HOME GROUND ADVANTAGE IN THE AUSTRALIAN NETBALL LEAGUE (COMMONWEALTH BANK TROPHY)

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Abstract

This paper investigates home advantage (HA) in Australian netball. Traditional measures of HA for whole competitions, such as the percentage of games won by home teams and alternative measures, such as the average margin of victory (in goals) for the home team, are calculated. Individual HAs for each team are obtained via a linear model, which takes account of teams sharing venues, using least squares methods. It is shown that HA in netball is small in comparison to other sports.

1 Introduction

Netball is the most popular women's sport (in a participation sense) in Australia. There is an estimated total of 1.2 million netball players in Australia currently (including males). Internationally, netball is played in approximately 50 countries, 45 of which are affiliated with the International Federation of Netball Associations.

The game is played between teams of seven players plus reserves on a court of fixed dimensions but varying surface, usually asphalt in lower grades. A match is played for four quarters, each lasting 15 minutes. One is added to the score each time a goal is scored.

The major Australian competition in netball, the Commonwealth Bank Trophy, began in 1997 with 14 rounds between eight clubs, and organised by Netball Australia. Adelaide, Melbourne and Sydney each have two clubs, and Brisbane and Perth one. Matches are played at venues with an indoor international standard court, on a double sprung wooden surface.

The competition is of a fairly standard type, with each team playing each other twice, once at home and once away. Some teams share the same home venue. In 1997, there was a difficulty in obtaining some venues for scheduled matches, and so some teams played others twice at home. Teams receive two points for a win and one for a draw. Ladder position is in order of wins with ties decided upon percentage (100 × total goals for ÷ total goals against). The top four teams at the end of the home and away draw play off in a final series to determine the ultimate winner.

Winning teams average about 60 goals per game, while losing teams average about 47 goals per game. In the last three years, there have been only five draws in 168 games. Table 1 gives information about the mean winning and losing scores for the matches played each year, as well as the mean total score per game. These are surprisingly consistent for the three years.

Year	1997	1998	1999
No. of matches	56	56	56
No. of draws	2	2	1
Mean winning score per match	59.5	60.5	59.9
Standard error of mean winning score per match	1.10	0.93	1.05
Mean losing score per match	46.1	47.8	47.5
Standard error of mean losing score per match	0.93	0.91	1.02
Mean total score per match	105.6	108.3	107.3
Standard error of mean total score per match	1.51	1.42	1.49

Table 1: Basic descriptive statistics for the Commonwealth Bank Trophy, 1997–1999.

Home advantage (HA) is the term used to describe the consistent finding that home teams playing in a balanced home and away sporting competition win over 50% of the games played. It is believed to occur because of circumstances such as familiar surroundings, crowd support influencing both players' behaviour and officials' decisions and travel factors associated with the opposition.

In this paper we investigate home advantage (HA) for the competition overall and for individual clubs, as a first step in explaining the differences in terms of the playing characteristics of the clubs.

When the competition first started in 1997, there were problems obtaining home grounds for three of the matches. These matches were played at the home ground of the "away" team. In addition, home grounds are changing. The AKAI Melbourne Kestrels and the Cenovis Melbourne Phoenix both played at the Waverley Netball Centre in 1997 and 1998, but the Cenovis Melbourne Phoenix had the Melbourne Sports and Aquatic Centre as their home ground for 1999. They both planned to move to a new venue in the Docklands precinct in 2000, but this venue is unlikely to be ready in time. The Decoré Sydney Sandpipers and the TAB Sydney Swifts both played at the Anne Clark Netball Centre at Lidcombe in 1997 and moved to the State Sports Centre in 1998. In 2000, the Decoré Sydney Sandpipers plan to move to the Penrith Sports Stadium.

2   Traditional measures of HA

The phenomenon of HA has been the basis of considerable study since the 1970s. Courneya and Carron [3] give a comprehensive review of this work. In their table surveying the "what" of home advantage, they list many studies which give the home win percentage on the basis of either points or wins/losses (with tied games excluded in the latter case). Two of the studies also give the difference between home and away winning percentages. Other measures of HA, such as winning margins, are not investigated in these studies.

In the first detailed study of HA by Schwartz and Barsky [5], the percentages of matches won by the home team were found to be 53% in major league baseball, 55% in professional (American) football and 59% in college (American) football, 64% in ice hockey and 64% in college basketball. Table 2 gives the percentage of wins by the home team for each year for the round matches in the Commonwealth Bank Trophy, omitting those played by teams sharing a common venue. A draw counts as half a win. These are similar to the percentages for other sports, although the figure in 1998 is surprisingly low.

Table 2 also gives the average margin of victory of the home team. This is quite small in comparison to the total number of goals scored in a game. Since the percentage of home wins depends on the variation in the performance level of the teams as well as their HA, it is difficult to compare HAs between seasons or between different sports. The values of the ratio of the average total goals scored in a match to the average margin of victory by the home team, r, given in Table 2, allows us to make such comparisons. Stefani and Clarke [8] determined the values of r for soccer (three European cups) – 3, hockey (USA) – 10, professional football (USA) – 12, Australian Rules football – 21, and baseball (USA) – 34. A value of r of 71 can be calculated from the data given in Snyder and Purdy [6] for collegiate

Year	No. of games	Percentage of wins by home team	Average margin of victory of home team (HGA)	Average total goals scored in a match (GOALS)	Ratio of GOALS to HGA (r)
1997	50	62	3.78	105.6	27.94
1998	50	50	0.16	108.3	676.88
1999	52	58	2.02	107.3	53.12
All	152	57	2.01	107.1	53.28

Table 2: Traditional measures of home advantage (HA) in Australian women's netball (Commonwealth Bank Trophy).

basketball. The values given for r in Table 2 indicate that netball has a low home advantage compared to other sports, except for basketball. This is probably due to factors such as having a fixed dimension indoor playing surface and a limited number of games during the season to lessen travel factors.

3 Linear model

The percentage of wins by the home team depends as much on the closeness of the competition and the variability of results as on HA. If all teams are of the same strength, then a small HA will result in most home teams winning. However, if teams are wide apart in strength, than a small HA will have little influence on the final result. Hence HAs are best investigated by models that incorporate a strength measure of the individual teams as well as a HA.

There are several linear models that can be used to model results between two teams. Clarke [1] presents three, and the third is chosen here because it assumes that each team has a different home advantage and takes account that some matches may be played between two teams who share a home ground. This model has been used by Stefani and Clarke [7, 8] to investigate individual HAs in Australian rules, by Harville and Smith [4] to investigate HA in basketball, and by Clarke and Norman [2] to find individual HAs for all English soccer teams.

Let w_{ij} be the winning margin (in goals) when the home team i plays away team j (in match k). Let u_i be a rating for team i, which is a measure of team i on a neutral ground. This summarises a team's ability, form or level of performance. Let h_i be the home ground advantage of team i, which includes all that is advantageous for team i playing at home and all that is disadvantageous for any other team playing at team i's home ground. Let c_{ij} be a common home ground factor, which takes the value 1 if team i and team j have a common home ground, and 0 otherwise. Let e_{ij} be a random error, usually assumed to have a mean of zero. Then

$$w_{ij} = u_i - u_j + h_i - c_{ij}h_j + e_{ij}.$$

The term $c_{ij}h_j$ is necessary as some teams share a common home ground.

Since the ratings u_i are relative, we add the constraint that the u_i sum to 800. (The number 800 was chosen so that if all teams were of equal ability, they would each have a rating of 100. Any other number could have been chosen here.) This model, with the additional constraint on the u_i, was fitted to the individual match results for each of the three years with a standard regression package. The values for u and h for each of the teams are given in Table 3. In each case the overall model was significant at the 0.0001 level, with $R^2 = 0.65$ (1997), 0.72 (1998) and 0.75 (1999). The high values of R^2 reflect the low variability in netball. Clarke and Norman [2] obtained a value of R^2 of 0.19 for English soccer, reflecting its high variability, and Clarke [1] obtained a value of R^2 of about 0.40 for Australian Rules football.

The range of the ratings (highest rating − lowest rating) has been increasing. In 1999, when the team with the highest rating played that with the lowest rating, the model predicts that the highest team

Team	1997		1998		1999	
	u	*h*	*u*	*h*	*u*	*h*
AAMI Adelaide Thunderbirds	113.36	2.21	113.19	−7.20	116.98	0.56
Firestone Queensland Firebirds	91.26	1.72	97.10	−8.83	96.96	−7.09
Adelaide Wendy's Ravens	95.21	4.48	106.69	−6.80	102.98	3.16
SmokeFree Perth Orioles	91.48	6.74	87.27	−1.17	81.39	11.41
Sydney TAB Swifts	106.75	−5.40	106.32	8.61	111.36	−7.89
AKAI Melbourne Kestrels	92.06	−0.59	101.72	−0.58	99.42	9.24
Decoré Sydney Sandpipers	102.33	2.13	85.49	13.64	98.86	−5.89
Cenovis Melbourne Phoenix	107.55	11.25	102.22	5.33	92.06	10.07
Maximum HA applicable		11.84		13.64		11.41
Range	22.10		27.70		35.59	

Table 3: Individual ratings and HAs for teams in Commonwealth Bank Trophy Women's Netball Competition 1997–1999.

would be ahead by 36 goals before allowances for HA. For 1997 and 1998, the maximum HA applicable was about half the range of the ratings, but in 1999, this was down to about a third.

Some teams are shown with a negative HA in some years. Clarke and Norman [2] show that the apparent HA of any side is affected by the HAs of the others. An end of season ladder for the 1999 Commonwealth Bank Trophy, with the values of *u* and *h* included, is given in the appendix. Three of the teams have a negative HA. Sydney TAB Swifts have won more matches away than at home, and also have a larger away goal difference than home goal difference, so their negative HA is understandable. Decoré Sydney Sandpipers have also won more matches away than at home, whereas their home goal difference is not as bad as their away goal difference. The third team with a negative HA, the Firestone Queensland Firebirds, have won as many matches at home as away, and their home goal difference is not as bad as their away goal difference. Certainly the HAs of the other teams have had some effect in determining the HA of the Sandpipers and the Firebirds.

The data from the three years were combined, and the model above fitted to the data (using the REG procedure in SAS), assuming the home advantage for each team remained constant over the three years but allowing the performance of individual teams to vary each year. The *p*-value for the model was 0.0001, with $R^2 = 0.67$. The HA for each club over the three years is given in Table 4. It is not surprising that the Perth based team has one of the higher HAs, due to travel factors. What is surprising is that one of the Melbourne based teams, Cenovis Melbourne Phoenix, has the highest HA, and appears to have been the most consistent in terms of HA over the three years.

Team	HA, 1997–1999
Cenovis Melbourne Phoenix	9.57
SmokeFree Perth Orioles	5.61
Decoré Sydney Sandpipers	3.21
AKAI Melbourne Kestrels	2.94
Adelaide Wendy's Ravens	0.21
AAMI Adelaide Thunderbirds	−1.59
Sydney TAB Swifts	−1.73
Firestone Queensland Firebirds	−4.88

Table 4: HA of teams, assuming constant from 1997–1999.

4 Further analysis of individual HAs

Do different teams have different HAs or are the above differences due to random variation? For each of the three years, and for the combined three years, an F-test was done under the hypothesis $H_0 : h_1 = h_2 = h_3 = h_4 = h_5 = h_6 = h_7 = h_8$, with p-values given in Table 5.

Year	p-value
1997	0.8111
1998	0.1307
1999	0.0904
1997–1999 combined	0.1145

Table 5: Test results for the h_is being the same.

The results are inconclusive. However, it must be noted that generally for each year the individual HAs have been calculated from only seven (or fewer) observations.

5 Conclusions

The Commonwealth Bank Trophy has only been in operation for three years. The HA for each of the teams over each of the three years and for the three years combined has been calculated. It has varied quite a bit for some teams over the three years. The maximum HA to apply to a game is shown to vary between one-third and one-half of the difference in the ratings of the highest and lowest teams. There is a significant HA in netball, but it appears to be lower than for other sports.

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Appendix   End of season ladder, 1999 Commonwealth Bank Trophy

Team	HW	HD	HL	Hf	Ha	HGD	AW	AD	AL	Af	Aa	AGD	GD	Points	u	h
AAMI Adelaide Thunderbirds	6	1		432	295	137	5		2	422	299	123	260	23	116.98	0.56
Sydney TAB Swifts	5		2	393	351	42	6		1	420	359	61	103	22	111.36	−7.89
AKAI Melbourne Kestrels	6		1	417	357	60	4		3	353	362	−9	51	20	99.42	9.24
Adelaide Wendy's Ravens	5		2	388	354	34	4	1	2	387	359	28	62	19	102.98	3.16
Cenovis Melbourne Phoenix	4		3	410	403	7	2		5	379	446	−67	−60	12	92.06	10.07
Decoré Sydney Sandpipers	1		6	369	397	−28	2		5	348	397	−49	−77	6	98.86	−5.89
SmokeFree Perth Orioles	3		4	311	380	−69	0		7	274	425	−151	−220	6	81.39	11.41
Firestone Queensland Firebirds	1		6	339	413	−74	1		6	367	412	−45	−119	4	96.96	−7.09

HW – number of home wins
HD – number of home draws
HL – number of home losses
Hf – number of goals for in home matches
Ha – number of goals against in home matches
HGD – goal difference for home matches (= Hf – Ha)
AW – number of away wins
AD – number of away draws
AL – number of away losses
Af – number of goals for in away matches
Aa – number of goals against in away matches
AGD – goal difference for away matches (= Af – Aa)
GD – goal difference for season (= HGD + AGD)
Points – points on ladder at end of season
u – team rating according to model
h – home advantage according to model