Elementary Statistics Lecture 13

Testing One Population Proportion P: SG 25

H_0: $p =$ | H_0: $p \leq$ | H_0: $p \geq$

H_1: $p \neq$ | H_1: $p >$ | H_1: $p <$

TTT | RTT | LTT

C.V. z invNorm

Drawing, labeling, Shading, TI command ✓

C.T.S. z

P-value P $\Rightarrow$ 1-PropZTest

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

Final Conclusion:

Reject the claim OR FTR the claim

The College claims that 60% of all students like online classes.

$H_0: P = .6$ claim

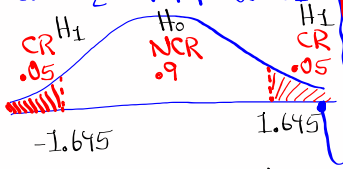
$H_1: P \neq .6$ TTT

I surveyed 280 college students and 182 of them liked online classes.

$n = 280$, $x = 182$

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

C.V. Z TTT $\alpha = .1$



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

CTS is in CR

P-value $\leq \alpha$

CTS $Z = 1.708$

P-value $P = .088$

1-PropZTest

$P_0: .6$ (H_0)

$x = 182$

$n = 280$

Prop $\neq P_0$ (H_1)

Calculate

H_0 invalid

H_1 valid

$\Rightarrow$ Invalid claim $\Rightarrow$ Reject the claim

CNN claims that at least 40% of all voters voted by Party line.

$P \geq .4$

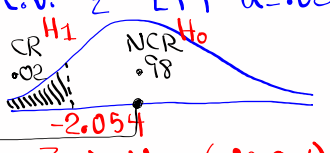
I surveyed 175 voters and 38% of them voted by Party line. $n = 175$ $\hat{P} = .38$ $x = n\hat{P} = 175(.38) = 66.5$ $x = 67$

Use this survey to test the claim at $\alpha = .02$.

$H_0: P \geq .4$ claim

$H_1: P < .4$ LTT

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



$Z = \text{invNorm}(.02, 0, 1)$

CTS $Z = -.463$

P-value $P = .322$

1-PropZTest

$P_0: .4$ (H_0)

$x = 67$

$n = 175$

Prop $< P_0$ (H_1)

CTS is in NCR

P-value $> \alpha$

H_0 valid

H_1 invalid

Valid claims

FTR the claim

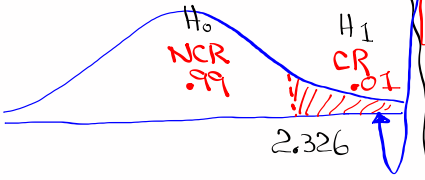
AT&T claims that more than 70% of all students have iPhone. $p > .7$ $H_0: p \le .7$

$H_1: p > .7$ claim, RTT

I surveyed 400 students and 80% of them had iPhone. $n = 400$ $\hat{p} = .8$ $x = n\hat{p} = 320$

Test the claim at $\alpha = .01$.

C.V. z RTT $\alpha = .01$



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

CTS $z = 4.364$

P-value $P = 6.4 \times 10^{-6}$

1-Prop Z Test

$P_0: .7$ (H_0)

$x = 320$

$n = 400$

Prop $> P_0$ (H_1)

CTS is in CR $\Rightarrow$ H_0 invalid

P-value $\le \alpha$ H_1 valid $\Rightarrow$ valid claim

FTR the claim.

Given CTS $z = 4.364$ RTT

Find P-value.

P-value = normalcdf(4.364, E99, 0, 1)

$= 6.4 \times 10^{-6}$

Given CTS $Z = -1.728$ TTT

Find P-value.

P-value = 2 * normalcdf(-E99, -1.728, 0, 1)

= .084

Testing One Population Mean μ: SG 25, SG 26

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

Case I: σ Known	
C.V. Z invNorm	
CTS $Z =$ P-value $P =$	Z-Test

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

Final Conclusion

Reject the claim OR FTR the claim

The College claims that the mean age of all students is 32 yrs.

$H_0: \mu = 32$ claim

$H_1: \mu \neq 32$ TTT

In a sample of 40 students, their mean age was 30 yrs.

$n = 40$

$\bar{x} = 30$

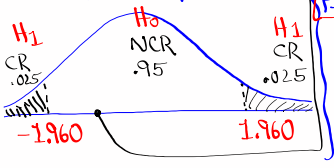
$\sigma = 8.5$

It is known that standard deviation of ages of all students is 8.5 yrs.

Test the claim. No α → use .05

σ known

C.V. Z TTT $\alpha = .05$



$Z = \text{invNorm}(.975, 0, 1)$

CTS is in NCR

P-value $> \alpha$

H_0 valid

H_1 invalid

→ valid claim

FTR the claim.

CTS $Z = -1.488$

P-value $P = .137$

Z-Test

inpt: STATS

$\mu_0: 32$ (H_0)

$\sigma = 8.5$

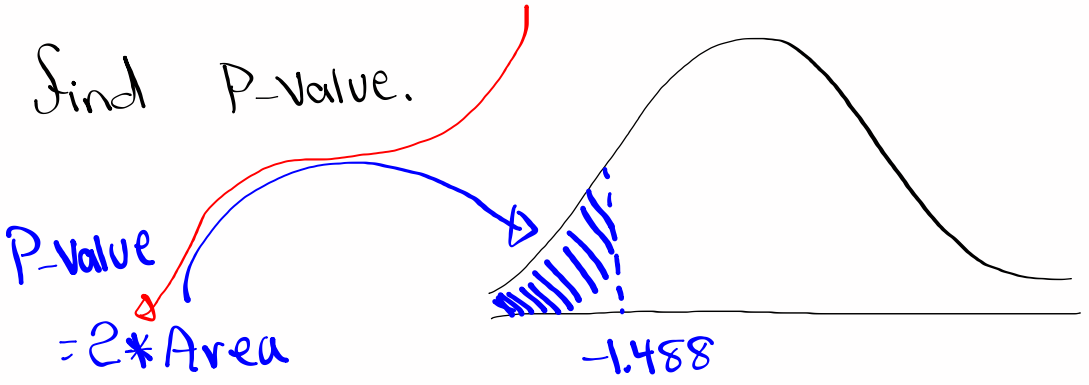
$\bar{x} = 30$

$n = 40$

$\mu \neq \mu_0$ (H_1)

CTS $Z = -1.488$ TTT

Find P-value.



$= 2 * \text{normalcdf}(-E99, -1.488, 0, 1)$

$= .137$

Dept. of Health Services claims that the mean Salary of all nurses is more than \$6250/month. $H_0: \mu \leq 6250$

$H_1: \mu > 6250$ claim, RTT

In a sample of 28 nurses, their mean Salary was \$6350/month.

$n=28 \quad \bar{x}=6350 \quad \sigma=475$

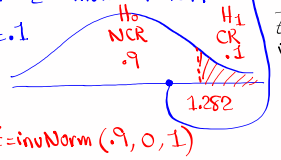
It is known that Stand. dev. of Salaries of all nurses is \$475/month.

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

σ Known

CV z invNorm RTT

$\alpha=.1$



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

CTS $z=1.114$

P-value $P=.133$

Z-Test

input: Stats

$\mu_0: 6250$ (H_0)

$\sigma=475$

$\bar{x}=6350$

$n=28$

$\mu > \mu_0$ (H_1)

CTS is in NCR H_0 Valid

P-value $>$ α (.133 $>$ .1) $\Rightarrow$ H_1 invalid

↳ Invalid claim

Reject the claim.

Suggest a value for α that changes the claim.

P-value $\leq \alpha$

$.133 \leq \alpha$

Choose .14, .15, .2, .3, .4, - - -

Testing One Population Mean μ: SG 25, SG 26

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

$H_1: \mu \neq$ TTT $\quad$ $H_1: \mu >$ RTT $\quad$ $H_1: \mu <$ LTT

Case I: σ Known	Case II: σ Unknown
C.V. z invNorm	C.V. t invT $df=n-1$
CTS $z=$ P-value $P=$ Z-Test	CTS $t=$ P-value p T-Test

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

Final Conclusion

Reject the claim OR FTR the claim

Given: $n=15$, $\bar{x}=120$, $s=10$, $H_0: \mu=125$

Claim is H_0.

Test the claim at $\alpha=.02$.

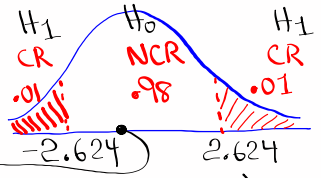
H_0: $\mu=125$ claim

H_1: $\mu\neq125$ TTT

σ unknown

CV t TTT $\alpha=.02$

$df=n-1=14$



CTS $t=-1.936$

P-value $P=.073$

T-Test

inpt: STATS

$\mu_0=125$

$\bar{x}=120$

$s=10$

$n=15$

$\mu\neq\mu_0$

$t=invT(.99, 14)$

CTS is in NCR $\Rightarrow$ H_0 valid

P-value $>\alpha$

H_1 invalid

Invalid claim

FTR the claim

Suggest a value for α to reverse conclusion.

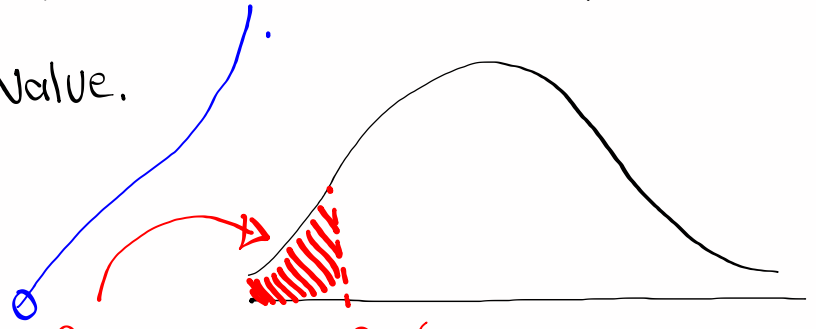
P-value $\leq\alpha$

$.073\leq\alpha$

.08, .09, .1, .15

CTS $t=-1.936$ TTT $df=14$

Find P-value.



P-value = 2 * Area

$=2*tcdf(-E99, -1.936, 14)$

$=.073$

I randomly selected 10 exams. Here are the scores:

72 95 83 100
70 80 90 98
65 75

Find
1) $\bar{x} = 83$
2) $s = 12$

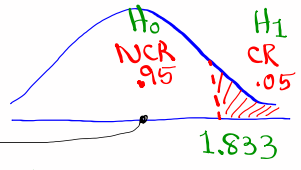
} Round to whole #

Dept. claims the mean of all exams is at most 80. Test the claim.

$H_0: \mu \leq 80$ claim
$H_1: \mu > 80$ RTT

σ unknown
C.V. t RTT
No $\alpha \rightarrow .05$
$df = n-1 = 9$

CTS $t = .791$
P-value $P = .225$
T-Test



CTS is in NCR
P-value $> \alpha$
H_0 valid
H_1 invalid $\Rightarrow$ valid claim

$t = invT(.95, 9)$
FTR the claim

CTS $t = .791$ RTT $df = 9$

Find P-value

P-value = Area
$= tcdf(.791, E99, 9)$
$= .225$ ✓