

Exercises: Prediction of breeding values

Exercise 3: animal model with herd effect.

We want to predict breeding values for seven Aberdeen Angus bulls for their growth rate (g/day). The bulls are unrelated and exist in two different herds.

Herd	
1	2
a ₁ (800)	a ₄ (900)
a ₂ (800)	a ₅ (1000)
a ₃ (900)	a ₆ (1200)
-	a ₇ (900)

- Set up a complete statistical model describing the data. Also give expectations and (co)variances for the random effects. What is this model called?
- Assume that heritability is 0.4. What is the value of the variance ratio σ^2_a/σ^2_u ?
- Set up the mixed model equations (MME) in matrix form for this example.
- To get unique solutions for the fixed effects, do a reparameterization such that the row and column for the mean (or one of the herd effects) are deleted. Then solve the equation system using Excel.
- What are the additive breeding values and ranking for the 7 bulls? Is it possible to rank the bulls over herds?