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Week 5

9. (1) 母体是常態分配，母体標準差  $s$  之點估計值  $\hat{s} = \sqrt{\frac{\sum x_i^2 - n\bar{x}^2}{n-1}}$

$14.3$

$$\sqrt{\frac{1284 - 6 \times 14.3^2}{5}} = \sqrt{10.38} = 3.22 \#$$

$$(2) 1-\alpha = 0.9 \quad \frac{\alpha}{2} = 0.05 \quad n-1 = 5 \quad \chi_{0.05}^2(5) = 11.07 \quad \chi_{0.95}^2(5) = 1.15$$

$$\left( \sqrt{\frac{5 \times 10.38}{\chi_{0.05}^2(5)}}, \sqrt{\frac{5 \times 10.38}{\chi_{0.95}^2(5)}} \right) = \left( \sqrt{\frac{51.9}{11.07}}, \sqrt{\frac{51.9}{1.15}} \right) = (2.17, 6.72) \#$$

18.

(1) 母体是常態分配，母体平均數  $\mu$  之點估計值  $\hat{\mu}$

$$\bar{x} = (3.5 + 2.4 + 3.2 + 2.9 + 4.8 + 5.5 + 3.4 + 4.5 + 4.3 + 5.8) / 10 = 3.99 \#$$

$$(2) 1-\alpha = 0.95, \frac{\alpha}{2} = 0.025 \quad n-1 = 9$$

$$\hat{\mu} = \frac{171.73 - 15.92 \times 10}{9} = 1.39$$

\* 小樣本，6 未知  $\rightarrow$  七分配

$$t_{\frac{\alpha}{2}}(n-1) = t_{0.025}(9) = 2.262$$

$$\bar{x} \pm t_{\frac{\alpha}{2}}(n-1) \frac{s}{\sqrt{n}} \quad s = 1.18$$

$$(3.99 - 2.262 \frac{1.18}{\sqrt{10}}, 3.99 + 2.262 \frac{1.18}{\sqrt{10}}) = (3.15, 4.83) \#$$

$$(3) 1-\alpha = 0.95, \frac{\alpha}{2} = 0.025 \quad \chi_{\frac{\alpha}{2}}^2(n-1) = \chi_{0.025}^2(9) = 19.02 \quad \chi_{0.975}^2(9) = 2.7$$

$$\textcircled{1} \quad \left( \frac{9 \times 1.39}{19.02}, \frac{9 \times 1.39}{2.7} \right) = (0.66, 4.63) \#$$

$$\textcircled{2} \quad \left( \sqrt{\frac{9 \times 1.39}{19.02}}, \sqrt{\frac{9 \times 1.39}{2.7}} \right) = (0.81, 2.15) \#$$

20.

(1)  $\sigma_1^2$  為投資組合一之變異數,  $\sigma_2^2$  為投資組合二之變異數.

$$\bar{x} = 7.67 \quad \bar{y} = 6.78 \quad s_1^2 = 9.27 \quad s_2^2 = 21.15$$

$$V = \frac{\left(\frac{9.27^2}{8} + \frac{21.15^2}{8}\right)^2}{\left(\frac{9.27^2}{8}\right)^2 + \left(\frac{21.15^2}{8}\right)^2} = 10.96 \approx 11$$

$$(0.89 - 2.201 \times 7.7, 0.89 + 2.201 \times 7.7)$$

$$= (-16.06, 17.84) \#$$

$$(2) 1-\alpha = 0.9 \quad \chi_{\frac{\alpha}{2}}^2(n_1-1) = \chi_{0.05}^2(8) = 15.51$$

$$\chi_{1-\frac{\alpha}{2}}^2(n_1-1) = \chi_{0.95}^2(8) = 2.73$$

$$\left( \sqrt{\frac{8 \times 9.27^2}{\chi_{0.05}^2(8)}}, \sqrt{\frac{8 \times 9.27^2}{\chi_{0.95}^2(8)}} \right) = (6.66, 15.87) \#$$

(3)

$$1-\alpha = 0.9 \quad F_{\frac{\alpha}{2}}(n_1-1, n_2-1) = F_{0.05}(8, 8) = 3.44$$

$$F_{0.95}(8, 8) = \frac{1}{F_{0.05}(8, 8)} = 0.29$$

$$\left( \frac{9.27^2}{21.15^2} \times \frac{1}{3.44}, \frac{9.27^2}{21.15^2} \times \frac{1}{0.29} \right)$$

$$= (0.06, 0.66)$$

31.  $n = 9$  累計 $\leq 90\%$ 信頼區間値  $(6.66, 15.87)$

(1)  $1 - \alpha = 0.9$   $\chi^2_{0.05}(8) = 15.51$

$$\chi^2_{0.95}(8) = 2.73$$

$$\sqrt{\frac{(n-1)s^2}{15.51}} = 6.66, s = 9.27$$

$$\begin{array}{r} 2.5 \\ 9.27 \\ \times 8 \\ \hline 74.16 \end{array}$$

(2) 
$$\left( \frac{(n-1)s^2}{\chi^2_{0.025}(8)}, \frac{(n-1)s^2}{\chi^2_{0.975}(8)} \right) = \left( \frac{(9-1) \times 9.27^2}{17.53}, \frac{(9-1) \times 9.27^2}{2.18} \right)$$

$\downarrow \quad \downarrow$

$17.53 \quad 2.18$

$$= \left( \frac{687.4632}{17.53}, \frac{687.4632}{2.18} \right)$$
$$= (39.22, 315.35)$$