

□ Linear Mixed Effect Model all variances and covariances of random effects and all expected values must be specified.

□ Model : $y = X\beta + Zu + e$

Annotations: y is random, X is fixed, Zu is random, e is random.

$$E[\beta] = \beta$$

$$\text{var}[\beta] = 0$$

Breeding values u are defined as deviations

$\Rightarrow E[u] = 0$

Annotations: u is a vector, $E[u]$ is a vector of zeros.

vector $u = \begin{bmatrix} u_1 \\ \vdots \\ u_{27} \end{bmatrix}$ and $\begin{bmatrix} 0 \\ \vdots \\ 0 \end{bmatrix}$

Residuals are also deviations

$$\Rightarrow E[e] = 0$$

$$\begin{aligned} \rightarrow E[y] &= E[X\beta + Zu + e] = E[X\beta] + E[Zu] + E[e] \\ &= XE[\beta] + ZE[u] + E[e] \\ &= X\beta + Z0 + 0 = X\beta \end{aligned}$$