

INFLUENCE OF STANDARD INDICATORS OF SITUATIONAL EFFECTIVENESS IN BASKETBALL, IN BOSNIAN LEAGUE 6 AND REGIONAL BASKETBALL LEAGUE

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Abstract

Research was conducted to determine relations among 15 standard indicators of situational effectiveness in basketball and the final score of a basketball game. Data was collected from 50 games in Bosnian League 6, final stage of basketball championships in Bosnia and Herzegovina (league which includes 6 teams who stay in contention for the championship trophy), and 20 games in Regional basketball league (Good Year League) where two teams from Bosnia and Herzegovina took part, "KK Bosna" from Sarajevo and "HKK Siroki" from Siroki Brijeg. Results of regression analysis showed that 3 variables have statistically significant influence on the final score of basketball games in Bosnian League, SO and OL on the level of 99%, and IL on the level of 95%. In Regional Basketball League, those variables are S3US, SBUS, SN, IL and OL, on the level of 99%, and S2US on the level of 95%. The difference among obtained results supports the fact of more consistent game in Regional Good Year League.

Key words: basketball, practice, situational indicators, entity, variable, success, regression analysis, prediction.

INTRODUCTION

Today, work in modern, top-quality basketball, as well as the modern technology of practice is aimed at accomplishing primary goal which can be explained by two fundamental tasks: making, producing top-quality players and making a top-quality achievement (Šeparović, V. 2007). Realization of these two tasks is considerably related, since without top-quality players there is no top-quality achievement. Process of making a top-quality achievement is determined by making of a top-quality team which is defined by individual qualities of players.

More rational practice produces better results, because it includes all new rule implementations which should be the basis for optimal practice (Hajnal, L. 1990). Modern basketball is a game of detail and finesse. Practices, which players as individuals and teams as units go through, should be professionally and scientifically set up, from the early stage all the way to the top-quality performance.

Aim of this research is to determine the influence of 15 standard indicators of situational effectiveness in basketball on the

final score of a basketball game in two levels of competition, Bosnian League 6 and Regional Basketball League.

RESEARCH METHODS

In this research, indicators of situational effectiveness which influence the success of basketball teams were analyzed. FIBA has standardized 13 indicators of situational effectiveness, which were expanded in this paper with two variables: 2pt field goal, layup – successful (Š2POUS), 2pt field goal, slam dunk – successful (Š2ZAUS). System of standard indicators of situational effectiveness in basketball was expanded because of assumptions for obtaining information of higher quality for more complete explanation of individual and team game, in segment of a successful 2pt field goal.

Entity sample

Sample comprises 50 basketball games (100 entities) played in two levels of competition, Bosnian League 6 played for Bosnian championship (30 games, 60 entities) and Regional Good Year League (20 games, 40 entities).

Variable sample

Situational or action effectiveness (Trninić, S. 1996) is developed by registering plays during a basketball game and in this way one gets indicators the game effectiveness, as well as parameters related to tactical responsibilities, involvement, discipline of players and teams, and other parameters interesting for the analysis of basketball.

Standard indicators of situational effectiveness (FIBA) are: 2 pt field goal, layup – successful (Š2POUS), 2 pt field goal, slam dunk – successful (Š2ZAUS), 2pt field goal from mid-range – successful (Š2PUS), 2pt field goal from distance – unsuccessful (Š2NE), 3pt field goal – successful (Š3US), 3pt field goal – unsuccessful (Š3NE), free throws – successful (SBUS), free throws – unsuccessful (SBNE), offensive rebound (SN), defensive rebound (SO), assists (A), personal fouls (OG), turnovers (IL), steals (OL), blocks (B).

DATA PROCESSING METHODS

In this paper, we made regression analysis of the success of basketball teams in 2 leagues (Bosnian League 6 and Regional League) in the system of standard indicators of situational effectiveness. We also made estimation of regression coefficients B, their standard error, standardized coefficients t value for coefficients B, as well as the significance for t calculated in this way. Our calculations produced result of 95% reliance level for all regression coefficients. Linear regression analysis also includes variance analysis and it usually uses matrices of correlation and covariance.

Since we talk about linear regression (Dizdarević, D. 2006), statistics of the quality of modeling by linear regression is shown: multiple correlation R, coefficient and corrected coefficient of determination R^2 , standard estimation error and variance analysis table. Then we have F value and its significance. We also made diagnostics of collinearity, typical values of cross-product matrix, determination indicators, as well as variance decomposition proportions. For residuals we performed Durbin-Watson test for serial correlation of residuals and particular cases from game samples.

As the main criterion related dependent variable we chose variable POB that shows the final score of a game (0-defeat, 1-win). In correlational analysis, it was concluded that many variables are related on statistically significant level, and that correlations are not that high to have a dominant role in deciding the final score of games. Therefore it is reasonable to expect that chosen units of variables can perform better criterion variable prediction. Regression analysis was chosen as one of the ways, although nonlinear analysis could possibly be used through some of logistic models which probably would produce similar results.

RESULTS AND DISCUSSION

Regression analysis of the success of basketball teams in Bosnian League 6

Analysis of results, which was together with situational variables, conducted on Bosnian League 6 games.

Table 1: Linear regression data using situational variables on Bosnian League games

R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
				R Square Change	F Change	df1	df2	Sig. F Change	
0.800	0.639	0.516	0.351	0.639	5.198	15	44	9.1E-06	1.419

Table 2: Variance analysis in linear regression using situational variables on Bosnian League games

	Sum of Squares	df	Mean Square	F	Sig.
Regression	9.589	15	0.639	5.198	9E-06
Residual	5.411	44	0.123		
Total	15	59			

Table 3: B and β coefficients, standard errors and t-test results

Var	BETA	St. Err.	B	St. Err.	t(44)	p-level
		of BETA		of B		
Intercept			-0.5151	0.7417	-0.694	0.49105
S2US	0.1208	0.1569	0.0123	0.0160	0.770	0.44553
S2NE	-0.2494	0.1321	-0.0275	0.0146	-1.888	0.06561
S2PO	-0.0559	0.1336	-0.0080	0.0191	-0.418	0.67768
S2ZA	0.2353	0.1185	0.0706	0.0355	1.986	0.05325
S3US	0.2515	0.1410	0.0439	0.0246	1.784	0.08139
S3NE	-0.1923	0.1203	-0.0265	0.0166	-1.599	0.11695
SBUS	0.0529	0.1356	0.0046	0.0118	0.390	0.69846
SBNE	-0.0074	0.1109	-0.0011	0.0160	-0.067	0.94681
SN	0.2227	0.1170	0.0355	0.0187	1.904	0.06353
SO	0.2910	0.0991	0.0358	0.0122	2.935	0.00528
A	0.0753	0.1372	0.0083	0.0151	0.549	0.58578
OG	0.0316	0.1036	0.0036	0.0119	0.305	0.76165
IL	-0.2606	0.1078	-0.0307	0.0127	-2.417	0.01986
OL	0.3125	0.1135	0.0396	0.0144	2.753	0.00854
B	0.0569	0.1045	0.0204	0.0375	0.544	0.58901

Tables of significance show that multiple correlation coefficient is very high, which points to a possible high-grade final score prediction. However, 3 variables all together have statistically significant coefficient value (SO and OL on the level of 99% and IL on the level of 95%). It should be mentioned here that it is possible that no coefficients in regression analysis have to have statistically important coefficient value, but that overall result of regression has a high value. One can see here from the correlation results that regression is statistically significant, and that coefficients of variables S2NE, S2ZA, S3US and SN are also very significant, very close to the level of statistical significance. Significance of regression itself is derived from all these variables.

If estimation of the final scores of given basketball games for Bosnian League 6 is

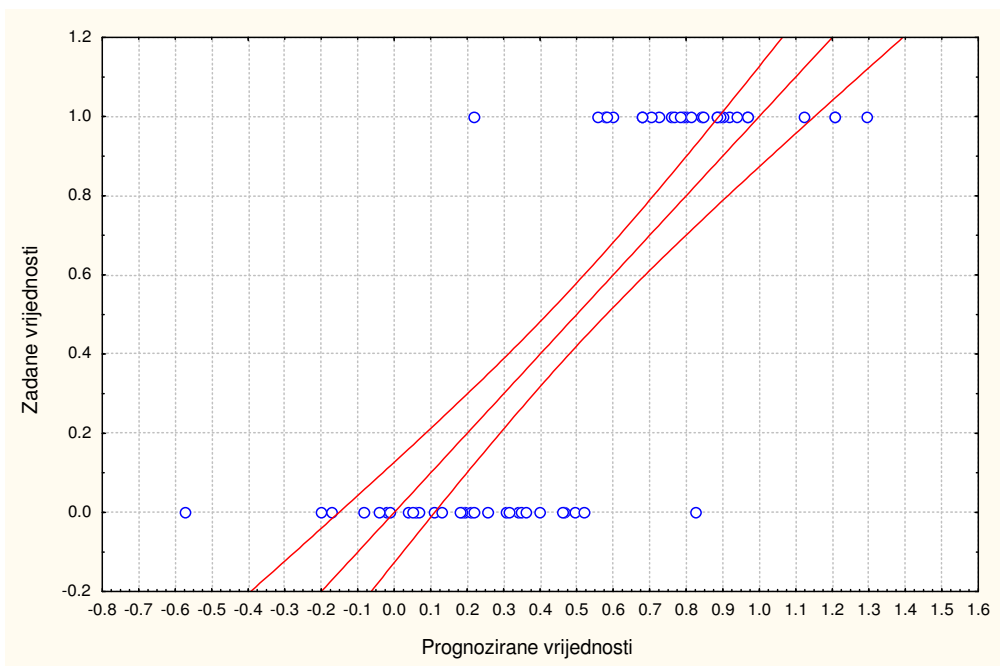
performed again, and after that evaluation of the final scores using obtained regression coefficients, than the diagram of given and calculated values will be just like the one on the following picture where there is also an interval of 95% reliance. We can see on the picture of the final score of games that two defeats are predicted by wins, and that only one win is predicted by a defeat (marginal value is 0.5). It can be concluded that it happened in three different games, so they could easily be detected in case of a real prediction.

Regression analysis of the success of basketball teams in Bosnian League 6

The following three tables offer regression analysis results performed by situational variables (FIBA) on the games of Regional Basketball League (Good Year League).

Table 4: Linear regression data using situational variables on the GY league games

R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
				R Square Change	F Change	df1	df2	Sig. F Change	
0.924	0.853	0.762	0.247	0.853	9.303	15	24	1.2E-06	1.603



Picture 1: Prediction of the final score of a game as compared to given final scores

Table 5: Variance analysis in linear regression using situational variables on the GY league games

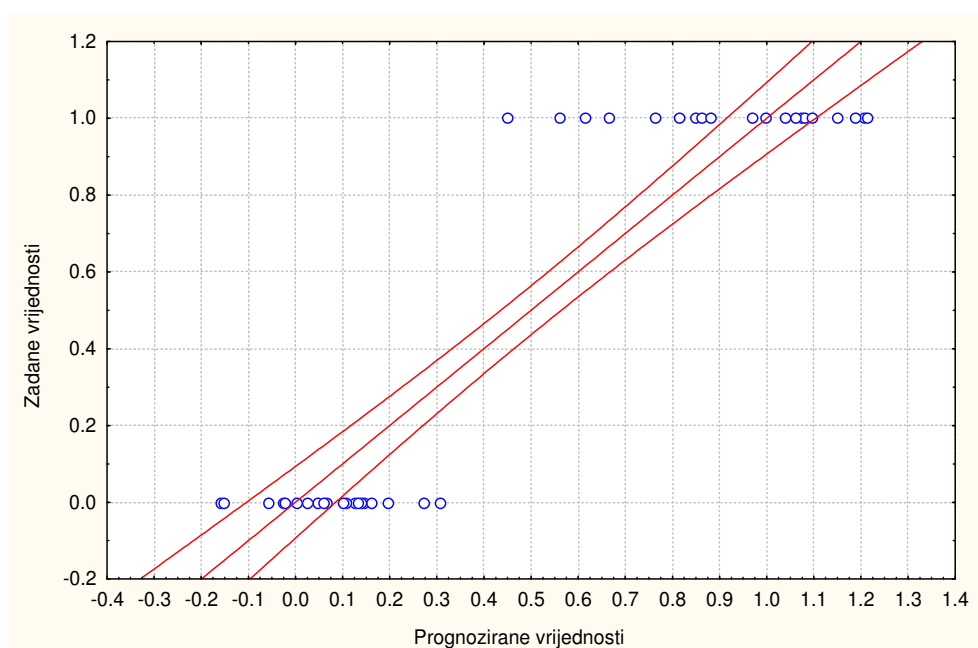
	Sum of Squares	df	Mean Square	F	Sig.
Regression	8.532	15	0.569	9.303	1E-06
Residual	1.468	24	0.061		
Total	10	39			

Table 6: B and β coefficients, standard errors and t-test results

Var	BETA	St. Err.	B	St. Err.	t(24)	p-level
		of BETA		of B		
Intercept			-1.8434	0.8559	-2.154	0.04153
S2US	0.3696	0.1429	0.0494	0.0191	2.586	0.01620
S2NE	-0.1358	0.1223	-0.0176	0.0158	-1.110	0.27796
S2PO	0.2283	0.1160	0.0447	0.0227	1.967	0.06081
S2ZA	0.0800	0.1107	0.0260	0.0359	0.723	0.47662
S3US	0.4934	0.1322	0.0843	0.0226	3.733	0.00103
S3NE	-0.2476	0.1248	-0.0279	0.0141	-1.984	0.05877
SBUS	0.3758	0.1109	0.0306	0.0090	3.390	0.00242
SBNE	0.1770	0.1315	0.0220	0.0163	1.346	0.19088
SN	0.5238	0.1172	0.0898	0.0201	4.471	0.00016
SO	0.2825	0.1399	0.0349	0.0173	2.019	0.05483
A	-0.0179	0.1367	-0.0026	0.0198	-0.131	0.89677
OG	-0.1733	0.1086	-0.0233	0.0146	-1.596	0.12357
IL	-0.3965	0.1107	-0.0595	0.0166	-3.582	0.00151
OL	0.3848	0.1009	0.0605	0.0159	3.814	0.00084
B	0.0494	0.1014	0.0211	0.0432	0.488	0.63025

From the significance table, one can also see that multiple correlation coefficient is very high here too, 0.924, which points to a possible final score prediction of a very good quality. Six variables have statistically significant coefficient value (S3US, SBUS, SN, IL and OL on the level of 99%, and S2US on the level of 95%). Free regression coefficient is also significant, on the level of 95%. Significance of regression itself is obtained from all these variables. The difference among obtained results supports the fact of more consistent game in Regional

Basketball League (Good Year League). In Bosnian League 6, games were won and lost with very similar data on many variables. This could be the reason for higher number of significant regression analysis coefficients. If we also make here estimation of the final score of given basketball games for Regional Basketball GY League, and then make evaluation of the final scores using obtained regression coefficients, than the diagram of given and calculated values will be like the one on the following picture, where there is again an interval of 95% reliance.



Picture 2: Prediction of the final score of a game as compared to given final scores

The picture of the final score prediction in relation to obtained coefficients shows that the mistake was made only in 1 out of 40 final scores (20 defeats and 20 wins). Only one win was marked as a defeat, although this value also was very close to a marginal value 0.5. Data insight shows that here we talk about the game from Regional Basketball GY League between Siroki and Bosna (79:68).

CONCLUSION

Aim of this research was to determine relation among indicators of standard effectiveness (FIBA, 15 variables) on the final score of basketball games, that is defined by binary variable win – defeat. Regression analysis is applied on 30 games of Bosnian League 6,

final round of competition for the championship of Bosnia and Herzegovina, and 20 games of Regional Good Year Basketball League.

Results in the significance table, obtained from Bosnian League 6 games show that multiple correlation coefficient is very high (0,800) which points to a possible final score prediction of a good quality. However, 3 variables all together have statistically significant coefficient value (SO and OL on the level of 99% and IL on the level of 95%). One can see from the correlation results that regression is statistically significant, and that coefficients of variables S2NE, S2ZA, S3US and SN are significant and very close to the level of statistical significance. Significance of

regression itself is derived from all these variables.

Defensive rebound and steals are characteristic segments of basketball on the defensive end of the floor, and as a consequence of quality-defense one also recognizes situational indicator turnovers. We can conclude that defensive rebound is a consequence of an opponent's shot attempt after a good pressure on the ball which causes low shooting percentage which again offers possibility that defensive rebound has a very strong influence on the final success.

By quality-defense on a ball handler we ensure precondition for a good defense on the off-ball opponents (opposing team's players on the first, second and third pass), because help for a defensive player who guards a ball handler is not necessary and in this way ball movement is blocked, and number of opposing team's turnovers is increased. In Bosnian League 6, it is possible to dominate and be effective by quality-defensive pressure and organized defensive rebounding, which brings success – win in a basketball game.

From the significance table which explains data collected from Regional GY Basketball League games it can also be seen that multiple correlation coefficient is also very high here, 0,924. Six variables have statistically significant coefficient value (S3US, SBUS, SN, IL and OL on the level of 99%, and S2US on the level of 95%). Free regression coefficient is also significant, on the level of 95%. Significance of regression itself is obtained from all these variables.

It is noticeable that variables that explain the quality of successful offensive effectiveness, successful 3 point, 2 point, and free throw shooting, as well as offensive rebound, according to obtained results have the strongest and the best influence on the effectiveness in a basketball game (win or defeat) in Regional Basketball League. On this quality-level of basketball competition defensive effectiveness is constant, and the strongest influence on success have variables that determine shooting accuracy from mid-range, from distance, and free throw shooting accuracy, which are on this quality-level a

consequence of intention to give maximum effort on the defensive end of the floor.

From the aspect of tactical influence we conclude that in Bosnian League 6, success is achieved by quality-defense, rebound and steals after which successful and effective fast breaks are developed, while in regional competition success is determined by shooting accuracy and offensive rebound aggressiveness, and it is implied that the level of defensive aggressiveness is high.

The difference between obtained results supports the fact of more consistent game in Regional Basketball League (Good Year League).

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UTICAJ STANDARNIH POKAZATELJA SITUACIJSKE EFIKASNOSTI U KOŠARKAŠKOJ IGRI U BH LIGI 6 I REGIONALNOJ KOŠARKAŠKOJ LIGI

Originalni naučni rad

Sažetak

Istraživanje je provedeno radi utvrđivanja relacija između 15 standardnih pokazatelja situacijske efikasnosti u košarci i konačnog rezultata u košarkaškoj utakmici. Podaci su prikupljeni na 50 utakmica u BH Lige 6 završnice prvenstva Bosne i Hercegovine (Liga za prvaka) i 20 utakmica Regionalne košarkaške Good Year lige u kojoj su se takmičila i dva kluba iz Bosne i Hercegovine, KK Bosna iz Sarajeva i HKK Široki iz Širokog Brijega. Rezultati regresijske analize pokazali su da statistički značajan uticaj na konačan rezultat utakmice u BH Ligi 6 imaju tri varijable, SO i OL na nivou od 99% i IL na nivou od 95%. U Regionalnoj ligi su to varijable S3US, SBUS, SN, IL i OL na nivou od 99%, a S2US na nivou od 95%. Razlika između dobijenih rezultata govori u prilog činjenici konzistentnije igre u Regionalnoj Good Year ligi.

Ključne riječi: košarka, trening, situacijski pokazatelji, entitet, varijabla, uspješnost, regresijska analiza, predikcija

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