

$$\begin{aligned} 2.9 &= 3x + y \\ 0.9 &= x - 2y \\ 1.9 &= 2x - 3y \end{aligned}$$

$$L = \begin{bmatrix} 2.9 \\ 0.9 \\ 1.9 \end{bmatrix} \quad X = \begin{bmatrix} 3 & 1 \\ 1 & -2 \\ 2 & -3 \end{bmatrix} \quad A = \begin{bmatrix} x \\ y \end{bmatrix}$$

$$\begin{aligned} A &= (X^T X)^{-1} X^T L \\ &= \begin{bmatrix} \frac{14}{171} & \frac{5}{171} \\ \frac{5}{171} & \frac{14}{171} \end{bmatrix} \begin{bmatrix} 3 & 1 & 2 \\ 1 & -2 & -3 \end{bmatrix} \begin{bmatrix} 2.9 \\ 0.9 \\ 1.9 \end{bmatrix} \\ &= \begin{bmatrix} 0.963 \\ 0.062 \end{bmatrix} \end{aligned}$$

$$\begin{aligned} x &= 0.963 \\ y &= 0.062 \end{aligned}$$

$$\frac{n}{1} \cdot \hat{y} = 0.062 \cdot 2 = 1$$

$$A = (X^T X)^{-1} X^T L$$

$$SSR = \sum_{i=1}^n (\hat{y}_i - \bar{y})^2 \quad v_0 = 1$$

$$SSE = \sum_{i=1}^n (y_i - \hat{y}_i)^2 \quad v_Q = n - 2$$

$$F = \frac{SSR/1}{SSE/n-2}$$

求最小 = 求  $b_0, b_1, b_2$

$$X = \begin{bmatrix} 1 & 1.32 & 1.15 \\ 1 & 2.69 & 3.4 \\ 1 & 3.56 & 4.10 \\ 1 & 4.41 & 8.75 \\ 1 & 5.35 & 14.82 \\ 1 & 6.20 & 15.15 \\ 1 & 7.12 & 13.32 \\ 1 & 8.87 & 18.18 \\ 1 & 9.8 & 35.19 \end{bmatrix}$$

$$A = \begin{bmatrix} b_0 \\ b_1 \\ b_2 \end{bmatrix}$$

$$L = \begin{bmatrix} 6.4 \\ 15.05 \\ 18.75 \\ 30.25 \\ 44.85 \\ 48.94 \\ 51.55 \\ 61.50 \\ 100.44 \end{bmatrix}$$

$$\begin{aligned} A &= (X^T X)^{-1} X^T L \\ &= \begin{bmatrix} 19 & 5.48 & 12.67 \\ 5.48 & 37.06 & 93.1 \\ 12.67 & 93.1 & 255.74 \end{bmatrix}^{-1} X^T L \end{aligned}$$

$$\begin{aligned} &= \begin{bmatrix} 9 & 49.32 & 114.06 \\ 49.32 & 333.574 & 838.015 \\ 114.06 & 838.015 & 2301.681 \end{bmatrix}^{-1} X^T L \\ &= \begin{bmatrix} -0.318 \\ 3.174 \\ 1.964 \end{bmatrix} \end{aligned}$$

$$\hat{y} = -0.318 + 3.174x_1 + 1.964x_2, \quad \bar{y} = 4.2$$

$$SSR = \sum_{i=1}^9 (\hat{y}_i - \bar{y})^2 = 6595.4$$

$$SSE = \sum_{i=1}^9 (y_i - \hat{y}_i)^2 = 15.5$$

$$F = \frac{SSR/82}{SSE/8} = \frac{278.5}{2.6} = 1278$$

$$1278 \gg F_{0.01}(2, 8)$$

$\therefore x_1, x_2$  对  $y$  显著

$x_1$  对  $y$  的影响要比  $x_2$  大 (通过最小二乘法验证正相关)

1/2, 1/2, 1/2  
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$$P_{IV} = 1$$

$$z + \left(\frac{\partial p}{\partial u}\right)$$

$$) + (22.5)^2$$

$$5.06 + 28$$

解

$$\hat{\sigma} = \sqrt{\frac{\sum_{i=1}^n (y_i - \hat{y}_i)^2}{9-2-1}} = 1.61$$

$$C = (X^T X)^{-1} = \begin{bmatrix} 0.824 & -0.226 & 0.0413 \\ -0.226 & 0.097 & -0.024 \\ 0.041 & -0.024 & 0.007 \end{bmatrix}$$

$$t_1 = \frac{\hat{b}_1}{\sqrt{C_{11}}\hat{\sigma}} = \frac{3.17}{0.097 \times 1.61} = 20.3$$

$$t_2 = \frac{\hat{b}_2}{\sqrt{C_{22}}\hat{\sigma}} = \frac{1.97}{0.007 \times 1.61} = 169.64$$

$$\alpha = 0.01 \quad t_{0.01,6} = 3.707$$

$$t_1, t_2 > t_{0.01,6}$$

$\therefore$  显著