Practical Wednesday afternoon

Part 1. Response to mass selection
Use mass_response.r for this exercise. The additive model for Ve is assumed.

1. Calculate the response in mean and variance when applying mass selection. The additive genetic variance σ^2_{am} in mean is 0.1, environmental variance (σ^2_E) is 0.9 and the genetic variance in Ve (σ^2_{av}) is 0.05. Change the selection proportion from 50% to 1%. What do you observe?

2. What is Ve and the normal heritability in the next generation for different selection intensities?

3. Use the index in R with P and P^2 and calculate the responses in mean and variance when $r_{am,av}$≠0. The rest of the parameters is the same as in question 1. The selected proportion is either 20% or 1%. Vary $r_{am,av}$ between -1 and 1.

4. Calculate the heritability of Ve for different values of varav and varam assuming the additive model for Ve. Make a plot of the heritability of Ve as a function of the heritability of the mean.

5. Calculate the heritability of Ve for different values of varav and varam assuming the exponential model for Ve. Make a plot of the heritability of Ve as a function of the heritability of the mean. What do you observe in comparison with question 4?

Part 2. Information of relatives and response to selection in variance
Use the R-code response to selection sibs.R. The additive model is assumed for Ve.

6. Calculate the accuracy of selection on Ve as a function of number of half-sib or half-sib offspring (10 – 200). Assume σ^2_{am} in mean is 0.1, environmental variance (σ^2_E) is 0.9 and the genetic variance in Ve (σ^2_{av}) is 0.05 or 0.02. Make a plot.

7. What is the response in variance when selecting the 10% animals in both sexes with highest EBV for variance when varam=0.1, vare=0.9, varav=0.05, rgamav=0 and assuming 50 half-sibs as information to estimate the breeding values for Ve.

8. Determine the responses in variance in the next 5 generations. Does the accuracy change? Why?

9. Make an index using economic weights of 1.0 and -1.0 for mean and variance. Use either 50 half-sibs or 50 half-sib progeny. Use the same parameters as in question1. Calculate the response in Am and Av when the selecting the best 10% animals in both sexes. Compare the responses to selection n Am and Av.

10. Assume 50 half-sib progeny for breeding value estimation and economic values of 1.0 and -1.0. Change the genetic correlation between Am and Av from -0.9 to 0.9. Make a plot of the responses in Am and Av.

11. Assume 50 half-sib progeny for breeding value estimation. Change the economic value on Av from 0 to -100; keep v_am=1. Assume the genetic correlation between mean and variance is 0 or 0.5. Make a plot.