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Model : $y = X\beta + Zu + e$

$$E\begin{bmatrix} y \\ u \\ e \end{bmatrix} = \begin{bmatrix} X\beta \\ 0 \\ 0 \end{bmatrix}; \text{var}\begin{bmatrix} y \\ u \\ e \end{bmatrix} = \begin{bmatrix} V & ZG & R \\ GZ^T & G & 0 \\ R & 0 & R \end{bmatrix}$$

Data : Introduce information from ^{data} used to the model for known parts :

$$y = \begin{bmatrix} 4.5 \\ 2.9 \\ 3.9 \\ 3.5 \end{bmatrix}; \text{ Known from data which is response variable (y)}$$

Other information (except pedigree) are fixed

⇒ Herd with two levels

$$\beta = \begin{bmatrix} \text{herd}_1 \\ \text{herd}_2 \end{bmatrix}; u = \begin{bmatrix} u_1 \\ u_2 \\ \vdots \\ u_6 \end{bmatrix}; e = \begin{bmatrix} e_1 \\ e_2 \\ e_3 \\ e_4 \end{bmatrix}$$

$$X = \begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 1 & 0 \\ 0 & 1 \end{bmatrix}$$

↑ ↑
herd₁ herd₂

$$Z = \begin{bmatrix} 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \\ 1 & 1 & 1 & 1 & 1 & 1 \\ u_1 & u_2 & u_3 & u_4 & u_5 & u_6 \end{bmatrix}$$

Based on y, X, Z we want estimates β for β and probabilities for u

Mixed Model Equations (MME)