

## UNCERTAINTY COEFFICIENT AS A METHOD FOR OPTIMIZATION OF THE COMPETITION SYSTEM IN TABLE-TENNIS LEAGUES IN "SOKAZ"

Joško Sindik<sup>1</sup> and Nives Vidak<sup>2</sup>

<sup>1</sup> Kindergarten "Trnoruzica", Zagreb, Croatia

<sup>2</sup> University of Dubrovnik, Dubrovnik, Croatia

*Original scientific paper*

### **Abstract**

*The Association of Recreational Table-Tennis Players in Zagreb (SOKAZ) attracts many table-tennis fans in Zagreb and its periphery. In spite of nominally recreational aims in these table-tennis leagues, there are many indicators to believe that SOKAZ gathers both recreational players as well as former elite table-tennis players. Among various methods of table-tennis team performance quality analysis, on the basis of the team's results in competition, the uncertainty coefficient of match outcome could to a large extent explain the uncertainty of competition. Thus, the main goal of this research was to attempt to determine possible correlation between the competitive level in SOKAZ leagues and the uncertainty coefficient in the championships for these leagues and, furthermore, on the basis of the correlation established eventually to adjust the competition system by attempting to raise the level of uncertainty in competition. This research has provided the data analysis of all the matches played in all SOKAZ leagues, during championships from autumn 2003 until autumn 2006. The research has ascertained that during all seven championship leagues the uncertainty of the matches showed a constant statistical decrease with the ordinal number of the league. On the basis of these results corrections in the competition system of SOKAZ leagues have been proposed by dichotomization of "better" and "weaker" leagues (with faster acceleration for the teams in "weaker" leagues), as same as some proposals for future researches.*

**Keywords:** SOKAZ, table-tennis, system, competition, uncertainty coefficient

### **Introduction**

There are two terms that usually occur in literature, important in sport economy, as same as in stimulating motivation for athletes in some sport contest and for sport attendants, too: "competitive balance" and "outcome of uncertainty". But the "competitive balance" and "outcome of uncertainty" are not the same phenomenon. Those terms are closely linked, but the "competitive balance" studies impact of alternative point systems on the competitive balance in professional sport leagues. The "outcome of uncertainty" means an effort that competition as a whole, doesn't have a predetermined winner at the outset of competition (Halicioglu, 2006). The most measures of the competitive balance are based on the dispersion of wins, i.e. on the winning percentage. The competitive balance could be measured by comparing "the actual performance" of a league to the performance that would have occurred if the league had the maximum degree of competitive balance in the sense that all teams were equal in playing strengths. The less the deviation of actual league performance from that of the ideal league is, the greater is the degree of competitive balance (Noll 1988, and Scully, 1989, all from Berri et al., 2005).

Summarizing previous findings and different theoretic approaches, there are no data found in individual sports, or co-active sports. Both concepts (outcome of uncertainty and competitive balance) are much more used in team sports, or in team competitions in individual sports. The most probable explanation is very simple: profit. Specifically, the concepts of competitive balance and uncertainty coefficient are interesting primarily from the aspect of sports economics. Namely, greater uncertainty of a sport game or sports competition as a whole means higher interest of viewers. A growing number of viewers mean greater financial profit. However, there are no data connected with the table tennis contest. But using measures of competitive balance and contest uncertainty, we can find more stimulating competition systems, even for the table tennis. The Association of Recreational Table-Tennis Players in Zagreb (SOKAZ) has been gathering many table-tennis fans in Zagreb and its periphery, but also from some more distant towns (Stubica, Zabok, Novska, etc.), for almost 60 years. Presently, SOKAZ includes 1200 sportsmen and sportswomen, distributed in 20 male leagues (12 teams in average) and one women's league with 12 teams.

Although the nominal goal of competition in table-tennis leagues is identical to those of sports recreation, there are a series of indicators to believe that SOKAZ attracts not only recreational players, but also sportsmen who, according to their previous sports achievements, could be classified as elite table-tennis players. Namely, although a large number of former "active" players competes in weaker SOKAZ leagues as well (e.g. in 11th, 12th and weaker), several top ranked SOKAZ leagues include the best players according to match results, who are often members of the most successful Croatian teams (1st and 2nd Croatian league), or top teams in neighbouring countries (Slovenia and Bosnia and Herzegovina), as same as in Austria or Germany. From the above it is to be concluded that both from the standpoint of recreational goals of SOKAZ and from the standpoint of "motivation of top sportsmen" the uncertainty coefficient is a very important factor that can motivate players participating in SOKAZ leagues. The recreational players can be motivated to persevere (to avoid boredom), and thus to reach the goals of keeping themselves healthy or socializing. The sportsmen can be motivated to keep the high level of achievements in sports, to advance in their table-tennis performance. Consequently, higher uncertainty coefficient in single or team matches could hypothetically motivate the players and the teams to find more pleasure in their performance, but also to keep the level of motivation that could bring progress or keep the achieved performance quality in table-tennis championships. Table-tennis is a complex poly-structural kinesiological activity.

Except for the technique area, i.e. motor abilities, table-tennis is demanding as far as information (tactical) knowledge is concerned, as well as relevant conative properties necessary for a successful result in competition (Grujić, 1975, Hudetz, 1984, 2000). Within the numerous relevant characteristics of a successful table tennis-player, the high quality selection process is extremely important. However, even after the successful selection process it is necessary to continue with systematic improvement of the player's performance. The main question raised by experts aiming at improvement of performance of the sportsmen or teams in various sports is how to assess the quality of game (Brčić, Viskiċ-Štalec, & Jaklinović-Fressl, 1997). From the sports aspect, both for individual players and teams, the main and most useful indicator of game quality are the score, both individual and team, obtained at a particular competition event. The hypothesis has therefore been made that results in table-tennis competition could also be the measure of a player's successfulness.

Nevertheless, if the aim is to use the scores from table-tennis matches in order to maintain the uncertainty in competition, it is important to pay due attention to maintenance of the level of uncertainty of match results within respective SOKAZ leagues. Among the various means of quality analysis of the game of table-tennis teams, the uncertainty coefficient (Buċo, 2007) could be the best. Thus, the main goal of this research was to attempt to determine possible correlation between the competitive level in SOKAZ leagues and the uncertainty coefficient in the championships for these leagues and, furthermore, on the basis of the correlation established eventually to adjust the competition system by attempting to raise the level of uncertainty in competition. Within the literature available no previous research directly connected by content to the goal set in table-tennis was found. From the research goals following problems have been made: finding correlation between the competitive level in SOKAZ leagues and the uncertainty coefficient in the championships as a whole (1); finding correlation between the competitive level in SOKAZ and the uncertainty coefficient in team matches (2); finding differences between the uncertainty coefficients in "better" and "weaker" leagues.

## Methods

The data was collected by examination of results of the individuals and teams in SOKAZ leagues competition from official records from the matches (Buċo, 2006).

### *Entities*

All data from all matches played in championships in all SOKAZ leagues, from autumn 2003 until autumn 2006, was analyzed. Each team played approximately 11 matches per championship. In each championship approximately 11 rounds were played following the "round robin" principle, each team having played 66 matches per championship in the average. For each hypothesis we have different sample of entities. For each hypothesis in the research we had three different samples of entities.

### *Samples*

First sample: "Respondents" in the research (Hypothesis 1) were all SOKAZ leagues, i.e. in 7 championships. Analyzed the number of respondents (leagues) was: 17 leagues in autumn 2003, 18 leagues in all championships from spring 2004 to autumn 2005, 20 leagues in championships in spring 2006 and autumn 2006. For all matches played in separate championships, for each SOKAZ league respectively, the uncertainty coefficient was calculated.

Second sample: In the second part of the research (Hypothesis 2) the "respondents" were all teams in all SOKAZ leagues, but only in spring (N1=233) and autumn 2006 (N2=241)<sup>1</sup> championships. The uncertainty coefficients were calculated for all matches played in all leagues during these two championships, for all the participating teams. Third sample: *Third sample*: The third part of the research (Hypothesis 3) included all SOKAZ leagues as "respondents", but only during spring and autumn 2006 (both N=20)<sup>2</sup> championships. The uncertainty coefficients for all matches played in all leagues during those two championships were calculated.

#### Variables

The dependent variable in the research is the uncertainty coefficient. Here is the "logics". One of the means of measuring uncertainty in a league (or uncertainty of an individual team match performance) is to follow the score. For example, the larger the number of matches won by the defeated team, the higher the uncertainty coefficient. For the championship and the chosen league (team) an average number of matches played by the defeated team in the chosen league or team (in case of a team it is irrelevant whether it won or lost the match) can be calculated.

The simplest "version" of uncertainty coefficient is the one that offers the same coefficients for matches with the same score. Consequently, the matches with the score 10:0 or 0:10 were given the coefficient 0, those which scores 9:1 and 1:9 the coefficient 1, scores 8:2 and 2:8 the coefficient 2, scores 7:3 and 3:7 the coefficient 3, scores 6:4 and 4:6 the coefficient 4, and the score 5:5 the coefficient 5. The total coefficients for all championship matches divided by the number of matches gives an average coefficient (shown within the results given). In this research we used the simplest "version" of uncertainty coefficient, with the exponent 1. So, in our research, formulae given could be transformed into:

$$CU_{team} = \frac{loss^{1.round} + loss^{2.round} + \dots + loss^{last.round}}{N_{rounds}}$$

$$CU_{league} = \frac{\sum loss}{N_{team.games}}$$

<sup>1</sup> This choice was made because a similar number of teams participated in these championships, and the number of leagues was identical.

<sup>2</sup> This choice was made because a similar number of teams participated in these championships, and the number of leagues was identical.

#### Legend:

"loss" – symbol for the number of individual matches won by the defeated team  
 $CU_{team}$  – team uncertainty coefficient  
 $CU_{league}$  – league uncertainty coefficient  
 $N_{rounds}$  – number of rounds  
 $N_{team.games}$  – number of team games in league championship

The independent variables are: ranking of the SOKAZ league (first to twentieth), affiliation of the team to a particular SOKAZ league.

#### Data Analysis

All the methods of analysis and result presentation used were found within the *Statistica 5.0* package. Uncertainty coefficients for the leagues and teams were calculated, as same as the average results and standard deviations (with the relative variability coefficients) for the uncertainty coefficients in all leagues during seven seasons (championships). Spearman correlation coefficients were calculated between the uncertainty coefficients and ordinary number of the SOKAZ league, i.e. between the uncertainty coefficients value and ordinary number of the SOKAZ league in which a team is positioned. Mann U Whitney test was made between the uncertainty coefficients in leagues with "more" (1-10. league) and "less" (11-20 league) quality in SOKAZ (in all championships from spring 2003. to autumn 2006).

#### Results and Discussion

The "logic" base of the uncertainty coefficient is very simple. It depends on very low and limited range of possible results in SOKAZ table tennis team games competition (10:0, 9:1, 8:2, 7:3, 6:4 and 5:5). Thus, we can say that uncertainty coefficient is a limited measure, in general. It can be applied only in the competitions with a limited number of possible results of the team matches. Utilitarian value of the uncertainty coefficient could definitely be contained in the possibility, on the basis of principally varying "attractiveness" of the matches (which is practically manifested in a higher number of matches with more balanced results), and on behalf of the public and the players, to modify the competition system, i.e. uncertainty of the matches. This research aimed at achieving this too. Table 1 contains correlation coefficients between the uncertainty coefficient value and ordinary number of SOKAZ league in championships from autumn 2003 until autumn 2006. It is obvious from the results that the correlations are generally negative and statistically significant. All correlation coefficients have similar values (they do not vary to a larger extent). They are significant, negative and medium-sized, in range from -.31 (autumn 2006) to -.59 (spring 2005).

Table 1. Spearman correlation coefficients between the uncertainty coefficient value and ordinary number of SOKAZ league in championships (autumn 2003 - autumn 2006).

League Championship	Correlation Coefficient (Spearman)	Probability of Importance
autumn 2003	- .58	< .01
spring 2004	- .47	< .05
autumn 2004	- .58	< .01
spring 2005	- .59	< .01
autumn 2005	- .54	< .05
spring 2006	- .56	< .05
autumn 2006	- .31	< .10

In championships for "weaker" (11<sup>th</sup>-20<sup>th</sup>) SOKAZ leagues, uncertainty coefficient values tend to be generally lower than for the "better" (1<sup>st</sup>-10<sup>th</sup> league) SOKAZ leagues. Table 2 contains important data about comparisons of the average uncertainty coefficient values for the all championship seasons in 1<sup>st</sup> - 10<sup>th</sup> leagues, with the same values in 11<sup>th</sup> - 20<sup>th</sup> leagues. As we can see by the inspection of the values in the Table 2, average values of the uncertainty coefficients varied in the rank from 2.44 (18<sup>th</sup> league) to 3.33 (6<sup>th</sup> league). Standard deviations of the uncertainty coefficients varied in the rank from .11 (2<sup>nd</sup> league) to .49 (18<sup>th</sup> league). Relative variability coefficients varied from 19.91 % (18<sup>th</sup> league) to 3.18 % (2<sup>nd</sup> league).

Table 2. The uncertainty coefficient values and Mann U Whitney test between the uncertainty coefficients in leagues with "more" (1-10. league) and "less" (11-20 league) quality in SOKAZ (all championships from spring 2003. to autumn 2006.)

N <sub>0</sub> league	autumn 2003	spring 2004	autumn 2004	spring 2005	autumn 2005	spring 2006	autumn 2006	M	σ	Relative variability
1.	3.41	3.14	2.91	2.85	2.86	2.80	2.85	2.97	.22	7.46
2.	3.20	3.23	3.49	3.21	3.33	3.30	3.38	3.31	.11	3.18
3.	2.80	2.88	3.17	3.38	3.26	3.27	2.85	3.09	.24	7.68
4.	3.39	3.15	3.06	3.06	3.39	3.05	3.06	3.17	.16	4.96
5.	2.77	3.21	3.12	3.27	3.33	3.47	3.14	3.19	.22	6.88
6.	3.41	3.56	3.46	3.14	3.39	3.23	2.85	3.33	.16	4.90
7.	2.91	3.61	2.83	3.33	3.50	3.36	3.15	3.24	.29	9.01
8.	2.73	3.40	3.12	3.20	3.39	3.24	3.14	3.17	.23	7.09
9.	3.46	3.09	3.32	3.30	3.61	3.00	3.42	3.31	.21	6.39
10.	3.08	2.99	3.35	3.21	2.89	2.96	3.36	3.12	.19	6.08
11.	3.17	2.97	3.09	2.94	2.89	3.49	2.76	3.04	.24	7.79
12.	3.29	3.20	2.56	3.24	3.18	2.92	3.20	3.08	.26	8.42
13.	2.83	3.38	3.32	3.36	3.00	2.77	3.21	3.12	.26	8.20
14.	2.79	3.14	2.92	2.92	2.99	2.95	3.11	2.97	.12	4.04
15.	2.29	3.26	3.02	2.89	3.38	3.03	3.08	2.99	.35	11.70
16.	2.87	2.61	2.82	2.24	2.99	3.02	3.11	2.81	.30	10.63
17.	2.02	2.74	2.47	2.06	2.73	2.65	3.08	2.54	.38	15.15
18.	-	2.56	1.68	2.68	2.01	2.83	2.88	2.44	.49	19.91
19.	-	-	-	-	-	2.96	2.66	2.81	.21	7.55
20.	-	-	-	-	-	2.69	2.59	2.64	.07	2.68
M <sub>stronger</sub>	3,12	3,23	3,18	3,20	3,30	3,17	3,15	3,19	0,20	6,36
M <sub>weaker</sub>	2,75	2,98	2,74	2,79	2,90	2,93	2,97	2,85	0,27	9,61
Difference	0,36	0,24	0,45	0,40	0,40	0,24	0,18	0,35	-0,07	-3,24
<b>U</b>	49	43.5	33.5	<b>18</b>	14.5	20.5	28	Mann U Whitney test values		
<b>Z</b>	0.08	0.49	1.25	<b>1.96</b>	2.27	2.23	1.67			
<b>p</b>	>.20	>.20	>.20	<b>&lt;.05</b>	<b>&lt;.02</b>	<b>&lt;.05</b>	<.10			

Legend:

*N<sub>0</sub> league* = ordinary number of the league

*M<sub>stronger</sub>* = average uncertainty coefficient value for the championship season in 1-10. leagues (as same as for *M*, *σ*, relative variability)

*M<sub>weaker</sub>* = average uncertainty coefficient value for the championship season in 11-20. leagues (as same as for *M*, *σ*, relative variability)

*Difference* = the difference between *M<sub>stronger</sub>* and *M<sub>weaker</sub>* (as same as for *M*, *σ*, relative variability)

*M* = average (arithmetical mean) of the uncertainty coefficient value for the whole specific league

*σ* = standard deviation of the uncertainty coefficient value for the whole specific league

*U*, *Z* = values of the Mann U Whitney Test

*p* = probability of importance

Relative variability (coefficient) = calculated with the Formula:  $\frac{\sigma}{M} * 100$

All differences in arithmetical means between "weaker" and "stronger" leagues tended to direction of higher uncertainty coefficient values for "stronger" leagues. The results of the Mann U Whitney test showed that these differences (between "weaker" and "stronger" leagues) are statistically significant for the championships in spring 2005, autumn 2005 and spring 2006. Finally, the indicators of the lower uncertainty (standard deviations and relative variability coefficient values) showed that those indicators are higher in "weaker" leagues in SOKAZ. Therefore, the uncertainty in SOKAZ leagues competition drops with the ordinary number of leagues. Consequently, in the "better" leagues (with smaller ordinary number) the uncertainty is higher, while in the "weaker" leagues the uncertainty of matches is significantly lower. All indicators in the Table 2 show the same fact: that the uncertainty coefficients during all championships are in average higher values in "stronger" leagues, while the deviations and variability between those coefficients are higher in "weaker" leagues. In "stronger" leagues championships have more uncertain games, than in "weaker" leagues. We can assume that the reasons for this trend are motivational in nature: maybe some "ambitious" new teams are too strong for their opponents in "weaker" leagues, while some teams loose their ambition and play "just recreative". When the analysis comprises teams in all the leagues, and not only the league as a whole (in this case results from only two seasons were analyzed with the same number of leagues, 20 each, and equal number of teams), both correlations are negative and statistically significant. Both correlation coefficients between the uncertainty coefficients value and ordinary number of the SOKAZ league in which a team is positioned have relatively similar values ( $\rho_{\text{spring2006}} = -.25$ ;  $p < .01$ ; ( $\rho_{\text{autumn2006}} = -.13$ ;  $p < .05$ ). They are significant, negative and low-sized. In championships for "weaker" (11<sup>th</sup>-20<sup>th</sup>) SOKAZ leagues, uncertainty coefficient values tend to be generally lower than for the "better" (1<sup>st</sup>-10<sup>th</sup> league) SOKAZ leagues. The uncertainty of a particular team's performance in SOKAZ leagues declines with the ordinary number of leagues. The uncertainty coefficient in the "better" (1<sup>st</sup>-10<sup>th</sup> league) and "weaker" (11<sup>th</sup>-20<sup>th</sup>) SOKAZ leagues in championships in autumn 2006 ( $M_{1-10\text{th}}=3.12$ ;  $M_{11-20\text{th}}=2.97$ ) and spring 2006 ( $M_{1-10\text{th}}=3.17$ ;  $M_{11-20\text{th}}=2.37$ ) are both (or very close to) statistically significantly different ( $t_{\text{spring2006}}=2.41$ ;  $p < .01$ ;  $t_{\text{autumn2006}}=1.52$ ;  $p < .07$ ). In championships for the "weaker" (11<sup>th</sup>-20<sup>th</sup>) SOKAZ leagues, uncertainty coefficient values are statistically significantly lower than for the "better" (1<sup>st</sup>-10<sup>th</sup> league) SOKAZ leagues. We register difference in correlation values between different league uncertainty coefficients and the ordinary number of league during seasons.

It could be explained by specific variations in uncertainty inside the same leagues. Par example, the competition in some league can be quite certain during one season (with one or two "dominant" and one or two "weak" teams), while during the other season the competition becomes in the same league becomes uncertain (when "weak" teams were relegated and the dominant teams promoted). Teams that have replaced promoted and relegated teams can have same competitive quality as the average team league in which they are now. The difference in correlation values between league and team uncertainty coefficients are probably not only the consequence of number of entities in different samples. It is possible that inter-league uncertainty is realistically higher than intra-league uncertainty, which could reflect in lower correlation values between the team uncertainty coefficients and ordinary number of the SOKAZ league in which a team is positioned. The number of teams in some (especially in "weaker") leagues is equal, and their competition with each other is uncertain. That partial uncertainty could be the reason why we are able to try to make different acceleration and deceleration systems for teams in the "weaker" and "better" SOKAZ leagues. These results mean that sport competition in "weaker" SOKAZ leagues has less uncertainty in general. Motivation of players that are playing in teams in the "weaker" leagues probably differs from the motivation of players in teams in the "better" leagues. Some teams in the "weaker" leagues are probably much more ambitious (they want to be accelerated), while the other teams play more for recreation. In the "better" leagues, most of the teams could have the similar motivation, playing more competitively and with more ambition. On the basis of data presented here, it can be estimated that for the purpose of increasing the uncertainty coefficient (and consequently the motivation for competing) in SOKAZ leagues, it would be suitable to form different competition systems for the "better" and "weaker" SOKAZ leagues. Instead of the existing system of "acceleration", by which the top positioned team at the end of the championships in all leagues (except the first and the second one) advances by two leagues, and the second and third team by one league (the team at the very bottom of the league "falls" by two leagues, while the penultimate and third team from the bottom "fall" by one league) different systems of acceleration of teams in the "better" and "weaker" SOKAZ leagues could be suggested. Thus, while the existing system could continue to be applied in the "better" leagues, the "weaker" leagues could consider the possibility of introducing alternative systems. For example, teams from 11<sup>th</sup> up to 20<sup>th</sup> league could advance.

That could be provided under the following system: top team advances by three leagues, second team advances by two leagues, third and fourth positioned team by one league. A similar method could be used to "decelerate" the lowest ranked teams. However, it could be possible to think of other systems of "acceleration" and "deceleration" for the purpose of increasing the uncertainty coefficient in competition, and after that check the effects by application of uncertainty coefficient after the championship. However, we have to be careful with application of the proposals for these "acceleration" and "deceleration" systems, based only on the uncertainty coefficient. This measure has to be compared with other formulae for calculating competitive balance. For example, we can compare the results obtained by using formulae made by Palomino & Rigotti (2000) or Fort & Quirk (1995).

On the other hand, it is not sufficient to analyze the uncertainty coefficient within leagues, because it doesn't incorporate any information about uncertainty coefficient if two teams from different leagues compete against each other. It would be much better to analyze the results of the teams that accelerated to better leagues. For instance, it is common that the team that won

(say) 16<sup>th</sup> league and progressed to 14<sup>th</sup> league was superior in this league, and next season progressed to 13<sup>th</sup> or even 12<sup>th</sup> league. Then, the analysis of the performance of this team in 13<sup>th</sup> or 12<sup>th</sup> should be performed. One could see the impact of the presence of this team in 14<sup>th</sup> or 13<sup>th</sup> league on the uncertainty coefficients. In other words, a certain longitudinal study has to be performed, to validate the uncertainty coefficient measure. It would be useful to use the uncertainty coefficient in other research work (perhaps in some other sports as well) on a multiple number of respondents in various competition ranks.

### Conclusions

The correlation coefficients between the competitive level in SOKAZ leagues and the uncertainty coefficient in all the leagues as a whole (as same as for all teams in all the leagues) in analyzed championships were mostly negative and significant. Following these results, we can propose different "acceleration" and "deceleration" systems in inter-league competition. However, we should make caution at decision-making only on the basis of coefficient of uncertainty, since it previously should be validated in comparative studies.

### Literature

- Berri, D.J., Brook, S.L., Frick, B., Fenn, A.J., & Vicente-Mayoral, R. (2005) The short supply of tall people: competitive imbalance and the National Basketball Association. *Journal of Economic Issues*. Retrieved June, 6, 2008. from: [http://goliath.ecnext.com/coms2/summary\\_0199-5210991\\_ITM](http://goliath.ecnext.com/coms2/summary_0199-5210991_ITM).
- Brčić, B., ViskiĆ-Štalec, N., & Jaklinović-Fressl, Ž. (1977) *Prediktivna vrijednost varijabli za evaluaciju tehničko-taktičkih elemenata u rukometu* /In Croatian/. [Predictive Value of Technical-Tactical Elements Variables in Handball.] *Kinesiology*, 29(1): 60-70.
- BuĆo, A. (2006) *SOKAZ – Rezultati* /In Croatian/. [SOKAZ – Results.] Retrieved December 31, 2006. from: [http://www.sokaz.hr/rez\\_form.php](http://www.sokaz.hr/rez_form.php).
- BuĆo, A. (2007) *SOKAZ – Statistika*. [SOKAZ – Statistics.] Retrieved December 31, 2007. from: <http://www.sokaz.hr/statistika.php>.
- Fort, R., & Quirk, J. (1995) Cross-subsidization, incentives, and outcomes in professional team sports leagues. *Journal of Economic Literature*, 33:1265-1299.
- Grujić, A. (1975) *Stoni tenis* /In Serbian/. [Table-Tennis.] Beograd: Savez za fizičku kulturu Jugoslavije.
- Halicioglu, F. (2006) The impact of football point systems on the competitive balance: evidence from some European football leagues. *Rivista di diritto ed economia dello sport*, 2(2):67-76.
- Hudetz, R. (1984) *Stolni tenis - tehnika* /In Croatian/. [Table-Tennis – Technique]. Zagreb: Sportska tribina.
- Hudetz, R. (2000) *Stolni tenis, tehnika sa Vladimirom Samsonovom* /In Croatian/. [Table-Tennis – Technique with Vladimir Samsonov]. Zagreb: Huno sport.
- Palomino, F., & Rigotti, L. (2000) *The Sport League's Dilemma: Competitive Balance versus Incentives to Win* /Working Paper E00-292/. Berkeley: University of California.

## KOEFICIJENT NEIZVJESNOSTI KAO SREDSTVO ZA OPTIMALIZACIJU SUSTAVA NATJECANJA U STOLNOTENISKIM "SOKAZ" LIGAMA

### **Sažetak**

Udruga stolnotenisača rekreativaca Zagreba (SOKAZ) privlači mnoge ljubitelje stolnog tenisa u Zagrebu i okruženju. Nasuprot mnogim nominalnim rekreacijskim ciljevima u stolnoteniskim ligama SOKAZ-a, postoje brojni pokazatelji da su igrači u SOKAZ-u i rekreativci i bivši vrhunski sportaši. Među različitim metodama analize kvalitete sportske uspješnosti stolnoteniske momčadi, izabrali smo koeficijent neizvjesnosti natjecanja. Osnovni cilj istraživanja bio je pokušati utvrditi povezanost između razine ligaškog natjecanja i koeficijenta neizvjesnosti ligaških mečeva, te na temelju utvrđene povezanosti (eventualno) korigirati sustav natjecanja u smislu povećanja izjednačenosti natjecanja. U ovom istraživanju analizirani su podaci svih mečeva koji su se igrali u svim ligama SOKAZ-a, tijekom prvenstava od jeseni 2003. do jeseni 2006. Rezultati istraživanja su pokazali da u odnosu na koeficijente neizvjesnosti, izjednačenost natjecanja u ligama SOKAZ-a opada s rednim brojem lige kojoj momčad pripada. Na temelju dobivenih rezultata, mogle bi se predložiti korekcije natjecateljskog sustava na temelju dihotomizacije "boljih" i "slabijih" liga, u smislu brže akceleracije uspješnijih momčadi u ligama s manje uspješnim momčadima, uz segusetije za buduća istraživanja.

**Ključne riječi:** SOKAZ, stolni tenis, sustav, natjecanje, koeficijent neizvjesnosti

---

Received: July 14, , 2009.

Accepted: October 11, 2009.

Correspondence to:

MSc Joško Sindik

Kindergarten "Trnoružica"

Rusanova 11, 10000 Zagreb, Croatia

Phone: + 385 1 2312-524

E-mail: josko.sindik@zg.t-com.hr