Grid WAR+

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Adjusting for opposing offensive quality

Suppose we knew p_i, the probability that batting team i with a randomly drawn defense defeats a randomly drawn opposing team. For an average offensive team, $p_i = 1/2$. Then

$$dp_i := p_i - 1/2 \tag{0.1}$$

is offense i's win probability above that of an average offense. Then a starting pitcher's Grid WAR in a game, adjusted for the offensive quality of the opposing team i is

$$\text{GWAR+} := \text{GWAR} + dp_i \times \frac{I}{9}, \tag{0.2}$$

where I is the starter's number of innings pitched in that game. The better the opposing offensive team, the more WAR credited to the starter.

We need to estimate $\{p_i\}$. To do so, suppose we knew μ_i, the mean runs scored in a game by team i against a randomly drawn defense. Given μ_i, we model

$$p_i = \frac{1}{29}\sum_{j\neq i}\left\{\mathbb{P}\big(\text{Poisson}(\mu_i) > \text{Poisson}(\mu_j)\big) + \frac{1}{2}\mathbb{P}\big(\text{Poisson}(\mu_i) = \text{Poisson}(\mu_j)\big)\right\}, \tag{0.3}$$

which is explicitly computable using the Skellam distribution. To estimate $\{\mu_i\}$, we use ridge regression. Our dataset consists of all half-innings in a given season, each datapoint (row) j represents a half-inning, the response column y_j is the actual runs scored in that half inning, we use the park factor $\widehat{\alpha}$ as an offset term (estimated previously), and we use fixed effects for the offense and defensive team. We tune the ridge parameter λ using cross validation.