Statistics

Lecture 12

Feb 19-8:47 AM

Testing one population Proportion: SG 24

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

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

TTT LTT RTT

Always identify the claim

Find Critical Value(s)
we use Z, invNorm. Clearly label everything

Find Computed Test statistic CTS and P-Value P.

STAT TESTS 1-Prop Z Test

Use Testing Chart to determine the validity of H_0 & H_1.

Draw final Conclusion about the claim

Reject the claim OR Fail-to-Reject the claim

Apr 27-6:53 PM

CNN claims that 30% of all voters are in favor of tougher Gun Laws.

I Surveyed 120 voters, and 40 of them were in favor of tougher gun laws.

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

H_0: $P = .3$ claim

H_1: $P \neq .3$ TTT

C.V. Z TTT $\alpha = .02$

H_1 CR .01 | H_0 NCR .98 | H_1 CR .01

-2.326 $\mu=0$ $\sigma=1$ 2.326

$Z = \text{invNorm}(.99, 0, 1)$

CTS $Z = .797$

P-Value $P = .426$

1-PropZTest

$P_0: .3$ H_0

$x: 40$

$n: 120$

Prop $\neq P_0$ H_1

Calculate

Traditional Method:

CTS is in NCR

H_0 valid & H_1 invalid

P-value Method:

P-value $>$ α

.426 .02

H_0 valid & H_1 invalid.

H_0 valid

valid claim → Fail-to-Reject the claim

Apr 27-7:03 PM

LA Times claims that more than 60% of Dodger's fan went to the parade.

I Surveyed 200 fans, and 135 of them went to the parade.

Test the claim.

CV Z RTT

No α → use .05

H_0: $P \leq .6$

H_1: $P > .6$ claim, RTT

H_0 NCR .95 | H_1 CR .05

$\mu=0$ $\sigma=1$ 1.645

$Z = \text{invNorm}(.95, 0, 1)$

CTS $Z = 2.165$

P-Value $P = .015$

1-PropZTest

$P_0: .6$ H_0

$x: 135$

$n: 200$

Prop $> P_0$ H_1

Calculate

CTS is in CR.

H_0 invalid, H_1 valid

P-value $\leq \alpha$

.015 .05

H_0 invalid, H_1 valid

Valid claim

FTR the claim

Apr 27-7:20 PM

College claims that at least 35% of all students have a job while going to school.

I surveyed 150 students and 32% ($\hat{p}$) of them had a job. $n=150$

$x = n\hat{p} = 150(.32) = 48$ if decimal → Round up

Use .1 Significance level to test the claim.

$H_0: p \geq .35$ claim

$H_1: p < .35$ LTT

CTS $z = -.770$

P-Value $P = .221$ ✓

1-Prop Z Test

$P_0: .35$ H_0

$x: 48$

$n: 150$

Prop $< P_0$ H_1

Calculate

CV z LTT $\alpha = .1$

H_1 CR .1 | H_0 NCR .9

-1.282 $\mu = 0$ $\sigma = 1$

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

CTS is in NCR

P-Value $> \alpha$

H_0 Valid & H_1 invalid

Valid claim

FTR the claim

Apr 27-7:35 PM

CTS $z = -.770$ LTT

Find P-Value.

P-Value = Area

$\alpha = .1$

-1.282

$-.770$ $\mu = 0$ $\sigma = 1$

$= \text{normalcdf}(-E99, -.770, 0, 1) = .221$

Apr 27-7:50 PM

College claims that 10% of all students Smoke.

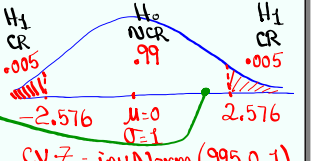
I Surveyed 275 students and 14% ($\hat{p}$) of them were Smokers. $n=275$, $\hat{p}=.14$, $x=n\hat{p}=275(.14)=38.5$ if decimal ↑ $x=39$

use $\alpha=.01$ to test the claim.

$H_0: p=.1$ claim

$H_1: p\neq.1$ TTT

CV Z TTT $\alpha=.01$



CV $Z=$ invNorm(.995,0,1)

CTS $Z=2.312$

P-Value $P=.021$

1-PropZTest

$P_0: .1$ H_0

$x: 39$

$n: 275$

Prop $\neq P_0$ H_1

Calculate

CTS is in NCR

P-value $>\alpha$

H_0 valid, H_1 invalid

Valid claim → FTR

I want to reject it.

Let's pick different α.

P-value $>\alpha$

$.021 > .01$

Pick α such that

P-value $\leq \alpha$

$.021 \leq \alpha$

Pick $\alpha=.03, .04, .05, \ldots$

Apr 27-7:55 PM

CNN claimed that about 10% of Americans Care about the Royal family.

I Surveyed 225 Americans ($n=225$), and 12% of them ($x=225(.12)=27$) Cared about the Royal family.

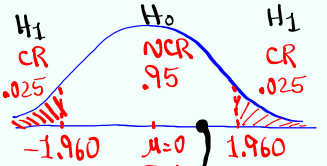
Test the claim.

No α → $\alpha=.05$

$H_0: P=.1$ claim

$H_1: P\neq.1$ TTT

CV Z TTT $\alpha=.05$



$Z=$ invNorm(.975,0,1)

CTS $Z=1$

P-Value $P=.317$

1-PropZTest

$P_0: .1$

$x: 27$

$n: 225$

Prop $\neq P_0$

CTS is in NCR

P-value $>\alpha$

H_0 valid

H_1 invalid

Valid claim → FTR the claim

Apr 29-6:56 PM

Testing one Population Mean:

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

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

TTT RTT LTT

Case I: σ Known

CV z

Drawing, labeling, Shading, and TI Command required

CTS z → Z-Test

P-Value P input: Stats

use Testing Chart to determine the validity of H_0 & H_1.

H_0 valid ⟷ H_1 invalid

H_0 invalid ⟷ H_1 valid

Draw final Conclusion about the claim

Reject the claim OR FTR the claim

Apr 29-7:08 PM

Dept. claims the mean of all exams is 82. $\mu = 82$ H_0

I randomly selected 30 exams, and the mean was 88. $n = 30$ $\bar{x} = 88$

It is known that standard deviation of all exam Scores is 10. $\sigma = 10$

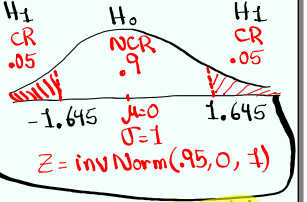
use $\alpha = .1$ to test the claim.

$H_0: \mu = 82$ claim

$H_1: \mu \neq 82$ TTT

σ Known

CV z TTT $\alpha = .1$



$z = \text{invNorm}(.95, 0, 1)$

CTS $z = 3.286$

P-Value $P = .001$

Z-Test

Stats

input:

$\mu_0: 82$ H_0

$\sigma = 10$

$\bar{x} = 88$

$n = 30$

$\mu \neq \mu_0$ H_1

CTS is in CR H_0 invalid

P-value $\leq \alpha$ H_1 Valid

Invalid claim

Reject the claim

Apr 29-7:17 PM

Dept. of Health claims the mean Salary of all nurses is at least \$6500/mo.

$\mu \geq 6500$ H_0

LA Times Collected data from 32 nurses, their mean Salary was \$6250/mo. $n=32$ $\bar{x}=6250$

It is known that standard deviation of Salaries of all nurses is \$300/mo. $\sigma=300$

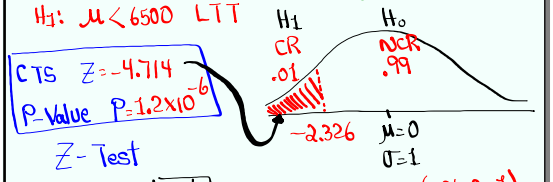
Test the claim at $\alpha=.01$

H_0: $\mu \geq 6500$ claim

H_1: $\mu < 6500$ LTT

σ Known

CV Z LTT $\alpha=.01$



CTS $Z=-4.714$

P-Value $P=1.2\times10^{-6}$

Z-Test

inpt: Stats

μ_0: 6500 H_0

σ: 300

$\bar{x}$: 6250

n: 32

$\mu < \mu_0$ H_1

$Z=$ invNorm(.01, 0, 1)

CTS is in CR { H_0 invalid; H_1 valid

P-value $\leq \alpha$

Invalid claim

Reject the claim

Apr 29-7:32 PM

Testing one Population Mean:

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

Case I: σ Known	Case II: σ unknown
CV Z	CV t $df=n-1$
Drawing, labeling, Shading, and TI Command required	Drawing, labeling, Shading, and TI Command required
CTS Z P-Value P → Z-Test inpt: Stats	CTS t P-Value P → T-Test inpt: Stats

use Testing Chart to determine the validity of H_0 & H_1.

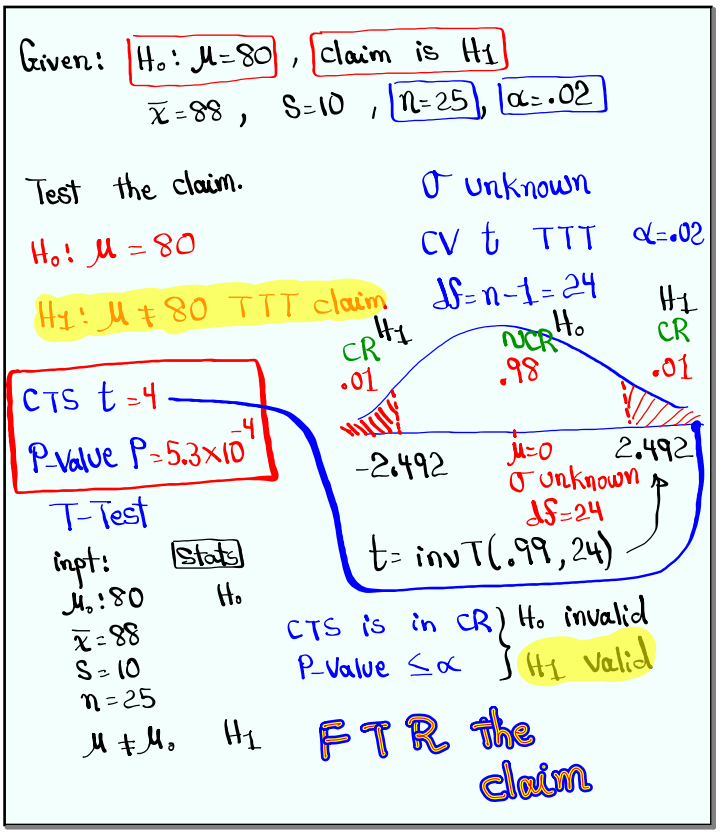
H_0 valid ⟷ H_1 invalid

H_0 invalid ⟷ H_1 valid

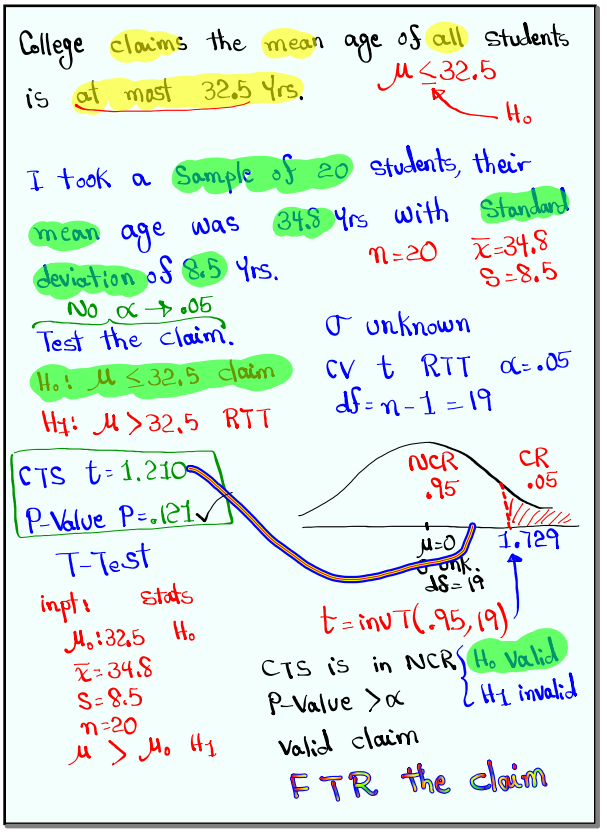
Draw final Conclusion about the claim

Reject the claim OR FTR the claim

Apr 29-7:08 PM



Apr 29-7:50 PM



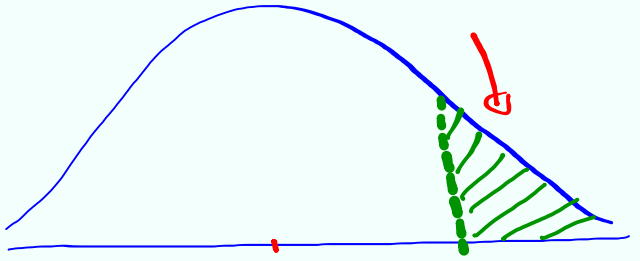
Apr 29-8:01 PM

CTS $t = 1.210$

RTT

$df = 19$

find p-value.



P-Value = $tcdf(1.210, E99, 19)$

$\approx$ .121

Apr 29-8:16 PM

12 exams were randomly selected. ← Sample

Here are the Scores:

75	82	100	90
68	70	96	80
100	98	85	78

Find $\bar{x} \approx 85$, $s \approx 12$ (Round to whole #)

Test the claim that the mean of exams is above 82. $\alpha = .05$

$\mu > 82$ ← H_1

$H_0: \mu \leq 82$

$H_1: \mu > 82$ claim, RTT

σ unknown

CV t RTT $\alpha = .05$

$df = n - 1 = 11$

CTS $t = .866$

P-Value $P = .202$

T-Test

inpt: Stats

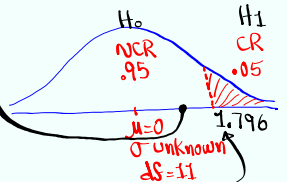
$\mu_0: 82$

$\bar{x} = 85$

$s = 12$

$n = 12$

$\mu > \mu_0$



t=invT(.95, 11):

CTS is in NCR ⇒ H_0 valid

P-Value > α ⇒ H_1 invalid

Invalid claim → Reject the claim

Apr 29-8:20 PM

Given cts $t = 3.825$ $df = 14$, TTT

Find P-Value.

2. Area = P-Value

P-Value = 2·tcdf(3.825, E99, 14)

$\approx$ .002

SG 23, 24, & 25

Apr 29-8:35 PM

College claims more than 60% of Students like in-person classes. $p > .6$, $\hat{p}$

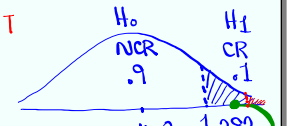
A survey of 250 Students, 65% of them liked in-person classes. $n = 250$, $\hat{p} = .65$, $x = n\hat{p} = 250(.65) \approx 163$

Test the claim using $\alpha = .1$.

CV Z RTT $\alpha = .1$

H_0: $p \leq .6$

H_1: $p > .6$ claim, RTT



CTS $Z = 1.678$

P-Value $P = .047$

1-PropZTest

P_0: .6 H_0

x: 163

n: 250

Prop > P_0 H_1

Calculate

$Z = \text{invNorm}(.9, 0, 1)$

CTS is in CR

P-Value $\leq \alpha$

H_0 invalid, H_1 Valid

Valid claim → FTR the claim

To reject the claim

P-Value $> \alpha$ $.047 > \alpha$

choose α to be .04, .03, .02, .01

Apr 27-8:16 PM