Statistics
Lecture 13

Feb 19-8:47 AM

(SG 24)

Testing Claims:

A claim is made, our task is determine its validity.

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

If claim is invalid ⇒ we reject it.

A claim could be made about

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

(Parameters)

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College claims that 5% of all students are left-handed. $P = .05$

College claims that mean age of all students is at least 32 years. $\mu \geq 32$

College claims that standard deviation of all math exams is below 15. $\sigma < 15$

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Why are we testing a claim?

Because we want to know if claim is valid or invalid.

Claim is valid $\Rightarrow$ we Support (Fail-to-Reject) the claim.

Claim is invalid $\Rightarrow$ we reject it.

Possible Errors:

If we reject a valid claim.

If we Support an invalid claim.

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Testing Methods:

1) Traditional Method
2) P-Value Method
3) Confidence Interval Method.

Regardless of the method, the final conclusion must be the same.

Reject the claim OR Fail-to-Reject the claim (FTR)

Action \ claim	Valid	Invalid
Support	Good Decision	Error
Reject	Error	Good Decision

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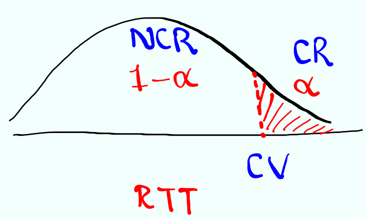
Testing Types:

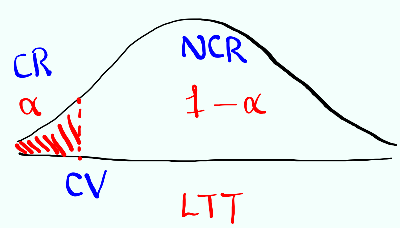
1) Right-Tail Test RTT
2) Left-Tail Test LTT
3) Two-Tail Test TTT

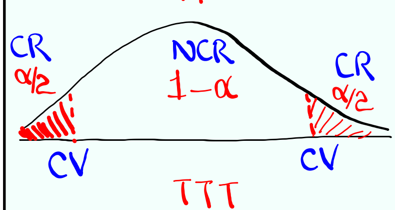
with every testing, there is a significance level α.

$0 < \alpha < 1$

when α not given $\Rightarrow$ 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 CV

Drawing, labeling, Shading, 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.

5) Draw Conclusion about the claim.

Reject the claim OR FTR the claim

Claim could be H_0 or H_1.

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More on H_0 & H_1:

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

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

Keywords for H_0:

is, equal, Same, not different, at least, at most, not less than, not greater than, ...

Keyword for H_1:

is not, not equal, not Same, different, more than, less than, greater than, above, below, exceed, ...

When $H_1: >$ Right-Tail Test

" $H_1: <$ Left-Tail Test

" $H_1: \neq$ Two-Tail Test

Always identify the claim & testing Type.

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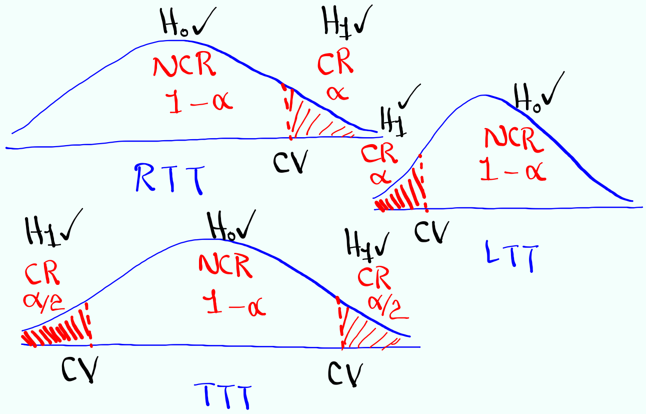
$H_0: =$	$H_0: \geq$	$H_0: \leq$
$H_1: \neq$	$H_1: <$	$H_1: >$
TTT	LTT	RTT



$P(H_0 \text{ valid}) = 1-\alpha = P(H_1 \text{ invalid})$

$P(H_0 \text{ invalid}) = \alpha = P(H_1 \text{ valid})$

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I claim that 15% of all students have a fulltime job.

$P = .15$

$H_0: P = .15$ claim

$H_1: P \neq .15$ TTT

I claim the mean age of all students is at least 32 yrs.

$\mu \geq 32$

$H_0: \mu \geq 32$ claim

$H_1: \mu < 32$ LTT

I claim standard deviation of salaries of all nurses is more than \$500

$\sigma > 500$

$H_0: \sigma \leq 500$

$H_1: \sigma > 500$

claim, RTT

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Type I and Type II errors

Action \ Reality	H_0 Valid	H_0 invalid
Support H_0	Good Decision	Type II Error
Reject H_0	Type I Error	Good Decision

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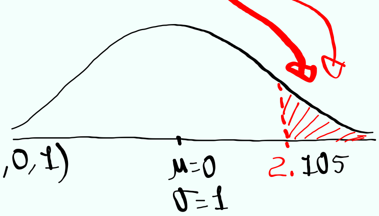
What is P-Value?

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

If doing TTT ⇒ Multiply by 2.

Given CTS $Z = 2.105$ RTT

Find P-Value.



normalcdf(2.105, E99, 0, 1)

= .018

If TTT → P-Value = 2(.018)

= .036

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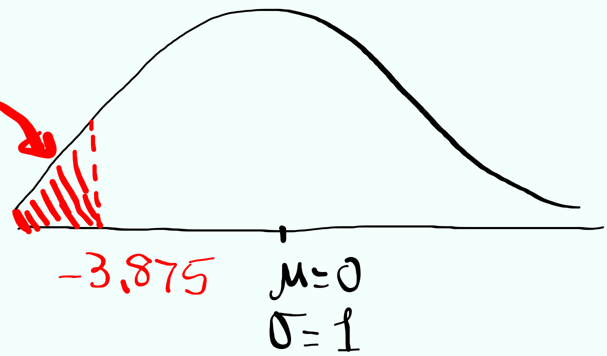
Given CTS $Z = -3.875$ LTT

find p-value.



$\text{normalcdf}(-E99, -3.875, 0, 1) = \boxed{5.3 \times 10^{-5}}$

If TTT → $\text{P-value} = 2(5.3 \times 10^{-5}) \approx 1.1 \times 10^{-4}$

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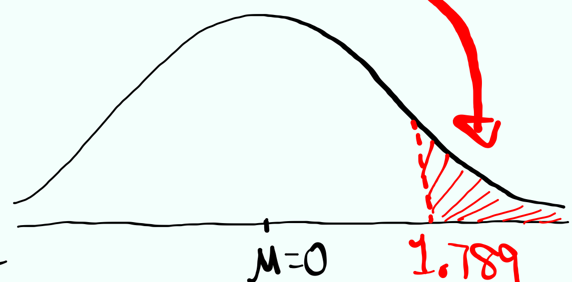
Given CTS $t = 1.789$ $df = 12$ RTT

find P-Value.



$\text{tcdf}(\underset{L}{1.789}, \underset{U}{E99}, \underset{df}{12}) = \boxed{.049}$

σ unknown
df=12

If TTT ⇒ $\text{P-Value} = 2(.049) = \boxed{.098}$

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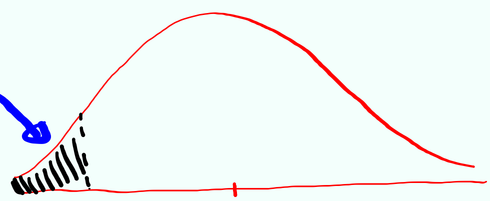
Given CTS $t = -5.678$ $df = 19$ LTT

Find p-value



$tcdf(\overset{L}{-E99}, \overset{U}{-5.678}, \overset{df}{19}) = \boxed{8.95 \times 10^{-6}}$

If TTT ⇒ p-value $= 2(8.95 \times 10^{-6})$

$= \boxed{1.79 \times 10^{-5}}$

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