

Assignment #9

(Due: Monday, April 14, 2008)

Reading: Oehlert, Chapter 16.1 – 16.4.

Faraway, Chapter 8.1 - 8.4. – concise summary of mixed effects models and data analyses;
Pinheiro and Bates, section 1.4.1 (Orthodont data); section 2.1.1 for the Laird and Ware (1982)
notation.

Written Assignment:

1. P15.3 (a) and (d).
2. P16.1 (a) and (c)
Hint: Only one of the two problems is a split-plot design. When describing split-plots, always identify whole plot units, whole plot treatment, split-plot units, split-plot treatment. Also, draw Hasse diagrams for both (a) and (c), complete with parantheses for random effects, superscripts and subscripts.
3. P16.4
4. P16.3
5. Consider the data in P16.8. This is a split-plot design. Assume the traditional model for split-plots, with CRD at the whole plot level. The split-plot is a specific “repeated measures” design.
 - a) Describe the data in P16.8 as a split-plot (whole plot unit, treatment; split-plot-unit, treatment). You don’t need to analyze the data.
 - b) Describe the data as a repeated measures design. Identify “groups” (well, we don’t have subjects here). What is the measure that is repeated within-group?
 - c) Identify the elements in the Laird and Ware (1982) notation,
$$\mathbf{Y}_i = \mathbf{X}_i\boldsymbol{\beta} + \mathbf{Z}_i\boldsymbol{\gamma}_i + \boldsymbol{\varepsilon}_i,$$
where \mathbf{Y}_i is the vector of observations in group i . Write up explicitly the elements of the matrices, the distributions of the random effects, and which random variables are i.i.d, and which are independent in this model.
 - d) Describe the model in the Faraway notation, page R7 of the lecture notes. Write up matrices and parameters element-wise, including the within-group correlation matrix $\boldsymbol{\Lambda}$, and the scaled covariance matrix for the random effects, \mathbf{D} .
 - e) In the Faraway notation, provide the covariance matrix $\text{var}(\mathbf{Y})$. If you have previously written up a matrix or vector element-wise, you can use the symbol – for example, you can use $\boldsymbol{\Lambda}$ and \mathbf{D} from part (d).

Midterm Exam 2, Monday, April 14, during the usual class time. Closed book, closed notes, 2 sheets of notes (handwritten by yourself) are allowed. Remember to bring your calculator. Material is cumulative, up to including split plots (Chapter 16, Oehlert). Problem 5 on this homework set is not on the exam, but do it anyway.