STAT 305 D Homework 11

Due Apr 25, 2013 at 12:40 PM in class

Show all 6 steps in your hypothesis tests.

1. For this problem, use the dataset, `polypolyols.jmp` posted on the materials page of the course website.

   Return to the situation of Exercise 3 of Section 4.1 and the polymer molecular weight study of R. Harris.

   (a) Find s_{LF} for these data. What does this intend to measure in the context of the engineering problem?

   (b) Plot both residuals versus x and the standardized residuals versus x. How much difference is there in the appearance of these two plots?

   (c) Give a 90% two-sided confidence interval for the increase in mean average molecular weight that accompanies a 1°C increase in temperature here.

   (d) Give individual 90% two-sided confidence intervals for the mean average molecular weight at 212°C and also at 250°C.

   (e) Give simultaneous 90% two-sided confidence intervals for the two means indicated in part (d).

2.

Nicholson and Bartle studied the effect of the water/cement ratio on 14-day compressive strength for Portland cement concrete. The water/cement ratios (by volume) and compressive strengths of nine concrete specimens are given next.

Water/Cement Ratio, x	14-Day Compressive Strength, y (psi)
.45	2954, 2913, 2923
.50	2743, 2779, 2739
.55	2652, 2607, 2583

(a) Find estimates of the parameters β_0, β_1, and σ in the simple linear regression model $y = \beta_0 + \beta_1 x + \epsilon$.

(b) Compute residuals and standardized residuals. Plot both against x and $\hat{y}$ and normal-plot them. How much do the appearances of the plots of the standardized residuals differ from those of the raw residuals?

(c) Make a 90% two-sided confidence interval for the increase in mean compressive strength that accompanies a .1 increase in the water/cement ratio. (This is $.1\beta_1$).

(d) Test the hypothesis that the mean compressive strength doesn't depend on the water/cement ratio. What is the p-value?

(e) Make a 95% two-sided confidence interval for the mean strength of specimens with the water/cement ratio .5 (based on the simple linear regression model).

3.

Return to the situation of Chapter Exercise 2 of Chapter 4 and the carburetion study of Griffith and Tesdall. Consider an analysis of these data based on the model $y = \beta_0 + \beta_1 x + \beta_2 x^2 + \epsilon$.

(a) Find s_{SF} for these data. What does this intend to measure in the context of the engineering problem?

(b) Plot both residuals versus x and the standardized residuals versus x. How much difference is there in the appearance of these two plots?

(c) Give 90% individual two-sided confidence intervals for each of β_0, β_1, and β_2.

The dataset for this problem and a description are as follows:

Nicholson and Bartle studied the effect of the water/cement ratio on 14-day compressive strength for Portland cement concrete. The water/cement ratios (by volume) and compressive strengths of nine concrete specimens are given next.

Water/Cement Ratio, x	14-Day Compressive Strength, y (psi)
.45	2954, 2913, 2923
.50	2743, 2779, 2739
.55	2652, 2607, 2583

4. For this problem, use the dataset, `pulp.jmp`

posted on the materials page of the course website.

Return to the situation of Exercise 2 of Section 4.2, and the chemithermomechanical pulp study of Miller, Shankar, and Peterson. Consider an analysis of the data there based on the model $y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \epsilon$.

(a) Find s_{SF}. What does this intend to measure in the context of the engineering problem?

(b) Plot both residuals and standardized residuals versus x_1, x_2, and $\hat{y}$. How much difference is there in the appearance of these pairs of plots?

(c) Give 90% individual two-sided confidence intervals for all of β_0, β_1, and β_2.

5. Weekly feedback. You get full credit as long as you write something.

   a. Is there any aspect of the subject matter that you currently struggle with? If so, what specifically do you find difficult or confusing? The more detailed you are, the better I can help you.

   You got full credit as long as you wrote something.

   b. Do you have any questions or concerns about the material, class logistics, or

anything else? If so, fire away. You got full credit as long as you wrote something.