

Question 3

a) After executed the R code, it returns

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a)           [,1]
Intercept    11.6819338
X1           0.3231552
X2           2.1526718
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$$\therefore \hat{\beta} = (11.6819, 0.32316, 2.1527)'$$

$$b) \hat{Y} = (19.10941, 33.96438, 24.06107, 19.10941, 11.35878, 29.01272, 33.64122, 21.58524, 14.15776)'$$

$$\hat{e} = (1.890585, -8.964377, -3.061069, 4.890585, -2.358779, 6.987277, 2.358779, 2.414758, -4.157761)'$$

$$SYY = 716.8889$$

$$RSS = 200.2901$$

$$SS_{reg} = 516.5988$$

$$\hat{\sigma}^2 = 33.38168$$

$$\hat{Var}(\hat{\beta}) = \begin{pmatrix} 13.052548 & 4.898245 & -6.710312 \\ 4.898245 & 21.461673 & -21.489987 \\ -6.710312 & -21.489987 & 21.914690 \end{pmatrix}$$

$$R^2 = 0.7206121$$

b) The best point estimator is $\tilde{y}^* = \mathbf{x}^* \hat{\beta}$, where $\mathbf{x}^* = (1, -1, 1)'$

After executed the R code, it returns

$$\tilde{y}^* = 13.51145$$

$$PI = [-12.10217, 39.12507]$$

c) # statistic already available in the above and the question from model 2

$$H_0: E(Y|X) = \beta_0 + \beta_2 x_2 \quad vs \quad H_1: E(Y|X) = \beta_0 + \beta_1 x_1 + \beta_2 x_2$$

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Regression	1	0.1599	0.1599	0.0048	0.947
Residual	6	200.2901	33.3817		
Total	7	200.45			

Since the p-value > 0.05 , we do not reject H_0 at $\alpha = 0.05$

We do not have sufficient evidence that $E(Y|X) = \beta_0 + \beta_1 x_1 + \beta_2 x_2$ is the appropriate model while comparing to $E(Y|X) = \beta_0 + \beta_2 x_2$

Comment Summary