Statistics

Lecture 27

Feb 19-8:47 AM

Math department claims that about 25% of all students using the tutoring lab. $P=.25$

$n=80$ $\hat{P}=.28$

I surveyed 80 students and 28% of them were using the tutoring lab.

No $\alpha \rightarrow .05$

Test the claim

$x = n\hat{p} = 80(.28) = 22.4$

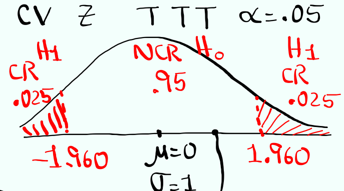
is decimal Round-up

$x=23$

$H_0: p=.25$ claim

$H_1: p \neq .25$ TTT

CV Z TTT $\alpha=.05$



CTS $Z=.775$

P-value $P=.439$

1 - Prop Z Test

$P_0=.25$ H_0

$x=23$

$n=80$

Prop $\neq P_0$ H_1

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

CTS is in NCR

P-value $> \alpha$

H_0 valid

H_1 invalid

Valid claim

FTR the claim

Dec 4-12:14 PM

Given: $H_0: \mu = 130$, Claim is H_1, $\alpha = .02$

$\bar{x} = 124$, $n = 28$, $\sigma = 18$

Test the claim.

$H_0: \mu = 130$

$H_1: \mu \neq 130$ TTT, Claim

CTS $z = -1.764$

P-Value $P = .078$

Z-Test

inpt: Stats

μ_0: 130 — H_0

σ: 18

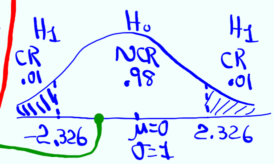
$\bar{x} = 124$

$n = 28$

$\mu \neq \mu_0$ — H_1

σ Known

CV Z TTT $\alpha = .02$



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

CTS is in NCR ⇒ H_0 Valid

P-Value $> \alpha$ — H_1 invalid

Invalid claim

Reject the claim

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

then P-Value $\leq \alpha$

H_0 invalid

H_1 valid → Valid claim → FTR the claim

Dec 4-12:25 PM

I randomly selected 12 exams. Here are the Scores

72	88	65	100
80	90	70	95
58	78	100	98

Find

1) $\bar{x} = 83$

2) $S = 14$

} Round to whole #

3) $n = 12$

Department claims the mean of all exams is below 85.

$\mu < 85$

Test the claim.

$H_0: \mu \geq 85$

$H_1: \mu < 85$ claim, LTT

CTS $t = -.495$

P-Value $P = .315$

T-Test

inpt: Stats

$\mu_0 = 85$ — H_0

$\bar{x} = 83$

$S = 14$

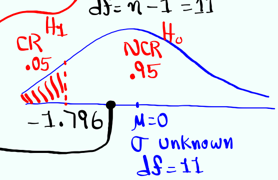
$n = 12$

$\mu < \mu_0$ — H_1

σ unknown

CV t LTT $\alpha = .05$

$df = n - 1 = 11$



$t = \text{invT}(.05, 11)$

CTS is in NCR ⇒ H_0 Valid

P-Value $> \alpha$ — H_1 invalid

Invalid claim

Reject the claim

Dec 4-12:37 PM

Dept. also claims that standard deviation of scores of all exams is 10. $\sigma = 10$

No $\alpha \to .05$

Test the claim

P-value method only.

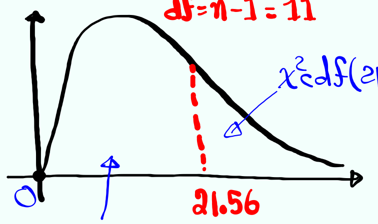
$H_0: \sigma = 10$ claim

$H_1: \sigma \neq 10$ TTT

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

$\chi^2 = \frac{(12-1)\cdot 14^2}{10^2} = \boxed{21.56}$

df $= n-1 = 11$



χ^2cdf(21.56, E99, 11) $= \boxed{.028}$

χ^2cdf(0, 21.56, 11) $= \boxed{.972}$

P-value = 2 · Smaller one
$= 2(.028)$
$= \boxed{.056}$

P-value > α
.056   .05

H_0 Valid, H_1 invalid
Valid claim
FTR the claim

If we choose α to be .06, .07, .08, .09, .1, ...,
P-value $\leq \alpha$
H_0 invalid → invalid claim
Reject it.

Dec 4-12:52 PM

Ages of nurses:

Female	$n = 10$	$\bar{x} = 48$	$s = 8$
Male	$n = 12$	$\bar{x} = 45$	$s = 10$

Use $\alpha = .01$ to test the claim that two Pop. standard deviations are the same.

$H_0: \sigma_1 = \sigma_2$ claim

$H_1: \sigma_1 \neq \sigma_2$ TTT

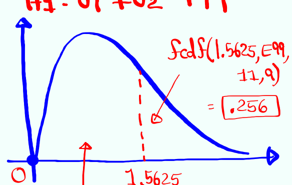
Male	Females
$n_1 = 12$	$n_2 = 10$
$s_1 = 10$	$s_2 = 8$

$s_1 > s_2$

Ndf $= n_1 - 1 = 11$
Ddf $= n_2 - 1 = 9$

CTS $F = \frac{s_1^2}{s_2^2} = \frac{10^2}{8^2}$

$\boxed{\text{CTS} = 1.5625}$



Fcdf(1.5625, E99, 11, 9) $= \boxed{.256}$

Fcdf(0, 1.5625, 11, 9) $= \boxed{.744}$

P-value $= 2(.256)$
$= \boxed{.512}$

P-value > α
.512   .01

H_0 Valid
H_1 invalid
Valid claim
FTR the claim

2-Samp F Test
Inpt: Stats
$s_1 = 10$
$n_1 = 12$
$s_2 = 8$
$n_2 = 10$
$\sigma_1 \neq \sigma_2$ H_1

CTS $F = 1.5625$
P-value $P = .512$

SG
24 - 27, 31

SG 35

Dec 4-1:03 PM

SG35

Comparing at least 3 pop. means:

$H_0: \mu_1 = \mu_2 = \mu_3 = \cdots = \mu_K$

H_1: At least one mean is different. RTT

K groups — $Ndf = K-1$ — CTS F

n total Sample Sizes — $Ddf = n-K$ — P-value P

[STAT] [TESTS] [↑] [ANOVA(] L1, L2, L3, ... [Enter]

↑ Analysis of Variance

Use Testing Chart

Final Conclusion about claim.

Dec 4-1:32 PM

ELAC			Mt.SAC			Chaffey		
84	75	100	88	77	98	72	85	98
65	90	95		70	100	80	100	65

ELAC → L1, Mt.SAC → L2, Chaffey → L3

$K = 3$

$n = 6+5+6 = 17$ ⇒ $Ndf = K-1 = 2$, $Ddf = n-K = 14$

Test the claim ($\alpha = .05$) that all means are the same.

$H_0: \mu_1 = \mu_2 = \mu_3$ claim

H_1: At least one mean is different. RTT

[STAT] [TESTS] [↑] ANOVA(L1, L2, L3 [Enter]

CTS $F = .081$

P-value $P = .922$

P-value > α

H_0 Valid — Valid claim

H_1 Invalid

F TR the claim.

Dec 4-1:38 PM

I randomly selected students from 4 different schools. Below are their ages

ELAC	Santa Monica	UCLA	Glendale
24 27 18	21 26 16	33 28	17 23 32
30 25 25	25 18 32	25 40	18 27 25
19	19	42 35	
		25	

$K=4$ $\quad$ $Ndf=K-1=3$ $\quad$ CTS F

$n=7+7+7+6=27$ $\quad$ $Ddf=n-K=23$ $\quad$ P-value P

No $\alpha \to .05$

Test the claim that not all means are the same.

$H_0: \mu_1=\mu_2=\mu_3=\mu_4$

H_1: At least one pop. mean is different. (claim) RTT

ELAC → L1
Santa Monica → L2
UCLA → L3
Glendale → L4

STAT TESTS ↑
ANOVA(L1,L2,L3,L4)

CTS F = 4.674
P-value P = .011

P-value ≤ α
.011 $\quad$ .05

H_0 invalid
H_1 valid → Valid claim

Let's change α = .01
P-value > α

H_0 valid
H_1 invalid → Reject

FTR the claim

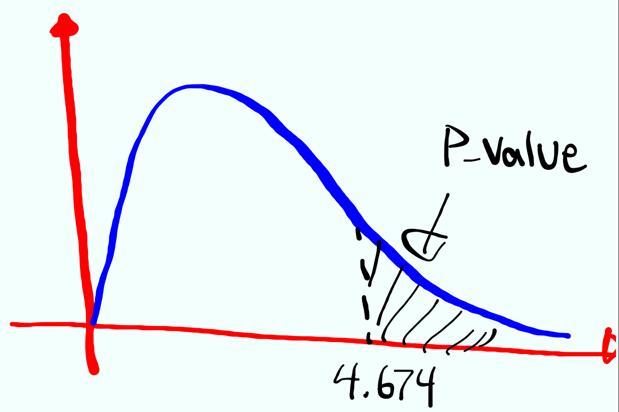
Dec 4-1:47 PM

CTS $F=4.674$

$K=4$ $\quad$ $n=27$

Find P-value.

$Ndf=K-1=3$
$Ddf=n-K=23$



fcdf(4.674, E99, 3, 23) = **.011**

SG 35

Dec 4-2:01 PM