

P&S Assignment

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$$\begin{aligned}
 1) \quad \Sigma x &= 850 \\
 \Sigma x^2 &= 905000 \\
 \Sigma y &= 1737 \\
 \Sigma y^2 &= 372717 \\
 \Sigma xy &= 192560
 \end{aligned}$$

$$\begin{aligned}
 a) \quad S_{xx} &= 852750 \\
 S_{yy} &= 71000.1 \\
 S_{xy} &= 34915
 \end{aligned}$$

$$b) \quad \frac{S_{xy}}{S_{xx}} = 0.040944$$

$$\begin{aligned}
 a &= \bar{y} - b\bar{x} \\
 &= 170.219
 \end{aligned}$$

$$\therefore \hat{y} = 170.219 + 0.040944x$$

$$H) \quad b = 0.040944$$

$\therefore b$ is very close to 0

$\therefore$ It is not significant.

$$2) \quad \Sigma x = 385.2$$

$$\Sigma x^2 = 12666.58$$

$$\Sigma y = 1162.5$$

$$\Sigma y^2 = 119026.9$$

$$\Sigma xy = 38191.41$$

$$S_{xx} = 301.66$$

$$S_{yy} = 6409.7125$$

$$S_{xy} = 878.16$$

$$\beta = 2.9011$$

$$\alpha = 3.7496$$

$$\hat{y} = 3.7496 + 2.9011x$$

$$(9) \sigma^2 = \frac{1}{n-1} (S_{yy} - \frac{S_{xy}^2}{S_{xx}})$$

$$= 387.0744$$

$$\hat{\beta} \sim N(\beta, \sigma^2 / S_{xx})$$

$$95\% \text{ CI}$$

$$\hat{\beta} \pm t_{2.5\%, 12} \left(\frac{\sigma}{\sqrt{S_{xx}}} \right)$$

$$= 2.9011 \pm (2.228)(1.132)$$

$$= (0.379, 5.423)$$

$$(10) y_0 \sim N(\hat{\alpha} + \hat{\beta}x, \frac{1}{n} + \frac{(x_0 - \bar{x})^2}{S_{xx}}) \sigma^2$$

~~95% CI~~

$$95\% \text{ CI} : y_0 \pm t_{\alpha/2, n-2} \sqrt{\left(\frac{1}{n} + \frac{(x_0 - \bar{x})^2}{S_{xx}} \right) \sigma^2}$$

$$= 119.7936 \pm 22.143$$

$$= (97.6504, 141.9366)$$

6)

$$\begin{aligned}\Sigma x &= 39 \\ \Sigma x^2 &= 207 \\ \Sigma y &= 5562 \\ \Sigma y^2 &= 40508 \\ \Sigma xy &= 2853 \\ S_{xx} &= 54.9 \\ S_{xy} &= 661.2 \\ S_{yy} &= 8923.6\end{aligned}$$

7)

$$r = \frac{S_{xy}}{\sqrt{S_{xx} \cdot S_{yy}}} = 0.944662$$

8)

$$\begin{aligned}\beta &= 12.0437 \\ \alpha &= 9.22957 \\ \hat{y} &= 9.22957 + 12.0437x\end{aligned}$$

9)

$$SS_{\text{tot}} = SS_{\text{reg}} + SS_{\text{res}}$$

$$SS_{\text{reg}} = \frac{S^2_{xy}}{S_{xx}} = 7963.30$$

$$SS_{\text{res}} = S_{yy} - \frac{S^2_{xy}}{S_{xx}} = 960.295$$

$$\begin{aligned}SS_{\text{tot}} &= 7963.30 + 960.295 \\ &= 8923.6 = S_{yy}\end{aligned}$$

$$\begin{aligned} \text{vi) } R^2 &= (9)^2 \\ &= (0.944662)^2 \\ &= 0.8923 \end{aligned}$$

$$\begin{aligned} \text{7) } \sum x &= 174.13 \\ \sum y &= 197.84 \\ \sum x^2 &= 7545.90 \\ \sum y^2 &= 4747.45 \\ S_{xy} &= 2176.84 \end{aligned}$$

$$S_{xx} = 4789.4221$$

$$S_{yy} = 1189.2076$$

$$\text{(8) } \beta = \frac{S_{xy}}{S_{xx}} = 2.20017$$

$$\alpha = -16.8432$$

$$\hat{y} = -16.8432 + 2.20017x$$

$$\text{(9) } H_0: \beta = 0$$

$$H_1: \beta \neq 0$$

$$\hat{\sigma}^2 = 199.8121$$

$$t_{\text{cal}} = \frac{\hat{\beta} - \beta}{\hat{\sigma} / \sqrt{S_{xx}}} = 10.77176$$

$$t_{\text{tab}} = 2.776$$

$$\therefore t_{\text{cal}} > t_{\text{tab}}$$

$\therefore$ Reject H_0

There is linear relationship between X and Y.

$$(87) r = \frac{S_{xy}}{\sqrt{S_{xx} \cdot S_{yy}}} = 0.912128$$

$$9) \sum x = 45$$

$$\sum x^2 = 277.5$$

$$\sum y = 644$$

$$\sum y^2 = 43,956$$

$$\sum xy = 2,602$$

$$S_{xx} = 75$$

$$S_{yy} = 2482.4$$

$$S_{xy} = -296$$

i) Looking at the plot. I see a negative correlation between x and y

$$(88) r = \frac{S_{xy}}{\sqrt{S_{xx} \cdot S_{yy}}} = -0.686$$

∴ There is a strong negative correlation.

$$(89) \tanh^{-1} r \sim N(\tanh^{-1} \rho; \frac{1}{n-3})$$

$$H_0: \rho = 0$$

$$H_1: \rho < 0$$

$$\frac{\text{rank}^{-1} r - \text{rank}^{-1} \rho}{\sqrt{\frac{1}{n-3}}}$$

$$= \frac{-0.84036 - 0}{\sqrt{\frac{1}{7}}}$$

$$\sqrt{\frac{1}{7}}$$

$$= -2.22338$$

$$Z_{\alpha/2} = 1.96 \quad \text{at } 5\% \text{ L.O.S.}$$

$$Z_{0.5\%} = 2.5758$$

at 5% L.O.S. Reject H_0

at 1% L.O.S. do not reject H_0

$\therefore$ There is negative correlation at 5% L.O.S.

$\therefore$ There is no correlation at 1% L.O.S.