Regression HW 6 Solutions

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Contents

Total: 10 pts

Reminder. Project progress.

1. Read about Type I sum of squares and partial determination.

2. Matrix notation for Grocery Retailer data using 1st-order regression model (Problem 6.9, 6.10. 10 pts, a-0, b-5, c-5).

a. The first 3 rows and the last 3 rows of the response vector. (The solution is provided in the assignment so that you have an example of part b and c.) (not graded.)

$$\underline{y} = \begin{pmatrix} 4264 \\ 4496 \\ 4317 \\ \vdots \\ 4499 \\ 4186 \\ 4342 \end{pmatrix}$$

b. The design matrix for the 1st-order model in Problem 6.10.

- The 1st-order model in Problem 6.10 is:

$$labor = \beta_0 + \beta_1(case) + \beta_2(costs) + \beta_3(holiday) + \varepsilon$$

Hence, the design matrix for the model in part (a) has 52 rows and 4 columns. The first 3 rows and the last 3 rows are:

$$\mathbf{X} = \begin{pmatrix} 1 & 305657 & 7.17 & 0 \\ 1 & 328476 & 6.20 & 0 \\ 1 & 317164 & 4.61 & 0 \\ \vdots & \vdots & \vdots & \\ 1 & 290455 & 7.99 & 0 \\ 1 & 411750 & 7.83 & 0 \\ 1 & 292087 & 7.77 & 0 \end{pmatrix}$$

- For R users, the design matrix can be saved to the regression output when you set argument `x = T` in the `lm()` function. An example will be provided in future assignment solutions.

c. The parameter vector and its estimate.

- Note that the "parameter vector" should be just in β notation, since the "parameters" refers to the unknown "true values" about the population or the model. The "estimates" are the values we calculate from the sample data, and are obtained from the model output. (The software output is not included here. But you can find them in previous assignments. The estimated coefficients are saved `lm( )` object, or you can use `summary()` to see the estimates.)

$$\underline{\beta} = \begin{pmatrix} \beta_0 \\ \beta_1 \\ \beta_2 \\ \beta_3 \end{pmatrix}, \quad \underline{\hat{\beta}} = \underline{\mathbf{b}} = \begin{pmatrix} 4150 \\ 0.000787 \\ -13.166 \\ 623.554 \end{pmatrix}.$$

This is the end of HW 6.