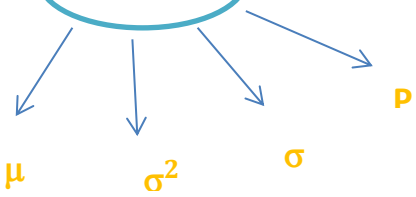
Chapter 6

Parameters : measure computed from population



Statistical Inferences

Estimation

تقدير بقيمة حقيقة للمعلمة المجهولة

Estimating the actual value of unknown parameters

Hypothesis test

Ch 7

Point Estimate

single value used to estimate the corresponding population parameter.

	Population parameters	Point estimation
Mean	μ	$\bar{x}$
Variance	σ^2	S^2
Standard deviation	σ	S
Proportion	P	$\hat{p}$
Difference between Two Population Means	$\mu_1 - \mu_2$	$\bar{x}_1 - \bar{x}_2$
Difference Between Two Population Proportions	$P_1 - P_2$	$\hat{P}_1 - \hat{P}_2$

Confidence Interval =Interval estimate

consists of two numerical values defining a range of values that most likely includes the parameter

Parameter $\in$ (L , U)

L < Parameter < U

Lower limit

Upper limit

(1-α) — Confidence coefficient

Confidence Level

الطريقة العامة لكتابة الفترة التقديرية :

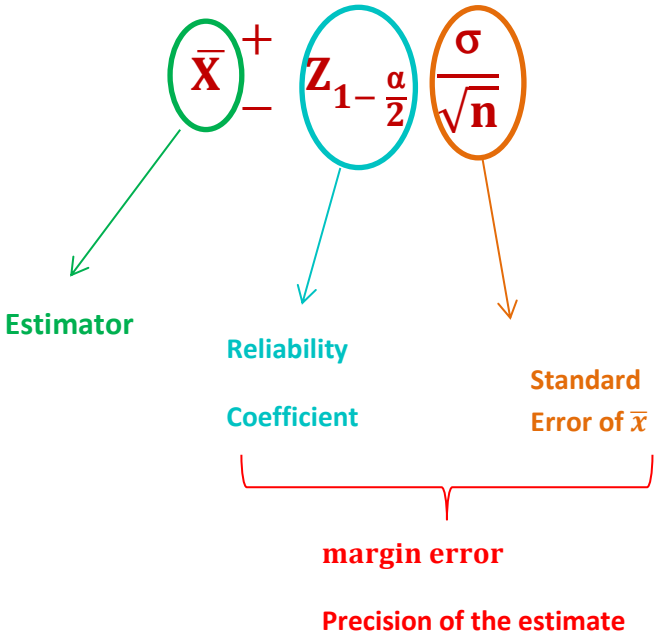
Estimator $\pm$ (reliability cofficent)(standard error)

Estimator $\pm$ *margin error*

Confidence Interval of μ

Interval Estimation of μ

- Normal + σ^2 Known
- Non-normal + σ^2 Known + $n \geq 30$ (large)



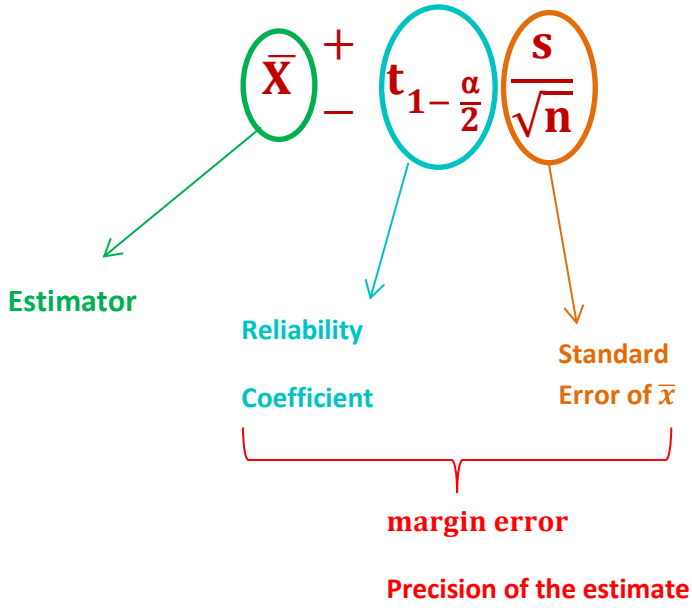
Upper limit :

$$\bar{X} + Z_{1-\frac{\alpha}{2}} \frac{\sigma}{\sqrt{n}}$$

Lower limit :

$$\bar{X} - Z_{1-\frac{\alpha}{2}} \frac{\sigma}{\sqrt{n}}$$

- Normal + σ^2 Unknown + $n < 30$ (small)



df = v = n-1

Upper limit :

$$\bar{X} + t_{1-\frac{\alpha}{2}} \frac{s}{\sqrt{n}}$$

Lower limit :

$$\bar{X} - t_{1-\frac{\alpha}{2}} \frac{s}{\sqrt{n}}$$

Confidence Interval for the Difference between Two Population Means $\mu_1 - \mu_2$

Interval Estimate $\mu_1 - \mu_2$

- Normal + σ_1^2 and σ_2^2 Known
- Non-normal + σ_1^2 and σ_2^2 Known + $n_1, n_2 \geq 30$ (large)

$$(\bar{X}_1 - \bar{X}_2) \pm Z_{1-\frac{\alpha}{2}} \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$$

Estimator

Reliability Coefficient

Standard Error of $\bar{X}_1 - \bar{X}_2$

margin error

Precision of the estimate

Upper limit :

$$(\bar{X}_1 - \bar{X}_2) + Z_{1-\frac{\alpha}{2}} \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$$

Lower limit :

$$(\bar{X}_1 - \bar{X}_2) - Z_{1-\frac{\alpha}{2}} \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$$

- Normal + $\sigma_1^2 = \sigma_2^2 = \sigma^2$ Unknown + $n_1, n_2 < 30$ (small)

$$(\bar{X}_1 - \bar{X}_2) \pm t_{1-\frac{\alpha}{2}} \sqrt{\frac{S_p^2}{n_1} + \frac{S_p^2}{n_2}}$$

Estimator

Reliability Coefficient

Standard Error of $\bar{X}_1 - \bar{X}_2$

margin error

Precision of the estimate

df = v = $n_1 + n_2 - 2$

Pooled estimate of the common variance σ^2:

$$S_p^2 = \frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{n_1 + n_2 - 2}$$

Upper limit :

$$(\bar{X}_1 - \bar{X}_2) + t_{1-\frac{\alpha}{2}} \sqrt{\frac{S_p^2}{n_1} + \frac{S_p^2}{n_2}}$$

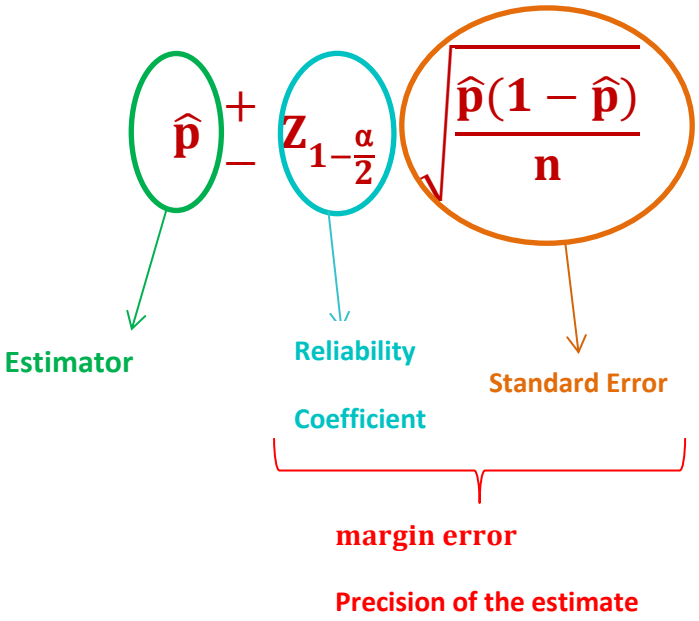
Lower limit :

$$(\bar{X}_1 - \bar{X}_2) - t_{1-\frac{\alpha}{2}} \sqrt{\frac{S_p^2}{n_1} + \frac{S_p^2}{n_2}}$$

Confidence Interval for a Population Proportion P

Interval Estimate P

- $n \geq 30$ (large) , ($\hat{q}$ =1-$\hat{p}$)



Upper limit :

$$\hat{p} + Z_{1-\frac{\alpha}{2}} \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

Lower limit :

$$\hat{p} - Z_{1-\frac{\alpha}{2}} \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

Confidence Interval for the Difference between Two Population Proportion $P_1 - P_2$

Interval Estimate $P_1 - P_2$

$\mathbf{n_1 \geq 30}$ (large) $\quad (\widehat{q_1} = 1 - \widehat{P_1})$

$\mathbf{n_2 \geq 30}$ (large) $\quad (\hat{q}_2 = 1 - \hat{P}_2)$

$$(\widehat{P}_1 - \widehat{P}_2) \pm Z_{1-\frac{\alpha}{2}} \sqrt{\frac{\widehat{P}_1\widehat{q}_1}{n_1} + \frac{\widehat{P}_2\widehat{q}_2}{n_2}}$$

- $(\widehat{P}_1 - \widehat{P}_2)$: Estimator
- $Z_{1-\frac{\alpha}{2}}$: Reliability Coefficient
- $\sqrt{\frac{\widehat{P}_1\widehat{q}_1}{n_1} + \frac{\widehat{P}_2\widehat{q}_2}{n_2}}$: Standard Error

Reliability Coefficient + Standard Error = **margin error**

Precision of the estimate

Upper limit :

$$(\widehat{P}_1 - \widehat{P}_2) + Z_{1-\frac{\alpha}{2}} \sqrt{\frac{\widehat{P}_1\widehat{q}_1}{n_1} + \frac{\widehat{P}_2\widehat{q}_2}{n_2}}$$

Lower limit :

$$(\widehat{P}_1 - \widehat{P}_2) - Z_{1-\frac{\alpha}{2}} \sqrt{\frac{\widehat{P}_1\widehat{q}_1}{n_1} + \frac{\widehat{P}_2\widehat{q}_2}{n_2}}$$

$\hat{P}_1 = \frac{x_1}{n_1} = \frac{\text{جزء}}{\text{كل}}$ $\qquad$ $\hat{P}_2 = \frac{x_2}{n_2} = \frac{\text{جزء}}{\text{كل}}$