

□ Reliability of predicted breeding value \hat{u}_i for animal i :

$$B_i = r_{u_i, \hat{u}_i}^2 = \frac{\text{cov}(u_i, \hat{u}_i)^2}{\text{var}(u_i) \text{var}(\hat{u}_i)} = \frac{\text{var}(\hat{u}_i)^2}{\text{var}(u_i) \text{var}(\hat{u}_i)}$$

using BLUP property : $\text{var}(\hat{u}_i) = \text{cov}(u_i, \hat{u}_i)$

$$B_i = \frac{\text{var}(\hat{u}_i)}{\text{var}(u_i)} \Rightarrow \text{var}(\hat{u}_i) = B_i \cdot \text{var}(u_i)$$

$$\begin{aligned} \text{PEV}(u_i) &= \text{var}(u_i) - \text{var}(\hat{u}_i) \\ &= \text{var}(u_i) - B_i \cdot \text{var}(u_i) = (1 - B_i) \text{var}(u_i) \end{aligned}$$

↓ solve for B_i

$$B_i \text{var}(u_i) = \text{var}(u_i) - \text{PEV}(u_i)$$

$$B_i = \frac{\text{var}(u_i) - \text{PEV}(u_i)}{\text{var}(u_i)} = 1 - \frac{\text{PEV}(u_i)}{\text{var}(u_i)}$$

$$= 1 - \frac{(G^{22})_{ii}}{\text{var}(u_i)}$$