

Mixed Effects Project Revisited - Formulas

The goal is to find the marginal effect of random-effect regressor $Z_p (QB, Team, Opponent)$ on passing efficiency (EPA_{pass}) while controlling for remaining random effects. The effects will be quantified by estimating random-effect coefficients and transforming them into parameters: θ_p . Random-effect coefficients are “parameterized” as the relative Cholesky factors of each random effect term Z_p . X_p is any fixed-effect(s) with coefficient(s) β_p . Coefficients will be estimated using OLS.

Formulas

Example: Finding marginal effect (θ_1) on passing efficiency (EPA_{pass}) when there’s a change in QB (ΔQB); dependent on $Team$ and $Opponent$

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

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

Equation: Finding θ_p on EPA_{pass} when ΔZ_p ; dependent on remaining random-effects.

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

I should be able to estimate the coefficients $\theta_1, \theta_2, \theta_4$

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

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

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

The coefficients $\theta_1, \theta_2, \theta_4$ should be able to tell us the relative impact that QB , $Team$, and $Opponent$ have on Passing Efficiency.