Statistics
Lecture 13

Feb 19-8:47 AM

Testing Claims:

SG 23-25

Claims are made about parameters.

Our task is to test them for validity.

If claim is valid ⇒ we Support it.
Fail-to-Reject

If claim is invalid ⇒ we reject it.

we test to determine the validity of the claim.

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Claim could be about

1) Population Proportion P.

2) Population Mean μ.

3) Population Standard Deviation σ.

Final Conclusion must be made about the claim.

Reject the claim OR

(claim is invalid)

Fail-to-Reject the claim

(claim is valid)

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Testing Methods:

1) Traditional Method

2) P-Value Method

3) Confidence Interval Method

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

Reject the claim OR

FTR The claim

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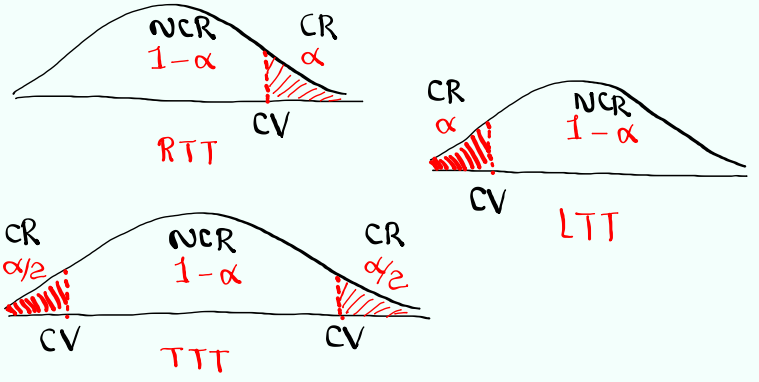
Testing Types:

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

With every testing, we must have a Significance level α.
$0 < \alpha < 1$
If α not given, we use .05.



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Testing Process:

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

2) Find all Critical Values.
Drawing, labeling, shading, full TI command required.

3) Find Computed Test Statistics (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 $\Leftrightarrow$ H_1 invalid
H_0 invalid $\Leftrightarrow$ H_1 valid

5) Draw final conclusion about the claim.
Reject the claim OR FTR the claim

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More on H_0 & H_1: Math Symbols

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

H_1 Cannot Contain the = Sign. $\neq, <, >$

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

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

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

H_1 helps us with testing type.

Always identify the claim.

Always identify the testing type.

claim could be H_0 or H_1.

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College claims that 5% of all Students are Smokers.

$P = .05$ ← H_0

$H_0: P = .05$ claim

$H_1: P \neq .05$ TTT

College claims that the mean age of all Students is at most 32 years. $\mu \leq 32$ ← H_0

$H_0: \mu \leq 32$ claim

$H_1: \mu > 32$ RTT

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College claims that Standard deviation of all math exam Scores is below 12.

$\sigma < 12$

$H_0: \sigma \geq 12$

$H_1: \sigma < 12$ claim, LTT

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Four - Possible outcomes of H_0:

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

Type I error $\Rightarrow$ Reject a valid H_0

Type II error $\Rightarrow$ Support an invalid H_0

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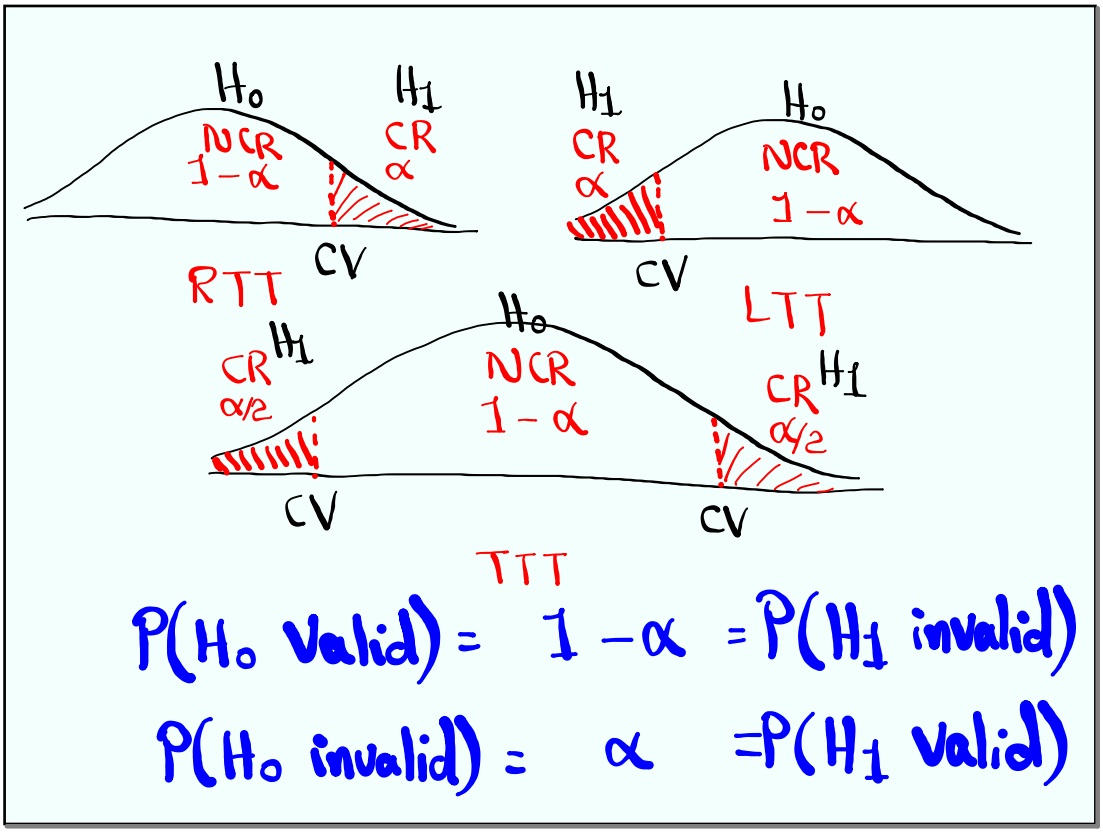

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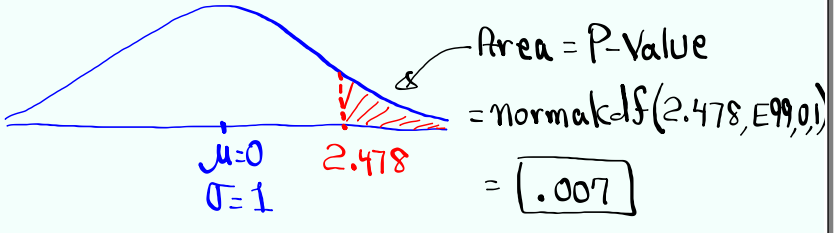
what is P-Value?

P-Value is the area of the tail marked by CTS.

Multiply by 2 only if it is TTT

Ex. Given CTS $Z = 2.478$ RTT

Find the Corresponding P-Value.



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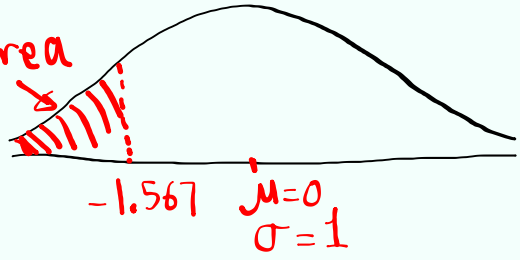
Given CTS $Z = -1.567$ TTT

Find Corresponding P-Value.

P-Value = 2 • Area



$= 2 \cdot \text{normalcdf}(-E99, -1.567, 0, 1) = .117$

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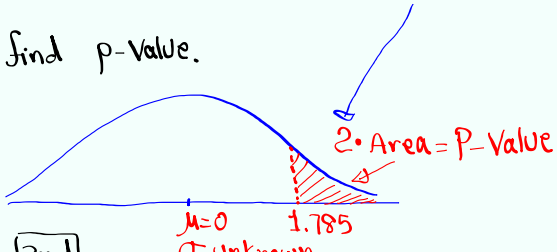
Given CTS $t = 1.785$ TTT $df = 11$

Find p-Value.



2nd VARS

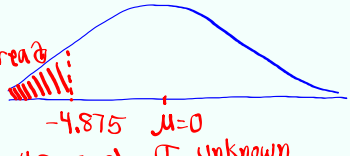
σ unknown
df = 11

Lower upper df

P-Value = 2 • tcdf(1.785, E99, 11) = .102

CTS $t = -4.875$ LTT $df = 29$

Find P-Value.



P-Value = tcdf(-E99, -4.875, 29)

σ unknown
df = 29

$= 1.795 \times 10^{-5}$

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Based on our observation

$P(H_1 \text{ is valid}) \leq P\text{-value}$

$P(H_0 \text{ is valid}) \geq 1 - P\text{-value}$

Sc 23 ✓

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Testing Population Proportion P: Sc 24

Given: $H_0: P = .4$, claim is H_0, $\alpha = .02$

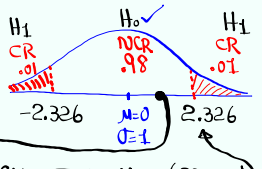
$n = 185$, $x = 78$

Test the claim.

$H_0: p = .4$ claim

$H_1: p \neq .4$ TTT

CV Z $\alpha = .02$ TTT



CTS Z = .600

P-value P = .548

CV Z = invNorm(.99, 0, 1)

STAT TESTS

1-PropZTest

$P_0: .4$ H_0

$x = 78$

$n = 185$

Prop $\neq P_0$ H_1

Calculate

using Testing Chart

CTS is in NCR

P-value $> \alpha$

H_0 valid, H_1 invalid

valid claim

FTR the claim

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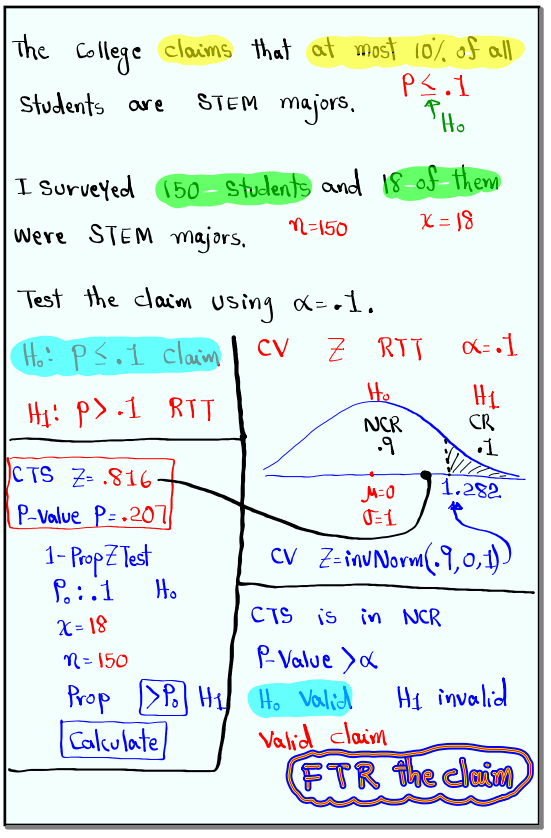

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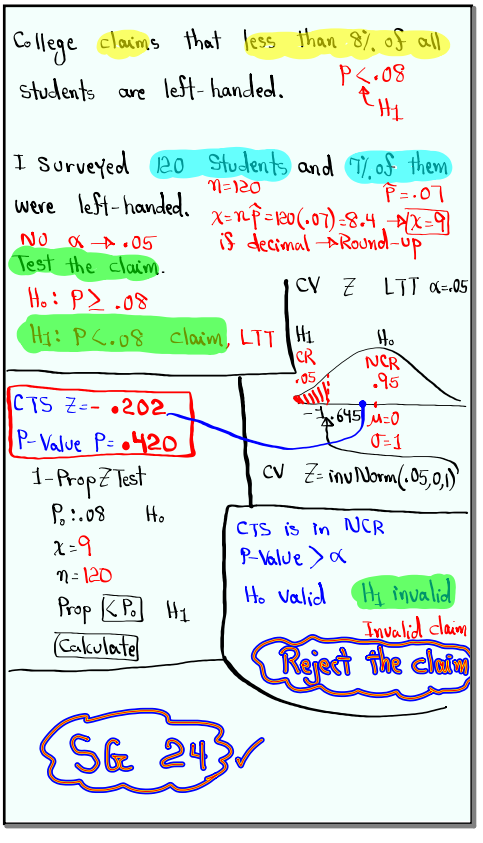

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