Pig Science - Breeding - Exercise 3

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Problem 1 Analysis of Variance

Estimate the variance component for the sire effect using an analysis of variance. The data is available from `https://charlotte-ngs.github.io/pigsciencess2022/data/gel_sire_w10.csv`. Because the data contains just female animals, the fixed effect of the sex can no longer be estimated.

Hint

- Use the functions `aov()` to do the analysis of variance and the function `summary()` on the ANOVA result to get the relevant parts of the variance components.

Problem 2: Variance Components Estimation Using REML

Use the same data set as for Problem 1 and a sire model to estimate the same sire variance σ_s^2. The sire model is the linear mixed effects model that contains sire effects as random component. The model can be specified as

$$y = Xb + Zs + e$$

where y is the vector of observations, b is the vector of fixed effects which are the same as in Problem 1, s is the vector of random sire effects and e is the vector of random error terms.

Hint

- Use the package `pedigreemm` to get a REML estimate for the sire variance component σ_s^2.
- We assume that the sires are not related. Hence variance-covariance matrix $var(s)$ of the sire components are $var(s) = I * \sigma_s^2$.

Problem 3: Variance Components Estimation Using an Animal Model

We are given the dataset with the response variable `carcass weight` (CW) and the predictor variables that resulted from the model selection process from Exercise 1. These consisted of

- sex (`sex`)
- slaughterhouse (`slh`)
- herd (`hrd`)
- age at slaughter (`age`)

The data is available from `https://charlotte-ngs.github.io/pigsciencess2022/data/gel_bp_w10.csv`.

We use a mixed linear effects model to estimate the variance components for the random effects in the model.

$$y = Xb + Za + e \tag{1}$$

where y is a vector of observations, b is a vector of fixed effects found to be relevant in Exercise 1, a is a vector of random breeding values and e is a vector of random errors.

Hint

- Use the package `pedigreemm` to get an estimate of the variance components

Your Task

- Estimate the variance components σ_a^2 and σ_e^2 for the two random component a and e, respectively.