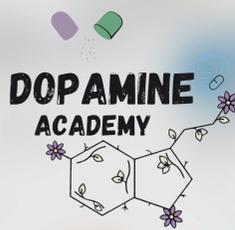


Statistics



لجان الرِّفعات



Subject: Lecture **14+15**



Subject: "The Sampling distribution of a sample mean"
and the Central Limit Theorem

properties of the sampling Distribution of \bar{x} :

1. Mean of the sampling distribution = mean of sampled population

$$\mu_{\bar{x}} = \mu$$

2. Standard deviation of the sampling distribution

standard error of the mean $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$ sample size $\sigma_{\bar{x}} \uparrow$ variation \uparrow

3. The variance of the distribution of \bar{x} = the variance of the population / n

$$\sigma_{\bar{x}}^2 = \frac{\sigma^2}{n}$$

• The sample mean is a consistent estimator

the value of \bar{x} becomes closer to μ as n increases.

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

$n < 30$ small

$n \geq 30$ large

normal sample \leftarrow يكون normal population إذا تذكر إنه ما يقين ال sample size

Sample size لكن في حال ما تذكر إنه normal ما يقين ال إذا كانت large يقين normal

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

Subject :

$$\text{Standard deviation of } \hat{p} = \sqrt{\frac{pq}{n}}$$

$$np \geq 5 \text{ and } nq \geq 5$$

The approximation to the normal distribution is excellent if :-

\hat{p} approximately $N(p, \frac{pq}{n})$ if n is sufficiently large.

Lec 15 : Estimating population

point estimate : a single value (or point) used to approximate a population parameter.

Confidence Interval : the range (or interval) of values used to estimate the a population parameter.

$$CI = \text{point estimate} \pm (\text{critical value})(\text{standard error})$$

Confidence Level : The probability that the confidence interval actually contains the population parameter.

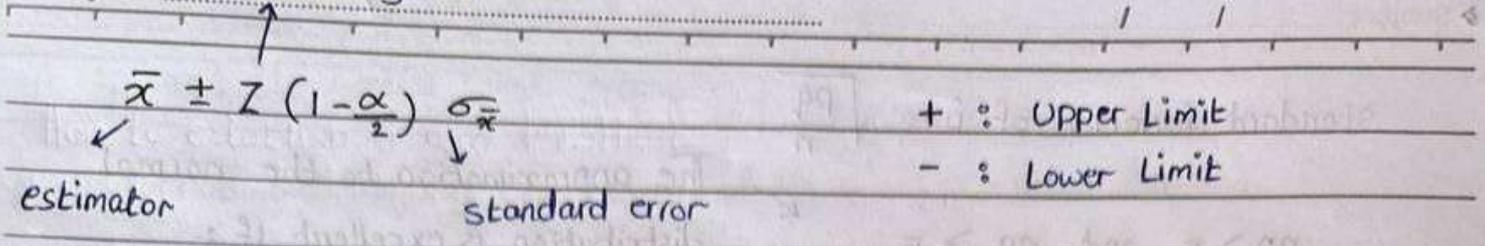
The most common confidence levels used are : 90% 95% 99%.

$$\alpha = 1 - CI$$

- Best point estimate for a population mean is : sample mean \bar{x}

Standard deviation is Known + large sample size :- "Z" table

Subject : reliability Coefficient



Standard deviation is Unknown + Small sample size :- "t" table

Properties of the (t) distribution :-

- It has a mean of 0
- It is symmetrical about the mean
- In general it has a variance greater than 1
- The variable (t) ranges from $-\infty$ to $+\infty$
- (n-1) degree of Freedom \rightarrow denominator of (S) : "القائم بالخرج العاشر"
- Compared to the normal distribution, the (t) distribution is less peaked in the center and has higher tails.

We may use the sample standard deviation to replace σ .

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

• T-scores has normal distribution called student's t distribution.

• (t) approaches (z) as (n) increases.

• (t) distribution يعطين (sd) أكبر وفترة أوسع من أن μ برازيلي.