Statistics
Spring 2023
Lecture 52

Feb 19-8:47 AM

LA Times has reported that 20% of all nurses have a second job. $P=.2$ claim (H_0)

In a survey of 275 nurses, 18% of them had a second job. $n=275$, $\hat{P}=.18$ $\rightarrow x=n\hat{p}=275(.18)=49.5$ $x=50$

use this survey to determine the validity of the report. No α → use .05

$H_0: P=.2$ Report

$H_1: P\neq.2$ TTT

CV Z TTT $\alpha=.05$

CR H_1 .025 | H_0 NCR .95 | CR H_1 .025

-1.960 1.960

Z=invNorm(.975,0,1)

CTS Z = −.754

P-value P=.451 ✓

1-PropZTest

$P_0=.2$

$x=50$

$n=275$

Prop ≠ P_0

CTS is in NCR ⇒ H_0 valid

P-value > α ⇒ H_1 invalid

Valid Report ⇒ FTR the report

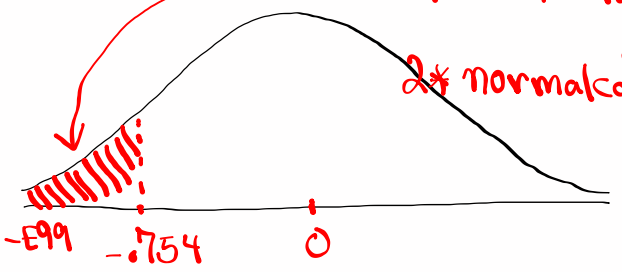
May 17-7:15 AM

Given CTS $z = -.754$, TTT, find P-Value.

Area * 2 = P-Value

2* normalcdf(-E99, -.754, 0, 1)

= .451

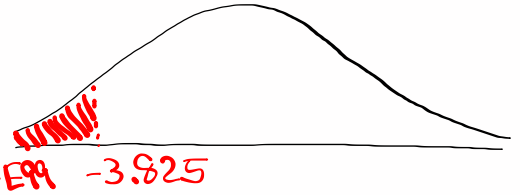


Given CTS $t = -3.825$, LTT, $df = 29$

Find P-Value.

Area

tcdf(-E99, -3.825, 29) = 3.2×10^{-4}



May 17-7:27 AM

Department of Health Services claims that the mean age of all nurses is at most 48.5 Yrs.

H_0 $\mu \leq 48.5$ claim

I randomly selected 28 nurses, and their mean age was 54.5 Yrs.

$n = 28$

$\bar{x} = 54.5$

It is known that standard deviation of ages of all nurses is 9.8 Yrs.

$\sigma = 9.8$

Test the claim using $\alpha = .01$

$H_0: \mu \leq 48.5$ claim

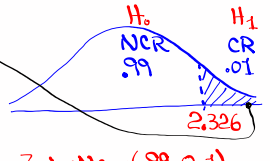
$H_1: \mu > 48.5$ RTT

Since σ is known

CV Z RTT $\alpha = .01$

CTS $Z = 3.240$

P-Value $P = 5.983 \times 10^{-4}$



Z-Test

Inpt: Stats

$\mu_0: 48.5$

$\sigma: 9.8$

$\bar{x}: 54.5$

$n: 28$

$\mu > \mu_0$

Z = invNorm(.99, 0, 1)

CTS is in CR H_0 invalid

P-Value $\leq \alpha \Rightarrow H_1$ valid

Invalid claim

Reject the claim

May 17-7:33 AM

I randomly selected 8 nurses and here are their monthly Salaries: → $n=8$

6000	6400	6500	5850
6150	6200	4850	6850

1) Find $\bar{x}$ and S. Round to whole #.

$\bar{x}=6100$ $S=593$

2) Test the claim that the mean monthly Salaries for all nurses is more than $6000.

$H_0: \mu \leq 6000$

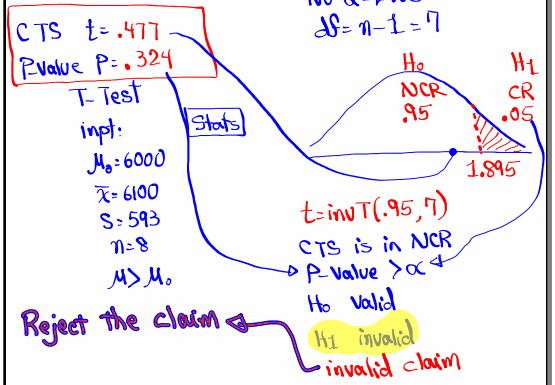
$H_1: \mu > 6000$ claim, RTT

σ is unknown

CV t RTT

NO $\alpha \rightarrow .05$

$df = n-1 = 7$



May 17-7:48 AM

3) Test the claim that standard deviation of monthly Salaries of all nurses is $500.

$H_0: \sigma = 500$ claim → No α → use .05

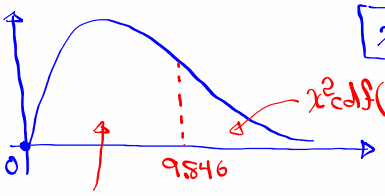
$\sigma = 500$ claim ↑ H_0 → $df=7$

$H_1: \sigma \neq 500$ TTT

P-Value Method

CTS $\chi^2 = \frac{(n-1)\cdot s^2}{\sigma^2} \approx \frac{(8-1)\cdot 593^2}{500^2}$

$\chi^2 = 9.846$



$\chi^2 cdf(9.846, E99, 7) = .197$

$\chi^2 cdf(0, 9.846, 7) = .803$

Verify total area = 1

$.197 + .803 = 1$ ✓

P-value = 2 * Smaller area

$= 2 * .197 = .394$

P-value $>$ α

.394 $>$ .05

H_0 valid ⇒ valid claim

H_1 invalid FTR the claim

Sec 25, 26, and 27

May 17-8:01 AM

Find $P(F > 3.875)$ with $Ndf = 4$ & $Ddf = 25$.

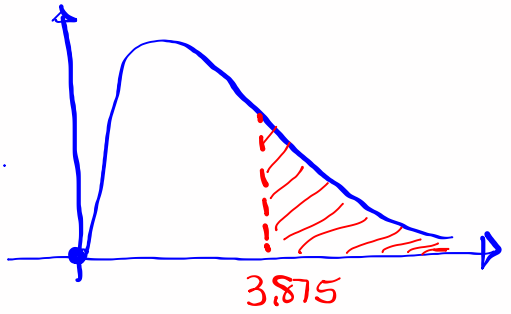
shade right

F-Dist

1) It is similar to χ^2-Dist.

2) It comes with Numerator df & Denominator df.

3) use Fcdf command.



fcdf(L, U, Ndf, Ddf)

= fcdf(3.875, E99, 4, 25) = .014

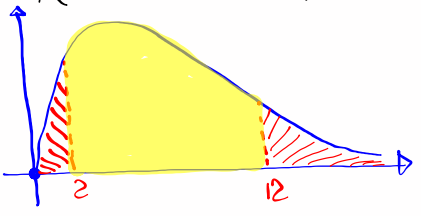
May 17-8:12 AM

Find $P(F < .5)$ with $Ndf = 3$, $Ddf = 20$

shade left

fcdf(0, .5, 3, 20) = .313

Find $P(F < 2$ OR $F > 12)$ with $Ndf = 4$, $Ddf = 35$.



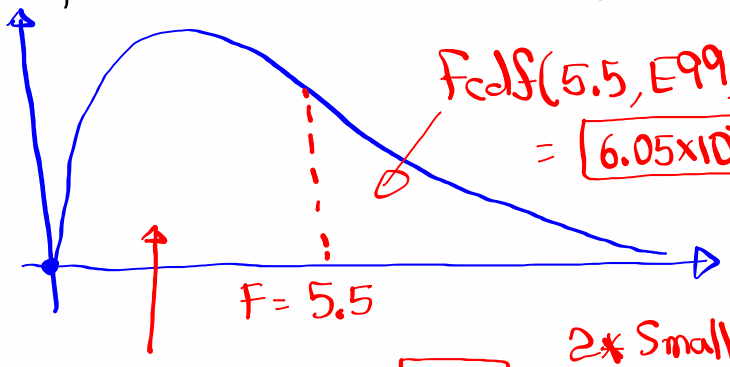
= 1 − fcdf(2, 12, 4, 35) = .884

1 ↑ Total Area

May 17-8:17 AM

Given $F = 5.5$, $Ndf = 5$, $Ddf = 40$

Find the area on each side of $F=5.5$, multiply the smaller area by 2.



fcdf(5.5, E99, 5, 40)
$= 6.05 \times 10^{-4} \approx .0006\ldots$
$\approx .001$

fcdf(0, 5.5, 5, 40) = .999

2 * Smaller area
$2 * .001 = .002$

May 17-8:23 AM