Model Assumptions: (must be specified for mixed model)

- Expected values
  - vector u of breeding values, defined as deviations $\Rightarrow E(u) = \emptyset \Leftrightarrow E\begin{pmatrix} u_1 \\ u_2 \\ \vdots \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ \vdots \end{pmatrix}$
  - vector e of residuals defined as deviations $\Rightarrow E(e) = \emptyset$

$$\Rightarrow E(y) = E[X\beta + Zu + e]$$
$$= E(X\beta) + E(Zu) + \underbrace{E(e)}_{\emptyset}$$
$$= X\beta + Z \cdot \underbrace{E(u)}_{\emptyset}$$
$$= X\beta$$

- Abbreviation:
$$E\begin{bmatrix} y \\ u \\ e \end{bmatrix} = \begin{bmatrix} X\beta \\ 0 \\ 0 \end{bmatrix}$$

- Variance: $var(u) = G$; $var(e) = R$; $var(y) = V$ where G and R are known variance-covariance matrices.
$cov(u, e') = \emptyset$