☆ Chapter 4.

CI for the means. μ.

△ One-sample case (σ^2 known)

$$\left[\bar{X} - z_{\frac{\alpha}{2}}\frac{\sigma}{\sqrt{n}}, \quad \bar{X} + z_{\frac{\alpha}{2}}\frac{\sigma}{\sqrt{n}}\right]$$

△ One-sample case (σ^2 unknown)

$$\left[\bar{X} - t_{\frac{\alpha}{2}}\frac{S}{\sqrt{n-1}}, \quad \bar{X} + t_{\frac{\alpha}{2}}\cdot\frac{S}{\sqrt{n-1}}\right].$$

△ Two-sample case $[\sigma_X^2 = \sigma_Y^2 = \sigma^2]$.

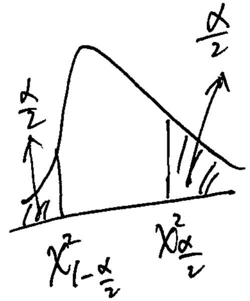
$$\left[\bar{X} - \bar{Y} - t_{\frac{\alpha}{2}}\cdot R, \quad \bar{X} - \bar{Y} + t_{\frac{\alpha}{2}}\cdot R\right].$$

$$\begin{cases} df = n+m-2. \\ R = \sqrt{\dfrac{nS_X^2 + mS_Y^2}{n+m-2}\left(\dfrac{1}{n}+\dfrac{1}{m}\right)} \end{cases}$$

☆ CI for variances.

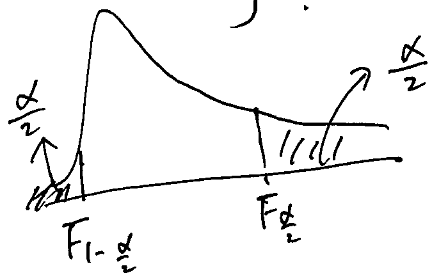
△ One-sample case.

$$\left[\frac{nS^2}{\chi^2_{\frac{\alpha}{2}, df=n-1}}, \quad \frac{nS^2}{\chi^2_{1-\frac{\alpha}{2}, n-1}}\right]$$



△ Two-sample case

$$\left[\frac{n(m-1)S_X^2}{m(n-1)S_Y^2}F_{1-\frac{\alpha}{2}, df=(m-1,n-1)}, \quad \frac{n(m-1)S_X^2}{m(n-1)S_Y^2}F_{\frac{\alpha}{2}}, df=(m-1,n-1)\right].$$



☆ CI: Large samples.

$$\left[\bar{X} - z_{\frac{\alpha}{2}}\cdot\frac{S}{\sqrt{n}}, \quad \bar{X} + z_{\frac{\alpha}{2}}\frac{S}{\sqrt{n}}\right].$$

1. $\overline{X} = 562.$ $\quad S_X^2 = 6630.5$ $\quad n=4$

$\overline{Y} = 539.2$ $\quad S_Y^2 = 3958.96$ $\quad m=5$

$\triangle$ $R = \sqrt{\frac{nS_X^2 + mS_Y^2}{n+m-2}\left(\frac{1}{n}+\frac{1}{m}\right)} = 54.5666$

$\left[\overline{X} - \overline{Y} \pm t_{\frac{\alpha}{2},df} \cdot R\right] = [-106.25, \ 151.85]$

$df = n+m-2 = 7.$

CI of $\mu_X - \mu_Y$.

$t_{0.025,7} = 2.365.$

$\triangle$ $\left[\overline{X} \pm t_{\frac{\alpha}{2},n-1} \frac{S_X}{\sqrt{n-1}}\right] \to$ CI of μ_X.

$[412.39, \ 711.61]$

$t_{0.025,3} = 3.182.$

2. CI of mean of difference of One Sample

$\begin{cases} X_i, & i=1, \text{—} n \\ Y_i, & i=1, \text{—} n. \end{cases}$

$\to D_i = X_i - Y_i \quad (i=1,\cdots,n)$

$\{D_i\}_{i=1}^{n} = \{-0.6, \ 0.1, \ -0.1, \ -2.1, \ -1.6\}.$

$\to$ CI of One sample mean Case

$\overline{X}_D = -0.86.$ $\quad S_D^2 = 0.7304.$ $\quad S_D = 0.854$

$n=5$

$\left[\overline{X}_D \pm t_{\frac{\alpha}{2},n-1} \frac{S_D}{\sqrt{n-1}}\right].$

$= \left[-0.86 \pm 2.776 \times \frac{0.854}{\sqrt{4}}\right]$

$= [-2.046, \ 0.326].$