Statistics
Spring 2023
Lecture 50

Feb 19-8:47 AM

The College claims that less than 7.5% of all Students Smoke.

$P < 7.5\% \Rightarrow P < .075$

No equal Sign $\rightarrow H_1$

I took a Sample of 150 students, and 6% of them were Smokers. $n = 150$, $\hat{P} = .06$ $\rightarrow x = n\hat{P} = 150(.06) = 9$

No $\alpha \rightarrow$ Use .05

Use this Sample to test the claim.

$H_0: P \geq .075$

$H_1: P < .075$ claim, LTT

C.V. Z invNorm

LTT No $\alpha \rightarrow .05$

CTS $Z = -.697$

P-value $P = .243$

1-PropZTest

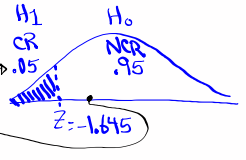
$P_0 = .075$ H_0

$x = 9$

$n = 150$

Prop $< P_0$ H_1

Calculate



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

CTS is in NCR.

P-value $> \alpha$

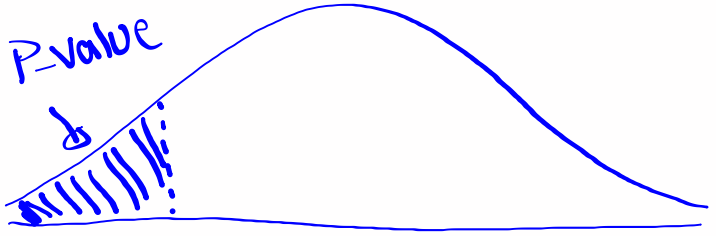
H_0 valid, H_1 invalid

Invalid claim

Reject the claim

May 15-7:17 AM

CTS $Z = -.697$, LTT, find P-value.



P-value =

normalcdf(-E99, -.697, 0, 1)

= .243

If this was a TTT, then we multiply by 2.

May 15-7:29 AM

The College bookstore claims that the mean price of all new textbooks is $100. $\mu = 100$ ↑ H_0 ✓

I took a sample of 28 new textbooks, and their mean price was $115. $n = 28$, $\bar{x} = 115$

It is known that standard deviation of prices of all new textbooks is $20. $\sigma = 20$

Use the sample to test the claim at .02 Significance level. $\alpha = .02$

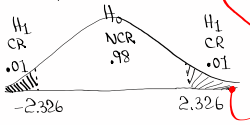
H_0: $\mu = 100$ claim

H_1: $\mu \neq 100$ TTT

Is σ known? ⇒ Z-Test

Is σ unknown? ⇒ T-Test

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



Z = invNorm(.99, 0, 1)

CTS Z = 3.969

P-value P = 7.232×10^{-5} ✓

Z-Test

inpt: Stats

μ_0: 100

σ: 20

$\bar{x}$: 115

n: 28

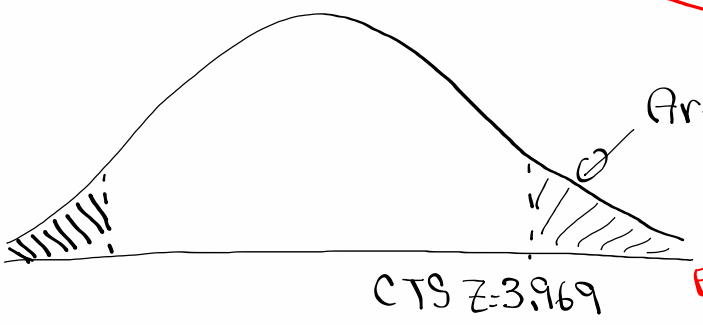
$\mu \neq \mu_0$

H_1

CTS is in CR. P-value $\leq \alpha$ ⇒ H_0 invalid, H_1 valid ⇒ invalid claim ⇒ Reject the claim

May 15-7:33 AM

CTS $Z=3.969$, TTT, find P-value.



2* normalcdf(3.969, E99, 0, 1)

$= 7.221 \times 10^{-5}$

May 15-7:51 AM

The math department claims that the mean of all final exams in math classes is more than 74.

$\mu > 74$ ← No equal sign ⇒ H_1

I took a Sample of 12 final exams in math classes, the mean score was 75 with standard deviation of 8.

$n=12$, $\bar{x}=75$, $s=8$

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

H_0: $\mu \leq 74$

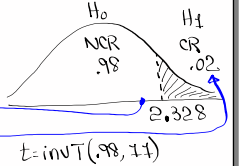
H_1: $\mu > 74$ claim, RTT

σ Known ⇒ Z-Test

σ Unknown ⇒ T-Test

CV t RTT $\alpha=.02$

$df = n-1 = 12-1 = 11$



CTS $t=.433$

P-value $P=.337$ ✓

$t=$invT(.98, 11)

T-Test
inpt:
$\mu_0=74$
$\bar{x}=75$
$s=8$
$n=12$
$\mu > \mu_0$

Stats

CTS is in NCR

P-value $> \alpha$

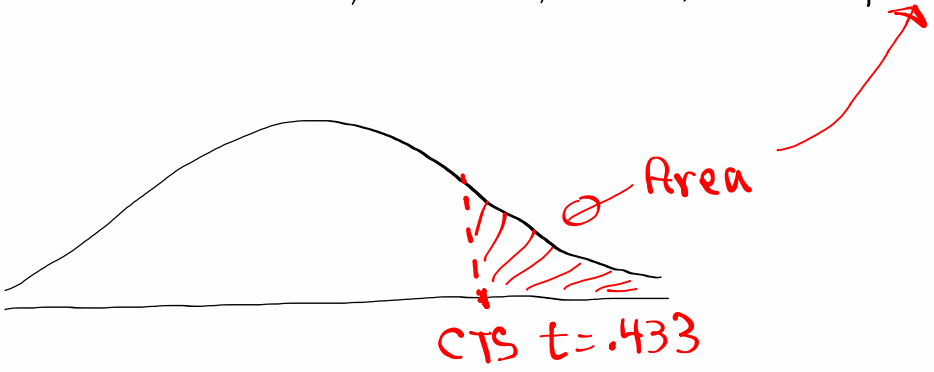
H_0 Valid, H_1 invalid

Invalid claim

Reject the claim

May 15-7:55 AM

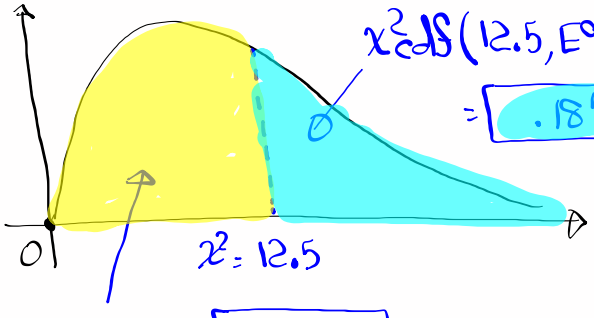
CTS $t = .433$, $df = 11$, RTT, find p-value.



P-value = tcdf(.433, E99, 11) = .337

May 15-8:11 AM

Find the area on each side of $\chi^2 = 12.5$ with $df = 9$, multiply the smaller area by 2.



χ²cdf(0, 12.5, 9) = .813

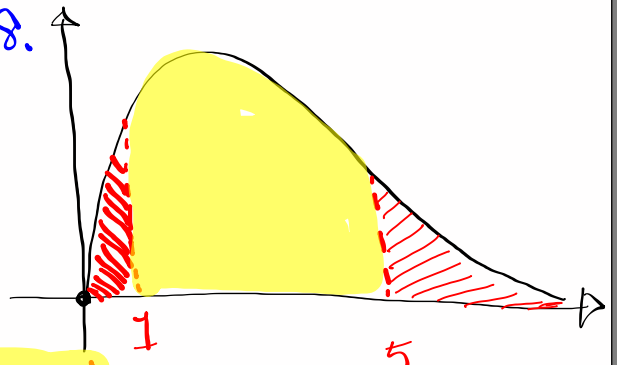
2 * Smaller area = 2 * (.187)

= .374

May 15-8:14 AM

Find $P(F<1 \text{ OR } F>5)$ with

Ndf = 4 & Ddf = 28.



$P(F<1 \text{ or } F>5) =$

$1 - P(1<F<5) =$

$1 - \text{fcdf}(1, 5, 4, 28) = .580$

1 → total Area; 1 → L; 5 → U; 4 → Ndf; 28 → Ddf

May 15-8:19 AM