Statistics

Lecture 15

Feb 19-8:47 AM

find minimum Sample Size needed to Construct 99% Conf. interval for population Proportion and we wish the margin of error not to exceed 5%. if

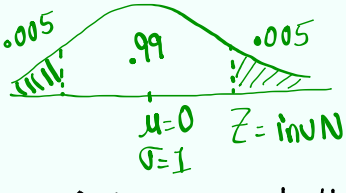
1) $\hat{P} = .25$

$$n = \hat{P}\hat{q}\left(\frac{z_{\alpha/2}}{E}\right)^2$$

$$= (.25)(.75)\left(\frac{2.576}{.05}\right)^2$$

$$\approx 497.6832$$

$$\approx \boxed{498}$$



$z = \text{invNorm}(.995, 0, 1) =$

2) $\hat{P}$ & $\hat{q}$ are both unknown.

use .5 for each

$$n = .25\left(\frac{2.576}{.05}\right)^2 \approx 663.5776$$

$$\approx \boxed{664}$$

Feb 5-4:32 PM

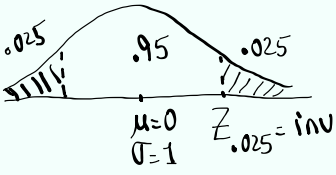
Find minimum Sample Size needed to Construct conf. interval for population mean if we wish the error not to exceed 10 and pop. standard dev. is 25.

↳ NO C-level use 95%.

$$n = \left(\frac{z_{\alpha/2} \cdot \sigma}{E}\right)^2$$

$$= \left(\frac{1.960 \cdot 25}{10}\right)^2$$

$$\approx 24.01 \approx 25$$



Sec 21 & 22 ✓

Feb 5-4:40 PM

Testing claims:

More details on H_0 & H_1:

H_0 must contain equal Sign.

$=$, $\geq$, $\leq$

H_1 cannot contain equal Sign.

$\neq$, $<$, $>$

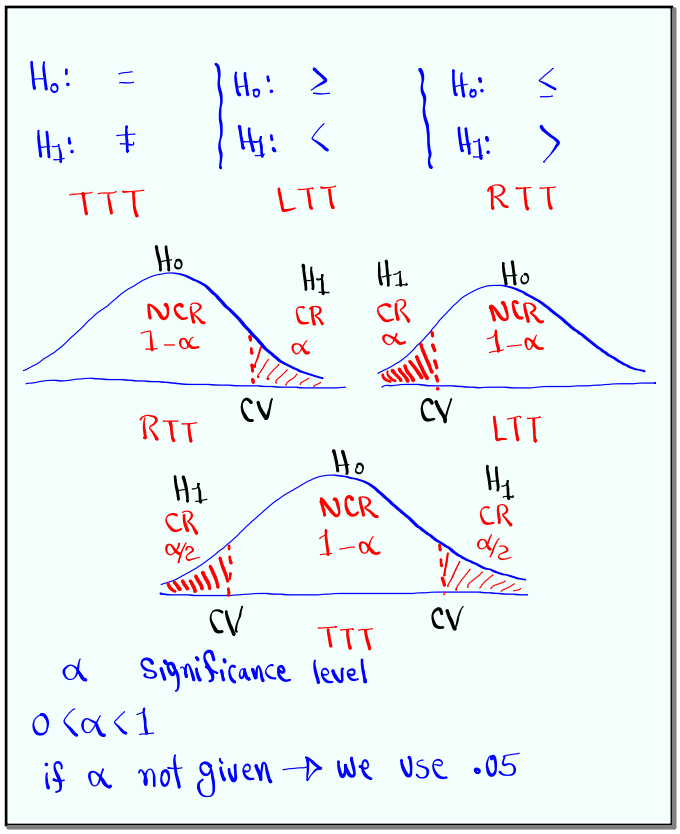
Keywords for H_0:

is, equal, the same, at least, atmost, ...

Keywords for H_1:

is not, not equal, not the same, different, more than, less than, above, below, exceed, lower than, ...

Feb 5-4:46 PM



Feb 5-4:51 PM

Claim could be about any parameters.

1) Population Proportion p

2) " Mean μ

3) " Standard deviation σ

ex: College claims that 10% of all students smoke.

$p = .1$ ← H_0

H_0: $p = .1$ claim

H_1: $p \neq .1$ TTT

Feb 5-4:58 PM

College claims that the mean age of all students is at most 30 yrs.

$\mu \leq 30$

H_0: $\mu \leq 30$ claim

H_1: $\mu > 30$ RTT

Math dept. claims the mean of all final exam scores is below 88.

$\mu < 88$

H_0: $\mu \geq 88$

No = Sign

H_1: $\mu < 88$ claim, LTT

H_1

Feb 5-5:02 PM

AAA claims that standard deviation of speed of all cars on FWY 210 is not 10 mph.

$\sigma \neq 10$

H_1

H_0: $\sigma = 10$

H_1: $\sigma \neq 10$ claim, TTT

Feb 5-5:06 PM

Four Possible outcomes for H_0

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

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

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

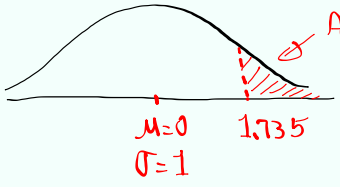
Feb 5-5:11 PM

One testing method is p-Value Method.

P-Value is the area of the tail marked by CTS (Computed Test Statistic)

Multiply by 2 only if it is TTT.

Suppose CTS $z = 1.735$, RTT



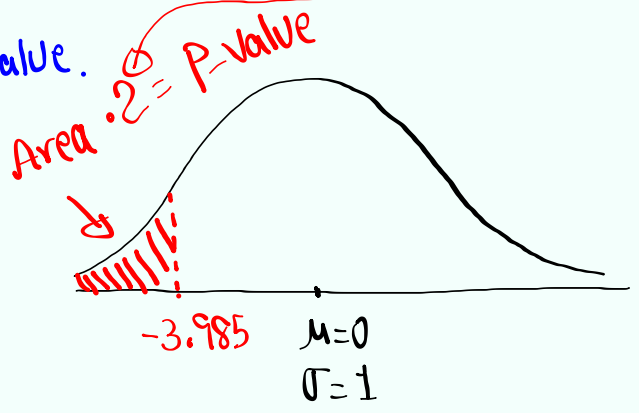
If it was TTT, P-value $= 2(.041)$

$= .082$

Feb 5-5:17 PM

Given CTS $z = -3.985$, TTT

Find P-Value.



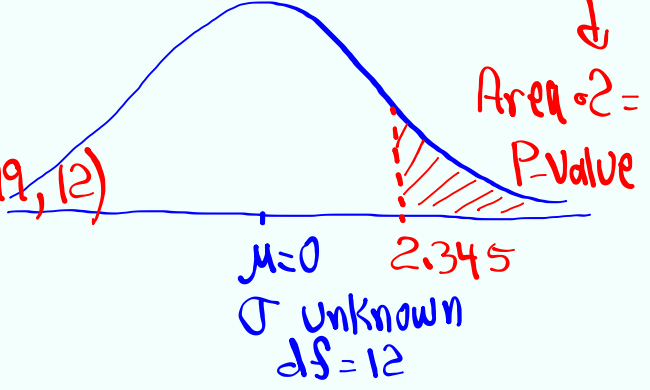
P-Value $= 2 \cdot$ normalcdf$(-E99, -3.985, 0, 1)$

$= \boxed{6.751 \times 10^{-5}}$

Feb 5-5:23 PM

Given CTS $t = 2.345$, TTT, $df = 12$

Find p-value.



P-Value:

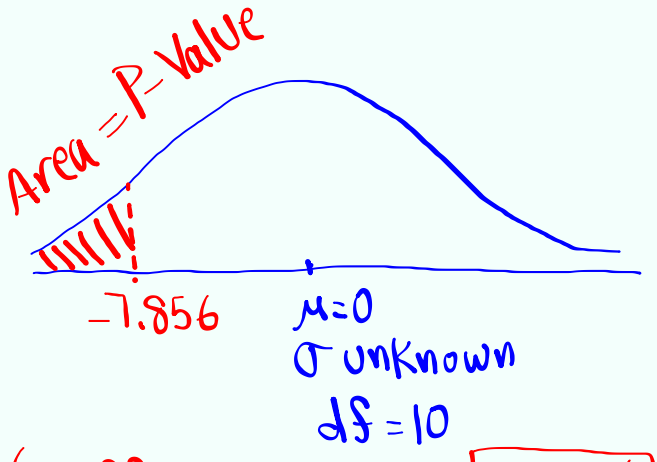
$2 \cdot$ tcdf$(2.345, E99, 12)$

$= \boxed{.037}$

Feb 5-5:26 PM

Given CTS $t = -7.856$, $df = 10$, LTT

Find p-Value

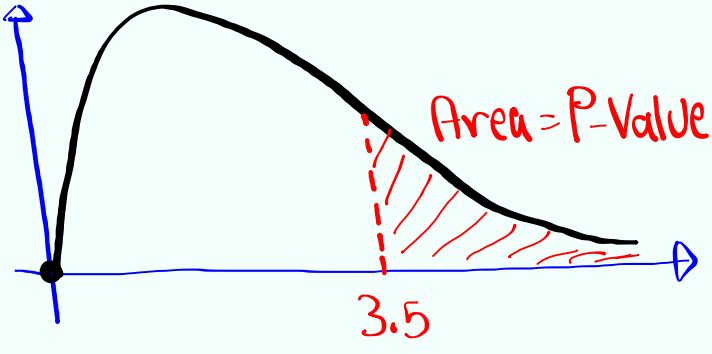


P-Value = tcdf(-E99, -7.856, 10) = 6.9×10^{-6}

Feb 5-5:30 PM

Given CTS $F = 3.5$ RTT Ndf=4,

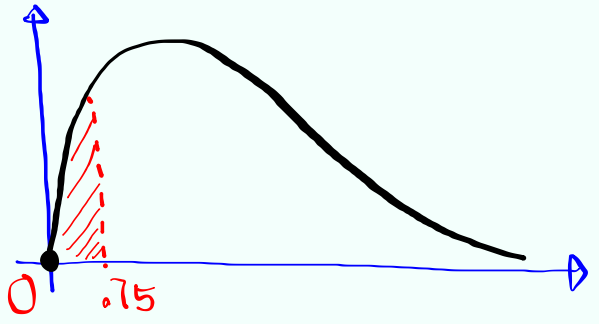
Ddf=25. Find P-Value



P-Value = fcdf(3.5, E99, 4, 25) = .021

Feb 5-5:34 PM

Given CTS F = .75 , LTT , Ndf = 3,
Ddf = 20. Find P-Value.

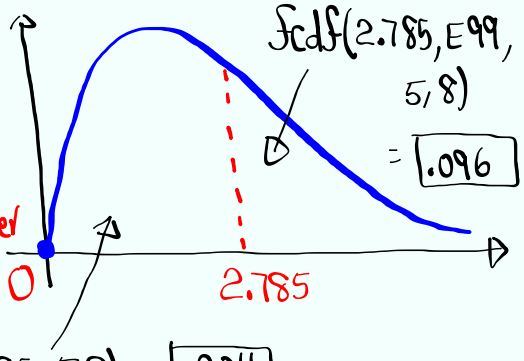


P-Value = fcdf (0, .75, 3, 20)
= .465

Feb 5-5:37 PM

Given CTS F = 2.785 , TTT , Ndf = 5,
Ddf = 8. Find P-Value.

Find both areas, then P-value = 2 · Smaller area



fcdf (0, 2.785, 5, 8) = .904

P-Value = 2 · Smaller area
= 2 (.096) = .192

Feb 5-5:40 PM

Testing one Population Proportion:

$H_0: P = P_0$ $H_0: P \leq P_0$ $H_0: P \geq P_0$

$H_1: P \neq P_0$ $H_1: P > P_0$ $H_1: P < P_0$

TTT RTT LTT

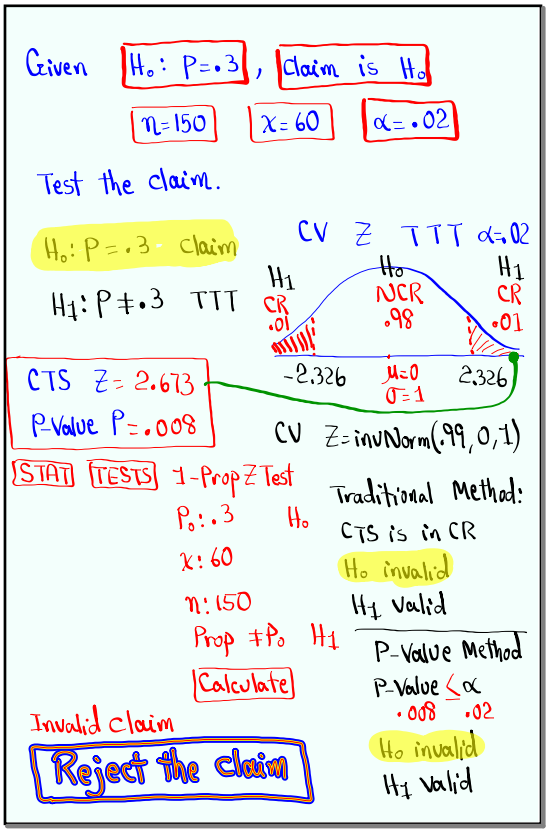
For C.V. use invNorm

For CTS Z
P-Value P use 1-Prop Z Test

we proceed with testing chart.

we draw final conclusion about the claim.

Feb 5-6:01 PM



Feb 5-6:06 PM

College claims that at most 10% of all students smoke. $P \leq .1$ (H_0)

I surveyed 250 students, and 30 of them were smokers. $n=250$ $x=30$

use $\alpha=.02$ to test the claim.

H_0: $P \leq .1$ claim

H_1: $P > .1$ RTT

CTS $Z = 1.054$

P-Value $P = .146$

1-PropZTest

$P_0: .1$ H_0

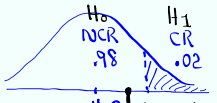
$x: 30$

$n: 250$

Prop. $> P_0$ H_1

Calculate

CV Z RTT $\alpha=.02$



CV $Z = \text{invNorm}(.98,0,1)$

CTS is in NCR

H_0 valid H_1 invalid

P-value $> \alpha$

.146 .02

Valid claim

Support the claim

FTR the claim

Feb 5-6:19 PM

College claims that less than 25% of all students are fan of online classes.

$P < .25$ (H_1)

H_0: $P \geq .25$

H_1: $P < .25$ claim, LTT

I took a survey of 300 students and 22% of them were fan of online classes.

$n=300$ $\hat{P}=.22$ $x = n\hat{P} = 300(.22) = 66$

Test the claim.

No α → use $\alpha=.05$

CV Z LTT $\alpha=.05$

CTS $Z = -1.2$

P-Value $P = .115$ ✓

1-PropZTest

$P_0: .25$ H_0

$x: 66$

$n=300$

Prop $< P_0$ H_1

CV $Z = \text{invNorm}(.05,0,1)$

CTS is in NCR

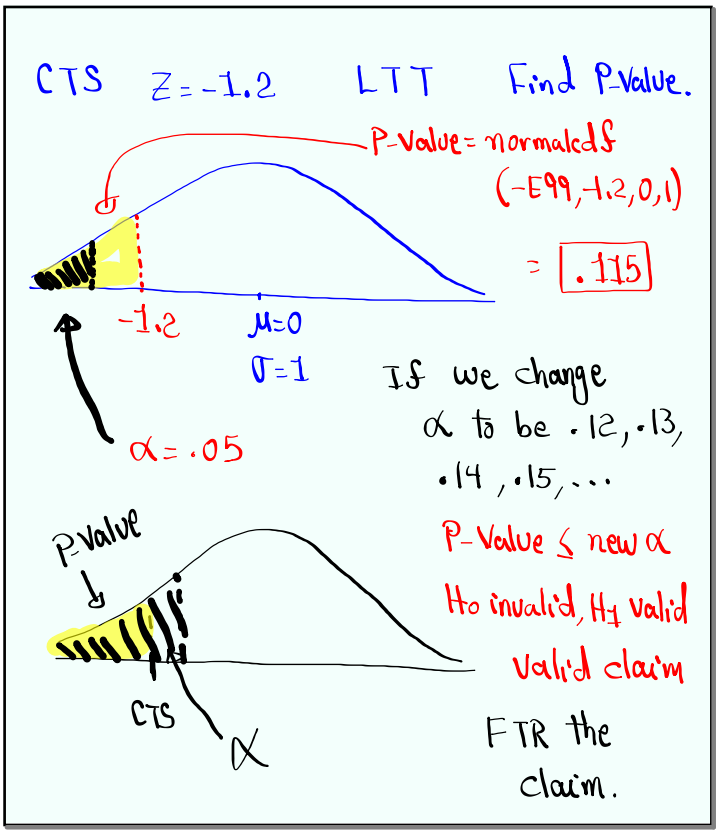
P-value $> \alpha$

H_0 valid H_1 invalid

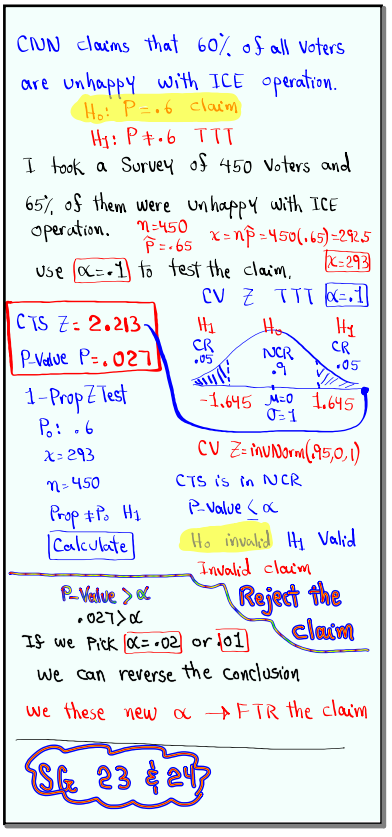
Invalid claim

Reject the claim

Feb 5-6:32 PM



Feb 5-6:46 PM



Feb 5-6:52 PM