سوف يتم وضع القانونا تجها ليدن وردي

ملخص مراجعة
ch. 6 / ch. 7 / ch. 8

① Types of Estimations are:

1 **Point estimation**

: $\mu \longrightarrow \bar{x}$

$\sigma^2 \longrightarrow s^2$

$\sigma \longrightarrow s$

$p \longrightarrow \hat{p}$

$\theta \longrightarrow \hat{\theta}$

general rule

↳ Note: If $E(\hat{\theta}) = \theta$

then, this is as unbiased estimator

2 **Interval estimation**

: $\bar{x} \sim N(\mu, \frac{\sigma^2}{n})$

الأهم

مهم Standard error of $\bar{x} = \left\{ \frac{\sigma}{\sqrt{n}} \text{ or } \frac{s}{\sqrt{n}} \right\}$

then: $Z = \frac{\bar{x}-\mu}{\sigma/\sqrt{n}} \sim N$

then: $t = \frac{\bar{x}-\mu}{s/\sqrt{n}} \sim t^{n-1}$

وصعا يمكننا رايجاد احتمال عند أرقام معينة $\bar{x}$

- Question: what do we mean by saying CI = %95

مهم

\# choice a correct answer:

a) The probability that μ belongs to this interval is %95 ✗

b) %95 of the samples containing μ ✓

- Interval. Estimation: —

σ is unkown and $n < 200$

$$\left(\underbrace{\bar{x} - t^{n-1}_{1-\frac{\alpha}{2}} * \frac{S}{\sqrt{n}}}_{\text{upper bound L.B}} , \underbrace{\bar{x} + t^{n-1}_{1-\frac{\alpha}{2}} * \frac{S}{\sqrt{n}}}_{\text{lower bound U.B}}\right)$$

or

σ is known regardless (n)

$$\left(\bar{x} - Z_{1-\frac{\alpha}{2}} * \frac{\sigma}{\sqrt{n}} , \bar{x} + Z_{1-\frac{\alpha}{2}} * \frac{\sigma}{\sqrt{n}}\right)$$

$$\left(\bar{x} - Z_{1-\frac{\alpha}{2}} * \frac{S}{\sqrt{n}} , \bar{x} + Z_{1-\frac{\alpha}{2}} * \frac{S}{\sqrt{n}}\right)$$

$\hookrightarrow$ σ is unkown but $n > 200$

Qusten (1): if σ is unkown and the sample size = 200.

Answer: we won't use (Z) but (t).

Question (2): if σ is unkown and the sample size = 201.

Answer: we will use (Z) not (t)

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(1) * $\underline{U.B} + \underline{L.B} = \frac{\cancel{2}\bar{x}}{\cancel{2}} = \frac{U.B + L.B}{2}$ $\therefore \bar{x} = \frac{U.B + L.B}{2}$

$\Rightarrow$ • The Qusetion may give you the interval itself, and ask about $(\bar{x})$: ex: $(a, b) \Rightarrow$ calculate $\bar{x}$

a = L.B, b = U.B

(2) The length of the interval $= [UB - LB = L = 2E]$

$\therefore L = 2E =$ * $L = 2 * \frac{\sigma}{\sqrt{n}} * Z_{1-\frac{\alpha}{2}}$ *

* $L = 2 * \frac{S}{\sqrt{n}} * t^{n-1}_{1-\frac{\alpha}{2}}$ *

(3) What are the factors that affect the length??

1. S, σ : $[S, \sigma \;\; \alpha \;\; L]$ تناسب طردي
2. n : $[\frac{1}{n} \;\alpha\; L]$ عكسي //
3. $1-\alpha$: $[1-\alpha \;\; \alpha \;\; L]$ طردي
4. α : $[\frac{1}{\alpha} \;\alpha\; L]$ عكسي

** We aim to have the interval that has a lowest length $\Longrightarrow$ more precise estimation.

: Population – proportion :

: recall that : $X \sim B(n, p)$, Now we will tak a sample : $\left\{ \hat{p} = \frac{X}{n} \right\}$

$X \to$ بخاصة العينة

$n \to$ حجم العينة الكلي

* notice that : $Ex(\hat{p}) = Ex\left(\frac{X}{n}\right) = \frac{1}{n} \cdot Ex(X) =$

: $E(\hat{p}) = p$ $\qquad = \frac{1}{n} * np = p$

un biased . estimator.

* notice that : $Var(\hat{p}) = Var\left(\frac{X}{n}\right) = \frac{1}{n^2} \cdot var(X)$

$Var(\hat{p}) = \frac{pq}{n}$ $\qquad = \frac{1}{n^2} * n \cdot pq = \frac{pq}{n}$

: $\hat{p} \sim N\left(p, \frac{p \cdot q}{n}\right) \Longrightarrow \dfrac{\hat{p} - p}{\sqrt{\frac{pq}{n}}} \sim N(0,1)$

Condition: $[n \hat{p} \cdot \hat{q} \geq 5]$

and when we want to write interval :

$$\Big(\underbrace{\hat{p} - Z_{1-\frac{\alpha}{2}} * \sqrt{\frac{\hat{p}\hat{q}}{n}}}_{L.B}\ ,\ \underbrace{\hat{p} + Z_{1-\frac{\alpha}{2}} * \sqrt{\frac{\hat{p}\hat{q}}{n}}}_{U.B}\Big)$$

التلخيص النهائي

لمقارنة استعمال (t , Z)

σ (known)

using (Z)

directly

$$Z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}}$$

σ unknown

$n > 200$

Z ✓

$$Z = \frac{\bar{x} - \mu}{S/\sqrt{n}}$$

$n \leq 200$

t^{n-1} ✓

$$\therefore t^{n-1} = \frac{\bar{x} - \mu}{s/\sqrt{n}}$$