

Question 1: What is the sample size of the data? 100

Question 2: Find out $\sum x_{1i}y_i$ 287.86

Question 3: Write out the fitted equation.

$$\hat{y} = -0.0984 + 1.432X_1 + 0.897X_2 + 2.031X_3 - 0.134X_4 + 0.269X_5$$

Question 4: Find out the MSE.

$$SSE \approx 210, \quad df = n - p = 100 - 6 = 94$$
$$MSE = 2.234$$

Question 5: Find out the standard error of β_2

$$\sqrt{MSE \times C_{22}} = \sqrt{2.234 \times 0.01934} = 0.208$$

Question 6: Apply t test on $H_0: \beta_3 = 2.5$ vs. $H_a: \beta_3 < 2.5$

$$t = \frac{2.031 - 2.5}{0.208} = -2.288$$

use $df = 75$

$df = 94, 0.0 < P\text{-value} < 0.025$

Question 7: Find out Type I SS for X_5

$$SS_{X_5 | X_1, X_2, X_3, X_4} = \text{Partial } SS_{X_5} = 4.19595$$

Question 8: Find out the following extra sum of squares. If you cannot find it based on the above information, then write NA.

- a) $SS_{X_2 | X_1}$ 247.091 \leftarrow seq. SS X_2
- b) $SS_{X_4 | X_1, X_2, X_3}$ 0.31054 \leftarrow seq SS X_4
- c) $SS_{X_1 | X_2}$ NA
- d) $SS_{X_2, X_3 | X_1}$ 247.091 + 243.085 = 490.176 seq SS X_2 + seq SS X_3 .
- e) SS_{X_5} NA
- f) SS_{X_1} 819.23 \rightarrow seq SS X_1
- g) $SS_{X_4 | X_1, X_2, X_3, X_5}$ 1.2009 \rightarrow partial SS X_4

Question 9: Find out the SSR_{Reg} for the model.

$$819.23 + 247.09 + 243.08 + 0.31 + 4.20 = 1313.9$$

Question 10: Apply GLHT on $H_0: \beta_4 = \beta_5 = 0$ vs. H_a : at least one of them is not zero.

a) Write out the reduced and full models.

$$\text{Reduced: } y_i = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \beta_3 x_{3i} + \epsilon_i; \quad \text{Full } y_i = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \beta_3 x_{3i} + \beta_4 x_{4i} + \beta_5 x_{5i} + \epsilon_i$$

b) Calculate the test statistic.

$$F = \frac{SS_{X_4, X_5 | X_1, X_2, X_3}}{2} \div MSE(F) = \frac{0.311 + 4.196}{2} \div \frac{209.988}{100 - 6} = 1.009$$

c) Find the degrees of freedom of the test statistic.

$$df = (2, 94)$$

d) Find the range of p-value based on the F table you have.

$$p\text{-value} > 0.05$$

e) What is your conclusion.

There is NOT sufficient evidence to reject the H_0 .