

Basketforces - An Accurate Rating System for Basketball Competitions

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22 Feb 2024 (Version 1.2.1)

1 Introduction

It's a stable rating system for basketball competitions. The rating depends on the achievements of a team for a long period.

Features

- Accurate;
- Be easy to calculate;
- Non-provisional;
- The points in a match had an effect on the ratings, enhance the competitiveness of the players.

2 How It Works

(1) Variables

For each of the matches of a team, we called the variable P_1 = the points the team got in the match, and P_2 = the points the opponents got in the match. The rating before the match of the team is R'_1 , of the opponent is R'_2 .

(2) Processing of data

We called $D = \frac{P_1 - P_2}{P_1 + P_2}$.

In particular, if $P_1 = P_2 = 0$, then $D = 0$.

We divide the matches into three categories based on home and away.

Category	Δ
Home	-0.03
Neither are home	0
Away(Opponents are home)	+0.03

Table 1: Categories

The final value $Df = D + \Delta$.

Due to the nature of the formula, we don't need to think about whether overtime was played or not.

(3) Main Formula

$$R_1 = R'_1 + \max(-0.1I, \min(0.1I, I \times (Df - ExpectedDf)))$$

Variables Explanation:

R_1 : The rating after the match;

I : The weight of the match;

$ExpectedDf$: Calculated as follows.

$$ExpectedDf = \frac{1}{2^{\frac{R'_2 - R'_1}{600}} + 1} - 0.5$$

Example: Team A's rating is 1200, the opponent Team B's rating is 1000.

Then,

$$\text{Team A: } ExpectedDf = \frac{1}{2^{\frac{1000 - 1200}{600}} + 1} - 0.5 = 0.0575$$

$$\text{Team B: } ExpectedDf = \frac{1}{2^{\frac{1200 - 1000}{600}} + 1} - 0.5 = -0.0575$$

The constant I is different in different levels of matches.

Level	I	Biggest change($\pm 0.1I$)
Small Countries/Clubs Friendly Matches	100	± 10
Friendly Matches	150	± 15
Small Regional Countries/Clubs Comp. Group	200	± 20
Small Regional Countries/Clubs Comp. Tournaments	250	± 25
Continental Countries/Clubs Comp. Group	300	± 30
Continental Countries/Clubs Comp. Tournaments	350	± 35
Worldwide Top Countries/Clubs Comp. Group	400	± 40
Worldwide Top Countries/Clubs Comp. Tournaments	500	± 50

Table 2: Match Levels

Note that in and after the Quarter Finals, the changes wouldn't drop. It will be friendly to the teams which had a high achievement.

(4) Association Managements

Every team in the association has a rating of 1500 points when the team didn't take part in any matches.

The rating will be provisional at first. Some teams will get a higher rating if they took part in fewer matches. So when we calculate the team ranking, think of the beginning ratings as follows:

Match Number(After the match)	Base Rating
1	500
2	900
3	1200
4	1400
5	1500

Table 3: Base Ratings

(5) Calculating Period

For leagues, we'd better calculate a new rating in a new season. The final rating R is calculated as follows:

$$R = \frac{1 \times R_0 + 0.875 \times R_1 + 0.75 \times R_2 + \cdots + 0.125 \times R_7}{1 + 0.875 + 0.75 + \cdots + 0.125}$$

R_0, R_1, \dots, R_7 are the ratings from the the 7-th previous season to the current season.

3 Examples

Team A's rating(R'_1) is 1200, the opponent Team B's rating(R'_2) is 1000. The result of a friendly match which was between them and played in Team A's stadium is 70-60. Then,

(For Team A)

$$D = \frac{70 - 60}{70 + 60} = 0.0769$$

$$Df = D + \Delta = 0.0469$$

$$ExpectedDf = \frac{1}{2^{\frac{1000-1200}{600}} + 1} - 0.5 = 0.0575$$

$$I = 150$$

$$R_1 = 1200 + \max(-0.15, \min(15, 150 \times (0.0469 - 0.0575))) = 1198.41$$

(For Team B)

$$D = \frac{60 - 70}{70 + 60} = -0.0769$$

$$Df = D + \Delta = -0.0469$$

$$ExpectedDf = \frac{1}{2^{\frac{1200-1000}{600}} + 1} - 0.5 = -0.0575$$

$$I = 150$$

$$R_1 = 1000 + \max(-0.15, \min(15, 150 \times (-0.0469 - (-0.0575)))) = 1001.59$$