Statistics

Lecture 23

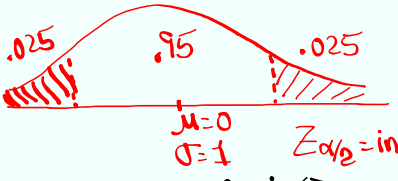
Feb 19-8:47 AM

Find minimum Sample Size (n) needed to Construct Conf. interval (No C-level) for pop. proportion with error not to exceed 10%.

1) Assume $\hat{P} = .42$

$$n = \hat{P}\hat{q}\left(\frac{z_{\alpha/2}}{E}\right)^2$$

$$= (.42)(.58)\left(\frac{1.960}{.1}\right)^2$$



$z_{\alpha/2} = \text{invNorm}(.975, 0, 1)$

$= 93.58\ldots$

2) Assume $\hat{p}$ & $\hat{q}$ are both unknown. $n = 94$

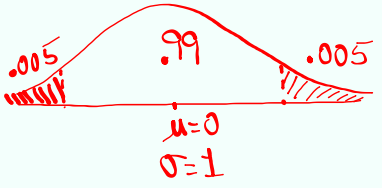
$$n = .25\left(\frac{z_{\alpha/2}}{E}\right)^2 = .25\left(\frac{1.960}{.1}\right)^2 = 96.04$$

$n \approx 97$

Nov 20-12:13 PM

Find minimum Sample Size (n) needed to Construct 99% Conf. interval for Pop. mean with error not to exceed 10 and assume Pop. Standard deviation is 25.

C-level .99



$z_{\alpha/2} = \text{invNorm}(.995, 0, 1)$

$$n = \left(\frac{z_{\alpha/2} \cdot \sigma}{E}\right)^2$$

$$= \left(\frac{2.576 \cdot 25}{10}\right)^2$$

$$\approx 41.4736$$

$$n \approx 42$$

Nov 20-12:21 PM

SG 24

Testing Claims:

A claim is made, our task is to determine if claim is valid or invalid.

If claim is invalid $\Rightarrow$ We reject it.

If claim is valid $\Rightarrow$ We fail-to-Reject it.

Support

Claim could be about

1) Population Proportion p
2) Population Mean μ
3) Population Standard deviation σ

Nov 20-12:27 PM

I claim 5% of all students drink.

Pop. Proportion p

I claim the mean age of all students is below 32.5 Yrs.

Population Mean μ

The department claims that standard deviation of all math exams is at least 10.

σ

Nov 20-12:33 PM

why do we need to test a claim?

Because we need to know the validity of the claim.

Valid claim $\Rightarrow$ Fail-to-Reject FTR

Support

Invalid claim $\Rightarrow$ Reject the claim

Possible errors

Claim is valid but we reject it.

Claim is invalid but we Support it.

Nov 20-12:37 PM

Testing Methods:

1) Traditional Method

2) P-Value Method

3) Confidence interval Method.
See me during office hours

Regardless of the method used, final Conclusion must be the Same.

Reject the claim OR when claim is invalid

FTR the claim when claim is valid.

Action \ claim	Valid	Invalid
Support	✓	Error
Reject	Error	✓

Nov 20-12:41 PM

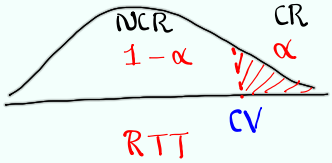
Testing Types:

1) Right-Tail Test RTT
2) Left-Tail Test LTT
3) Two-Tail Test TTT

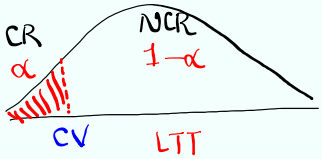
with every testing, there is a Significance level α

$0 < \alpha < 1$

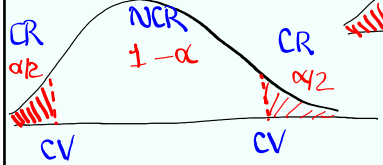
when α not given, use .05



RTT



LTT



TTT

Nov 20-12:49 PM

Testing Process:

1) Set-up H_0 & H_1. ← Alternative Hypothesis (H_a)
   ↑ Null Hypothesis

2) Find all critical values
   Drawing, labeling, shading, and Formula/TI Command required.

3) Find Computed Test Statistic(CTS) and P-value. P.
   Formula or TI command required.

4) Use Testing chart to determine the validity of H_0 & H_1.
   H_0 valid ⟺ H_1 invalid
   H_0 invalid ⟺ H_1 valid

5) Draw Final Conclusion about the claim
   Reject the claim OR **FTR the claim**

Claim could be H_0 or H_1.

Nov 20-12:57 PM

More on H_0 & H_1:

H_0 must contain the equal Sign. $=, \geq, \leq$

H_1 Can not contain the equal Sign. $\neq, <, >$

Keywords for H_0:
is, equal, not different, at least, at most, ... Same, ...

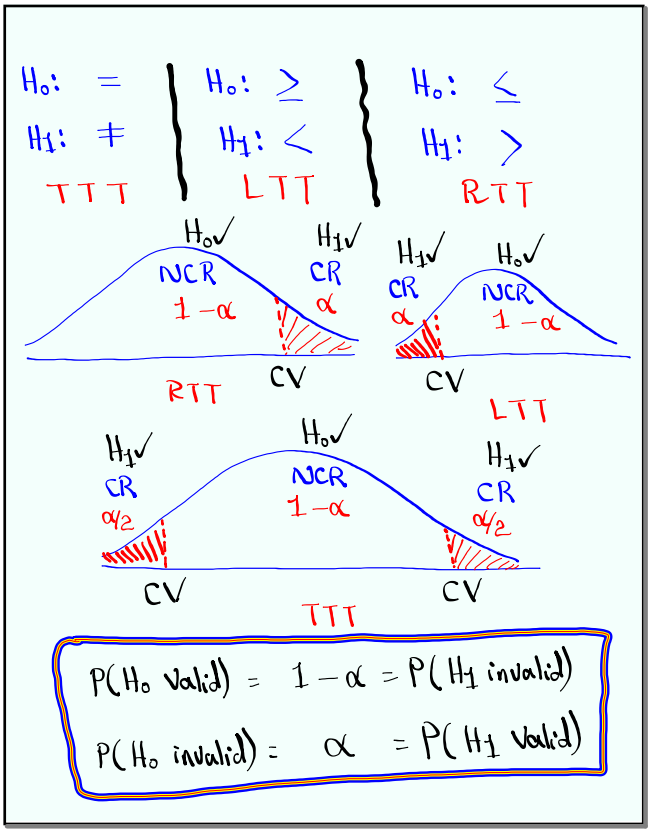
Keywords for H_1:
not equal, different, not Same, more than, less than, above, below, exceed, ...

When
$H_1 >$ ⟹ RTT
$H_1 <$ ⟹ LTT
$H_1 \neq$ ⟹ TTT

H_1 tells us what type of Testing.

Always identify claim & Testing Type

Nov 20-1:08 PM



Nov 20-1:32 PM

I claim that 25% of all students are in favor of online classes.

H_0: $P = .25$ claim

H_1: $P \neq .25$ TTT

College claims the mean age of all students is at most 32.5 yrs.

H_0: $\mu \leq 32.5$ claim

H_1: $\mu > 32.5$ RTT

Nov 20-1:40 PM

The department claims standard deviation of all exam scores is below 12.

$H_0: \sigma \geq 12$

$H_1: \sigma < 12$ claim, LTT

Type I & II Errors

Reality / Action	H_0 Valid	H_0 invalid
Support H_0	Good Decision	Type II error
Reject H_0	Type I error	Good Decision

Nov 20-1:44 PM

Testing One Population Proportion P

$H_0: P = P_0$	$H_0: P \geq P_0$	$H_0: P \leq P_0$
$H_1: P \neq P_0$	$H_1: P < P_0$	$H_1: P > P_0$
TTT	LTT	RTT

CV Z invNorm

Drawing, labeling, shading, TI command ✓

CTS Z STAT TESTS 1-PropZTest

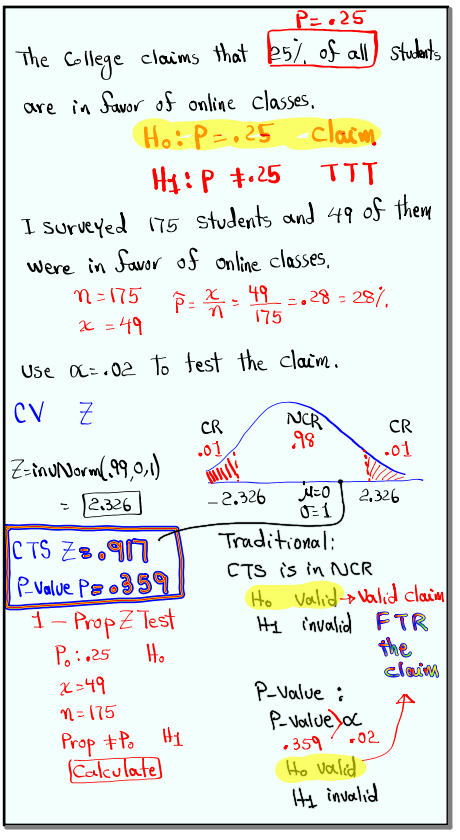
P-value P

Use testing chart to determine the validity of H_0 & H_1.

Final Conclusion must be about the claim.

Reject the claim OR FTR the claim

Nov 20-1:54 PM



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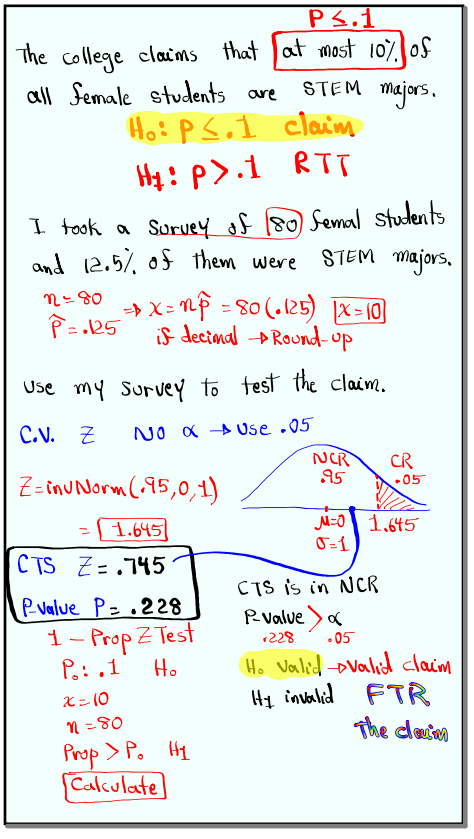

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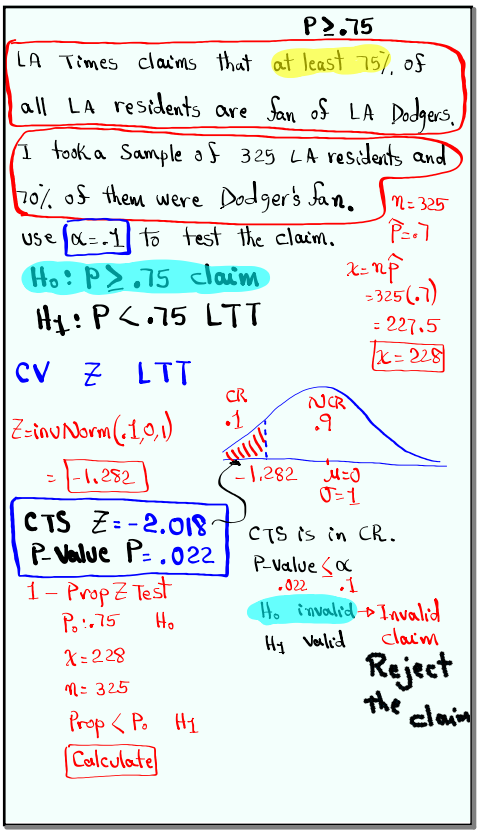
P ≥ .75
LA Times claims that at least 75% of all LA residents are fan of LA Dodgers.
I took a Sample of 325 LA residents and 70% of them were Dodger's fan.
use α = .1 to test the claim.
n = 325
P̂ = .7
H₀: P ≥ .75 claim
H₁: P < .75 LTT
x = nP̂
= 325(.7)
= 227.5
x = 228
CV Z LTT
Z = invNorm(.1, 0, 1)
= -1.282
CR .1
NCR .9
-1.282
μ = 0
σ = 1
CTS Z = -2.018
P-Value P = .022
CTS is in CR.
P-value ≤ α
.022 .1
H₀ invalid → Invalid claim
H₁ valid
Reject the claim
1 - Prop Z Test
P₀ : .75 H₀
x = 228
n = 325
Prop < P₀ H₁
Calculate

Nov 20-2:28 PM