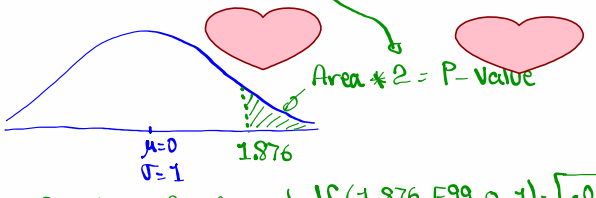
Statistics

Lecture 17

Feb 19-8:47 AM

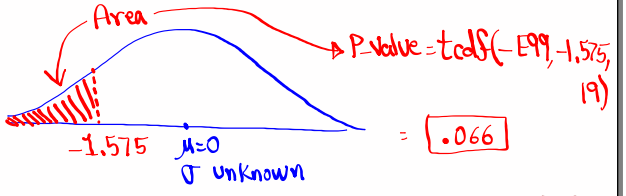
Given CIS $z = 1.876$, TTT, find p-value.



P-value = 2 * normalcdf(1.876, E99, 0, 1) = .061

P(H1 valid) = P(Ho invalid) = .061

Given CIS $t = -1.575$, LTT, $df = 19$, find P-value.



P-value = tcdf(-E99, -1.575, 19) = .066

P(H1 valid) = P(Ho invalid) = .066

Feb 14-4:29 PM

AAA claims that prop. of all workers in DTLA carpool to work is below 12%.

$P < .12$

In a survey of 352 workers, 10% of them were carpooling to work.

$n = 352$

$x = 352(.1) = 35.2$

$x = 36$

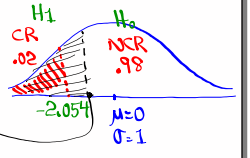
use $\alpha = .02$ to test the claim.

$H_0: P \geq .12$

$H_1: p < .12$ claim, LTT

CV Z invNorm

LTT $\alpha = .02$



CTS $Z = -1.023$

P-value $P = .153$ ✓

1-PropZTest

$P_0: .12$

$x: 36$

$n: 352$

Prop $< P_0$

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

CTS is in NCR

H_0 valid, H_1 invalid

P-value $> \alpha$ Invalid claim

Reject the claim

If we choose $\alpha = .2$

P-value $\leq \alpha$

$.153$ $.2$

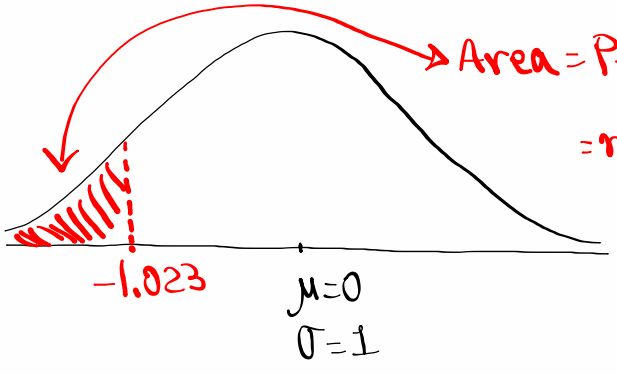
H_0 invalid

H_1 valid $\Rightarrow$ valid claim

FTR the claim

Feb 14-4:38 PM

Given CTS $Z = -1.023$, LTT, find P-value



Area = P-value

= normalcdf(-E99, -1.023, 0, 1)

= .153

Feb 14-4:51 PM

College claims that at most 60% of all students like online classes. $P \leq .6$ ← H_0

$n = 585$

I randomly selected 585 students and 63% of them liked online classes. $x = 585(.63) = 368.55$, $x = 369$

No α → use .05

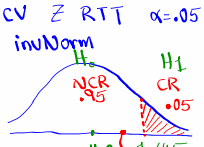
Test the claim.

H_0: $P \leq .6$ claim

H_1: $P > .6$ RTT

CV Z RTT $\alpha = .05$

invNorm



CTS $Z = 1.519$

P-value $P = .064$

1-PropZTest

P_0: .6

x: 369

n: 585

Prop > P_0

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

CTS is in NCR

H_0 valid, H_1 invalid

P-value .064 > α .05 → valid claim FTR the claim

If we choose α to be .07, .08, .09, .1, ...

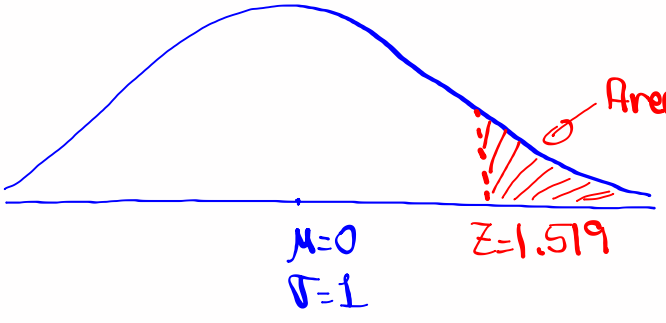
P-value $\leq \alpha$ → H_0 invalid → invalid claim Reject the claim

Since H_0 is valid

If we reject H_0, then we have made type I error.

Feb 14-4:54 PM

CTS $Z = 1.519$, RTT, find p-value.



Area = P-value

= normalcdf(1.519, E99, 0, 1)

= .064

Feb 14-5:07 PM

Testing one Population Mean μ

$H_0: \mu = \mu_0$ $\quad H_1: \mu \neq \mu_0$ — TTT

$H_0: \mu \leq \mu_0$ $\quad H_1: \mu > \mu_0$ — RTT

$H_0: \mu \geq \mu_0$ $\quad H_1: \mu < \mu_0$ — LTT

Case I: σ Known

CV	invNorm
CTS z	z-Test
P-value P	
P-value	normalcdf

Feb 14-5:10 PM

College claims the mean age of all students is 30 yrs. $\mu = 30$

I randomly selected 40 students, their mean age was 32.5 yrs. $n=40$ $\bar{x}=32.5$

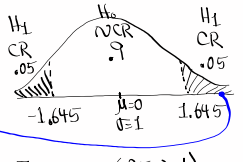
It is known that standard deviation of ages of all students is 8.5 yrs. $\sigma=8.5$

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

$H_0: \mu=30$ claim

$H_1: \mu \neq 30$ TTT

CV z TTT $\alpha=.1$



CTS $z = 1.860$

P-value $P = .063$

z-Test

Stats

inpt:

$\mu_0: 30$

$\sigma = 8.5$

$\bar{x} = 32.5$

$n = 40$

$\mu \neq \mu_0$ TTT

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

CTS is in CR

H_0 invalid, H_1 valid

P-value $\leq \alpha$ → Invalid claim

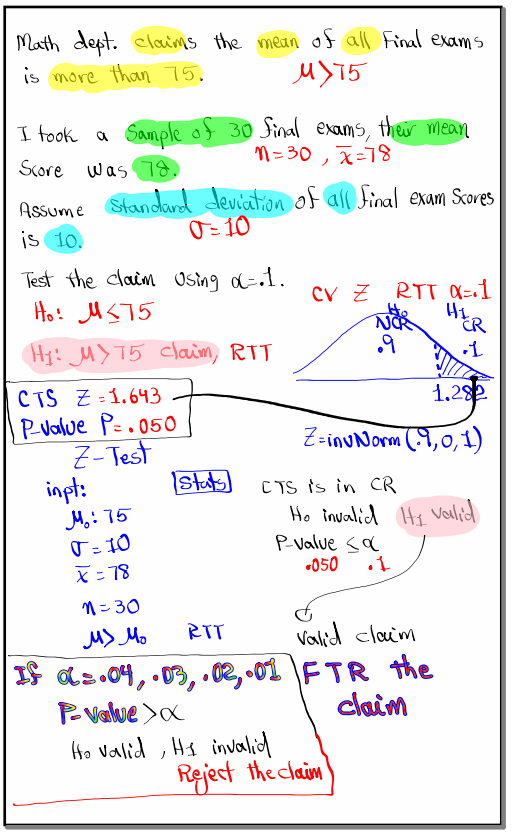
.063 .1 Reject the claim

If we choose $\alpha = .05, .04, .03, .02, .01$

P-value $> \alpha$ ⇒ H_0 valid → valid claim

FTR the claim

Feb 14-5:14 PM



Feb 14-5:28 PM

Testing one Population Mean μ

$H_0: \mu = \mu_0$ $H_1: \mu \neq \mu_0$ TTT

$H_0: \mu \leq \mu_0$ $H_1: \mu > \mu_0$ RTT

$H_0: \mu \geq \mu_0$ $H_1: \mu < \mu_0$ LTT

Case I: σ Known		Case II: σ unknown	
CV	invNorm	CV	invT, df=n-1
CTS z	Z-Test	CTS t	T-Test
P-value P		P-value P	
P-value	normalcdf	P-value	tcdf

Feb 14-5:10 PM

Given $n=15$, $\bar{x}=78$, $S=10$, $H_0: \mu=80$

Claim is H_0, $\alpha=.02$

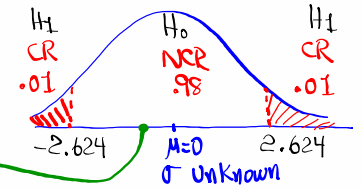
Test the claim. σ unknown → Case II

$H_0: \mu=80$ claim

$H_1: \mu \neq 80$ TTT

CV t TTT $\alpha=.02$

$df=n-1=14$



CTS $t=-.775$

P-value $P=.451$

T-Test

inpt:

$\mu_0: 80$

$\bar{x}=78$

$S=10$

$n=15$

$\mu \neq \mu_0$ TTT

Stats

$t=invT(.99,14)$

CTS is in NCR

H_0 valid, H_1 invalid

P-value $>\alpha$ (.451 > .02) → Valid claim

FTR the claim

Feb 14-5:56 PM

I randomly Selected 12 students, here are their ages Sample

25	32	18	20
40	28	19	24
42	36	38	30

1) Find $\bar{x}$ & S. Round to 1-decimal.

$\bar{x}=29.3$, $S=8.4$

2) Use $\alpha=.02$ to test the claim that the mean age for all students is more than 27.5 yrs.

$H_0: \mu \leq 27.5$

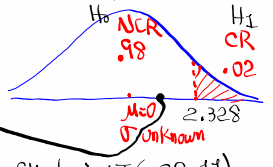
$\mu > 27.5$

$H_1: \mu > 27.5$ claim, RTT

σ unknown

CV t RTT $\alpha=.02$

$df=n-1=11$



CTS $t=.742$

P-value $P=.237$

T-Test

inpt:

$\mu_0=27.5$

$\bar{x}=29.3$

$S=8.4$

$n=12$

$\mu > \mu_0$ RTT

Stats

CV $t=invT(.98,11)$

CTS is in NCR

H_0 valid, H_1 invalid

P-value $>\alpha$ → Invalid claim

Reject the claim

Feb 14-6:05 PM

AAA claims the mean speed of all cars on certain FWY is below 70 mph. $\mu < 70$

A sample of 10 cars on that freeway had a mean speed of 66 mph with stand. dev. of 8 mph. $n = 10,\ \bar{x} = 66,\ s = 8$

Test the claim. σ unknown

$H_0: \mu \geq 70$ CV t LTT No α .05

$H_1: \mu < 70$ claim, LTT $df = n - 1 = 9$

CTS $t = -1.581$

P-value $P = .074$

T-Test

inpt: $\mu_0 = 70$, $\bar{x} = 66$, $s = 8$, $n = 10$, $\mu < \mu_0$ LTT

Stats

H_1 CR .05 | H_0 NCR .95

-1.833 $\mu = 0$ σ unknown

$t = invT(.05, 9)$

CTS is in NCR

H_0 valid, H_1 invalid

P-value $> \alpha$ ↳ Invalid claim

Reject the claim

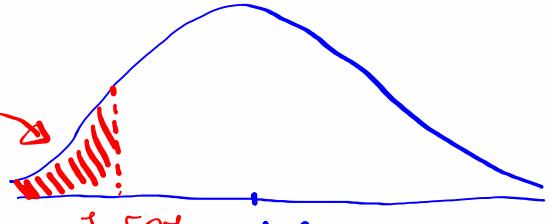
Suggest a value for α to reverse the conclusion

P-value $\leq \alpha$ $.074 \leq \alpha$ .08, .09, .10

Feb 14-6:18 PM

Given CTS $t = -1.581$, $df = 9$, LTT

Find P-value.



P-value = Area

$= tcdf(-E99, -1.581, 9)$

$= .074$

-1.581 $\mu = 0$ σ unknown

SG 25 & SG 26

Feb 14-6:32 PM