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習題 9、 (1) $s=\sqrt{\dfrac{\sum(x_i-\bar{x})^2}{n-1}}=\sqrt{\dfrac{\sum x_i^2-n\bar{x}^2}{n-1}}$

$=\sqrt{\dfrac{1.284-6\times14.33^2}{5}}=\sqrt{10.38}=3.22$ ∴ σ 點估計 3.22

(2) $1-\alpha=0.90$, $\dfrac{\alpha}{2}=0.05$, $n-1=5$,

$\chi^2_{\frac{\alpha}{2}}(n-1)=\chi^2_{0.05}(5)=11.07$,

$\chi^2_{1-\frac{\alpha}{2}}(n-1)=\chi^2_{0.95}(5)=1.15$,

∴ σ 信賴區間 $\left(\sqrt{\dfrac{5\times10.38}{\chi^2_{0.05}(5)}},\sqrt{\dfrac{5\times10.38}{\chi^2_{0.95}(5)}}\right)$, $\left(\sqrt{\dfrac{51.9}{11.07}},\sqrt{\dfrac{51.9}{1.15}}\right)=(2.17, 6.72)$

習題 20. (1) $\sigma_1^2\neq\sigma_2^2$

$v=\dfrac{\left(\dfrac{9.27^2}{9}+\dfrac{21.15^2}{9}\right)^2}{\dfrac{\left(\dfrac{9.27^2}{9}\right)^2}{8}+\dfrac{\left(\dfrac{21.15^2}{9}\right)^2}{8}}=10.96\doteq11$

∴ $\mu_1-\mu_2$ 信賴區間

$(\bar{x}-\bar{y})\pm t_{\frac{\alpha}{2}}(v)\sqrt{\dfrac{S_1^2}{n_1}+\dfrac{S_2^2}{n_2}}$

$=(7.67-6.78)\pm t_{0.025}(11)\sqrt{\dfrac{9.27^2}{9}+\dfrac{21.15^2}{9}}$

$=0.89\pm2.201\times7.70$

$=0.89\pm16.95 \Rightarrow (-16.06, 17.84)$

(2) $1-\alpha=0.90$, $\chi^2_{\frac{\alpha}{2}}(n_1-1)=\chi^2_{0.05}(8)=15.51$, $\chi^2_{1-\frac{\alpha}{2}}(n_1-1)=\chi^2_{0.95}(8)=2.73$

∴ σ_1 信賴區間 $\left(\sqrt{\dfrac{8\times9.27^2}{\chi^2_{0.05}(8)}},\sqrt{\dfrac{8\times9.27^2}{\chi^2_{0.95}(8)}}\right)=\left(\sqrt{\dfrac{687.46}{15.51}},\sqrt{\dfrac{687.46}{2.73}}\right)$

$=(6.66, 15.87)$

(3) $1-\alpha=0.90$. $F_{\frac{\alpha}{2}}(n_1-1,n_2-1)=F_{0.05}(8,8)=3.44$, $F_{1-\frac{\alpha}{2}}(n_1-1,n_2-1)$

$=F_{0.95}(8.8)$

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

∴ $\dfrac{\sigma_1^2}{\sigma_2^2}$ 信賴區間

$\Rightarrow \left(\dfrac{S_1^2}{S_2^2}\times\dfrac{1}{F_{\frac{\alpha}{2}}(n_1-1,n_2-1)},\dfrac{S_1^2}{S_2^2}\times\dfrac{1}{F_{1-\frac{\alpha}{2}}(n_1-1,n_2-1)}\right)=\left(\dfrac{9.27^2}{21.15^2}\times\dfrac{1}{3.44},\dfrac{9.27^2}{21.15^2}\times\dfrac{1}{0.29}\right)$

$=(0.06, 0.66)$