STAT 8004, Homework 2

Group # ... (Replace this)
Members: ... (Replace this)

Feb. 6, 2013

This homework is due Thu., 2014/02/13, 5:30pm.

Instructions: Generate a PDF file from it and submit the PDF file to blackboard. Each group should submit one file with file names **hw[number]-[groupnumber].pdf**. For exmaple, "hw01-1.pdf" for homeowrk 1 and group 1. Please also include your R code in the appendix.

Problem 1. (40 points) An investigator would like to know what factors would affect the impact strength of insulation cut. The data they collected ("insulate.txt") contained the following variables:

Variable	Description
Lot	Lot of insulation material
Cut	lengthwise(Length) or crosswide (Cross)
Strength	Impact strength in foot-pounds

a). (5 points). Build up a two-way ANOVA model without interaction to estimate the impact strenth of insulation cut.

b). (5 points). Estimate the parameters in your model in a).

c). (5 points) The investigator would like to test whether the effect of cut is significant. Please construct a corresponding hypothesis based on your model in a) and show the results.

d). (5 points) Plot group mean curve. Is there any evidence of the existence of the interaction term?

e). (5 points) Build up a two-way ANOVA model with interaction to estimate the impact strenth of insulation cut.

f). (5 points) Estimate the parameters in your model in e).

g). (5 points) Please test whether the interaction term is significant or not.

h). (5 points) Interpretate your results to the investigator, assuming that he is not a statis-

tician.

Problem 2. (50 points) (Try NOT to use computer for this problem. You can use a calculator though.) An investigator conducted a weight loss intervention experiment. 27 subjects under different levles of depression (None, Mild, Severe) wrere randomized to one of the three different physical activity interventions (Walking, Walking and Weight Lifting, Running and Weight Lifting). Here are the data:

Interventions/Depression	None	Mild	Severe
Walk	2, 1, 3	0.5, 0.5, 1.2	1, 0, 0.5
Walk & Weight	3, 4, 8	0.6, 0.7, 1.3	0.25, 1, 0
Run & Weight	5, 7, 9	0.8, 0.9, 1.5	0.75, 0.5, 2

Table 1: Pounds Lost after Physical Interventions of Patients with Depression

a). (5 points) Please build up a two-way ANOVA model (the non-full-rank model) without intervention to study the effect of depression and physical interventions on weight loss.

b). (10 points) Transform your model into the format of $\mathbf{Y} = \mathbf{X}\boldsymbol{\beta} + \boldsymbol{\epsilon}$. Write out the format of each term. What's the rank of $\mathbf{X}$?

c). (5 points) Estimate the parameters in a).

d). (5 points) Please build up a two-way ANOVA model (the non-full-rank model) with intervention to study the effect of depression and physical interventions on weight loss.

e). (5 points) Estimate the paramters in d).

f). (10 points) Test whether the effect of depression is significant.

g). (10 points) Test whether the effect of interaction is significant.