

Mixed Effects Project Revisited - Formulas

11/26/2020

Intro

The goal is to find the effect of a change Δ in random-effect Z_p (QB , $Team$, $Opponent$) have on passing efficiency ($EPA_{pass,i}$) while controlling for the other random effects. I made these formulas aimed to estimate coefficients θ_p , and explain marginal effects of any random effect on ($EPA_{pass,i}$) dependent on the remaining random-effects.

X_p is any fixed-effect(s); their/its coefficient(s) β_p will be estimated using OLS. θ_p will be estimated via the factorization of the list of the intercepts (multilevel) of each p random effect.

Effect of Δ Quarterback Dependent on Team

$$EPA_{pass,i} = \beta_p X_{pi} + \theta_1 QB_i + \theta_2 Team_i + \theta_3 Team_i QB_{ij} + \epsilon_i$$

$$\frac{EPA_{pass,i}}{\Delta QB} = \theta_1 + \theta_3 Team_i$$

Effect of Team Dependent on QB

$$\frac{EPA_{pass,i}}{\Delta Team} = \theta_2 + \theta_3 QB_i$$

QB dependent on Team and Opponent

$$EPA_{pass,i} = \theta_1 QB_i + \theta_2 Team_i + \theta_3 Team_i QB_i + \theta_4 Opponent_i + \theta_5 Opponent_i QB_i + \epsilon_i$$

$$\frac{EPA_{pass,i}}{\Delta QB} = \theta_1 + \theta_3 Team_j + \theta_5 Opponent_j$$

Let's get funny

$$EPA_{pass,i} = \beta_{p,i} X_{p,i} + \theta_1 QB_i + \theta_2 Team_i + \theta_3 Team_i QB_i + \theta_4 Opponent_i + \theta_5 Opponent_i QB_i + \theta_6 Opponent_i Team_i + \epsilon_i$$

With this formula, I should be able to estimate the coefficients $\theta_1, \theta_3, \theta_4$

$$\frac{EPA_{pass,i}}{\Delta QB} = \theta_1 + \theta_3 Team_i + \theta_5 Opponent_i$$

$$\frac{EPA_{pass,i}}{\Delta Team} = \theta_2 + \theta_3 QB_i + \theta_6 Opponent_i$$

$$\frac{EPA_{pass,i}}{\Delta Opponent} = \theta_4 + \theta_5 QB_i + \theta_6 Team_i$$

The coefficients $\theta_1, \theta_3, \theta_4$ should be able to tell us the impact that QB , $Team$, and $Opponent$ have on Passing Efficiency.