HOME ADVANTAGE AND TIED GAMES IN SOCCER

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0. Introduction.

Home advantage and the occurence of tied matches are an important feature of soccer. In the national competition in the Netherlands about half the games end in a victory for the home team, one quarter end up tied, while only one quarter results in a win for the visiting team. In addition, the number of goals scored per game (one average about 3) is rather low. The home advantage is supposedly evened out between the teams by playing a full competition, where each two teams play two matches with both as home team in turn.

I have wondered about the matter of the considerable home advantage in soccer ever since I first became interested in it.[1] This was the result of the book *"Speel nooit een uitwedstrijd – Topprestaties in sport en management"*[2] by Pieter Winsemius (1987). In this book he discusses various aspects of business management and illustrates these with facts and anecdotes from sports. In the first chapter he notes that in the German Bundesliga the top teams get their high positions in the standings on the basis of regularly winning away games. Teams on lower positions have often lost only a few more home matches, but it is the away games where they have gained much fewer points. The message is clear: never play an away game! In management terms this lesson means, according to Winsemius, for example that you arrange difficult meetings to take place in your own office.

Clearly, home advantage plays an important role in soccer competitions. Look for example at tournaments like regional (e.g. European) and world championships. The final round has a clear home advantage for the country organising the championships. Of the 17 times the FIFA World Cup competition has been held, six times the organising country has become world champion, while it has been runner-up on two more occassions. In the preliminaries there is the system of group competitions with each team playing each other team once at home and once away. When two teams end with the same number of points, sometimes then the outcome of the two matches these teams played against each other are often determining the ranking. Here there is no obvious home advatage.

In a knock-out competition each team plays a home and an away game and the aggregate counts, which would compensate for home advantage. To break a possible tie, goals scored in away matches count with double weight when the aggregate is calculated. If this does not produce a winner, the game continues in overtime; clearly here the home team might very well have an advantage. A penalty shoot-out follows when in overtime no winner appears and again the home team might be in a advantageous position.

The low number of goals per match, the relatively large incidence of tied games and the home advantage have a serious effect on the game. It can be further illustrated by considering two extreme examples, that I recall. These are extremes and they illustrate the possible effects in a magnified way.

The first is a curious development that happened in the preliminaries to the 1984 European championships. In group 7 participated Spain, the Netherlands, Ireland, Iceland and Malta, so each country played eight matches. The two favorites, of which only one would proceed to

[1] I have also noted that in other sports the home advantage is much less prominent. E.g. in Major League Baseball in the USA the home advantage is very small and I have often wondered why.

[2] Never play an away game – Top performance in sports and management.

Table 1: Developments in Group 7 in the preliminaries to the 1984 European Championships.

Team	Final		Home					Away				
	pnts	goals	win	tie	loss	pnts	goals	win	tie	loss	pnts	goals
	Results after October 16, 1983											
Netherlands	11	17– 6	3	0	0	6	7– 2	2	1	1	5	10– 4
Spain	11	12– 7	3	0	0	6	4– 0	2	1	1	5	8– 7
Ireland	9	20–10	2	1	1	5	15– 6	2	0	2	4	5– 4
Iceland	3	3–13	1	1	2	3	2– 5	0	0	4	0	1– 8
Malta	2	4–20	1	0	3	2	4–11	0	0	0	0	0– 9
	Results after December 21, 1983											
Spain	13	24– 8	4	0	0	8	16– 1	2	1	1	5	8– 7
Netherlands	13	22– 6	4	0	0	8	12– 2	2	1	1	5	10– 4
Ireland	9	20–10	2	1	1	5	15– 6	2	0	2	4	5– 4
Iceland	3	3–13	1	1	2	3	2– 5	0	0	4	0	1– 8
Malta	2	5–37	1	0	3	2	4–11	0	0	0	0	1–26

the final tournament in France, were Spain and the Netherlands, but Ireland was considered an serious outsider. Already in its first game, the Netherlands played a tie against Iceland in Iceland (1 – 1), a loss of a point that would cost dearly. The games between the Netherlands and Spain ended in a win (1 – 0) for Spain and a win for the Netherlands (2 – 1) in their home games. By October 1983 all matches had been played, except the Netherlands against Malta on December 17 and Spain against Malta on December 21, four days later. Both Spain and the Netherlands had won five times, played one tie (Spain against Ireland in Ireland) and had one loss (in their away games against each other); and therefore had an equal number of points.[3] Both were expected to win at home against Malta, so the balance of goals (goals scored by a team minus goals scored against that team) would count. The situation has been summarised in the top part of Table 1.

At that stage the Netherlands had scored 17 goals (of which 7 at home in three games and 10 away in four matches) and Spain 12 (4 at home and 8 away). So, the Netherlands had by far a better aggregate in goals. The Netherlands subsequently beat Malta at home with 5 – 0 final score and that meant that Spain would need to win from Malta with at least 11 goals difference to get equal in aggregate and to proceed to the finals on the basis of goals scored[4]. In the first half Malta to everybody's surprise scored and at the intermission the score was 3 –1 for Spain. Everything seemed OK for the Netherlands. But then in the second half Spain started scoring at a fast rate and, watching the game on television, I quickly realised that it was at the required rate of one goal per five minutes in order to score nine times. I remember that only halfway through the second half, the television commentator noted this and only then started to worry. In the end the game ended 12 – 1 and Spain went to the finals in France (lower part of Table 1). There has been speculation that there was foul play involved, but that of course has never been proven. Certainly the amateurs of Malta suffered from the fact that they had

[3]At that time a winner was given two points and in case of a tie each team gained one point. Since middle 1990's the winner gets three points, a measure taken to make the game more offensive and attractive. We will see below that very little difference can be noticed. But of course with this method both would still have had equal points.

[4]If the difference would be eleven and the away goals would have counted twice the Netherlands would go to the finals, but the rule was at the time that then the number of goals scored would determine the result. If the combined result of the matches between Spain and the Netherlands would have determined the outcome, Spain would proceed, since the aggregate of goals in the two games was he same, but Spain scored one away goal that would count with double weight.

Table 2: Points gained in home and away matches for the Dutch soccer competition 2004–2005.

Team	Final			Home					Away				
	#	pnts	goals	win	tie	loss	pnts	goals	win	tie	loss	pnts	goals
PSV	1	87	89–18	16	0	1	48	50– 8	11	6	0	39	39–10
Ajax	2	77	74–33	11	3	3	36	32–17	13	2	2	41	42–16
AZ	3	64	71–41	10	6	1	36	39–12	9	1	7	28	32–29
Feyenoord	4	62	90–51	11	1	5	34	55–27	8	4	5	28	35–24
SC Heerenveen	5	60	64–52	9	2	6	29	32–26	9	4	4	31	32–26
FC Twente	6	54	48–38	7	5	5	26	29–19	8	4	5	28	19–19
Vitesse	7	54	53–49	7	3	7	24	23–24	9	3	5	30	30–25
Roda JC	8	47	60–55	8	4	5	28	34–21	5	4	8	19	26–34
RKC	9	47	44–51	8	5	4	29	26–22	5	3	9	18	18–29
Willem II	10	45	44–56	9	2	6	29	30–25	4	4	9	16	14–31
FC Utrecht	11	44	40–43	8	3	6	27	23–20	4	5	8	17	17–23
FC Groningen	12	40	50–58	5	5	7	20	23–24	6	2	9	20	27–34
NEC	13	37	41–47	7	6	4	27	27–21	2	4	11	10	14–26
ADO	14	36	44–59	7	2	8	23	25–26	3	4	10	13	19–33
NAC	15	35	43–67	4	4	9	16	24–32	5	4	8	19	19–35
RBC	16	32	38–77	6	2	9	20	22–27	4	0	13	12	16–50
de Graafschap	17	19	32–78	3	5	9	14	19–38	1	2	14	5	13–40
FC den Bosch	18	19	23–75	4	1	12	13	13–33	1	3	13	6	10–42

to play two matches in five days and were clearly at the end of their physical (and maybe also mental) resources in the second half against Spain. And of course, Spain had the advantage of knowing how many goals it had to score and the home advantage to try and do that.

The second notable case concerns the large incidence of tied games and that played an extreme role in 1988 when PSV Eindhoven won the predecessor of the Champions Laugue competition, the tournament for the Europe Cup I for national champions. This followed at that time a knock-out system. PSV played Galatasaray Istambul in the first round, winning with 3 – 0 at home and but loosing with 2 – 0 away. In the second round they eliminated Rapid Wien, winning first the away game with 2 – 1 and winning at home with 2 – 0. In the quarterfinals they played Girondins Bordeaux and both games ended in a tie, first in Bodeaux with 1 – 1 and then in Eindhoven with 0 – 0. So PSV advanced on away goals. In the semi-final exactly the same thing happened against Real Madrid, first a tie in Madrid with 1 – 1 and then 0 – 0 in Eindhoven. The final was against Benfica Lisbon, which ended in 0 – 0, even after overtime. PSV won the subsequent penalty shoot-out (6 – 5). So, PSV then won the Europe Cup I with no less than five ties of which each gane in the quarterfinals, semifinals and the final. Only two goals for and two against in 300 minutes (5 hours!) of play. Not a very convincing and overwhelming victory of the tournament!

1. Some statistics on soccer.

It is not difficult to find on the Web a site with archival information about soccer in the Netherlands. The most extensive site is that of the magazine *"Voetbal International"* at **www.vi.nl**. Other possible sites are *"Voetbalstats.nl: Opstellingen, feiten en statistieken"* at **www.voetbalstats.nl** or *"Archieven Voetbalfocus"* at **www.beijen.net/frank/arch**.

Table 3: Results (in percentages) of games and goals scored over the last 15 years in the Dutch soccer championship competition. The lower part (AFP) concerns only matches in which Ajax, Feyenoord or PSV are among the teams.

	hometeam			goals		
	win	tie	loss	home	away	total
1990–1995	45.7	27.6	26.7	1.71	1.19	2.89
1995–2000	47.7	24.2	28.0	1.81	1.30	3.10
2000–2005	48.4	23.3	28.3	1.73	1.23	2.95
1990–2005	47.3	25.1	27.7	1.75	1.24	2.98
AFP at home	75.8	14.9	9.3	3.04	0.95	3.99
AFP away	21.8	26.3	51.9	1.07	1.94	3.01
AFP games	48.8	20.6	30.6	2.05	1.44	3.50

First let me illustrate the finding of Pieter Winsemius for the Dutch national competition. In that competition (also called the *"Holland Casino Eredivisie"* after the main sponsor) 18 teams compete and play a full set of matches; that is to say one home and one away game against every other team. The winner is the national champion and the top teams qualify for either the European Champions League or the EUFA Cup competition. So a total of 306 matches are played per year. The results for the season 2004–2005 have been collected in table 2.

We see the effect of Pieter Winsemius approximately; the numbers 5 through 14 in the final standing have earned between 23 and 29 points at home, but between 10 and 31 points away. Most teams indeed gained more points in home games than away. Actually, the home advantage is quite large. Of the 306 matches played, 140 (45.8%) end in a win by the home team, 107 (35.0%) in a win by the visiting team and 59 games (19.3%) end in a tie.

In goals scored the difference is also considerable. Of the 948 goals scored, 526 (55.5%) were scored by the home team and 422 (44.5%) by the visiting team. This translates into 1.72 goals per game for the home team and 1.38 for the away team for a total of 3.10 goals per match. It is of interest to look over longer periods to see how typical this is and that is done in Table 3 and involves 4590 games.

There is not much variation with time, although the trend is that there are somewhat fewer ties in recent times, but the wins are distributed equally over both teams (in a ratio 1.71 between home and visiting teams). In rough terms the distribution 47-25-28 means a win by the home team half the time and ties and wins by the away team a quarter of the time. There is no real trend in the number of goals scored per match, nor in the distribution among the two teams.

On a longer time scale the total number of goals per match changed in a minor way. Between 1956 and 1965 it was 3.36, between 1965 and 1975 it dropped to 2.83, went back to 3.10 between 1975 and 1985 and was 2.98 between 1985 and 1995. The decrease after the first interval is probably significant and might correspond to real changes in the technical skills and physical condition of the players. With the season 1995–1996 the method of awarding three points per win was introduced. For the period 1995–2005 the average number of goals per game remained at 3.00. If indeed the objective was to make the game more attractive by awarding wins more points, it certainly is not observed in the number of goals per match. But possibly the decrease in tied games noted above is a positive result.

In order to look into that point in more detail I calculated the percentage of tied games per decade as I just did for the goals per match averages. Between 1956 and 1965 the tied games

were 24.7% of the total, between 1965 and 1975 it rose a bit to 26.9%, remained at about this level with 27.2% between 1975 and 1985 and 27.4% between 1985 and 1995 and then dropped to the current value of 23.8% between 1995 and 2005. The increase between 1956–1965 and 1965–1975 may again be due to a changes suggested above. But we do see a probably significant decrease from about 27% before the "three-point rule" to the 24% now.[5]

The conclusion for the moment is then that there is a relatively large fraction of games ending in a tie, at least more than I would consider desirable, and a relatively low number of goals per match. I will look at different sports in the next section. For soccer the two effects may be coupled in the sense that when a game has few moments of scoring and the majority of the teams are of roughly equal strength, then a relatively large number of ties is not unexpected. If there are more goals per game, then there are more possible final scores in the first place and ties make up a smaller percentage of these. And in the Dutch championship competition, the difference in teams is very small if we ignore the top three or four and the bottom three or so.

A way to check this possibility (i.e. looking for consistency rather than trying to prove it) is by examinig the *"Amstel Cup"* (now the *"Gatorade Cup"*) which is played by a knock-out competition with only one game between two teams and the home team determined by random draws. The teams participating range all the way from the national champion and teams in the highest division (sometimes even their second teams), teams from the lower division of professional soccer to the best amateur teams in the country. So there is a whole range of strengths. The matches go into two times 15 minutes overtime if the score is equal and a penalty shoot-out determines the winner if that still is the case at the end of overtime. So, there clearly should be a definite advantage for the home team. The strongest teams do not partake in the early rounds, which was played in groups until the season 2002–2003.

I have taken the three competitions starting in 2002 and ending in 2005. The listing I used did not indicate whether or not a game went into overtime, but did say when the final result was determined by a penalty shoot-out. Of the 215 matches (for 2002–2003 played after the end of the initial group matches), 92 (42.8%) ended in a win by the home team and 111 (51.6%) in a loss by the home team (remember sometimes after overtime). In 12 cases (5.6%) there was a penalty shoot-out and this was won 7 times by the home team. So, we see that the home advantage in terms of outcome of the match has disappeared, probably partly because of the larger difference in strengths. Indeed the number of goals per match is 3.93, but some of these goals must have been scored in overtime. Still the highest scores are found in the initial stages and this average is almost one goal more per match than in the normal competition with teams that are more or less equal in strengths.

In this context it is also interesting to look back at those matches in the national competition in with the strongest teams in the competition participate. The lower half of Table 3 therefore has over the same years of competition only those games where Ajax, Feyenoord or PSV participate. We see that the overall outcome is that the home advantage remains, but now in the sense that the rate of occurence of ties is 15% at home and 26% away. These three teams win about 75% of their home matches and still 52% of their games away and loose only 9% of their matches at home and 22% away. We do see that the number of goals per match is significantly higher than the average when the strong teams play at home, the visiting teams having some more difficulty scoring and the strong home teams scoring about three goals per game. When the strong teams play away, the host teams have about the same scoring rate as they have in away games, but the visiting strong teams of course score more goals than the average away team, leaving the

[5] Actually, in the 2005 and 2006 seasons the percentage of tied games has dropped to 19.6 and 19.3 respectively. The percentage of wins by visiting teams has gone up to 35.0 and 31.0, while the home wins have changed little and were 29.5 and 45.8. (Added in June 2006.)

total number of goals in these matches about the same as the average. Interestingly, on average AFP score about three goals per match at home and two away, but both at home and away the other teams score one goal per match.

2. Comparison to other sports.

The next step is to compare this to other sports, keeping in mind that in soccer there are very few goals per match, rather many tied games and a pronounced home advantage. I will express this home advantage simply as the ratio of matches where the home team wins to that where the visiting team wins. I call that the Home Advantage Ratio HAR. Also we will see how some other sports treat the matter of resolving tied games.

Let us first turn to a sport that might be expected to be on first principles comparable to soccer, namely field hockey. I look at the scores in the highest league ("Rabo Hoofdklasse") for both men and women between February 2005 and March 2006. This concerns a total of 142 matches played. The average number of goals per match is 5.35 for men and 3.94 for women, so with a total average of 4.65 it is definitely higher than for soccer. The distribution of wins over home and away teams is almost similar for men and women, namely in 45.8% the home team wins, 12.7% of the games end tied and in 41.5% of the matches the away team wins. So, we see here a higher number of scores per match, a much lower incidence of tied games and the home advantage has almost disappeared.

Next we turn to handball, which has many more scores per match. I look at the Dutch competition in the highest leagues ("Eredivisie") for the season 2005-2006 (up til mid-March) again both for men and women, which means a total of 256 games. The number of goals per match is 56.5 for men and 49.8 for women. The differences between men and women are not grossly different. For handball in 53.9% of the matches the home team wins, 5.9% of the games end tied and in 40.2% of the matches the away team wins. The percentage of tied games is again lower than in soccer, but the home advantage is now somewhat more pronounced than it was for field hockey, although not as extreme as for soccer. For handball the home advantage ratio is 1.34, for field hockey it is 1.10 and for soccer it was 1.71. Although an effect for handball, home advantage is not at all such a significant factor as it is for soccer, also because in handball ties are relatively rare.

The last sport for which I take competitions in the Netherlands is baseball, which I will also discuss below for the case of Major League Baseball in the USA. Here it should be noted that tied games are avoided largely by playing overtime (of one inning for each team at a time) until the end of the 12th inning, and only then the game is actually declared tied. The "Major League" in the Netherlands is considered for the competitions 2004 and 2005. In these two seasons 348 games have been played. Only 7 (2.0%) end in a tie. There is a modest, but noticable home advantage; of all games 54.0% is won by the home team and 44.0% by the visiting team, but sometimes after overtime. The home advantage ratio is 1.23.

Now let us look at American sports. One feature of this is that in the USA it is generally considered so undesirable that a match ends in a tie that always some measures to break a tie are in use. Of the four major American sports I look at baseball, American football and ice hockey, leaving basketball outside the discussion. Basketball is played indoors and characterised by very high scores. Often in basketball matches the scores go up rather evenly and the last 5 or 10 minutes really determine the outcome. In ice hockey and American football the length of the match is measured in real playing time. The clock stops whenever the is no play ongoing; this facilitates commercials when the game is being televised.

Table 4: Summary of the home advantage ratio HAR, percentage of ties and scores per match in various sports.

Sport	HAR	ties (%)	scores/game
Soccer (NL)	1.71	23	3.0
Field hockey (NL)	1.10	13	4.7
Handball (NL)	1.34	6	53
Baseball (NL)	1.25	2	4.1
Ice hockey (USA)	1.37	0	5–6
American Football (USA)	1.31	0	∼9
Baseball (USA)	1.19	0	4.8

First, let us consider ice hockey in the NHL (National Hockey League). When after three periods of 20 minutes playing time (the regular total time for a match after which the winner gets 2 points for the standing) the game is tied, each team is awarded 1 point. Then they play a 5 minutes playing time in overtime until a *"sudden death"* (sometimes also called *"golden goal"*) and the winner gets an additional point. If the overtime does not produce a winner the game is decided by a shoot-out. So that there always is a winner. I looked at the 2004–2005 season, in which 1824 games have been played. The listing I had does not state how many games have been decided in overtime, but it does for each team indicate how many points it won in overtime without winning the game. From this I reconstruct that 45.3% of the time the home team wins in regular time and 33.0% of the time the visiting team. In total then 21.7% of the time the match goes into overtime, of which the precentage of wins are 11.4% for the home team and 10.3% for the away team. So, we see a mild home advantage during regular game time (the home advantage ratio used above is 1.37), but not very much in games that go into overtime (in this season this occured 198 times). The relatively large fraction of games ending in a tie at the end of regular time is avoided by this interesting way of treating tied games. The number of goals per match is 6.21; this does include goals in overtime and reducing this for it results in somewhat more than 5[6].

Now I turn to American Football in the National Football League (NFL). Here there is also a tie break, which almost always produces a winner. If after four quarters regular time (of 15 minutes playing time each) the game is tied, there is an overtime of 15 minutes playing time, during which any score produces a sudden death. If no score has been made after 15 minutes the result of the fourth quarter determines the winner. If there was also no winner in the fourth quarter, then the game is pronounced tied. In the seasons 2001 to 2005 (5 seasons of about 250 games each) a tie has occured only once, so it is very rare indeed. In the seasons 2001 and 2005 (a total of 504 matches), the home team won 56.9% of the games and the team on the road 43.1%. I have no information how many of these games went into overtime, but my experience is that it does not happen very often. The home advantage ratio is 1.31. I have estimated the number of scoring occassions per game as follows. In the two seasons the teams played 504 games and scored 20580 points or 40.8 points per game. A first estimate would be that two-thirds of these are fieldgoals and one-third a touchdown followed by a one-point conversion in essentially all cases. That would lead to an estimate of the number of scoring occassions of about 9 per game.

Finally I turn to America's national sport, baseball. Here a tie is virtually impossible; it

[6]Here I first assumed that almost all games in overtime ended before a shoot-out was necessary and found a result of 5.0; if a significant fraction of the games that go into overtime go into a shoot-out then the end result is between 5 and 6 goals per game during regular time.

only occurs when weather or other conditions force the umpires to end the game. Otherwise it continues with an additional inning for each team at a time. For Major League Baseball there is a very involved statistical research effort, called *"Sabermetrics"*[7]. It uses databases for professional baseball as it has been played since the last decade or so of the nineteenth century. In fact, each play ever played in Major League Baseball has been and is being recorded and archived.[8]

In the regular season of MLB in 2004, 2428 games were played, of which 53.5% was won by the home team. In the 2429 games in 2005 this was 55.0%. So, in Major League Baseball the home advantage is small. The home advantage ratio was 1.15 in 2004 and 1.22 in 2005. In addition a regular season means 162 games for each team, so that any effect of a poor day or injuries of the best players is minimised. For the 2005 season only 7.7% of the games (186) went into overtime; of this 4.2% was won by the home team and 3.5% by the visiting team. Here the home advantage is somewhat more pronounced. Of these 186 games in overtime, 79 ended after the 10th inning, 57 after the 11th, 28 after the 12th, 15 after the 13th and 4 after the 14th inning. One each went on until the 15th, 16th and 18th innings. For MLB the home advantage is small and ties are avoided, but note that less than 1% of the games going into overtime for more than three innings.

So, what have we learned? The results have been collected in Table 4. Clearly, soccer is unusual in that it suffers from a small number of scoring moments per match and has a rather pronounced home advantage and incidence of tied games. Most other sports do not have that intrinsically or find ways to avoid the most serious aspects of this. It has been suggested that maybe in football the goals should be enlarged so that the number of goals per game goes up, but that has been met with fierce opposition. I don't really see why it is not an option and why one should be so conservative in this. After all, the only thing it does would be to destroy comparative statistics, but it is already strongly affected by the passage of time (nowadays there are more international competitions and players play many more matches per year than a few decades ago). I think that efforts to find out who was the best player or sporter of all time are interesting, but the attractiveness of the sport is more important. Enlarging the goal might very well make the game more attractive (after all, with the current low number of scores, the team that gets ahead is tempted to start playing more defensively, while that would be less likely when there are more scores) and in addition reduce the home advantage and possibly also the number of tied games.

3. What possible changes can we contemplate?

If the option of enlarging the goals is not feasible for whatever reason, it may be of interest to think about other possibilities to make the game more offensive. We have seen that the double weight on goals scored in away games to break tied games and avoid overtime in international competitions and the award of three points per win in regular competitions are options that have already been applied. The "three-point rule" may very well have resulted in a slightly reduced percentage of tied games in the Dutch competition from 27% to 24% or so (and even below 20% in the last two years). I will investigate two possibilities now, that take the home

[7]Sabermetrics comes from SABR, the Society for American Baseball Research.

[8]The preoccupation with statistics in baseball has prevented the use of new and improved materials, such as bats made out of metal or artificial materials. Instead wooden bats are still used even though these often break. The involved way in which sabermetricians calibrate stadiums and circumstances changing with time and correct players' accomplishments for such effects would suggest that they should be able to tackle such changes also.

Table 5: Points gained in home and away matches for the Dutch soccer competition 2004–2005 in the new counting system. The second column shows the ranking in the old (current) system.

Team	Final			Home					Away				
	#	pnts	goals	win	tie	loss	pnts	goals	win	tie	loss	pnts	goals
PSV	1	77	89–18	16	0	1	32	50– 8	11	6	0	45	39–10
Ajax	2	70	74–33	11	3	3	25	32–17	13	2	2	45	42–16
Feyenoord	4	55	90–51	11	1	5	23	55–27	8	4	5	32	35–24
AZ	3	55	71–41	10	6	1	26	39–12	9	1	7	29	32–29
SC Heerenveen	5	55	64–52	9	2	6	20	32–26	9	4	4	35	32–26
FC Twente	6	51	48–38	7	5	5	19	29–19	8	4	5	32	19–19
Vitesse	7	50	53–49	7	3	7	17	23–24	9	3	5	33	30–25
Roda JC	8	43	60–55	8	4	5	20	34–21	5	4	8	23	26–34
RKC	9	42	44–51	8	5	4	21	26–22	5	3	9	21	18–29
FC Utrecht	11	41	40–43	8	3	6	19	23–20	4	5	8	22	17–23
Willem II	10	40	44–56	9	2	6	20	30–25	4	4	9	20	14–31
FC Groningen	12	37	50–58	5	5	7	15	23–24	6	2	9	22	27–34
NAC	15	35	43–67	4	4	9	12	24–32	5	4	8	23	19–35
NEC	13	34	41–47	7	6	4	20	27–21	2	4	11	14	14–26
ADO	14	33	44–59	7	2	8	16	25–26	3	4	10	17	19–33
RBC	16	26	38–77	6	2	9	14	22–27	4	0	13	12	16–50
de Graafschap	17	18	32–78	3	5	9	11	19–38	1	2	14	7	13–40
FC den Bosch	18	18	23–75	4	1	12	9	13–33	1	3	13	9	10–42

advantage not only as a given, but uses it in the procedures in competitions as a virtue. The first applies to regular competitions.

The proposal is to award only two points for a win in a home game, but keep the rule of three points for a win in an away match. When a game ends tied my proposal is to award two points to the visiting team, but the usual one point to the home team. In the current system the award of points is three in total if there is a win and two when the game is tied. This would change in the sense that two points are now awarded only when the home team wins and three points in the other cases.

In Table 5 I have illustrated what effect this has on the outcome of the Dutch competition of 2004–2005. The differences are relatively small, which is good, as one should not completely upset the thing. Of course the effect is that now most teams win more points away than they do at home. I find this a positive effect and it might stimulate more offensive strategies by the visiting team and a more proactive attitude by the home team. It is of interest then to look in more detail at the cases where a change has occured.

First we see that the numbers 3 (AZ) and 4 (Feyenoord) have interchanged and now have an equal number of points as number 5 (SC Heerenveen). In their home games, AZ had two points more than Feyenoord in the old system, which has increased now to three. This I would think is reasonable, since Feyenoord has lost 6 of their home games, while for AZ this is only one. In their away games they did get the same number of points, but now Feyenoord gets three more than AZ. This results from the fact that Feyenoord did loose fewer (5 against 7) away games. So the result is positive in my view. SC Heerenveen now has equal points, while before it had 2 points less than Feyenoord and 4 less than AZ. They still collect fewer points at home, but are rewarded for losing only 4 away games. Again, I think this is positive.

Another interchange is between Willem II (10) and FC Utrecht (11). Here the change comes

Table 6: Points gained in home and away matches for the Dutch soccer competition 2004–2005 in the new counting system, where ties have been broken by giving double points to goals scored away and to goals against at home.

Team	Final			Home					Away				
	#	pnts	goals	win	tie	loss	pnts	goals	win	tie	loss	pnts	goals
PSV	1	77	+102	16	0	1	32	50– 8	11	6	0	45	39–10
Ajax	2	70	+66	11	3	3	25	32–17	13	2	2	45	42–16
AZ	3	55	+50	10	6	1	26	39–12	9	1	7	29	32–29
Feyenoord	4	55	+47	11	1	5	23	55–27	8	4	5	32	35–24
SC Heerenveen	5	55	+18	9	2	6	20	32–26	9	4	4	35	32–26
FC Twente	6	51	+10	7	5	5	19	29–19	8	4	5	32	19–19
Vitesse	7	50	+10	7	3	7	17	23–24	9	3	5	33	30–25
Roda JC	8	43	+10	8	4	5	20	34–21	5	4	8	23	26–34
RKC	9	42	–11	8	5	4	21	26–22	5	3	9	21	18–29
FC Utrecht	11	41	–6	8	3	6	19	23–20	4	5	8	22	17–23
Willem II	10	40	–23	9	2	6	20	30–25	4	4	9	20	14–31
FC Groningen	12	37	–5	5	5	7	15	23–24	6	2	9	22	27–34
NAC	15	35	–37	4	4	9	12	24–32	5	4	8	23	19–35
NEC	13	34	–13	7	6	4	20	27–21	2	4	11	14	14–26
ADO	14	33	–22	7	2	8	16	25–26	3	4	10	17	19–33
RBC	16	26	–50	6	2	9	14	22–27	4	0	13	12	16–50
de Graafschap	17	18	–71	3	5	9	11	19–38	1	2	14	7	13–40
FC den Bosch	18	18	–75	4	1	12	9	13–33	1	3	13	9	10–42

about because Willem II had one more tie away instead of a loss, while FC Utrecht had one more home tie instead of a win. And the away tie earned more points than the home tie did cost compared to a win.

The other change is NAC , which was at position 15 and is now 13th; the other teams around this position have not changed their relative order. Why is this? At home NAC has done rather poorly, losing 9 of their 17 matches. But away they have won 5 and tied 4. In the old system they did already gain more points away than at home (19 versus 16), but now that has increased considerably (23 versus 12). This extra award for performance in away games again is deserved.

Also note that in the old system the numbers 6 and 7 and the last two at positions 17 and 18 were tied in the number of points. The rule then is that the balance in goals determines the order. FC Twente (6) scored 10 goals more than there were scored against it and for Vitesse (7) this was 4. For de Graafschap at position 17 and FC den Bosch at 18, the numbers were –46 and –52 respectively. In all these cases there have now been differences in the number of points. Both FC Twente and Vitesse lost 5 away games and at home they both won 7 times. Basically then Vitesse lost out by losing two more games rather than ties at home than FC Twente, which is having more weight than Vitesse winning one more away game rather than a tie away. On balance I think again this is positive. The basic difference between de Graafschap and FC den Bosch is that the latter lost 3 more games at home, but won 1 more, while away they had one more tie. This then compensated and they ended with equal points, which I think is OK.

The next question then is how to break the tied ranking of Feyenoord, AZ en SC Heerenveen, that has now resulted and that between de Graafschap and FC den Bosch that remained. We

Table 7: Cases in the Champions League and EUFA Cup competitions between 2000 and 2005, where a double weight in the goals scored by away teams make a difference in the result of the aggregate. In each score the home team in the *second* match has been put first.

Scores		aggregate		times	
		old	new		
0 – 0	2 – 1	2 – 1	2 – 2	8	*
0 – 0	3 – 2	3 – 2	3 – 4	5	
0 – 0	4 – 2	4 – 3	4 – 4	–	*
0 – 0	4 – 3	4 – 3	4 – 6	1	
0 – 1	3 – 1	3 – 2	3 – 3	8	*
0 – 1	4 – 2	4 – 3	4 – 5	1	
0 – 1	5 – 3	5 – 4	5 – 7	1	
1 – 0	2 – 2	3 – 2	4 – 4	4	*
1 – 0	3 – 3	4 – 3	5 – 6	–	
1 – 1	3 – 2	4 – 3	5 – 5	3	*
1 – 1	4 – 3	5 – 4	5 – 7	–	
1 – 2	4 – 2	5 – 4	6 – 6	4	*
1 – 2	5 – 3	6 – 4	7 – 8	–	
2 – 0	2 – 3	4 – 3	6 – 6	2	*
2 – 1	3 – 3	5 – 4	7 – 7	1	*
2 – 2	4 – 3	6 – 5	8 – 8	1	*

could take the same system as before, which would give the order as in Table 5. Feyenoord has a balance of +39, AZ of +30 and SC Heerenveen of +12. De Graafschap has -46 and FC den Bosch -52. However, in the spirit of giving more credit to achievements away than at home, we could count the goals scored in away games and the goals against in home matches with double weight. The result of that is in Table 6. Surprisingly for this case the original ranking between AZ and Feyenoord has been restored. And the ranking of de Graafschap and FC den Bosch is again not affected.

I now turn to knock-out competitions. The first thing to note is that the rule to break ties by giving goals scored away double weight already is in force. There is no obvious other manner to break remaining ties, since in all these cases the scores in both matches always are the same. The overtime and possibility of shoot-outs is the only reasonable way out.[9] Let us first look at the statistics. For this I take the Champions League and UEFA Cup competitions between 2000 and 2005, for so far as it was played in a knock-out system. This involves in total 689 pairs of matches.

After two games the aggregate score determines a winner in 87.2% of the cases (it is of course no surprise that this is better than in the case of a single match) and in an additional 8.3% the winner is determined on the basis of more away goals. So, only in 4.5% of all cases does a game actually have to go into overtime and that is not all that much. In the period that I examined this was a total of 31 times. Of these, however, 20 (2.9% of the total) were eventually decided by penalties. In overtime the home team won 9 times and lost 2 times, so there we see a home advantage (however this is small number statistics). After penalties the home team advanced

[9]There is of course in principle the option of playing a third match at neutral ground, but that clearly is not practicle.

11 times and the away team 9 times.

Still, it would be interesting to see what would happen if *always* away goals would be counted with double weight. One might expect intuitively that this makes a very large difference, but as it turns out only in 5.8% of the cases does this happen. So, it might be interesting to see in what cases this does make a difference and to what extent it might be a good idea in view of the relatively large home advantage in soccer to actually go and use that rule. The cases that actually occured plus a few that might have occured are collected in Table 7. The asterisks in the last column indicate the cases in which the aggregate now becomes a tie; however, when the actual *number* of away goals is taken still the winner and loser are interchanged with respect to the current system. Of course the situation is similar if the order of the matches is in the other way around, as long as the home and away teams are also the other way around.

The outcome of this is interesting. Take for example the first case. In the first match there is no score, which is now being seen as an advantage for the team that was away team, since all they have to do is win the second match at home. However, now the other team still has a good chance by scoring one goal in the return match, because then the home team in that match has to score twice. And if it were the other way around and in the first game the home team had won with $2 - 1$, a tie at $0 - 0$ in the second game does not suffice. Similar statements can be made on the other cases that occured. Since the new rule would not make a large difference in most outcomes, it does not completely change things, but in general it promises to make the game interesting. After all, it does not really pay to go for a tie in the first game if you play it at home or for a tie at home in the second game, if you had won the away game with a small difference.

4. Conclusions.

Compared to other team sports soccer has the peculiarity of a high rate of tied games and a rather pronounced home advantage. This is to some extent due to the fact that there is a rather low number of scores per match. On average the home team wins half the games, while the visiting team wins about a quarter of the matches. A quarter of the time the game ends with a tie. There are on average 3.0 goals per match. The solution of enlarging the goals is an obvious one, but it is unlikely that this will be accepted easily on a short time scale.

If such a change is not introduced then it is important to try and minimize the effect of the home advantage. In regular competitions teams play all others in a home and an away game and I have shown that an interesting suggestion would be to actually give bonusses for accomplishments in away games. The proposal is to award only two points for a win in a home game and three points in an away game. In cases of tied games the home team should be awarded one point, but the visiting team two. A examination of the effect of this has been performed by applying it to the end result of the 2004–2005 Dutch competition for the national championship. The changes are minor, but in all cases are positive. The cases where teams end with equal points are usually decided by looking at the balance between goals scored and goals against. It is also possible to adapt that by giving a double weight to goals scored in away matches and to goals against in home games. Also this does minimize the effects of home advantage.

In knock-out competitions two teams play two matches with both of them playing at home once and then looking at the aggregate in goals scored. This gives a winner in about 87% of the cases. The current system of resolving the outcome when after two matches the teams have equal scores in the aggregate is by giving a double weight to goals scored away. This resolves most of the ties in aggregates, but not in those cases where the scores in the two matches are identical. In these 4.5% of all team-ups there is no solution rather than playing overtime or if

that does not help using a penalty shoot-out, and the home advantage for the home team in the second game is obvious. The alternative of playing a third game at a neutral site is unpracticle. I have looked at the effect of always giving double weight to goals scored away and have shown that although it makes no difference in most cases, in 8.5% of them it does in such a way that it might work towards forcing teams to follow more offensive strategies, making the game more attractive.

Groningen/Baltimore, March 2006.

Note added June 2006

The results for the 2005-2006 soccer competition in the Netherlands is shown in tables 8 and 9. The most remarkable result of that competition was the performance of FC Groningen (my home-town). This team was very strong at home, gaining 42 points in the old system in home matches. This corresponds to a third place in a ranking of home results; Feyenoord had also 42 points at home but ranks second on goals and the number of 42 points is only 3 less than champion PSV. But away FC Groningen scored only 14 points, which puts it at thirteenth place. My new system leaves the relative rank at home the same and away it now is twelfth, but it would put them in the final ranking at sixth place rather than fifth now. I think that makes sense.

A curious system of play-offs (actually three full competitions betwwen ranks 2 through 5, 6 through 9 and 10 through 13) has determined the details of the qualifications for European competitions. In the end it did not change the outcome too much compared to the previous situation, where it was based only on final rank in the regular competition. However, it could have (and almost did) result in rank 5 (FC Groningen) playing in the preliminaries of the Champions League, which would have been very curious. Now it was fourth rank Ajax, while second placed AZ missed out and goes to the UEFA Cup competition. FC Utrecht missed out on also going to that competition, while SC Heerenveen now qualifies. Otherwise Heerenveen would have to compete first in the Intertoto Cup competition (top teams after this competition go to the UEFA Cup competition), which now will happen to FC Twente (rank 9). In theory rank 9 could have qualified for the UEFA Cup competition and rank 13 (!) for the Intertoto Cup Competition.

I feel that such post-season competitions are silly. There is no need and only serves the purpose of more matches and income. It is also evident in US Major League Baseball, where a successful regular season of 162 games can be ended in a poor performance in only three matches. I fact in the last 9 seasons the team with the best score in the regular season won the World Series only once and that with the second best score not at all. The World series has not been played between ranks 1 and 2 of the regular season over this period and in 4 times neither of these ranks made it into the World Series. World champions ended in the regular season as rank 9 (once), 7 (twice), 6 (once), 4 (twice), 3 (twice) and 1 (once). On the other hand, the final ranking in the regular season is the result of playing the same teams an equal number of times. The only sensible solution would be to extend the play-offs to more games, while the number of games in the regular season would be reduced. I doubt that this will be accepted.

Table 8: Points gained in home and away matches for the Dutch soccer competition 2005–2006.

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Team	Final			Home					Away				
	#	pnts	goals	win	tie	loss	pnts	goals	win	tie	loss	pnts	goals
PSV	1	84	71–23	14	3	0	45	36– 8	12	3	2	39	35–15
AZ	2	74	78–32	11	4	2	37	43–18	12	1	4	37	35–14
Feyenoord	3	71	79–34	13	3	1	42	47–11	8	5	4	29	32–23
Ajax	4	60	66–41	9	6	2	33	35–15	9	0	8	27	31–26
FC Groningen	5	56	46–43	13	3	1	42	26– 9	3	5	9	14	20–34
FC Utrecht	6	55	48–44	8	4	5	28	26–22	8	3	6	27	22–22
SC Heerenveen	7	50	63–58	10	4	3	34	41–25	4	4	9	16	22–33
Roda JC	8	50	57–54	9	2	6	29	30–28	6	3	8	21	27–26
FC Twente	9	47	44–36	9	1	7	28	25–17	4	7	6	19	19–19
NEC	10	47	43–43	7	4	6	25	23–20	6	4	7	22	20–23
Vitesse	11	44	52–54	9	2	6	29	33–27	4	3	10	15	19–27
RKC	12	39	48–58	7	4	6	25	29–26	4	2	11	14	19–32
Heracles	13	39	35–58	6	3	8	21	19–28	5	3	9	18	16–30
Sparta	14	37	34–50	8	0	9	24	25–23	2	7	8	13	9–27
ADO	15	35	36–62	6	3	8	21	18–22	4	2	11	14	18–40
NAC	16	33	45–66	6	5	6	23	24–31	2	4	11	10	21–35
Willem II	17	28	45–66	5	4	8	19	27–29	2	3	12	9	18–37
RBC	18	9	22–90	1	5	11	8	14–32	0	1	16	1	8–58

Table 9: Points gained in home and away matches for the Dutch soccer competition 2005–2006 in the new counting system, where ties have been broken by giving double points to goals scored away and to goals against at home.

Team	Final			Home					Away				
	#	pnts	goals	win	tie	loss	pnts	goals	win	tie	loss	pnts	goals
PSV	1	73	106– 31	14	3	0	31	36–16	12	3	2	42	70–15
AZ	2	64	113– 50	11	4	2	26	43–36	12	1	4	38	70–14
Feyenoord	3	63	111– 45	13	3	1	29	47–22	8	5	4	34	64–23
Ajax	4	51	97– 56	9	6	2	24	35–30	9	0	8	27	62–26
FC Utrecht	6	50	70– 66	8	4	5	20	26–44	8	3	6	30	44–22
FC Groningen	5	48	66– 52	13	3	1	29	26–18	3	5	9	19	40–34
FC Twente	9	45	63– 53	9	1	7	19	25–34	4	7	6	26	38–19
SC Heerenveen	7	44	85– 83	10	4	3	24	41–50	4	4	9	20	44–33
Roda JC	8	44	84– 82	9	2	6	20	30–56	6	3	8	24	54–26
NEC	10	44	63– 63	7	4	6	18	23–40	6	4	7	26	40–23
Vitesse	11	38	71– 81	9	2	6	20	33–54	4	3	10	18	38–27
Sparta	14	36	43– 73	8	0	9	16	25–46	2	7	8	20	18–27
Heracles	13	36	51– 86	6	3	8	15	19–56	5	3	9	21	32–30
RKC	12	34	67– 84	7	4	6	18	29–52	4	2	11	16	38–32
ADO	15	31	54– 84	6	3	8	15	18–44	4	2	11	16	36–40
NAC	16	31	66– 97	6	5	6	17	24–62	2	4	14	14	42–35
Willem II	17	26	63– 95	5	4	8	14	27–58	2	3	12	12	36–37
RBC	18	9	30–122	1	5	11	7	14–64	0	1	16	2	16–58