

Modelli Statistici Avanzato
Homework n. 1

Exercise n. 1

We have data about 100 classes of high schools. We regress the average test score (TS) on the class size (CS). The OLS results are as follows:

$$TS = 520.4 - 5.82 \cdot CS \qquad \sigma_{\hat{}} = 11.5 \qquad R^2 = 0.08$$

- a. Compute the prediction of the average test score for a class of 22 students.
- b. Suppose a class increases the number of students from 19 to 23: compute the expected variation of the average test score.
- c. Knowing that the sum of squared deviations of the regressor is 27.07766, compute the standard error of the estimate of the regression coefficient. Then derive a 95% confidence interval.
- d. Compute the p-value of a bilateral test for the null hypothesis that the slope is zero. Do we reject the null hypothesis at a 5% confidence level? At the 1% level?
- e. The sample mean of the class size is 21.4. Compute the sample mean of the average test score. (Hint: exploit the properties of OLS estimators).
- f. What is the unit of measurement of the slope? Write a sentence to explain the meaning of the estimate of the slope in this application.

Exercise n. 2

We have a sample of 200 men aged 20. Regressing weight (in pounds) on height (in inches) we obtain

$$\text{weight} = -99.41 + 3.94 \cdot \text{height} \qquad \sigma_{\hat{}} = 10.2 \qquad R^2 = 0.81$$

- a. Compute the predicted weight for a man with height equal to 70 inches. Then for a man with height equal to 74 inches.
- b. Compute the expected difference in weight for two individuals differing 1.5 inches in height.
- c. Knowing that the standard error of the slope is 0.31, compute a 99% confidence interval for the expected variation in weight of the previous question.
- d. Now we convert the weight from pounds to kilograms and the height from inches to centimetres. Write down the new values of the following quantities: OLS estimate of the intercept, OLS estimate of the slope, $\sigma_{\hat{}}$, standard error of the slope, R^2 .
- e. What is the unit of measurement of the slope? Write a sentence to explain the meaning of the estimate of the slope in this application.