

## NONSTANDARD INDICATORS OF THE OFFENSIVE EFFECTIVENESS IN BASKETBALL AND SUCCESSFULNESS OF BASKETBALL TEAMS

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*Original scientific paper*

### **Abstract**

*Analysis of new nonstandard indicators of the offensive effectiveness has been done in research project comprising 50 basketball games in "Bosnian League 6" and Regional "Goodyear Basketball League" (now known as NLB League). This scientific paper, with the help of Discriminative Analysis on new nonstandard indicators, showed which variables separate winning teams from losing teams in Bosnian League 6 and regional league, as well as which variables separate winning teams in two different quality ranks of competition.*

**Key words:** *successfulness, basketball, win, situational indicators, discriminative analysis, Bosnian League 6, regional basketball league, transition offense and set offense*

### **Introduction**

One fact that motivated our research of the game of basketball was the fact that modern basketball is totally devoted to requests of basketball fans who by attending games want to enjoy in its dynamics and attractive plays. Our wish is to give you a closer look in professional and scientific conception of basketball. Having in mind obvious difference in quality between Bosnian League 6 and regional basketball league, we used this research as an attempt to define which nonstandard indicators of offensive effectiveness determine successfulness (to win or to lose a game) in Bosnian League 6 and regional basketball league. Offensive and defensive effectiveness in most cases depend on the ability of all players to transform at the same time as fast as possible from one to the other activity (Trninić, 1995). In terms of offense this means to come by opportunity to execute a fast break as the most effective way of offense, and then execute a set play.

### **Aim of the research**

Aim of this research is to determine if 6 new nonstandard indicators of offensive situational effectiveness in the game of basketball distinguish winning from losing teams in Bosnian League 6 and regional league. Through explaining results that determine which variables mostly distinguish winning from losing teams in Bosnian League 6 and regional basketball league, conclusions have

been presented with regard to qualitative difference in these two ranks of competition.

### **Methods**

#### *Entity sample*

Entity sample comprises all played games, 30 games of basketball teams in Bosnian League 6 for the champion of Bosnia and Herzegovina and 20 games in regional Good Year League (now known as NLB). Base for data processing therefore comprises 50 games or total number of 100 nonstandard statistical patterns. Data is collected by official statisticians as they go through game video tapes.

#### *Variables sample*

Situational effectiveness therefore presents just a part of total successfulness that can be measured by game stat notes. Standard pattern of situational effectiveness doesn't give enough information to have more accurate estimate about the structure of successfulness of a basketball team (Dežman, 2002). We chose to perform more detail analysis with the help of newly created pattern for following offensive effectiveness in order to get more information for analyzing successfulness in basketball. By increasing number of game information we can also increase prognostic quality of analysis of the outcome of basketball games (Hajnal, 2002). Starting from the remark that balance, relationship between the number of transition

and set plays, is the most important in collective approach to offense. (Šeparović, 2007), we have determined that successfulness of performing transition and set offense influences final outcome of the game in Bosnian League 6 and regional basketball league (NLB).

#### *Variables*

Selective variables:

1. league: regional – Goodyear (now NLB) – Premier League (G-B)

2. game outcome: win – loss (1-0)

Variables on the type of offense:

1. transition offense – successful (TU),

2. transition offense – unsuccessful (TB),

3. transition offense – neutral (TN),

4. set offense – successful (PU),

5. set offense – unsuccessful (PB),

6. set offense – neutral (PN).

We recognized successful offensive play, either transition play or set play, as a made shot from 3 point range, made shot from 2 point range, and forced personal foul followed with 2 free throws. Unsuccessful offensive play, transition or set play is recognized as missed shot from 3 point range, missed shot from 2 point range and turnover (lost possession of a ball). In both set and transition play, we also recognized situation when the offense was neither successful nor unsuccessful by our standards, therefore leaving it to be considered as neutral. Neutral outcome of transition offensive play or set offensive play relates to forced personal foul, inbound play and offensive rebound.

#### *Data processing methods*

For analyzing of groups, data processing was done in the following way: descriptive statistical parameters were calculated, by applying canonical discriminative analysis testing of important features of discriminative function by Burtlett  $\chi^2$  test it has been determined if there is a statistically important difference between winning and losing teams in Bosnian League 6 and in regional basketball league. It has also been determined how certain variables contribute to distinguishing winning from losing teams and which are variables that distinguish winning teams in two ranks of competition.

Data has been processed by software package *Statistica 12.0* on School of electrical engineering on Tuzla University.

### **Results and discussion**

#### *Descriptive statistics, results in Bosnian League 6 and regional basketball league*

The chapter for results and disquisition is made of 2 parts. First part refers to compared results of descriptive statistics between winning teams in Bosnian League 6 and regional basketball league in 6 indicators of situational effectiveness. Second part comprises results of discriminative analysis in 6 nonstandard indicators of situational effectiveness between winning and losing teams in Bosnian League 6 and regional basketball league. League winners are mostly distinguished by variables T B & T\_N. There is a much larger number of unsuccessful transition plays in regional league (6,25) than in Bosnian League 6 (3,83). Dominance of stronger teams in Bosnian League 6 is so strong that in a situation where one team is head and shoulders above other(s) it is difficult to stop transition offense and that is why there are less unsuccessful transition plays. Variable transition offense – unsuccessful includes situations, three point shot – unsuccessful, two point shot – unsuccessful and turnover (lost ball) in transition. The reason for larger number of unsuccessful transition plays in regional league for winning teams is in strong transition defense. Losing league teams are mostly distinguished by variable T\_U, then T\_N and P\_U. Transition offense – successful is variable that is less present for losing teams in Bosnian League 6 (9,57) than for losing teams in regional competition (12,70). In regional competition there is almost equal average number of successful transition plays for losing teams and winning teams, and that shows us again that it is not possible in such a strong competition to make a significant advantage in transition phase mainly because of strength of teams and smaller number of strong teams for defending the transition offensive play. In Bosnian League 6 that is not the case and losing teams make much smaller number of successful transition plays on offense than losing teams in regional competition. On this level of descriptive analysis, we can only confirm evident difference in quality of the game in 2 different competitions. One can also conclude that the quality of teams and game in Bosnian League 6 is not balanced and that small number of strong teams in regional competitions can dominate by their quality on transition offense and defense, while in regional league that is not possible.

Table 1: Results of comparison of winning teams in Bosnian League 6 and regional league in the field of 6 nonstandard variables.

Variable	Mean	Mean	t-value	df	P	Std.Dev	Std.Dev	F-ratio	P
	Bosnian	Good Year				Bosnian	GY		
transition offense – success	13.27	12.95	0.34	48	0.73465	3.46	2.80	1.53	0.345
transition offense – unsuccessful	3.83	6.25	-3.56	48	<b>0.00086</b>	2.04	2.77	1.85	0.131
transition offense – neutral	1.53	3.35	-4.40	48	<b>0.00007</b>	1.17	1.76	2.26	<b>0.046</b>
set offense – successful	29.40	30.05	-0.62	48	0.53596	3.89	3.14	1.54	0.330
set offense – unsuccessful	25.10	24.25	0.76	48	0.45220	4.45	2.81	2.51	<b>0.039</b>
set offense – neutral	10.73	11.00	-0.26	48	0.79918	3.62	3.60	1.01	1.000

Table 2: Results of comparison of losing teams in Bosnian League 6 and regional league in the field of 6 nonstandard variables.

Variable	Mean	Mean	t-value	df	p	Std.Dev	Std.Dev	F-ratio	P
	Bosnian	Good Year				Bosnian	GY		
transition offense – success	9.57	12.70	-3.820	48	0.00038	2.73	3.01	1.22	0.614
transition offense – unsuccessful	5.17	6.65	-1.890	48	0.06478	3.06	2.08	2.16	0.084
transition offense – neutral	2.27	3.30	-2.557	48	0.01377	1.31	1.53	1.35	0.452
set offense – successful	26.53	25.20	1.091	48	0.28082	4.88	3.00	2.64	0.031
set offense – unsuccessful	29.07	31.20	-1.694	48	0.09667	4.39	4.31	1.04	0.952
set offense – neutral	12.90	11.25	1.723	48	0.09139	3.42	3.16	1.17	0.734

*Discriminative analysis of Bosnian League 6 and regional basketball league*

When the number of groups is limited to 2, and at the same time larger number of variables is analyzed as in our case, one simple method of discriminative analysis is used – Fisher's linear discriminative analysis. Distinctive values of discriminative function and canonical correlation are given in table 3. Large distinctive value has been calculated

and the value of correlation is large as well, 0.717, which definitely shows that 6 adopted indicators of situational effectiveness are very good in distinguishing successful from unsuccessful teams in Bosnian League 6. Results in table 3 also prove statistically significant discriminative function by Wilks  $\lambda$  and Burtlett  $\chi^2$  – test. The value of Wilks test is obviously small, and  $\chi^2$  – test shows significance -0.00000052, which is much smaller than  $p=0.01$ .

Table 3: Bosnian League 6. Distinctive values of discriminative function and test of significance of function by Wilks and  $\chi^2$  – test.

Function	Eigenvalue	Canonical Correlation	Wilks' Lambda	Chi-square	Df	Sig.
1	1.057	0.717	0.486	39.672	6	0.00000

Tabela 4: Regional league. Distinctive values of discriminative function and test of significance of discriminative function by Wilks and  $\chi^2$  – test.

Function	Eigenvalue	Canonical Correlation	Wilks* Lambda	Chi-square	Df	Sig.
1	2.102	0.823	0.322	39.623	6	0.00000

Table 5: Correlations between certain variables and discriminative function. (Pooled within-groups correlations between discriminating variables and standardized canonical discriminative functions - \* Variables ordered by absolute size of correlation within function.)

Structure matrix			
Bosnian League 6		Regional league	
Var	Function 1	Var	Function 1
transition offense – success	-0.59	set offense – unsuccessful	0.68
set offense – unsuccessful	0.44	set offense – successful	-0.56
set offense – successful	-0.32	transition offense – unsuccessful	0.06
set offense – neutral	0.30	transition offense – success	-0.03
transition offense – neutral	0.29	set offense – neutral	0.03
transition offense – unsuccessful	0.25	transition offense – neutral	-0.01

Table 4 gives distinctive values of discriminative function and canonical correlation. Very large distinctive value was calculated as well as the value of correlation which is extremely large which shows that 6 adopted indicators of situational effectiveness are very good in distinguishing successful from unsuccessful teams in regional basketball league. The value is larger from those calculated through some other ways of research.

Table 4 proves statistical significance of the importance of discriminative function by Wilks X and Burtlett  $\chi^2$  – test. The value calculated by Wilks test is obviously small, and  $\chi^2$  – test shows significance of 0.00000054, which is much smaller than  $p=0.01$ . Results presented in table 5 point to influence of certain variables and to their discriminative power compared to game outcome. We can see in the table that in Bosnian League 6 the largest correlation with standardized coefficient of canonic discriminative function has following variables: transition – successful and position – unsuccessful, and other variables have to some extent smaller correlation. Successful transition offensive play is the one with the largest coefficient of correlation with discriminative function. Bosnian League 6 for the champion of Bosnia and Herzegovina is the league with small number of strong teams (strong teams are mostly 2 teams that at the same season play in regional league as well) who are head and shoulders above other teams very early in the season and who dominate with their quality defense which ignites fast break that leads to successful offense. In the part of the table where the results from regional basketball league are presented, the largest correlation with discriminative function among 6 variables has variable set offense unsuccessful (0.68).

Set offense unsuccessful and successful (0.56) are variables that mostly influence discrimination of winning from losing teams. Regional basketball league has high quality where the effectiveness of set offensive play is dominant in distinguishing wining from losing teams.

One of the reasons is also that such strong teams are capable to use their strong defense to stop transition offense which can lead to easy points. On the other hand, win through set plays is also determined by level of defense which is very strong in this rank of basketball competition.

**Conclusion**

Results of discriminative analysis give us the right to discriminate winning from losing teams on the basis of 6 selected variables. The use of discriminative analysis and significance of discrimination completely justify choice of this method in data processing. We came up with very large distinctive value of discriminative function in scores from Bosnian League 6, and correlation value is high, 0.717, which definitely shows that 6 approved indicators of situational effectiveness are very good in distinguishing successful from unsuccessful teams. Statistical significance of discriminative function by Wilks and Burtlett  $\chi^2$  has also been confirmed. Wilks test showed very small value and  $\chi^2$  test showed significance of 0.00000052, which is much less than  $p = 0.01$ . The largest correlation with standardized coefficients of canonic discriminative function has variable: transition – successful. It has been determined that winning and losing teams can also be discriminated in terms of quality regional basketball league.

Calculated canonic correlation is 0.823 and the level of significance is 0.00000053, which is therefore under 0.01. Variables that influence discriminative function the most are set play – unsuccessful and set play – successful. Unlike Bosnian League 6, in regional league variables from set offensive play more distinguish winning from losing teams which can be explained with technical, tactical and physical counterbalance of teams in regional league that are strong enough to

stop transition offensive play, having in mind its effectiveness. The results confirm obvious difference in quality of the game in these two competitions. By balancing strong teams in Bosnian League 6 we could expect that successfulness in this competition differentiates based on effectiveness in performing set play offense, just like this research established that the same case is currently in regional basketball league.

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## NESTANDARDNI INDIKATORI NAPADAČKE EFIKASNOSTI U KOŠARCI I USPJEŠNOSTI KOŠARKAŠKIH EKIPA

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### Sažetak

*Analiza nestandardnih indikatora napadačke efikasnosti primjenjena je u istraživačkom projektu koji je uključivao 50 utakmica "Bosanske lige 6" i regionalne "Goodyear Basketball League" (sada poznate kao NLB Liga). Ovaj naučni članak, uz pomoć diskriminativne analize nestandardnih indikatora, pokazao je koje varijable razdvajaju pobjedničke ekipe od poraženih u Bosanskoj ligi 6 i Regionalnoj NLB ligi, kao i koje varijable dijele pobjednike od poraženih ekipa u dva različita takmičarska ranga.*

**Key words:** *uspješnost, košarka, pobjeda, situacijski indikatori, diskriminativna analiza, Bosanska Liga 6, regionalna košarkaška liga, tranzicijska odbrana i postavljeni napad*

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*Received: September, 21. 2008.*

*Accepted: December, 10. 2008.*

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