Statistics
Lecture 44

Feb 19-8:47 AM

Testing Claims:

SG 24-27

A claim is made, our task is to test the claim for validity.

If claim is invalid ⇒ we reject it.

If claim is valid ⇒ We fail-to-reject it.
                        Support

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

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I claim that 5% of all students smoke.
← Pop. Proportion P

I claim that the mean age of all students is below 32 Yrs.
Population Mean μ

I claim that standard deviation of all exams is at least 10.
Population Standard deviation σ

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why do we need to test a claim?
because we need to know if claim is valid or invalid.
If claim is invalid ⇒ we reject it.
If claim is valid ⇒ we support it.
Fail-to-Reject
FTR

Possible Errors:
when reject a valid claim.
when support an invalid claim

Nov 19-9:01 AM

Testing Methods:

1) Traditional Method
2) P-Value Method

We use these as part of lecture

3) Confidence Interval Method

Use office hours to go over it.

Regardless of method, final conclusion must be the Same.

Reject the claim OR

when claim is invalid

Fail-to-Reject the claim

when claim is Valid

Action \ claim	Valid	Invalid
Support	✓	Error
Reject	Error	✓

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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 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

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Testing Process:

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

↑ Null Hypothesis

2) Find Computed Test Statistic (CTS)
   Drawing, labeling, shading, and full TI Command required.

3) Find all Critical Values CV
   Drawing, labeling, shading, and full TI Command required.
   If we use formula, write the formula.

4) Use Testing chart to determine the Validities of H_0 & H_1.
   If H_0 is valid ⇒ H_1 must be invalid.
   If H_0 is invalid ⇒ H_1 must be valid.

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

   Reject the claim   OR   FTR the Claim.

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More on H_0 & H_1:

H_0 must contain equal sign. $=, \geq, \leq$

H_1 cannot contain equal sign. $\neq, <, >$

Keywords for H_0:
  is, equal, at least, at most, not different, same, · · ·

Keywords for H_1:
  is not, not equal, more than, less than, exceed, below, above, different, · · ·
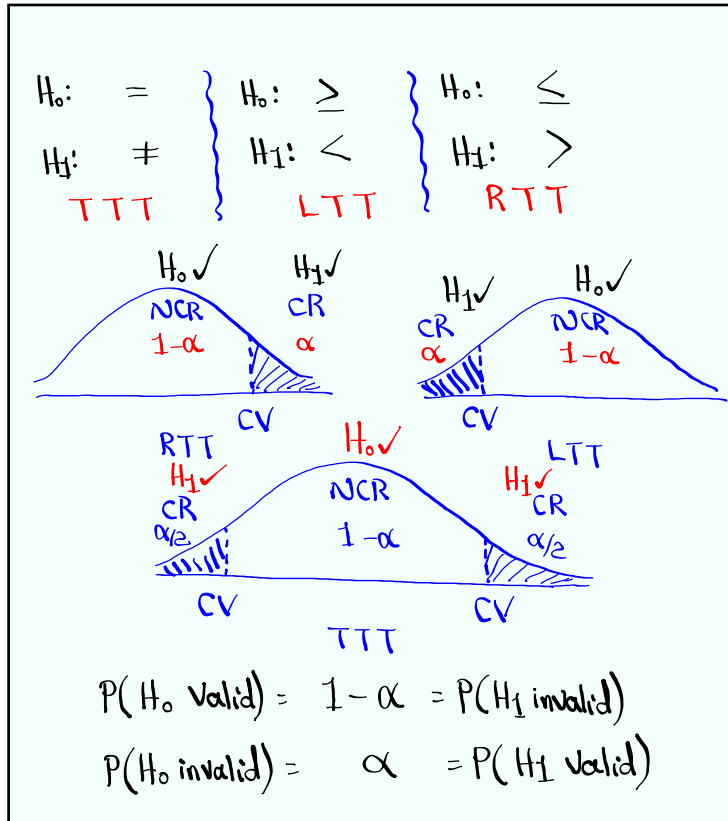
when $H_1 >$ .... Right-Tail Test

$H_1 <$ .... Left-Tail Test

$H_1 \neq$ .... Two-Tail Test

H_1 tells us what type of testing.

Always identify claim & type of Test.

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$H_0: \quad =$ $\}$ $H_0: \quad \geq$ $\}$ $H_0: \quad \leq$

$H_1: \quad \neq$ $\}$ $H_1: \quad <$ $\}$ $H_1: \quad >$

TTT $\}$ LTT $\}$ RTT

$H_0 \checkmark$ $\quad H_1 \checkmark$ $\qquad H_1 \checkmark$ $\quad H_0 \checkmark$

NCR $\quad$ CR $\qquad$ CR $\quad$ NCR

$1-\alpha$ $\quad \alpha$ $\qquad \alpha$ $\quad 1-\alpha$

CV $\qquad\qquad$ CV

RTT $\qquad H_0 \checkmark$ $\qquad$ LTT

$H_1 \checkmark$ $\quad$ NCR $\qquad H_1 \checkmark$

CR $\qquad 1-\alpha$ $\qquad$ CR

$\alpha/2$ $\qquad\qquad \alpha/2$

CV $\qquad\qquad$ CV

TTT

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

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

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I claim 15% of all students work full time. $\quad H_0: P = .15 \quad$ claim

$\qquad\qquad\qquad H_1: P \neq .15 \quad$ TTT

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

$\qquad H_0: \mu \leq 32 \quad$ claim

$\qquad H_1: \mu > 32 \quad$ RTT

I claim the standard deviation of ages of all students is less than 10 yrs.

$\qquad H_0: \sigma \geq 10$

$\qquad H_1: \sigma < 10 \quad$ claim, LTT

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Type I & Type II errors:

Reality Conclusion	H₀ valid	H₀ invalid
Support H₀	Good Decision	Type II error
Reject H₀	Type I error	Good Decision

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