Statistics

Fall 2022

Lecture 24

Feb 19-8:47 AM

Final Exam is next Thursday.

We have lecture everyday next week: M T W.

Final exam is everything from day 1.

Start your study for final exam. I allow you to ask questions at the end of each lecture.

You can ask all your questions during office hrs.

You must take the final during Zoom meeting with your camera on.

Any work on the final exam must be similar to my lectures. No deviations accepted.

Any other work is considered Cheating.

Dec 6-6:02 AM

Testing Claims: SG 24-27

A claim could be about
  1) Population   Proportion P
  2) Population   Mean μ
  3) Population   Standard deviation σ.

Why are we testing claims?

We test claim to determine its validity.

If claim is valid $\Rightarrow$ We support it.

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

Any possibilities of error? Yes

If claim is valid but we reject it.

If claim is invalid but we support it.

Dec 6-6:10 AM

Testing   Methods:
  1) Traditional   Method   These two methods
  2) P-Value   Method   are commonly used.

  3) Confidence Interval Method

Regardless of the method used, the
Final Conclusion must be the same.

                                        Support
Reject the claim   OR   Fail-to-Reject
                                     the claim

when claim is invalid.   When Claim is
                                            Valid.

Action \ Claim	Valid	Invalid
Reject	Error	Not error
Fail-to-Reject	Not error	Error

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Testing types:

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

Every testing comes with some Significance level α.
$0 < \alpha < 1$
If α not given $\Rightarrow$ use .05

NCR $1-\alpha$ CR α CV
RTT

CR α NCR $1-\alpha$ CV
LTT

CR $\alpha/2$ NCR $1-\alpha$ CR $\alpha/2$ CV   CV
TTT
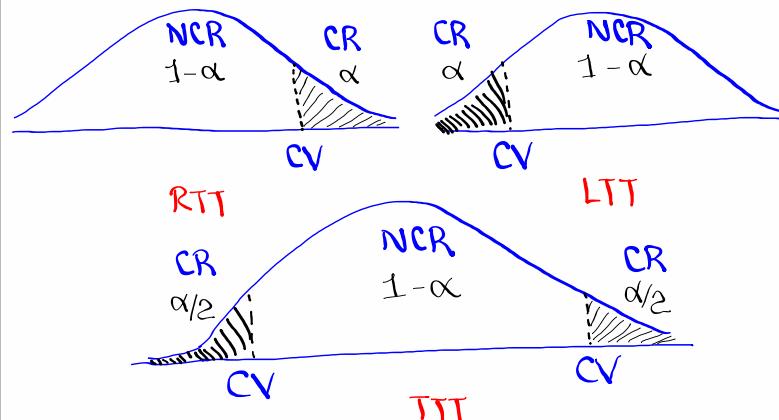
Dec 6-6:29 AM

Testing Process:

1) Set-up H_0 and H_1.
   ↑ Null Hypothesis
   — Alternative Hypothesis.

2) Find all Critical Values.
   Drawing, labeling, Shading, Full TI-Command required.

3) Find Computed test Statistic (CTS) and P-value (P).
   Full TI-Command or Formula required.

4) Use [Testing Chart] to deteremine the Validity of H_0 and H_1.
   H_0 valid $\Longleftrightarrow$ H_1 invalid
   H_0 invalid $\Longleftrightarrow$ H_1 valid

5) Final Conclusion must be about claim
   Reject the Claim   OR   FTR the claim
   (Invalid Claim)   (Valid claim)

Dec 6-6:39 AM

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More on H_0 & H_1:

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

H_1 Cannot contain = Sign. $\Rightarrow$ $\neq$, $<$, $>$

Keywords!

H_0: is , equal, Same, at least, at most,...

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

Always Identify the claim and testing type.

claim could be H_0 and H_1 but not at the Same time.

Dec 6-7:04 AM

H_0: = H_0: $\geq$ H_0: $\leq$

H_1: $\neq$ H_1: $<$ H_1: $>$

TTT   LTT   RTT

H_1 tells us what type of testing.
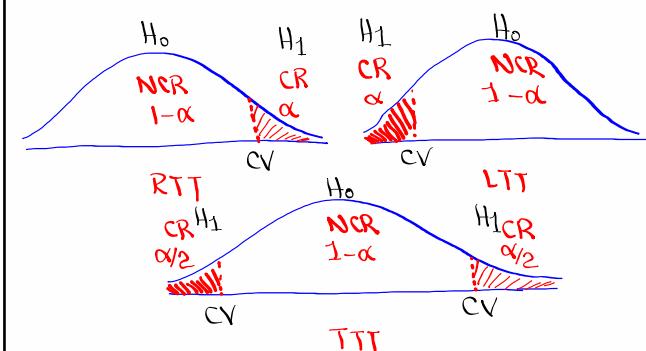
$$P(H_0 \text{ valid}) = 1 - \alpha = P(H_1 \text{ invalid})$$

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

Dec 6-7:10 AM

Four - Possible outcomes for H_0:

Conclusion \ Reality	H_0 Valid	H_0 invalid
Support H_0	Correct Decision	Type II Error
Reject H_0	Type I Error	Correct Decision

Dec 6-7:21 AM

College claims that 10% of all Students Smoke.

$$P = .1$$

$H_0: P = .1$ Claim

$H_1: P \neq .1$ TTT

Suppose H_0 is valid and we reject it.

Type I error

I reject the claim that 10% of all Students Smoke.

Dec 6-7:26 AM

College claims that the mean of all final exam Score in math classes is at least 75.

$$\mu \geq 75$$

$H_0: \mu \geq 75$ claim

$H_1: \mu < 75$ LTT

Suppose Ho is invalid but we support it.

Type II error

I Support the claim that the mean of all exams is at least 75.

Dec 6-7:32 AM

College claims that standard deviation of ages of all students is more than 8 Yrs.

$$\sigma > 8$$

$H_0: \sigma \leq 8$

$H_1: \sigma > 8$ claim, RTT

Dec 6-7:39 AM

what is p-value?

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

Only for TTT, multiply by 2.

Area = P-value

CTS

RTT

CTS

LTT
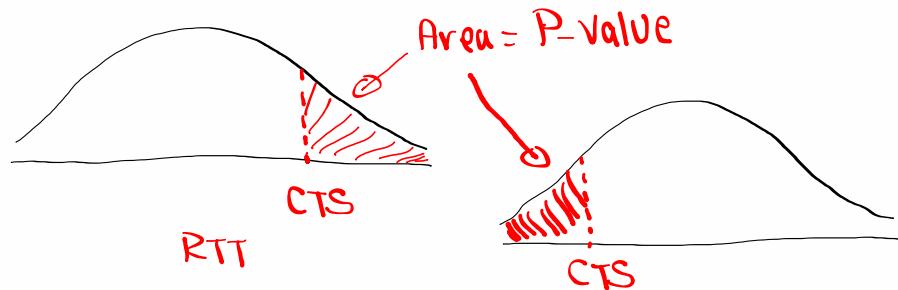
only when doing TTT

⇒ Multiply by 2.

Dec 6-7:44 AM

Suppose CTS $Z = 2.125$, RTT, find P-value.

Area = P-value

normalcdf$(2.125, E99, 0, 1)$

$Z = 2.125$

$= \boxed{.017}$
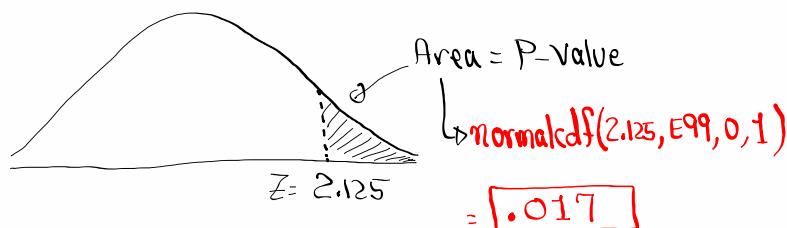
CTS $Z = -1.985$, TTT, find P-value

P-value $= 2 *$ Area

$Z = -1.985$
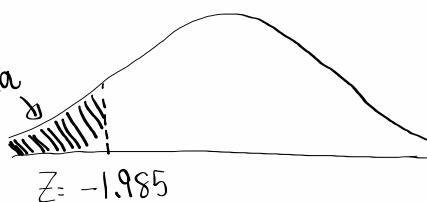
P-value $= 2 *$ normalcdf$(-E99, -1.985, 0, 1)$

$= \boxed{.047}$

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CTS $t = 1.785$, RTT, df=14, find P-value.

Area = P-Value

$tcdf(1.785, E99, 14)$

L   U   df

$= .048$
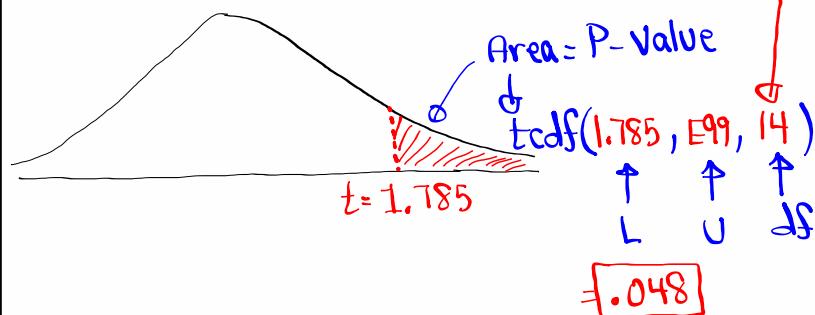
CTS $t = -1.785$, LTT, df=14

find P-value.

P-Value = Area

-1.785

P-value = $tcdf(-E99, -1.785, 14) = .048$
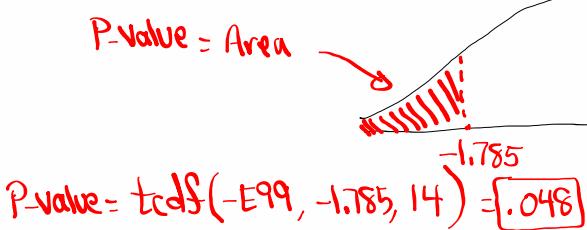
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CTS $t = 3.725$, df = 19, TTT

find P-Value.

P-Value = 2 * Area

3.725

$= 2 * tcdf(3.725, E99, 19) = .001$

SG 24

Dec 6-8:02 AM