Statistics

Lecture 13

Feb 19-8:47 AM

Testing claims:

(SG 24)

A claim is made and our task is to determine the validity of claim.

Fail-to-Reject

If claim is valid ⇒ we Support it.

If claim is invalid ⇒ we reject it.

A claim could be about a parameter.

Claim could be about

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

Nov 22-8:03 AM

College claims that 5% of all students smoke

$P = .05$

College claims that mean age of all students is below 32.5 yrs.

$\mu < 32.5$

College claims that standard deviation of all exam scores is at least 12.

$\sigma \geq 12$

Nov 22-8:09 AM

Why do we test a claim?

Because we wish to know the validity of the claim.

Valid claim $\Rightarrow$ we fail-to-Reject it.

Invalid claim $\Rightarrow$ we reject it.

Possible errors:

If we reject a valid claim.

If we fail-to-Reject an invalid claim.

Nov 22-8:13 AM

Testing Methods:

1) Traditional Method

2) P-Value Method

3) Confidence Interval Method

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

Final Conclusion must be about the claim.

Reject the claim OR **FTR the claim**

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

Nov 22-8:16 AM

Testing Types:

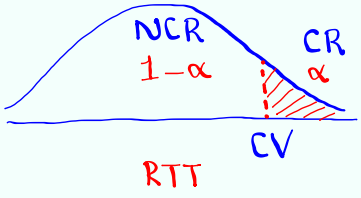
1) Right-Tail Test **RTT**

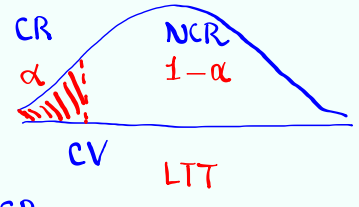
2) Left-Tail Test **LTT**

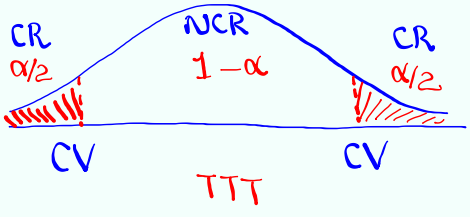
3) Two-Tail Test **TTT**

With every testing, there is a significance level α $0 < \alpha < 1$

If α not given $\Rightarrow$ we use .05







Nov 22-8:23 AM

Testing Process:

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

2) Find all Critical values CV
   Drawing, labeling, Shading, and TI Command Required

3) Find Computed Test statistic CTS and P-Value P.
   Formula or TI command required.

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

5) Draw Final Conclusion about the claim
   Claim could be H_0 or H_1.
   Reject the claim OR FTR the claim

Nov 22-8:30 AM

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, atmost, ...
not less than, not greater than, not more than

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

when H_1: $>$ Right-Tail Test
when H_1: $<$ Left-Tail Test
When H_1: $\neq$ Two-Tail Test

H_1 helps us to determine type of testing

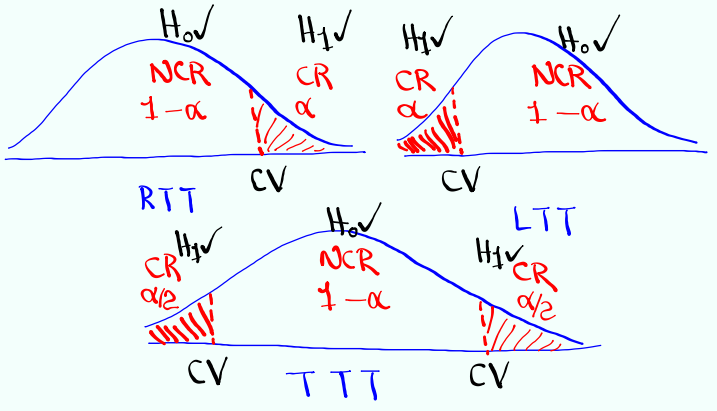
Always identify the claim and type of Test.

Nov 22-8:40 AM

$H_0: =$ $H_1: \neq$ TTT

$H_0: \geq$ $H_1: <$ LTT

$H_0: \leq$ $H_1: >$ RTT



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

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

Nov 22-8:49 AM

I claim 20% of all students have a full time job.

$H_0: P = .2$ claim

$H_1: P \neq .2$ TTT

I claim the mean age of all students is at least 30 years. $\mu \geq 30$

$H_0: \mu \geq 30$ claim

$H_1: \mu < 30$ LTT

I claim the standard deviation of monthly salaries of all nurses is more than \$500. $\sigma > 500$

$H_0: \sigma \leq 500$

$H_1: \sigma > 500$ claim, RTT

Nov 22-8:55 AM

Type I & II Errors:

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

Nov 22-9:02 AM

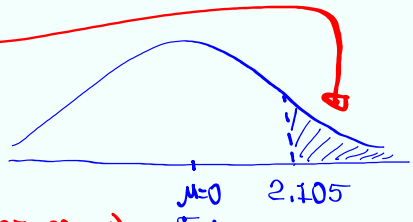
What is P-value?

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

If working with TTT, Multiply that area by 2.

Given CTS $Z = 2.105$ RTT

find P-value.



normalcdf(2.105, E99, 0, 1)

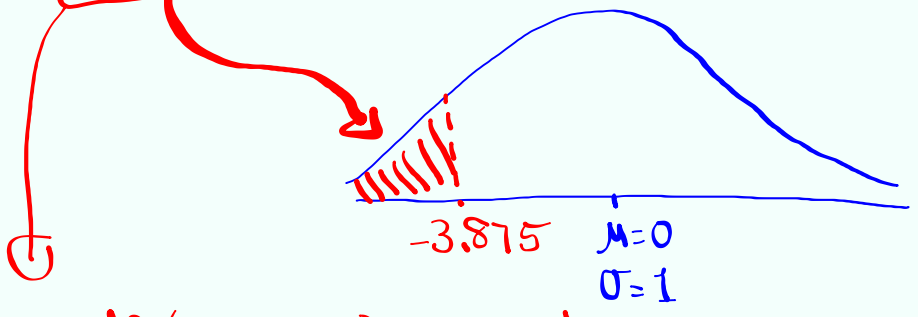
$= .018$

If TTT $\rightarrow$ P-value $= 2(.018) = .036$

Nov 22-9:06 AM

Given CTS $z = -3.875$ LTT

Find P-value.



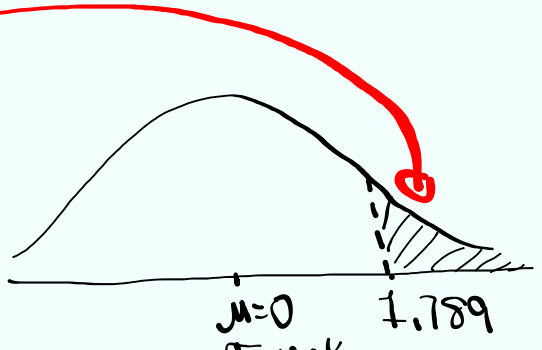
normalcdf(-E99, -3.875, 0, 1) = 5.3×10^{-5}

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

Nov 22-9:11 AM

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

Find P-value.



tcdf(L, U, df)

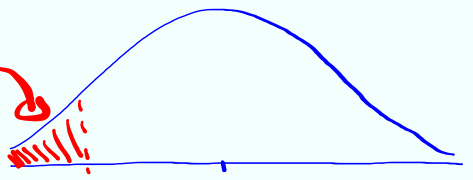
tcdf(1.789, E99, 12) = .049

If TTT $\rightarrow$ P-value $= 2(.049) \approx .098$

Nov 22-9:14 AM

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

Find P-value.



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

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

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

SG 24

Nov 22-9:19 AM