

The Mechanisms in Place for Separating Teams with Identical Records in English football Leagues and International football Competitions

Andrew S. Brown⁺⁺ and Richard J. C. Brown^{*}

National Physical Laboratory, Hampton Road, Teddington, Middlesex, TW11 0LW, UK

(Received October 4 2007, accepted December 20 2007)

Abstract. In the 119 years since the formation of the English football league, there has only been one instance where two teams have finished a league season with identical records. In the paper, we analyse the final 2006-7 English Premier League using principal component analysis (PCA) to examine the likelihood of such an event occurring. We then review the mechanisms in place for separating teams with equal records in a range of English leagues, the major divisions of other UK football federations, and other international football competitions.

Keywords: Football, soccer, league, identical records, principal component analysis.

1. Introduction

The English Football League was established in 1888, making it the longest-running national football league in the world. During this time, there has been one instance where two teams have finished a league season with exactly identical records. There has been another occasion where two teams have finished with an identical number of points, goals scored and goals against, but a different number of wins, draws and losses.

With a modern league season consisting of up to 46 matches (depending on the number of teams in the division – see Section 2.1), the casual observer may think it unsurprising that there has only been one instance of identical records occurring in English league football because of the apparently large number of variables involved over the course of a season. In this work, we first briefly outline the format of the English Football League, the English pyramid system, and the other major football competitions studied. We then apply principal component analysis (PCA) to the final 2006-07 English Premier League table and, finally, review the mechanisms in place for separating teams with equal records in English leagues, the premier divisions of the other UK federations, and major international competitions,

2. Competitions studied

2.1. The English Football League[†]

The English Football League was founded in 1888 with a single division of 12 teams. The 1892-93 season saw the league expanded to two divisions that, by the turn of the century, each consisted of 18 teams. A third division was added in 1920-21, and second regional third division the following season – this regionalised third tier was split into Division Three and Division Four in 1958-59. With the league

⁺ Corresponding author. Tel.: +44-20-8943 6831; fax: +44-20-8614 0448
E-mail address: andrew.brown@npl.co.uk

^{*} The authors contributed equally to this work

[□] Correspondence address only. The work described in this article has not been carried out under the auspices of, and does not represent the views of the National Physical Laboratory

[†] For the sake of convenience, and to avoid confusion, the term 'Football League' is used throughout this article to describe the English professional league system (which currently consists of the four divisions outlined in Section 2.1). Since 1992-93, the top league in the English system ('The Premier League') has been run by the Football Association, with the next three leagues remaining under the auspices of The Football League.

suspended for the duration of the two World Wars, there have been a total of 371 completed divisional competitions over 110 seasons up to and including the 2006-07 season,

The four divisions are currently named:

- (1) The Premier League (20 teams)
- (2) The Football League Championship (24 teams)
- (3) Football League One (24 teams)
- (4) Football League Two (24 teams)

In each division, each team plays each other twice and therefore plays 38 or 46 matches.

2.2. The English football pyramid system

English football is organised in a 'pyramid' system – a hierarchy of leagues (the Premier League being the top league) which becomes more regionalised in structure at its lower levels. Promotion and relegation exist between all tiers, thus providing a theoretical route for the smallest village team to reach the Premier League.

The structure of the pyramid is detailed in full at [1] and a brief summary of the formation for the current (2007-08) season is given in Table 1. Note that Table 1 excludes pyramid levels 1 to 4, which are outlined in Section 2.1, and all leagues below level 12 - the pyramid actually extends down to level 24. [1]

Table 1: Outline of levels 5 to 12 of the English football pyramid system

Level	League(s)					
5	The Football Conference National					
6	The Football Conference North			The Football Conference South		
7	Northern Premier League (NPL) Premier Division		Southern Football League (SFL) Premier Division		Isthmian (south-east) League (IL) Premier Division	
8	NPL Division 1 North	NPL Division 1 South	SFL Division 1 Midlands	SFL Division 1 South & West	IL Division 1 North	IL Division 1 South
9	14 leagues [typically sub-regional (e.g. North-west) leagues' first divisions]					
10	14 leagues [typically sub-regional (e.g. North-west) leagues' second divisions]					
11	47 leagues [typically county (e.g. Cheshire) leagues' first divisions]					
12	47 leagues [typically county (e.g. Cheshire) leagues' second divisions]					

2.3. Other United Kingdom national football leagues

The premier national leagues of the other three UK football federations are also discussed in this article. In summary, the format of these leagues is:

- (a) Scottish Premier League. The league consists of 12 teams who initially play each other three times. The league then 'splits' into the top six and the bottom six, each team playing the other five teams in their half of the league one more time each. Each team therefore plays 38 matches.
- (b) Welsh Premier League. The league consists of 18 teams who play each other twice. Each team therefore plays 34 matches.
- (c) Northern Irish Premier League. The league consists of 16 teams who play each other twice. Each team therefore plays 30 matches.

2.4. Major international competitions

The format of the three internal competitions considered in this articles are summarised below.

- (a) FIFA World Cup Finals. The 32 national teams who qualify for the final competition are first split into eight groups, each consisting of four teams, the top two of which qualify for the knock-out stages of the competition. Each team therefore plays three matches in the group stage.
- (b) UEFA European Championship Finals. The 16 national teams who qualify for the final competition are split into four groups, each consisting of four teams, the top two of which qualify for the knock-out stages of the competitions. Each team therefore plays three matches in the group stage.
- (c) UEFA Champions League. Following a series of qualifying rounds, 32 European club teams are split

into eight groups each consisting of four teams. The top two in each group qualify for the knock-out stages of the competition and the third-placed teams enter the UEFA Cup (another European club competition). Each team plays all others home and away in the group stage and thus plays six matches in total.

3. Results and discussion

3.1. Principal component analysis

The variables in a standard football league table show a very large degree of correlation. Correlations in sets of multivariate data may be successfully elucidated by use of principal component analysis (PCA) techniques. A PCA analysis has been performed using XLSTAT software on the final 2006-07 English Premier League table, with the following variables included: position, games won, games drawn, games lost, goals for, goals against and points. The results of this analysis, a 'correlation circle' plot showing a projection of the variables of the PCA analysis in the factor space, displayed with respect to the two principal components, is shown in Figure 1. The full league table is given for information in Annex A.

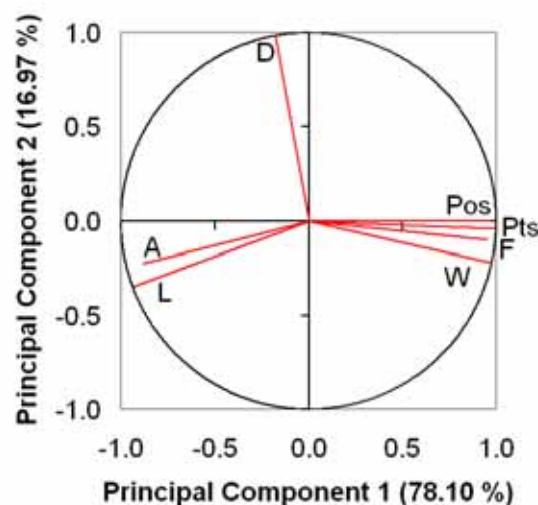


Fig. 1: Correlation circle plot showing a projection of the variables (Pos – position, Pts – points, W – number of wins, F – goals for, D – number of draws, L – number of losses, A – goals against) of the PCA analysis in the factor space, displayed with respect to the first two principal components for the final 2006-07 Premier League table.

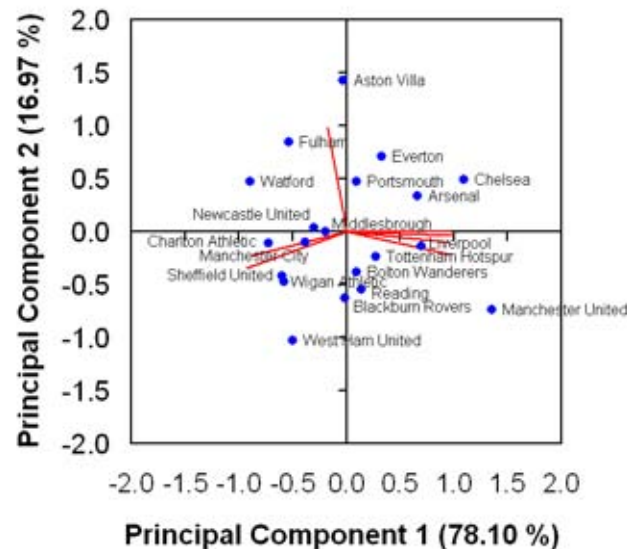
The two principal components which best describe the variability of the dataset account for 95% of the total variability, which is very high for multi-dimensional data sets. Principal component (PC)1 is associated with the number of games won and lost, whilst PC2 is associated with the number of games drawn. When two variables are far from the centre, then, if they are close to each other, they are significantly positively correlated. If they are orthogonal, they are not correlated; and if they are on the opposite side of the circle, then they are significantly negatively correlated. It is clear from Figure 1 that position, points, number of wins, and goals scored are highly positively correlated with each other, and all highly negatively correlated with number of losses and goals against. Interestingly, number of draws shows almost no correlation with any other parameter.

Figure 2 displays a 'scores plot' of the projection of the individual observations (in this case the teams in the Premier League in 2006-07) in factor space with respect to the first two principal components (the correlation circle plot is overplayed for comparison). Teams to the right of the figure have won more games than they have lost, whilst those on the left have lost more than they have won. Teams towards the top of the plot have drawn many games (Aston Villa), and those towards the bottom have drawn only a few (West Ham United). Hence those teams with the largest positive values on the PC1 axis performed best in the Premier League (Manchester United, Chelsea, Liverpool and Arsenal), whilst those teams with the largest negative values on the PC1 axis did least well (Watford, Charlton Athletic and Sheffield United were all relegated). As indicated by the correlation circle plot, the value displayed by a team on the PC2 axis has little correlation with performance in the Premier League. Moreover, those teams which appear very close together on the scores plot will have very similar records. An example of this in the 2006-27 season is Wigan and Sheffield United who finished with the same points, wins, draws and losses, and were separated by goal difference, -22

to -23 respectively.

Figure 2: Scores plot of the projection of the individual observations (in this case the teams in the Premier League in 2006-2007)) in factor space with respect to the first two principal components. The correlation circle plot is overlaid for comparison.

Principal component analysis has proved to be an interesting methodology to analyse the correlation present in football leagues tables and to investigate relative team performance over the season. It has been shown that many of the variables in a league table are actually highly correlated, and one should not be



surprised that teams finish league seasons with very similar leagues records. It has been shown that this shows up on a principal component scores plot as the teams in question appear very close to each other. Teams with identical records would be co-incident on the scores plot. Interestingly the number of draws attributable to individual teams over the course of a season showed no significant correlation to any of the other variables, and did not have a great effect on final league position.

3.2. Mechanisms for separation teams with identical records

Considering the results of the PCA outlined above, it is somewhat surprising that there has only been one occasion where two teams have finished one of the 371 completed English League divisional competitions with exactly identical records. This occurred exactly a century ago when Blackburn Rovers and Woolwich Arsenal shared 14th place in Division One of the 1907-08 season with records of P38, W12, D12, L14, F51, A63, Pts36. Tranmere Rovers and Chesterfield came very close to repeating this feat in the 1952-53 Division Thee (North): both teams had records of P46 F65 A63, Pts47, but a different number of wins (21 and 18 respectively).

There have, however, been occasions in more recent times when it seemed as though there may be a tie for ultimate prize in the England domestic game, the Football League title. The nearest we have come thus far was the 1988-89 season when Arsenal secured the league title by virtue of having scored eight more goals during the course of the season (points and goal difference were identical for both teams). There have also been numerous instances when promotion and relegation issues have been decided on goal difference or goals scored.

Table 2 summarises the mechanisms for separating teams with an equal number of points (All information here, and throughout this article has been obtained from rules published on the leagues' websites, or by direct contact with league officials.)

We first consider the English leagues. The reader may be surprised to find that the Premier League do not have a firm rule in place should two teams have identical records – a Premier League spokesperson confirming that being that “the Premier League Board would need to decide an appropriate method of determining the result, through means such as a play-off”. If the top two teams in the league were to finish a season with equal records, it is quite likely that one of the teams would be involved in an end-of-season cup final, and a number of their squad members may be required to play in a summer international competition, so a decision would need to be made by the Premier League Board very quickly, otherwise a mutually convenient date for a play-off may be difficult to find.

By contrast, the leagues further down the English pyramid structure have specific rules to separate teams with identical records. Regulation 9.2 of the Football League (pyramid levels 2 to 4) specifies a play-off if teams cannot be separated by goal-difference, goals scored or head-to-head record, and similar mechanisms exist in the rules of all the leagues forming levels 5 to 8 of the pyramid. The one league studied at pyramid levels 9 to 10, the North West Counties League, also stipulate a play-off between the teams involved, as do the top leagues of the other three UK associations (Scottish Premier League, Welsh Premier League and Northern Irish Premier).

Table 2: Criteria used to separate teams finishing with an equal number of points in the competitions listed (GD = goal difference, H-to-H = head-to head record)

League / competition	Country	Pyramid level	Criterion number				
			1	2	3	4	5
Premier League	England	1	GD	Goals	Note A	-	-
Championship; Leagues 1 & 2	England	2 – 4	GD	Goals	H-to-H	Play-off	-
Football Conference	England	5 – 6	GD	Goals	Wins	Play-off	-
Northern Premier League	England	7 – 8	GD	Goals	Play-off	-	-
Southern Football League	England	7 – 8	GD	Goals	Wins	H-to-H	Play-off
Isthmian League	England	7 – 8	GD	Goals	Wins	H-to-H	Play-off
North West Counties League	England	9 – 10	GD	Goals	Wins	Play-off	-
Scottish Premier League	Scotland	-	GD	Goals	Note B	-	-
Premier League	Wales	-	GD	Goals	Wins	Play-off	-
Premier League	N. Ireland	-	GD	Goals	Play-off	-	-
2006 World Cup	FIFA	-	GD	Goals	H-to-H	Lots	-
2008 European Championship	UEFA	-	H-to-H	GD	Goals	Note C	-
2007-08 Champions League	UEFA	-	H-to-H	GD	Goals	Note D	-

Note A: The teams are given an equal position in the league unless the title or any other issue (e.g. relegation, qualification for a European club competition, etc.) is at stake. In this case, the Premier League Board would need to decide an appropriate method of determining the result, through means such as a play-off.

Note B: The teams are given an equal position in the league unless the title or any other issue (see above) is at stake. In this case, a play-off is held, with extra time then penalty kicks in the event of a draw.

Note C: In the event of the two teams involved playing each other in the final group game, a penalty shoot-out is used to determine league placings. In other circumstances, the next criteria are: (4) record in the qualifying stage of the competition, (5) fair play ranking, and (6) the drawing of lots. (Information from articles 7.07 & 7.08 of [2].)

Note D: Coefficient. (For a detailed explanation of UEFA's coefficient, see Articles 6.05, 8.02 and Annex II of [3].)

The probability of a tie occurring are even greater in the mini-leagues used in the early stages of International and European club competitions because of the fewer permutations possible in smaller groups. The most famous example of this was Group F in the first round of the 1990 FIFA World Cup Finals (held in Italy) which ended as shown in Table 3.

Table 3: Final table, Group F, 1990 FIFA World Cup

	P	W	D	L	F	A	Pts
England	3	1	2	0	2	1	5
Rep. of Ireland	3	0	3	0	2	2	3
Netherlands	3	0	3	0	2	2	3
Egypt	3	0	2	1	1	2	2

As the Republic of Ireland and the Netherlands drew against each other, they could not be separated in any way, so lots were drawn to decide second and third place. Both teams however qualified for the second round as the rules of the competition in 1990 (which consisted of 24 teams) also saw the four third-placed team with the best record qualify for the knock-out stages. As an aside, if Egypt had scored an equalizing goal in their 0-1 defeat by England, the Group would have finished in a four-way tie.

UEFA's Champions League and European Championship competitions also have well-defined rules in place to separate teams (as with the World Cup, scheduling an extra play-off game is impracticable.) The Champions League uses head-to-head record before total goal difference, goals scored, and a 'coefficient' calculated from performances of the club and its association over the previous five seasons. The rules for the 2008 European Championship Finals detail the sequence for separating teams as: head-to-head record, goal difference, goals, record in the qualifying stage of the competition, fair play and the drawing of lots. If, however, the two teams involved play each other in the final group game, the criteria after goals scored are disregarded and replaced by a penalty shoot-out.

4. Conclusions

Since its inception in the 1888-89 season, there has been once instance of two teams finishing a season with identical records, a further occurrence of two teams having equal points, goals scored and goals conceded, and a number of near misses (including the outcome of the Football League title in 1988-89). We have used PCA to demonstrate that the variables in a league table are highly correlated and we therefore conclude that the fact that these incidences have occurred in the 371 completed divisional competitions in the Football League should not come as a surprise.

We have also studied the mechanisms in place for separating teams with identical records in a number of English, other UK and major international football competitions. With the exception of the English Premier League, all of the competitions consider that the possibility of two teams finishing with identical records is high enough to warrant a regulation outlining how to separate the teams involved

5. Acknowledgements

The authors would like to acknowledge kind assistance of the officials of the UK football competitions contacted during the compilation of this article.

6. References

- [1] www.thepyr.amid.info/asp/pyramid3.asp
- [2] Regulations of the UEFA European Football Championship 2006,08.www.uefa.com/newsfiles/19079.pdf
- [3] Regulations of the UEFA Champions League 2007,08.www.uefa.com/newsfiles/19071.pdf

Annex A

The final table of the 2006-07 English Premier League is shown below. Teams are awarded three points for a win, one point for a draw and no points for a loss. The three teams below the dashed line were relegated.

		Pl	W	D	L	F	A	Pts
1	Manchester United	38	28	5	5	83	27	89
2	Chelsea	38	24	11	3	64	24	83
3	Liverpool	38	20	8	10	57	27	68
4	Arsenal	38	19	11	8	63	35	68
5	Tottenham Hotspur	38	17	9	12	57	54	60
6	Everton	38	15	13	10	52	36	58
7	Bolton Wanderers	38	16	8	14	47	52	56
8	Reading	38	16	7	15	52	47	55
9	Portsmouth	38	14	12	12	45	42	54
10	Blackburn Rovers	38	15	7	16	52	54	52
11	Aston Villa	38	11	17	10	43	41	50
12	Middlesbrough	38	12	10	16	44	49	46
13	Newcastle United	38	11	10	17	38	47	43
14	Manchester City	38	11	9	18	29	44	42
15	West Ham United	38	12	5	21	35	59	41
16	Fulham	38	8	15	15	38	60	39
17	Wigan Athletic	38	10	8	20	37	59	38
18	Sheffield United	38	10	8	20	32	55	38
19	Charlton Athletic	38	8	10	20	34	60	34
20	Watford	38	5	13	20	29	59	28