

Methods of Data Analysis II

Homework 6

Name:

OSU-ID:

Instructions

- The homework is due on Friday, June 5th (in class). Late homeworks will not be accepted under any circumstances.
- You may work individually or in groups of 2 people. If you work in groups, you must include the names and OSU-ID numbers of all the students in the group and submit only one assignment per group.
- You must provide complete answers in order to receive full credit. The homework is worth 25 points.
- You must clearly indicate the problem that you are working.
- Homeworks must be stapled when submitted (including this sheet as a cover page). Do not use folders, paper clips or any other objects to keep the pages together.

1. Consider a data set on 861 ACT Assessment Mathematics Usage Test scores from 1987. The test was given to a sample of high school seniors who met one of three profiles of high school mathematics course work: (a) Algebra I only; (b) two Algebra courses and Geometry; and (c) two Algebra courses, Geometry, Trigonometry, Advanced Mathematics and Beginning Calculus.

The data frame consists on 861 observations on the following 3 variables:

Sex: a factor with levels “female” and “male”

Background: a factor with levels “a”, “b” and “c”

Score: ACT mathematics test score

- (a) Construct box-plots for the *scores* by *sex* and for the *scores* by *background*. Based on these box-plots, do you think there is some evidence for a gender effect. Is there any evidence of a background effect? Explain.
- (b) Fit the non-additive model for *scores* vs *sex* and *background* and produce the ANOVA table. Is there any evidence of an interaction effect?
- (c) Construct the interaction plot to look for interactions between the factors *sex* and *background*. Is the interaction plot consistent with the results from the ANOVA table in part (b)?
- (d) Fit the additive model for *scores* vs *sex* and *background* and produce the ANOVA table. Based on the ANOVA table, which factors seem to have a significant effect on the scores?
- (e) Conduct an ESS *F*-test to compare the additive and the non-additive models. Based on your results, which model seem to be more appropriate? Explain.
- (f) Obtain a 95% confidence interval for the effect “male”, after accounting for *Background*.

Note: The data set can be read in R using the following commands

```
> library('Sleuth3')  
> head(ex11320) # To see the data structure  
> ex1320 # To read the full data set
```