MATH 3424 Tutorial

November 6, 2020

1 Review

Quiz 2 revision. Chapter 2 Sec 2 one categorical variable.

2 Exercises

Using the following data set

x_1	x_2	y_1	x_1	x_2	y_1
2	-2	2	1	-1	2
0	1	3	1	3	5
2	3	7	3	3	11
1	4	6	0	5	6
1	6	9	1	8	11

with summary statistics:

Overall

$n = 10$, $\sum_{i=1}^{10} x_{i1} = 12$, $\sum_{i=1}^{10} x_{i2} = 30$, $\sum_{i=1}^{10} y_i = 62$,

$\sum_{i=1}^{10} x_{i1}^2 = 22$, $\sum_{i=1}^{10} x_{i1}x_{i2} = 31$, $\sum_{i=1}^{10} x_{i2}^2 = 174$, $\sum_{i=1}^{10} x_{i1}y_i = 84$,

$\sum_{i=1}^{10} x_{i2}y_i = 262$, $\sum_{i=1}^{10} y_i^2 = 486$,

$S_{x_1x_1} = 7.6000$, $S_{x_1x_2} = -5.0000$, $S_{x_2x_2} = 84.0000$, $S_{x_1y} = 9.6$,
$S_{x_2y} = 76.0000$, $S_{yy} = 101.6000$.

and

$$\begin{pmatrix} 7.6000 & -5.0000 \\ -5.0000 & 84.0000 \end{pmatrix}^{-1} = \begin{pmatrix} 0.136942 & 0.008151 \\ 0.008151 & 0.012390 \end{pmatrix},$$

to fit the following model

$$y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + e_i, \quad e_i \sim_{iid} N(0, \sigma^2)$$

For your information:
When β_0, β_1 and β_2 are all unknown, $\hat{\beta}_0 = 0.81937$, $\hat{\beta}_1 = 1.93414$, $\hat{\beta}_2 = 1.01989$

1. Find the multiple correlation coeffcient.

2. Construct 95% prediction interval for y at $x_1 = 2.2$ and $x_2 = 5$.

3. Test the hypothesis $H_0 : \beta_1 - \beta_2 = 0$ *v.s.* $H_\alpha : \beta_1 - \beta_2 \neq 0$ at the significant level of $\alpha = 0.05$. Construct the test statistic using

   (a) F test for testing $H_0 : C\beta = d$. Write down the test statistic, the critical value and your conclusion clearly.

   (b) "Increase in Regression Sum of Squares". Write down the test statistic, the critical value and your conclusion clearly.