- Generalisation

$$\hat{u}_i = \mu_u + b\,(y_i - \mu_y)$$

vectors $u, e$ and $y$ follow multivariate-normal distribution, then

$$\hat{u}_i = E(u_i \mid y_i) = E(u_i) + \frac{cov(u_i, y_i)}{var(y_i)} \{y_i - E(y_i)\}$$

- Aggregation for all $q$ animals : $u = \begin{bmatrix} u_1 \\ u_2 \\ \vdots \\ u_i \\ \vdots \\ u_q \end{bmatrix}$

$$\hat{u} = E(u \mid y) = \underbrace{E(u)}_{0} + cov(u, y^T) \cdot \underbrace{var(y)^{-1}}_{V^{-1}} \cdot (y - E(y))$$

$$= \underline{0} + U \cdot Z^T \cdot V^{-1} \cdot (y - Xb)$$

$$= U \cdot Z^T \cdot V^{-1} (y - X\underline{b})$$

unknown, replace it with $\hat{b}$

$$\hat{u} = U \cdot Z^T \cdot V^{-1} (y - X\hat{b})$$

- $\hat{u}$ depends on $V^{-1}$ which is difficult to compute

$V = var(y)$ has dimensions $n \times n$. $\{ n = 10^4$