



Active Power Ratings Engine

Overview

The Active Power Ratings Engine (PRE) is a predictor-corrector procedure program that solves the following equation:

$$\sum_{i=1,n} \{ \sum_{j=1,n} \{ (P_i - P_j) - (score_i - score_j) + hf \alpha \} \} = 0.0 \quad [1]$$

Where:

\sum = *sum*

i = *team_i*

j = *team_j*

n = *number_of_teams*

P = *power_rating*

score = *game_score*

hf α = *home_field_advantage*

This equation states that the difference in power ratings between two teams equals the average of the difference in game scores between those teams and adjusted by the home-field advantage. Thus if team A plays team B and team A has a power rating of 90.0 and team B has a power rating of 80.0, then the power rating predicts A would beat B by 10 points if the game were played at a neutral site. The power ratings are based on all games a team plays and averaged for performance. The numerical technique iterates on all teams for all games such that the power ratings are adjusted up or down based on the error produced by the equation.

The power rating is a number computed for every team such that if you sum the difference of the power ratings between a team and all its opponents and add in a home-field advantage for each game, the result is exactly equal to the sum of the margin of victory or loss for each of the games played for that team. Another interpretation of the power rating is that based on past game scores, if two teams played each other on a neutral field the margin of victory or loss will, on average, be equal to the difference in power rating between these two teams. Power ratings are based on 'trends' in the data continuing where past performance is used to predict future performance. If trends in the result hold up, the power ratings are good indicators; if trends do not continue, power ratings are less accurate in the predictions.



All teams start even at the beginning of the season and performance in past seasons has no influence on the ratings. Early in the season the program has no knowledge initially of favorites or underdogs and thus has no bias. On the other hand, the program requires 5 or 6 games per team to evaluate the strength of teams and only when opponent's true ratings are determined, only then can the results be realistic.

The power ratings do not take into account numerous factors that contribute to a team's ratings. The program does not consider if the game is played early or late in the season and weighs all games equally. The power ratings are meant to serve as a baseline for ranking teams when only game results are the criteria. Any further interpretation of rankings/predictions beyond this premise is made at the reader's risk.

PRE computes the power ratings for high school, college and professional sports. The 'engine' or core program receives input from a database and processes the data to produce results which are then exported to the data base or automatically create web pages.

The input consists of teams, schedules and scores, classification groups, coaches polls and a Factors file. The output consists of power ratings, rankings and derived quantities such as strength of schedule and quality wins.

Factors

There are numerous Factors which can be used in a power rating to various degrees. The application of these factors provides the art in the Active Power Ratings.

In the current release of PRE these factors are:

- (1) [MRG](#): margin of victory and site (home,away,neutral)
- (2) [EXT](#): external games, or games played outside the local region
- (3) [SOS](#): strength of schedule
- (4) [RPI](#): ratings percentage index
- (5) [COR](#): correction based on performing above/below a power rating
- (6) [QWF](#): quality win factor based on defeating a team ranked by either its power rating or poll ranking
- (7) [POL](#): poll ranking
- (8) [TGL](#): Adjusting rating for running-up-the-score
- (9) [WLP](#): won-loss percentage

The formula can weigh all of the ratings and combine them with different weight factors (coefficients) associated with each of them. Each factor can have a weight of 0 to 1 such that the sum of all weights must be less than or equal to 1.



Segmentation

Groups of teams (leagues, sections, states) can be rated against each other as long as there are adequate games between the groups. If two groups of teams have no interplay then they cannot be automatically rated as a single pool. For example, a group of club teams in the east and another in the west may only play among themselves. Each group can have power ratings generated for them that would be meaningful, but comparing the power ratings across groups would not automatically be meaningful; an APR of 90 in the west might be better, worse or the same as an APR of 90 in the east, but PRE would not assist in determining that.

To facilitate this analysis PRE accommodates the notion of “segment offsets” allowing for the automatic adjustment of APR’s between a “local” power rating, computed directly for the pool, and a “national” power rating which is calculated by using the segment offset in conjunction with the local power rating.

Assuming our two groups of club teams from above, the local APR would be 90 in the east and 90 in the west. Based on assessments by sport experts we might decide that the general quality of play in the west is, on average, worth 2 less points in the power ratings and so the east *national* APR would remain at 90 but the west *national* APR would be reduced to 88.

PRE is currently configured to run on a state-by-state basis for high-school sports.