Discussion #4

February 11, 2013
Outline

• Q. 1.1 from HW 8
• Q. 2.4 from HW 8
• Log Transformation
• Q. 4 from HW 8
• Q. 2.1 from HW 8
• Recognizing experimental design
**Design:**
RCBD with one rep per block*treatment combination

**Response Variable:**
Total methane emissions over 3-months

**Experimental Unit:**
1 Plot

<table>
<thead>
<tr>
<th>Class Variable</th>
<th>Block or Treatment</th>
<th>No. of Levels</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Block</td>
<td>4</td>
<td>Four areas in a field</td>
<td></td>
</tr>
<tr>
<td>2 Treatment</td>
<td>7</td>
<td>Six treatments and a control</td>
<td></td>
</tr>
</tbody>
</table>

**Subsamples?**
Technically, yes; but they are summed over time.
A closer look at Q 2.4

2.4 Using the data that meet the ANOVA assumptions, retain the Block*Treatment interaction term in your model and answer the following questions. [Note: Choose a method of analysis that controls MEER for all questions simultaneously.]

a. Is there a significant treatment effect? The ANOVA table
b. Is there a significant effect of Compound A on weight loss?
c. Is there a significant effect of Compound B on weight loss?
d. Is the effect of Compound A different at the different levels of Compound B?
e. Which pills would you recommend to a dieter?

What about questions b-e?
The only test we know about that allows us to perform group comparisons and all pairwise comparisons while still controlling the overall MEER is Scheffe's Test.

(2.4b-d) The group comparisons must be calculated by hand.
(2.4e) While the ranking via pairwise comparisons can be done with SAS.
Lets go logging
The effect of F at M0 (x) \(0.883 - 0.712 = 0.171\)
The effect of F at M1 (y) \(0.687 - 0.305 = 0.382\)

The difference in the effect of F between the two levels of M (i.e. the interaction) 
\(0.382 - 0.171 = 0.211\)
Q 4 continued

Interaction Plot Between Males and Females

Original (Detrans) Scale

The effect of F at M0 (x)  
0.949 – 0.868 = 0.081

The effect of F at M1 (y)  
0.855 – 0.610 = 0.245

The difference in the effect of F between the two levels of M (i.e. the interaction)  
0.245 – 0.081 = 0.164
Transformed Scale

The effect of F at M0 (x)  $0.883 - 0.712 = 0.171$

The effect of F at M1 (y)  $0.687 - 0.305 = 0.382$

The difference in the effect of F between the two levels of M (i.e. the interaction)

$0.382 - 0.171 = 0.211$

Original (Detrans) Scale

The effect of F at M0 (x)  $0.949 - 0.868 = 0.081$  $111\% \ (0.171/0.081)$

The effect of F at M1 (y)  $0.855 - 0.610 = 0.245$  $56\% \ (0.382/0.245)$

The difference in the effect of F between the two levels of M (i.e. the interaction)

$0.245 - 0.081 = 0.164$

Must Look at Absolute Values:

$x \ |.171-.081| = 0.09$ and $y \ |.382-.245| 0.197$
**Q. 2.1—HW 8**

<table>
<thead>
<tr>
<th>Class Variable</th>
<th>Block or Treatment</th>
<th>No. of Levels</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Block</td>
<td>4</td>
<td>Age groups</td>
</tr>
<tr>
<td>2</td>
<td>Treatment</td>
<td>4</td>
<td>Four combinations of two compounds (00, A0, 0B, and AB)</td>
</tr>
</tbody>
</table>

**Design:** RCBD with two reps per block*treatment combination

**Response Variable:** Weight loss in lbs after 4 weeks

**Experimental Unit:** One Person
Recognizing Experimental Designs
A professor wants his graduate student to carry out an experiment to see the effects of four different light conditions (100, 600, 1100, 1600 µmol/m²s) on photosynthetic rates in soybean leaves. He has 16 plants and four growth chambers, each of which has four isolated compartments where light intensity is regulated independently. The four growth chambers are a various ages with different levels of precision in temperature control.
The professor's suggested design:

**Experimental design 1:** Assign one light level to each growth chamber (e.g. light levels 100, 600, 1100, 1600 assigned randomly to growth chambers A, B, C, and D, respectively) and randomly assign one plant to each of the four compartments in each chamber. After one week, measure the photosynthetic rate of two randomly selected leaves from each plant.

The student suggests an alternative design:

**Experimental design 2:** Randomize the four light levels within each chamber (one to each of the four isolated compartments) and randomly assign one plant to each of the four compartments in each chamber. After one week, measure the photosynthetic rate of two randomly selected leaves from each plant.

Questions:
1. What are the designs of these two experiments?
2. Which is the better design?
3. What is the number of replications in each design?
Final tips

Average subsamples! Test all assumptions using these averages. Be very clear about the experimental design before touching SAS. Read all directions and descriptions extremely carefully.

To maximize your grade…

Include all SAS code.
Report p-values when stating conclusions.
When asked to choose the most appropriate method of analysis, choose one method.