Recitation 9 Practice Problems

11/20/2017

Problem 1

Kutner 6.1

Set up the X matrix and β vector for each of the following regression models (assuming i=1,...,4)

a. $Y_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i1} X_{i2} + \epsilon_i$
b. $logY_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \epsilon_i$

Problem 2

Kutner 6.5

In a small-scale experimental study of the relation between degree of brand liking (Y) and moisture content (X_1) and sweetness (X_2) of the product, the results were obtained from the experiment based on a completely randomized design.

The data can be obtained here: http://www.stat.ufl.edu/~rrandles/sta4210/Rclassnotes/data/textdatasets/KutnerData/Chapter%20%206%20Data%20Sets/CH06PR05.txt.

a. Obtain the scater plot matrix and the correlation matrix. What information do these diagnositic aids provide here?
b. Fit a regression model to the data. State the estimated regression function. How is b_1 interpreted here?

Problem 3

Kutner 6.6

Using the data from problem 2:

a. Assuming the model from 1a, test whether there is a regression relation, using $\alpha = 0.01$. State the alternatives, decision rule, and conclusion.

Problem 4

Kutner 6.7

Using the data from problem 2:

a. Calculate the coefficient of multiple determination R^2. How is it interpreted here?

Problem 5

Kutner 7.3

Using the data from problem 2:

a. Obtain the analysis of variance table that decomposes the regression sum of squares into extra sums of squares assoicated with X_1 and with X_2 given X_1.

b. Test whether X_2 can be dropped from the regression model given that X_1 is retained. Use the F statistic and the level of significance 0.01. State the alternatives, decision rule, and conclusion. What is the p-value of the test?

Problem 6

Kutner 7.24

Using the data from problem 2:

a. Fit first-order simple linear regression model for relating brand liking (Y) to moisture content (X_1). State the fitted regression function.
b. Compare the estimated regression coefficient for moisture content obtained in part (a) with the corresponding coefficient found in 2b. What do you find?
c. Does SSR (X_1) equal SSR($X_1|X_2$)? If not is the difference substantial?
d. Refer to the correlation matrix obtain is 2b. What bearing does this have on your findings in parts (b) and (c)?