Regression Slope b

- $b = \frac{cov(u,y)}{var(y)}$

- $cov(u,y)$ can be expanded by replacing y with the genetic model: $y = \mu + u + e$

$$\Rightarrow cov(u,y) = cov(u, (\mu + u + e))$$

$$= cov(u,\mu) + cov(u,u) + \underbrace{cov(u,e)}_{\text{model assumption} = 0}$$

μ: fixed quantity $\Rightarrow cov(u,\mu) = 0$

$$= cov(u,u) = var(u)$$

- $\Rightarrow b = \frac{cov(u,y)}{var(y)} = \frac{var(u)}{var(y)} = h^2$ (heritability)

- b is used as weight in prediction of breeding values

$\Rightarrow$ predicted breeding value $\hat{u}_i$ for animal i based on own performance:

$$\hat{u}_i = b \cdot (y_i - \mu) = h^2 (y_i - \mu)$$

(μ: population mean)