Statistics

Lecture 23

Feb 19-8:47 AM

SG 23-25

Testing Claims:

A claim is made about any parameter, and our task is to Test them.

Parameters describe population

Statistic describe Sample.

why do we need to test a claim?

We test a claim to determine its validity.

If claim is valid ⇒ we $\boxed{\text{Support}}$ it.
Fail-to-Reject

If claim is invalid ⇒ we reject it.

Nov 24-10:41 AM

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

Fail-to-Reject the claim

Nov 24-10:47 AM

Testing Methods:

1) Traditional Method ✓

2) P-Value Method

3) Confidence Interval Method

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

Final Conclusion:

Reject the claim OR

Fail-to-Reject the claim

Nov 24-10:51 AM

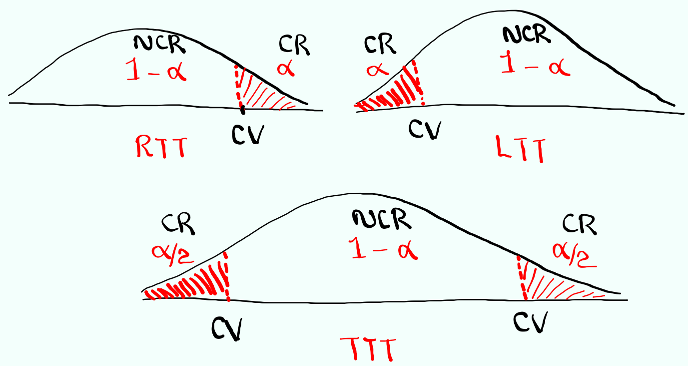
Testing types:

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, Use .05



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Testing Process:

1) Set-up H_0 and H_1.

Alternative Hypothesis (H_a)

Null Hypothesis

2) Find all Critical Values.

Drawing, labeling, shading, and Full TI command required.

3) Find Computed Test Statistic (CTS) and P-Value (P).

Formula or Full TI command required.

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

5) Draw final conclusion about the claim.

Reject the claim OR FTR the claim

Nov 24-11:04 AM

More on H_0 & H_1:

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, exceed, above, below, ...

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

Always identify the claim

Always identify the testing Type.

Claim could be H_0 or H_1.

Nov 24-11:13 AM

College claims that 8% of all students are left-handed. $P = .08$ $\leftarrow H_0$

$H_0: p = .08$ claim

$H_1: p \neq .08$ TTT

College claims that the mean age of all students is at most 32.5 Yrs. $\mu \leq 32.5$ $\leftarrow H_0$

$H_0: \mu \leq 32.5$ claim

$H_1: \mu > 32.5$ RTT

Nov 24-11:22 AM

College claims that standard deviation of ages of all students is below 10 yrs.

$\sigma < 10$ ← H_1

$H_0: \sigma \geq 10$

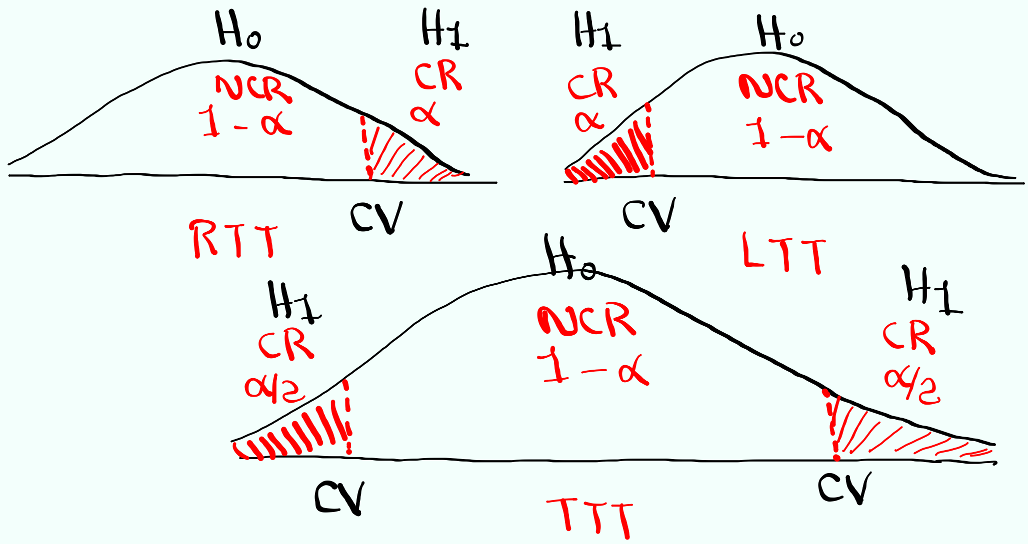
$H_1: \sigma < 10$ claim, LTT

Nov 24-11:29 AM

Four-Possible outcomes of H_0:

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

Nov 24-11:32 AM



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

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

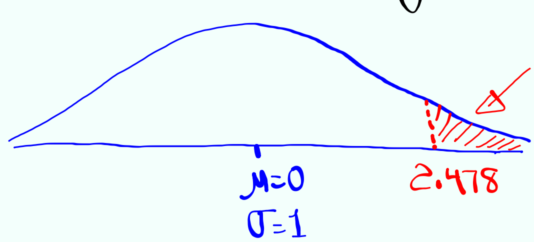
Nov 24-11:38 AM

What is P-Value?

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

Multiply by 2 only if it is TTT

Ex. CTS $Z = 2.478$ RTT Find Corresponding P-Value.



Area = P_Value = normalcdf(2.478, E99, 0, 1)

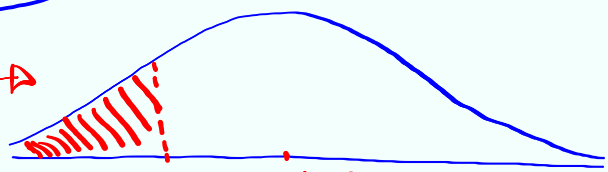
$= \boxed{.007}$

Nov 24-11:44 AM

CTS $z = -1.567$ TTT

find Corresponding p-Value.

P-Value = 2 • Area



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

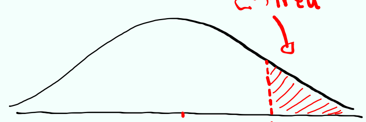
$= \boxed{.117}$

Nov 24-11:52 AM

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

find p-Value.

2 • Area

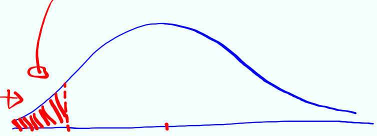


P-Value $= 2 \cdot \text{tcdf}(1.785, E99, 11)$ σ unknown df=11

$= \boxed{.102}$

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

find p-Value.



P-Value = Area σ unknown df=29

$= \text{tcdf}(-E99, -4.875, 29) = \boxed{1.795 \times 10^{-5}}$

Nov 24-11:58 AM

Based on our observation

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

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

SG 23

Nov 24-12:07 PM