

vector u of breeding values is unknown and must be predicted from the data. The connection between which breeding value is associated with which observation is given by the design matrix Z .

- ④ vector e of random error terms. The vector e is of length n which is the same length as the vector of observations y .

$$e = \begin{bmatrix} e_3 \\ e_4 \\ e_5 \\ e_6 \end{bmatrix}$$

Combining ① - ④ :

$$\begin{bmatrix} 4.5 \\ 2.9 \\ 3.9 \\ 3.5 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 0 & 1 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} \mu_{male} \\ \mu_{female} \end{bmatrix} + \begin{bmatrix} 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} u_1 \\ u_2 \\ u_3 \\ u_4 \\ u_5 \\ u_6 \end{bmatrix} + \begin{bmatrix} e_3 \\ e_4 \\ e_5 \\ e_6 \end{bmatrix}$$

$y = X\beta + Zu + e$

$0 \cdot u_1 + 0 \cdot u_2 + 1 \cdot u_3 + 0 \cdot u_4 + 0 \cdot u_5 + 0 \cdot u_6$