1696**	**0.00329**
2	$Y_i = 4.288 \cdot X_1^{-1.6767} \cdot X_{11}^{0.3095} \cdot X_{12}^{0.5984}$	0.651	const.	1.1940	1.2192	0.22476
			1	**0.3816**	**-4.3935**	**0.00002**
			11	**0.0407**	**7.5985**	**< 0.00001**
			12	**0.0545**	**10.9712**	**< 0.00001**
3	$Y_i = 2512.466 \cdot X_1^{-2.2855} \cdot X_2^{0.718} \cdot X_{13}^{-0.7599}$	0.725	**const.**	**1.5109**	**5.1818**	**< 0.00001**
			1	**0.4853**	**-4.7093**	**0.00002**
			2	**0.0860**	**8.3452**	**< 0.00001**
			13	**0.1084**	**-7.0028**	**< 0.00001**
4	$Y_i = 0.105 \cdot X_4^{0.6670} \cdot X_5^{0.6054} \cdot X_{12}^{0.5561}$	0.801	**cont.**	**0.9156**	**-2.4604**	**0.03929**
			4	**0.2507**	**2.6606**	**0.02878**
			5	**0.2404**	**2.5182**	**0.03591**
			12	**0.2257**	**2.4637**	**0.03909**
5	$Y_i = -0.419 - 7.868 \cdot X_6 + 0.040 \cdot X_{12}$	0.773	const.	0.6647	-0.6304	0.53372
			6	**2.2357**	**-3.5191**	**0.00156**
			12	**0.0040**	**9.9536**	**<0.00001**
6	$Y_i = 1243.307 \cdot X_1^{-2.4904} \cdot X_3^{-1.0461} \cdot X_{11}^{0.9043} \cdot X_{13}^{-0.6081}$	0.738	**const.**	**1.5927**	**4.4740**	**0.00003**
			1	**0.5132**	**-4.8528**	**<0.00001**
			3	**0.2285**	**-4.5776**	**0.00002**
			4	**0.0934**	**3.4318**	**0.00109**
			11	**0.1241**	**7.2870**	**<0.00001**
			13	**0.0894**	**-6.7989**	**<0.00001**
7	$Y_i = 0.144 \cdot X_1^{-1.555} \cdot X_4^{0.2935} \cdot X_{11}^{0.6393} \cdot X_{12}^{0.6861}$	0.830	const.	1.8201	-1.0627	0.29400
			1	**0.5539**	**-2.8074**	**0.00754**
			4	**0.1154**	**2.5432**	**0.01475**
			11	**0.1581**	**4.0427**	**0.00022**
			12	**0.0844**	**8.1253**	**< 0.00001**
8	$Y_i = -0.023 + 0.309 \cdot X_2 + 0.364 \cdot X_4 - 0.577 \cdot X_9 - 0.368 \cdot X_{10} + 0.022 X_{12}$	0.674	const.	0.9093	-0.0254	0.97984
			2	**0.1080**	**2.8631**	**0.00553**
			4	**0.1792**	**2.0326**	**0.04588**
			9	**0.1185**	**-3.1057**	**0.00274**
			10	**0.1589**	**-3.6296**	**0.00054**
			12	**0.0058**	**3.7512**	**0.00036**
9	$Y_i = 10.598 - 0.503 \cdot X_1 + 0.635 \cdot X_4 + 0.024 X_{12}$	0.663	**const.**	**3.4098**	**3.1082**	**0.00286**
			2	**0.1442**	**-3.4857**	**0.00092**
			4	**0.1000**	**6.3504**	**< 0.00001**
			12	**0.0058**	**4.1073**	**0.00012**

Note: X1 – age; X2 – performance; X3 – the number of position in the first line-up; X4 – goals; X5 – assists; X6 – red cards; X7 – yellow cards; X8 - double yellow cards; X9 – substitutes in; X10 – substitutes out; X11 – a total time on the pitch; X12 – the team value; X13 – a team position in a league table.

1 – goalkeepers; 2 – backs (in general); 3 – center backs; 4 – left backs; 5 – right backs; 6 – midfielders (in general); 7 – wings; 8 – forwards (in general); 9 – center forwards ("nines").

Source: own calculations

The best approximation in econometric modelling was obtained for the model 1 — for the goalkeepers group (R-square equals 0.838). It was not unexpected because this group was not divided into a smaller homogenous

samples. Only two variables have the statistically significant impact on the goalkeepers' performance rights. They are performance of a player and the market value of the whole team. The parameter standing near the variable X_2 (performance) indicates that if the performance of a goalkeeper increases by one the market value of the player will increase by 0.0762%, in accordance with the rule of ceteris paribus. The increase of the market value of the whole team by 1 million Euro causes the increase of a goalkeeper's performance right by 0.0021% ceteris paribus.

The worst results in econometric modelling (R-square equals 0.663) were obtained for the "strikers" — the group of forwards playing in the center zone between the last back of opposite team. This group of players is responsible for scoring; but this group is also very diversified with the age being the only exception. A striker on a football pitch is a special person who has his own unique game style, and this could be the reason for worse statistics. According to the specificity of the game, the number of goals scored by the player during the season has the biggest influence on the estimated value. The increase of the number of goals scored by the striker by one causes the increase of his market value by 0.635 million euro ceteris paribus. Just as in the case of variable X_4, the increase of the market value of a football club by 1 million euro causes the increase of the player's performance rights by 0.024 million euro assuming that all the other factors are constant. In this equation, there is also information about the influence of age of a striker on his market value. This influence is negative and it could be interpreted that yearly the market value of a player decreases by 0.503 million euro excluding the influence of any other factors.

3. Conclusion

The untypical intangible asset for a company was presented in this article. It was also shown that there is a need to estimate the fair value of this asset for the transparent accounting system. Such models could be also used in arbitration cases between management of a club and a player to estimate a loss of profits in case of the litigation.

The approaches presented in the literature can be successfully used in practice. Three analytical forms of models used in the econometric modelling of the value of football players' performance rights give good results. More often the power models and the linear models are used. There are not so big differences between measures of the model's fitting (adjusted R-square). The best approximation was obtained for the model for the group of goalkeepers (R^2 equals 0.838). The probable reason for such a result is the highest homogeneity of the sample and the lowest differences in a game style (the most important feature is effectiveness of goalkeeper). The most difficult to estimate were values of players' performance rights in the sample of center forwards (the highest R^2 equal 0.663).

Thanks to the research, it is also possible to indicate positive and negative regressors between non-economic variables used for the estimation of econometric models. Among all the analyzed variables, several of them have positive impact on the market value of football players' performance rights. These are among others: player's performance during the season, the number of goals, the number of assists, the total time on the football field and the market value of the team. There are also some variables having negative impact on the dependant variable, such as: the age of the player, the number of red, yellow and double yellow cards and the number of situation, when the player is changed (from the pitch to the substitute bench and on the contrary). The other variables do not have precise direction of impact on the football player's value, therefore their usefulness in econometric modelling is rather small. They are as follows: a number of position in the first line-up and a team position in a league table.

The hypothesis of this research that the sport results influence the market value of football players' performance rights was positively verified. First of all, an econometric models are useful tools for intangible assets valuation. Secondly, the division of players into groups according to their functions on a football pitch causes more

homogeneity and results better fitting of econometric models. The level of indetermination of econometric model suggests that there are some variables not captured in the econometric modelling process.

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