Regression Assignment Two

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Question One Answer: (a) According to the basic SLR model, we can see that $\beta_1 = \frac{S_{xy}}{S_{xx}}$ and now we are given $\sum x$ and $\sum y$:

$$\begin{aligned} S_{xy} &= \sum(x_i - \overline{x})(y_i - \overline{y}) \\ &= \sum(x_i - \overline{x}) \sum(y_i - \overline{y}) \\ &= (\sum(x_i) - \frac{1}{n}\sum(x_i))(\sum(y_i) - \frac{1}{n}\sum(y_i)) \\ S_{xx} &= \sum(x_i - \overline{x})^2 \\ &= \sum x^2 - \frac{(\sum x_i)^2}{n} \end{aligned}$$

We can get $\beta_1 = 69.42857, \beta_0 = -204.2857$ the LSR line is: $\hat{y} = -204.2857 + 69.42857x$

(b) β_1 is the estimated change in the average value of Y as a result of a one-unit change in X

β_0 represents the Y is also influenced by other factor.

(c) $SS_{residual} = \sum(y_i - \hat{y}_i)^2$ $SS_{total} = \sum_i(y_i - \overline{y})^2$

The Sum of Squares Regression (SSR) is the sum of the squared differences between the prediction for each observation and the population mean.

(d)

Question Two Answer: Using the matrix, we can notice that $y = \mathbf{X}\beta_1 + \epsilon \Rightarrow \beta_1 = (\mathbf{X^T X})^{-1}\mathbf{X^T}y$, we can get $\beta_1 = 0.37$ and $(\mathbf{X^T X})^{-1} = 2 \times 10^{-5}$
$b_1 = \beta_1 = 0.37, 0 = \bar{y} - 1\bar{x} = 0.19$