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□ Variance-Covariance Matrix

▸ Residuals: $var(e) = \begin{bmatrix} var(e_1) & cor(e_1,e_2) & \cdots \\ cov(e_2,e_1) & var(e_2) & \cdots \\ & & \ddots \\ & & & var(e_n) \end{bmatrix}$

$var(e_1) = var(e_2) = \ldots = var(e_n) = \sigma_e^2$ "Residual variance component"

estimated from data

$cov(e_1,e_2) = \ldots \; \emptyset$

$\Rightarrow var(e) = I * \sigma_e^2 = R$

identity matrix

extracted σ_e as standard error in output from lm()

▸ Breeding values u:

$var(u) = \begin{bmatrix} var(u_1) & cov(u_1,u_2) & \cdots \\ cov(u_2,u_1) & var(u_2) & \\ & & \ddots \\ & & & var(u_q) \end{bmatrix}$

$var(u) = U = A * \sigma_u^2$

relationship matrix

additive genetic variance

▸ $var(y) = V = ZUZ^T + R$