ERSH 8320 Homework #4
Due Tuesday, November 13th at 11:59:59PM

[This data set originally from Neter et al. (1996)]

A hospital administrator wished to study the relation between patient satisfaction (Y) and patient's age (X_1, in years), severity of illness (X_2, an index), and anxiety level (X_3, an index). For all variables, assume each is measured with perfect reliability. The administrator randomly selected 23 patients and collected the data presented below, where larger values of Y, X_2, and X_3 are, respectively, associated with more satisfaction, increased severity of illness, and more anxiety.

a) Fit a regression model for Y using the three predictor variables (using X_1, X_2, X_3 to predict Y) and state the regression parameters and their standard errors.

b) Are any outliers present in the analysis? Describe your conclusion by showing any plots and/or statistics.

c) Does the assumption of constant error variance hold for this analysis? Provide any necessary plots and/or statistical tests (using a Type-I error rate of 0.05). For the statistical test, describe what is being tested, how it is being tested, and how you used this to reach your conclusions.

d) Does the assumption of normally distributed error terms hold for this analysis? Provide any necessary plots and/or statistical tests (using a Type-I error rate of 0.05). For the statistical test, describe what is being tested, how it is being tested, and how you used this to reach your conclusions.

e) Overall, does this model significantly account for variation in Y? Provide the statistical test used to answer this question (using a Type-I error rate of 0.05). For the statistical test, describe what is being tested, how it is being tested, and how you used this to reach your conclusions.

f) Obtain the partial correlation between patient satisfaction (Y) and severity of illness (X_2), controlling for the effects of age (X_1) and anxiety level (X_3). Interpret this value – what can you tell about the relationship between Y and X_2 when the other values are controlled.

g) Compare the partial correlation with the zero-order correlation between Y and X_2. Can you explain why these may be different?

h) Obtain a 95% confidence interval estimate of the mean satisfaction when $X_1 = 35$, $X_2 = 45$, and $X_3 = 2.2$. Interpret this interval.

i) Obtain a 95% confidence interval estimate for a new patient's satisfaction when $X_1 = 35$, $X_2 = 45$, and $X_3 = 2.2$. Interpret this interval.

patient satisfaction	patient's age	severity of illness	anxiety level
48	50	51	2.3
57	36	46	2.3
66	40	48	2.2
70	41	44	1.8
89	28	43	1.8
36	49	54	2.9
46	42	50	2.2
54	45	48	2.4
26	52	62	2.9
77	29	50	2.1
89	29	48	2.4
67	43	53	2.4
47	38	55	2.2
51	34	51	2.3
57	53	54	2.2
66	36	49	2.0
79	33	56	2.5
88	29	46	1.9
60	33	49	2.1
49	55	51	2.4
77	29	52	2.3
52	44	58	2.9
60	43	50	2.3