

**EDF 5401 HW 3**  
**Due 7/ 14/ 10**

**Please type your answers as much as possible.**  
**Total 100 points**

In this assignment, use an SPSS data file, hw3.sav. You can find the data, under the assignments folder in the Blackboard. Use *fltxsstd* (Student science standardized score) as outcome or dependent variable and *flrace* (Asian, Hispanic, Black, White and Other), *flses* (Socio-Economic status composite), as independent variables.

	<i>flrace</i>
Asian, Pacific Islander	1
Hispanic	2
Black, not Hispanic	3
White, not Hispanic	4
American Indian, Alaskan (Other)	5

To learn about ANCOVA you will run two separate analyses. However, they ought to give you essentially the same results when you are done. You will see that using the general linear model is the easier way to do ANCOVA.

You will need a set of four dummy variables for the first four of the five races coded into *flrace* (do not make a dummy for Other). Use the **Variables, Recode into different variables menu** to make up four dummies for students from the Asian, Hispanic, Black and White.

Before running any analyses, filter out cases that are unnecessary from the analysis, do the following:

1. Choose **Data**, then **Select cases**, choose **If condition is satisfied**, then click **If** box;
2. Select your dummy variable, *flrace*, click this into the box and type "< 6" (We type "< 6" because we are interested only in Asian, Hispanic, Black, White and Other groups).
3. Choose **Continue**, then **OK**.

You can see the eliminated cases in data spread sheet. Also, "filter\_\$" variable is created.

1. (10 points) Make a scatterplot of *flses* and *fltxsstd*. Be sure to set markers by race, *flrace*, so you can check for an interaction. Does SES appear to be a good potential predictor of student moral score? Do you see any hint of an interaction with race?

2. Compute the regression of *flses* and your four dummy variables on *fltxsstd* for the students in the data set. Be sure to make a histogram and a residual plot (residuals versus predicted values) for the analysis.

- a. (10 points) Does *flses* seem to be a good predictor? Also, check assumptions.

b. (10 points) What do the dummy variables seem to tell you about differences among the races? (Are any of the dummy variables significant? Report *p-values*.)

c. (10 points) What does the overall *F-test* for this regression tell you? Report  $R^2$ . Is it significant? What is your conclusion?

3. (10 points) Next, use the **Analyze, General linear model, and Univariate** menu to run an ANCOVA for the *fltxsstd* outcome. Use *flses* as the **covariate** and *flrace* (not the race dummy variables) as a **fixed factor**. You will first need to verify that the covariate and treatment (i.e., race) do not interact. Use the **Model** window to create a **custom** model with **both predictors plus their interaction**. (Highlight both names at once and click on the arrow to build this interaction.)

Is the interaction of *flses* with *flrace* significant? What evidence do you have to support your decision?

4. Remove the interaction from the model and run the model with only the main effects of *flrace* and *flses*. When you run this model, click on the **[Options...]** button and select the following items:

- estimated marginal means by race (to get these, move *flrace* to the right in the top of the options window)
- descriptive statistics
- parameter estimates
- homogeneity tests, and
- residual plot

Also click the **[Plots...]** button and make the plot of *flrace* means (click the name into the Horizontal axis box, then click **Add**, and then **Continue**).

a. (10 points) Look at the homogeneity tests. Do the group variances seem to be equal?

b. (15 points) Compare the marginal mean estimates to the means from the descriptive statistics output. Add (e.g., draw on by hand) the values of the marginal means to the plot of means that was produced by SPSS. Discuss differences between the two sets of means.

c. (10 points) Compare the parameter estimates from the ANCOVA to the ones you obtained for the regression in item 3. What does the parameter for *flses* in the ANCOVA model represent?

d. (10 points) Look at the ANCOVA residual plot and compare it to the residual plot from item 3. What error assumption is this plot meant to examine? Do you think the data satisfy that assumption?

e. (5 points) What is your conclusion about racial differences in student science standardized score, based on the results of this ANCOVA?