Biol 531 - Linear Models Name KEY

Nested variables and random effects

Gestation in mammals, not mass adjusted:

1. Record the SS for each taxonomic level below, and place an asterisk by each one that is significant.

Order SS 68.4 Family SS 0.38 Genus SS 1.52

Total SS 73.26

2. Calculate the proportion of total variation accounted for by each level:

Order prop 0.93 Family prop 0.005 Genus prop 0.02

3. Interpret the results. At which taxonomic level is there the greatest amount of variation in gestation length?

*Most of the variation explained by taxonomy was at the order level. Families and genera did not vary in gestation length much compared with orders.*

Gestation in mammals, mass adjusted:

4. Record the SS for each taxonomic level below, and place an asterisk by each one that is significant.

Order SS 23.6 Family SS 0.23 Genus SS 1.59

Total SS 73.26

5. Calculate the proportion of total variation accounted for by each level:

Order prop 0.32 Family prop 0.003 Genus prop 0.02

6. Did your interpretation change when you accounted for mass? Does there still seem to be an effect of taxonomic level, or can differences among taxonomic groups be attributed to differences in mass?

*The overall pattern is the same, but a large fraction of the variation among orders can be attributed to body mass. Even when body mass is accounted for, order still accounted for the greatest proportion of variation in the taxonomic hierarchy.*

Random effects - two crossed random effects

7. Fill in the table below (which you needed to complete in Excel):

| Source | Df | SS | MS | F | p |
|---|---|---|---|---|---|
| sire | 4 | 1.03 | 0.26 | 1.37 | 0.38 |
| dam | 1 | 0.52 | 0.52 | 2.74 | 0.17 |
| sire:dam | 4 | 0.77 | 0.19 | 2.38 | 0.12 |
| Residuals | 10 | 0.83 | 0.08 | | |

8. Interpret the result - is there significant variation in piglet weight gain among sires or dams, and is there a significant interaction?

*None of the effects are significant.*

Random effects - sire fixed, dam random and nested within sire

9. Fill in the following table:

| | Df | SS | MS | F | p |
|---|---|---|---|---|---|
| sire | 4 | 1.03 | 0.26 | 1 | 0.48 |
| sire:dam | 5 | 1.29 | 0.26 | 3.25 | 0.05 |
| Residuals | 10 | 0.83 | 0.08 | | |

10. Interpret the result - is there significant variation in sires? Is there significant variation among dams?

*There is no difference among sires, but dams nested within sire are nearly significantly different. A farmer wishing to produce piglets with good growth rates would be better off concentrating on the quality of the mother than on the sire.*