

STAT 516 - Spring 2001 - Homework 6

Due: Monday, April 9th

1) This problem uses the data discussed on pages 382-388 (especially 388) of the text. The data and most of the code is provided on the web-page. While determining what factors are significant is fairly straightforward, presenting those results is a bit trickier. In particular, we would like to have estimates of the different parameters in the model equation:

$$y_{ijk} = \mu + n_i + s_j + (ns)_{ij} + e_{ijk}$$

where:

$$\sum n_i = n_1 + n_2 + n_3 = 0$$

$$\sum s_j = s_1 + s_2 = 0$$

$$\sum_i (ns)_{ij} = \sum_j (ns)_{ij} = 0$$

- a) The “solutions” command gives us some estimates of the model parameters, but doesn’t give them so that they average out to zero. Because of this, the intercept (μ) that it gives isn’t the “overall average”. Instead it is the average of one of the six possible groups. Which one of the six is it the average for? How were you able to tell this?
- b) Finish entering the code to find the rest of the main effect and interaction estimates. (The web-page finds four of them, μ , n_1 , s_1 , and $(ns)_{11}$; you need to find the other 8.)
- c) Say we were only concerned about a possible interaction between OMCD and Hypertensive. Construct a 95% confidence interval for the magnitude of this interaction.
- d) Say we were only interested in testing for a difference between the mean of the OMCD-Normal group and the OMCD-Hypertensive group. Test whether this difference is zero at the $\alpha=0.05$ level.

2) Three refining processes are available for a chemical company to choose from, and they wish to determine which of them is most effective. Because they are aware that the quality of the unrefined chemical is important, and changes quite a bit, they decide to use a block design. They randomly select five days from the following two months, and divide the incoming chemicals that day into three groups, one for each of the processes (day is thus a random effect). They get the following yields:

	Day				
	1	2	3	4	5
Method A	31.0	39.5	30.5	35.5	37.0
Method B	28.0	34.0	24.5	31.5	31.5
Method C	25.5	31.0	25.0	33.0	29.5

- a) Why can’t you test whether the interactions between day and method are significant?
- b) If possible, test the null hypothesis that all three methods perform the same at an $\alpha=0.05$ level. Verify that you are using the correct F statistic, or say why it is impossible.
- c) If possible, test the null hypothesis that variance of the effect of different day’s batches is zero at an $\alpha=0.05$ level. Verify that you are using the correct F statistic, or say why it is impossible.