

Homework #10 – Due December 3
STAT-UB.0103 – Statistics for Business Control and Regression Models

Problem 1

Sincich, Ex. 11.27.

(Note: If you have the 2nd edition of the textbook, then the problem number is 10.25)

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Problem 2

Sincich, Ex. 11.32.

(Note: If you have the 2nd edition of the textbook, then the problem number is 10.29. The data is slightly different, as is the regression fit. On your assignment, add a note for the TA to let him know that you are using the older edition; otherwise, he might mark your answer as incorrect.)

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Problem 3

Sincich, Ex. 11.58. The problem asks for evidence of a “decrease” (one-sided alternative). It is ok to give the p -value for “change” (two-sided alternative).

(2nd edition: Sincich, Ex. 10.48.)

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Problem 4

Financial institutions charge, in general, different interest rates on their loans. A financial analyst was interested in the relationship between Y and X , where

- Y = the default rate per 1000 loans (i. e. the number of loans that default per 1000 loans)
- X = the interest rate (%) on a loan.

She collected data on a random sample of financial institutions, that is for each institution in the sample she recorded the interest rate charged by that institution and the number of defaults per 1000 loans given by that institution. Please answer the following questions using your own Minitab output. (The data are posted on the course webpage as `DefaultInt`.)

- (a) Obtain a scatter plot of the data. Does the scatter plot indicate a linear relationship between Y and X ?
- (b) Obtain the regression model of Y on X . Interpret the regression coefficients in this model.
- (c) Find the standard error of regression (s) and interpret it. Compare it with the sample standard deviation of default rates (s_Y). Explain the meanings of s and s_Y .
- (d) Is there a statistically significant linear relationship between Default rate and Interest rate? Test at $\alpha = 0.01$? (State H_0 and H_a , the rejection rule of the test and your conclusion.)
- (e) What proportion of the variability in Y is explained by the regression model?

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Problem 5

In this problem, we check the modeling assumptions in Problem 4. Use the same dataset, predictor, and response. To verify the model assumptions examine the residual diagnostics produced by minitab (Stat \Rightarrow Regression \Rightarrow Regression; Click “Graphs...”). Choose “Standardized” instead of “Regular” or “Deleted” residuals.

- (a) Provide a printout of the “Four in one” residual plots.
- (b) Do the “Normal Probability Plot” and “Histogram” plots indicate a departure from normality?
- (c) Do you see any patterns in the “Versus Fits” or the “Versus Order” plots? If so, this indicates that there may be some dependence in the residuals. The y -axis for these two plots gives the residual. What are the x axes in these two plots?
- (d) Do you see any potential outliers (i.e., any unusually large residuals). Since we have used “Standardized” residuals, 95% of them should be between -2 and $+2$; also, 99.7% should be between -3 and $+3$.

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