Assignment 7

Released: 10/29/2020   Due: 11/03/2020

The objective of this homework is to apply and interpret statistical techniques, evaluate applications of statistical techniques and use a statistical application package.

Problem 1

The following table contains the ACT scores and the GPA (grade point average) for eight college students. Grade point average is based on a four-point scale and has been rounded to one digit after the decimal.

Student	GPA	ACT
1	2.8	21
2	3.4	24
3	3.0	26
4	3.5	27
5	3.6	29
6	3.0	25
7	2.7	25
8	3.7	30

(i)   Estimate the relationship between GPA and ACT using OLS; that is, obtain the intercept and slope estimates in the equation $GPA = \beta_0 + \beta_1 ACT$. Comment on the direction of the relationship. Does the intercept have a useful interpretation here? Explain. How much higher is the GPA predicted to be if the ACT score is increased by five points?

(ii)   Compute the fitted values and residuals for each observation and verify the residuals sum to zero.

(iii) What is the predicted value of GPA when ACT = 20?

(iv)   How much of the variation in GPA for these eight students is explained by ACT?

Problem 2

A student estimates the relation between annual income and consumption (both measured in dollars) using the function $cons = -124.84 + 0.853\ inc$ using information from 100 families. The r-square is 0.692.

(i)   Interpret the slope and intercept in this equation.

(ii)   What is the predicted consumption when the family income is $30,000.

Problem 3

The following equation relates housing price (*price*) to the distance from a recently built garbage incinerator (*dist*)

$$\log(price) = 9.4 + 0.312 \log(dist)$$

$$n = 135 \quad R^2 = 0.162$$

    (i)   Interpret the slope and intercept in this equation.

    (ii)   What is the coefficient of determination? Interpret?

Problem 4

The data set in CEOSAL2 contains information on chief executive officers for U.S. corporations. The variable *salary* is annual compensation, in thousands of dollars, and *ceoten* is prior number of years as company CEO.

    (i)   Find the average salary and the average tenure in the sample.

    (ii)   How many CEOs are in their first year as CEO (i.e. *ceoten* = 0)? What is the longest tenure as a CEO?

    (iii)   Estimate the simple regression model $\log(salary) = \beta_0 + \beta_1 ceoten + \varepsilon$

    (iv)   Interpret the results of the regression model (coefficients and R^2)

    (v)   What is the predicted percentage increase in salary given one more year as a CEO?