Modelling The Effect of Changing Point Systems to Teams' Competition Standing in A Malaysian Soccer Super League

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Modelling The Effect of Changing Point Systems to Teams' Competition Standing in A Malaysian Soccer Super League

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Abstract. In a sports league such as in a soccer league, the teams' competition standing is based on a cumulative point system. Typically, the standard point system is given to every single match for win, draw and lose teams is the 3-1-0 point system. In this paper, we explore the effect of changing point systems to teams' competition standing by changing the weightage values for win, draw and lose teams. Three types of point systems are explored in our soccer simulation model; firstly the 3-1-0, secondly the 2-1-0 and thirdly the 4-1-0 point system. Based on the teams participating in a Malaysian soccer Super League, our simulation result shows that there are small changes in term of teams' competition standing when we compared the actual rank and the simulation rank position. However, the 4-1-0 point system recorded the highest Pearson correlation value which is 0.97, followed by the 2-1-0 point system (0.95) and thirdly the 3-1-0 point system (0.94).

1. Introduction

In a sports league such as a soccer league, the cumulative point system is used to figure out the teams' competition standing. The team with the highest cumulative points will become the league champion, followed with the second runner-up team with the second highest cumulative points. The accumulated points are calculated based on the outcomes of individual match, either win, draw or lose. Typically in a soccer league, the standard point system used is the 3-1-0 point system where 3 points for a winning team, 1 point each for draw and 0 points for a losing team. In group stages of soccer World Cup Finals, The Fédération Internationale de Football Association (FIFA) uses the 3-1-0 system. After all match played, the two teams with the highest cumulative points are qualified to the knockout stages. Meanwhile, in soccer leagues in many countries such as in England, Spain, Netherlands, Japan, South Africa, Australia and Malaysia, the 3-1-0 point system is used.

In this paper, we aim to explore the effect of changing point systems to the teams' competition standing. To do this, we have developed a soccer simulation model using a Decision Support System (DSS). This graphical user interface of the soccer simulation model is fundamentally similar with the work in Yusof et. al. (2016) but that work is focusing on the effect of changing various tournament formats such as round-robin and knockout structures. Differently, this paper extended the soccer simulation model in order to study the effect of changing the weightage values for a win, draw and lose team on the teams' competition standing. Here, we have considered three options of point systems; firstly the standard point system used in a soccer league which is 3-1-0, secondly the 2-1-0

point system and thirdly, the 4-1-0 point system. We have simulated a league season based on 12 teams participating in a Malaysian Soccer Super League in season 2017.

2. Methodology

In order to investigate the effect of changing point systems to teams' competition standing, we have developed a soccer simulation model. The model is developed using DSS. DSS is basically a computer-based information system supporting decision-making activities to help an organization make relevant decisions. In this paper, we use DSS to assist in modelling the effect of changing point systems without changing the real situation of a Malaysian soccer Super League. The framework for this study is shown in Figure 1.

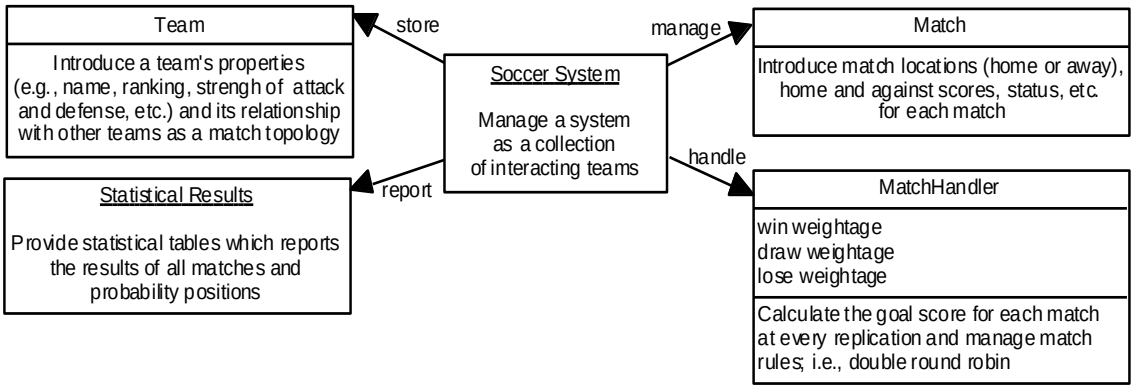

Figure 1. A Framework of A Soccer Simulation System

In our framework, *Team* stores a team's properties; e.g., its name, ranking position and values of attacking strength and defensive weaknesses. *Match* manages match locations, the score and the status (win or lose) of each match. The *Statistical Results* reports the results for all matches and the position ranks of the teams in the league. *MatchHandler* uses the Double Poisson model to calculate the goal scored and conceded for each match at each replication based on the values of attacking strength and defense weakness for each team. This class has properties storing the weightage values of win, draw and lose and the number of replications to be performed to simulate the match outcomes.

The match outcome in our soccer simulation model is based on the number of goals scored and conceded. For simplicity, we used a double Poisson model proposed by Maher (1982). By denoting X_{ij} and Y_{ij} to be the number of goals scored in the match between teams indexed i and j, the model for individual match scores is shown below

$$\begin{aligned}(X_{ij}, Y_{ij}) &\sim \text{Poisson}(\propto_i \beta_j \gamma, \alpha_j \beta_i) \text{ for team } i \text{ playing at home} \\ &\sim \text{Poisson}(\propto_i \beta_j, \alpha_j \beta_i \gamma) \text{ for team } j \text{ playing at home}\end{aligned}$$

where α_i measures the attacking strength of the teams, the β_j measures the defensive weakness, and γ is allocated for home advantage effects. The team strength and team weakness for 12 teams participated in a Malaysian soccer super league 2017 is shown in Table 1. This strength is calculated based on the 114 individual match outcomes, starting from 20 January 2017 until 5th August 2017.

Table 1. Team Strength and Team Weaknesses (Home advantage: 1.2631)

ID	TEAM	Attacking strength	Defensive Weaknesses
1	JDT	1.42138	1.208459
2	KEDAH	1.65613	1.271639
3	PAHANG	0.91677	1.126739
4	FELDA	1.03439	1.095529
5	SELANGOR	1.6077	1.234631
6	PERAK	1.5785	1.211152
7	PKNS	1.19646	0.965437
8	TTEAM	1.05023	0.994242
9	KELANTAN	1.08488	1.21809
10	MALACCA	1.61216	0.922087
11	SARAWAK	1.43317	1.569173
12	PENANG	1.21892	1.476355

3. Analysis

We develop the soccer simulation model using Visual Basic (VB). The Graphical User Interface (GUI) for this study is shown in Figure 2. As seen in Figure 2, there are several menu options which can be selected such as the structure of the tournament either to choose the round-robin one lag or the round-robin two legs (once played at home and once play at away), the summarization of the report, the types of the point system and finally, the number of the soccer simulation replication.

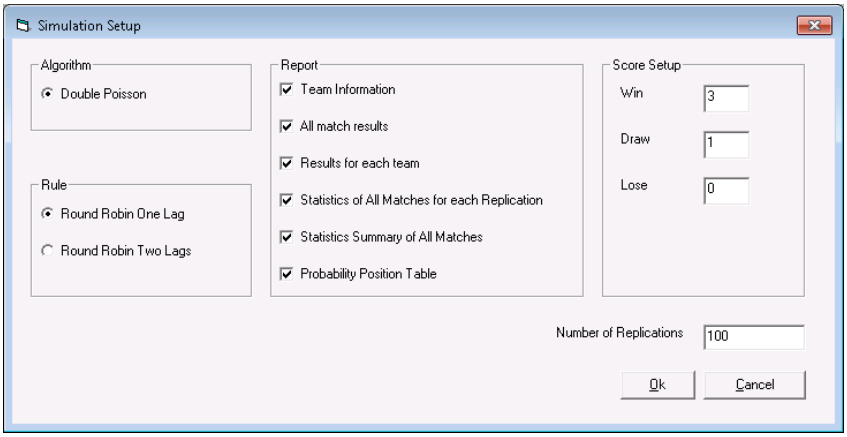

Figure 2. Graphical User Interface for Inputting Win, Draw and Lose Weightage Values

Table 2 shows the example of the outcomes for two-leg round robin, using the 3-1-0 point system and we simulate the soccer league for 100 times. We summarize that after 100 times played in the league, JDT played in total 2200 matches. From all matches, JDT win 792 matches, draw 1340 matches and lose 68 matches. The goal scored and conceded by the JDT team is 1056 and 120 goals respectively. The cumulative points collected by JDT after 100 simulations are 3716 points. Based on the 3-1-0 point system, we find that JDT has the highest probability to become the champion of the league (0.36) compared with other teams.

Table 2. The League Standings Using the 3-1-0 Point System

POS	TEAM	P	W	D	L	GF	GA	GD	PTS	P(win)
1	JDT	2200	792	1340	68	1056	120	936	3716	0.3600
2	KEDAH	2200	636	1413	151	857	245	612	3321	0.2891
3	PERAK	2200	512	1399	289	698	405	293	2935	0.2327
4	FELDA	2200	505	1400	295	683	421	262	2915	0.2295
5	PAHANG	2200	493	1402	305	655	419	236	2881	0.2241
6	SELANGOR	2200	478	1419	303	652	403	249	2853	0.2173
7	TTEAM	2200	308	1383	509	424	676	-252	2307	0.1400
8	PKNS	2200	286	1398	516	406	701	-295	2256	0.1300
9	KELANTAN	2200	267	1437	496	398	687	-289	2238	0.1214
10	MALACCA	2200	200	1431	569	309	788	-479	2031	0.0909
11	SARAWAK	2200	196	1409	595	288	808	-520	1997	0.0891
12	PENANG	2200	142	1339	719	212	965	-753	1765	0.0645

In Table 3, we show the number of league standing position after 100 simulations. The JDT team appears 58 times as a league champion, the Kedah team 25 times and the Pahang team 4 times as league champions.

Table 3. Numbers of Appearance in League Standing Position in 100 simulations.

TEAM	Post 1	Post 2	Post 3	Post 4	Post 5	Post 6	Post 7	Post 8	Post 9	Post 10	Post 11	Post 12
JDT	58	23	12	5	0	2	0	0	0	0	0	0
KEDAH	25	24	17	17	9	3	4	0	1	0	0	0
PAHANG	4	13	9	17	18	19	9	3	5	3	0	0
FELDA	4	15	15	20	13	13	5	8	3	4	0	0
SELANGOR	4	9	18	14	16	15	9	11	2	2	0	0
PERAK	5	11	23	14	18	13	7	4	3	2	0	0
PKNS	0	1	3	2	9	7	13	14	16	13	14	8
TTEAM	0	3	1	7	7	11	8	18	17	16	6	6
KELANTAN	0	1	2	2	5	10	17	14	15	14	11	9
MALACCA	0	0	0	1	3	3	13	12	13	21	18	16
SARAWAK	0	0	0	1	0	2	10	12	18	19	21	17
PENANG	0	0	0	0	2	2	5	4	7	6	30	44

In Table 4, we summarize the probability for each team to become the league champion for various point systems. For example, JDT have the highest probability to win a league using the 3-1-0 point system, followed by the 4-1-0 point system and thirdly by using the 2-1-0 point system.

Based on the Pearson correlation value, we find that there are small changes occurred in the teams' competition standing when we compared the actual rank position and the rank position in our simulation model. All the three point systems we consider give value more than 0.9. Its shows that all the points systems, either 3-1-0, 2-1-0 or 4-1-0 does not affect very much to teams' competition standing.

Table 4. Probability of Teams to Become League Champions and League Standing Position

Actual rank	TEAM	3-1-0 point system		2-1-0 point system		4-1-0 point system	
		Simulation rank	P(win)	Simulation rank	P(win)	Simulation rank	P(win)
1	JDT	1	0.3600	1	0.3134	1	0.3409
2	KEDAH	2	0.2891	2	0.2723	2	0.2841
3	PAHANG	5	0.2241	3	0.2264	4	0.2214
4	FELDA	4	0.2295	6	0.2205	5	0.2195
5	SELANGOR	6	0.2173	5	0.2182	3	0.2386
6	PERAK	3	0.2327	4	0.2327	6	0.2059
7	PKNS	8	0.1300	9	0.1200	8	0.1359
8	T-TEAM	7	0.1400	7	0.1377	7	0.1409
9	KELANTAN	9	0.1214	8	0.1318	9	0.1314
10	MALACCA	10	0.0909	10	0.0991	11	0.0868
11	SARAWAK	11	0.0891	11	0.0882	10	0.0900
12	PENANG	12	0.0645	12	0.0495	12	0.0518
Pearson Correlation Value		0.94		0.95		0.97	

4. Conclusion and Future Works

This paper explores the effect of changing point systems in a soccer league, particularly in a Malaysian soccer Super League. We consider three types of point systems; firstly 3-2-1, secondly 2-1-0 and thirdly 4-1-0 point systems. We simulate the individual match outcome using a double Poisson model and determine the winner, drawer and loser result based on the number of goals scored and conceded. We have developed the soccer simulation model using the Decision Support System.

Based on our analysis, we can conclude that all the point systems we consider give similar interpretation. There are very small changes occurring in the teams' competition standing. JDT and Kedah for example dominate the top two league rank while Malacca, Sarawak, Penang teams dominate the top three in the bottom league. Based on the comparison of the actual teams' competition standing and the simulation model, the result shows that the 4-1-0 point system gives a better result. The Pearson correlation value is 0.97. It shows that there are small changes in term of teams' competition standing when we compared the actual rank and the simulation rank position.

This research however has some limitations and needs further improvement. In our simulation model, we assume that the team strength and team weaknesses for all teams are constant throughout the league. In real situations, every team can make some adjustment in the middle of the league, such as the player's replacement because of the injured, low performance, etc. Secondly, the match prediction we used is very simple, a double Poisson model. Other match prediction models could be explored such as dynamic bivariate Poisson (Koopman and Lit, 2015), a Poisson regression model (Groll et.al, 2015), mixed model effect (McHale and Szcepanski, 2014). Instead of using a round-robin structure, the implication of the teams' competition standing could also be explored for a hybrid tournament and seeding policy rules (Scarf et. al, 2009; Scarf and Yusof, 2011).

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