Selecting a Default Glicko C Value

Aaron Weinstock

11/21/2018

To save computational intensity (due to time constraints), this simulation will apply the second method for selecting c outlined in the `01_Using_Glicko.pdf`. That method (copied from Dr. Glickman's algorithm documentation) is reproduced below:

> *"Determine how much time (in units of rating periods) would need to pass before a rating for a typical player becomes as uncertain as that of an unrated player. ... If [calculation of the new RD from the RD at the last period] were applied over t rating periods without any activity, then the resulting RD would be:"*
>
> $$RD = min(\sqrt{{RD_{old}}^2 + c^2 t},\ 350)$$
>
> *"We want to solve for c such that:"*
>
> $$350 = \sqrt{{RD_{old}}^2 + c^2 t}$$

Because NFL teams play very frequently, we should have a fairly high level of confidence in their ratings; consequently, we will assume for this scenario that the "typical" team has $RD = 100$, a value associated with a length 200 95% confidence interval for a team's rating. Given that an unrated team will default to a 1500 rating, and that ratings will rarely exit the 1000-2000 range over an extended period (due to general parity in the NFL), a 200 point confidence interval seems reasonable for the distribution of talent and success over time in the league (i.e., there is clear separation between good and bad teams, but the difference is usually not extreme).

Furthermore, as of 2016, the NFL Players Association (NFLPA) estimated the average NFL career at 3.3 years in length (source: http://www.espn.com/blog/nflnation/post/_/id/207780/current-and-former-nfl-players-in-the-drivers-seat-after-completing-mba-program). In a vaccuum, this would mean complete roster turnover every 3.3 years, or that a team would essentially become equivalent to an "unrated" team every 3.3 years. With 21 rating periods in each year (17 regular season weeks, 4 playoff weeks), 3.3 years is equal to 69.3 rating periods, so we will assume for this scenario $t = 69.3$

With these assumptions, we now solve:

$$350 = \sqrt{100^2 + c^2(69.3)}$$

Which yields:

$$c = 40.29115$$

So, for this simulation, $c = 40.29115$ will be applied to the Glicko rating algorithm. **Note that the logic applied here by no means represents the only reasonable assumptions,** and other logic could lead to other values for c. Moreover, given more time, we would certainly prefer to apply the computational method given by Glickman [method 1 for selecting c outlined in the `01_Using_Glicko.pdf`] to this challenge.