MA677 Homework 7 Chaoqun Yin

1. X: 0.225, 0.262, 0.217, 0.240, 0.230, 0.229, 0.235, 0.217.

Y: 0.209, 0.205, 0.196, 0.210, 0.202, 0.207, 0.224, 0.223, 0.220, 0.201.

$\rightarrow \bar{X} = 0.2321$, $\bar{Y} = 0.210$.

$S_X^2 = \frac{\sum X_i^2}{n} - \bar{X}^2 = 0.00013$.

$S_Y^2 = \frac{\sum Y_i^2}{n} - \bar{Y}^2 = 0.00008$.

$\therefore t = 4.53$.

$P(t \geq 4.53) = 0.00034 < 0.05$.

$\therefore$ They are writen by different authors.

2. $X_1 - X_n \sim N(\mu, \sigma^2)$

$\bar{X} = \frac{\sum x_i}{n} = 156.7 \rightarrow \sigma_X = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n-1}} = 22.6$.

$sd = \frac{\sigma_X}{\sqrt{n}} = 5.06$.

$\Phi^{-1}(1-0.05) = \Phi^{-1}(0.95) = 1.729$.

Confidence Interval: $[148.1, 165.6]$

3. $X_1 - X_n \sim N(\mu, \sigma^2)$

$Y_1 - Y_n \sim N(\mu, \sigma^2)$

$H_0: \mu_1 \geq \mu_2$,

$H_1: \mu_1 < \mu_2$.

$$U = \frac{(m+n-2)^{\frac{1}{2}} \cdot (\bar{X}_1 - \bar{X}_2)}{(\frac{1}{m} + \frac{1}{n})^{\frac{1}{2}} (S_{X_1}^2 + S_{X_2}^2)^{\frac{1}{2}}} \approx -1.69$$

$df = m+n-2 = 12$, $\alpha = 0.1$

$U \sim t_{12}(0.9) = 1.365$.

$\therefore \mu_1$ is less than μ_2.