Statistics

Lecture 24

Feb 19-8:47 AM

In a Survey of 85 females, 8% were Smokers.

In a Survey of 65 males, 7% were Smokers.

1)

Females	Males
$x_1 = 7$	$x_2 = 5$
$n_1 = 85$	$n_2 = 65$

$n = 85$, $\hat{P} = .08$

$x_1 = n_1 \cdot \hat{P}_1 = 85(.08) = 6.8 = 7$

$n = 65$, $\hat{P} = .07$

$x_2 = n_2 \cdot \hat{P}_2 = 65(.07) = 4.55 = 5$

2) Pooled Proportion

$$\bar{P} = \frac{x_1 + x_2}{n_1 + n_2} = \frac{7+5}{85+65} = \frac{12}{150} = .08$$

3) Find 90% Conf. interval for the difference of two Pop. Proportions.

2-Prop Z Int

$$-.07 < P_1 - P_2 < .08$$

$$E = \frac{.08 - (-.07)}{2} = \frac{.15}{2} = .075$$

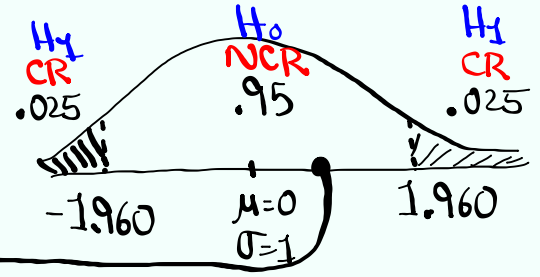
May 11-6:52 PM

4) Test the claim that two pop. Proportions are the Same.

$H_0: P_1 = P_2$ claim

$H_1: P_1 \neq P_2$ TTT

CV Z TTT No $\alpha \to .05$



CTS $z = .121$

P-Value $P = .903$

$z_{.025} = \text{invNorm}(.975, 0, 1)$

2-PropZTest

CTS is in NCR $\Rightarrow$ H_0 valid

P-Value $> \alpha$ $\Rightarrow$ H_1 invalid

Valid claim

FTR the claim

May 11-7:02 PM

15 randomly Selected Female nurses had a mean monthly Salary of \$6500/mo.

20 " " male " " "

" " " " \$6200/mo.

It is known that Standard dev. of all monthly Salaries of all female nurses is \$400 & for all male nurses is \$500.

Females	Males
$n_1 = 15$	$n_2 = 20$
$\bar{x}_1 = 6500$	$\bar{x}_2 = 6200$
$\sigma_1 = 400$	$\sigma_2 = 500$

1) Find 99% C.I. for $\mu_1 - \mu_2$

σ_1 & σ_2 known $\to$ 2-SampZInt

$-92 < \mu_1 - \mu_2 < 692$

$E = \frac{692 - (-92)}{2} = 392$

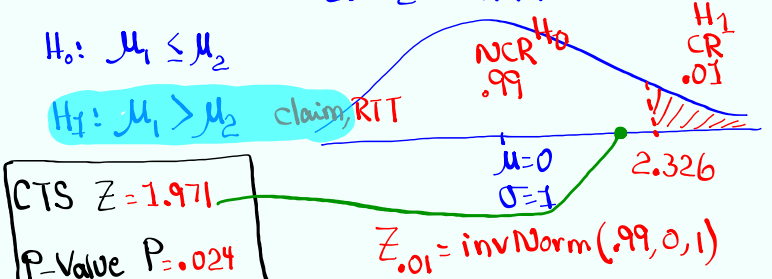
May 11-7:10 PM

Use $\alpha = .01$ to test the claim that the mean monthly salary of all females is more than the males.

CV z RTT $\alpha = .01$

$H_0: \mu_1 \le \mu_2$

$H_1: \mu_1 > \mu_2$ claim RTT



CTS $z = 1.971$

P-Value $P = .024$

$z_{.01} = \text{invNorm}(.99, 0, 1)$

2-Samp z Test

CTS is in NCR H_0 valid

P-Value $> \alpha \Rightarrow$ H_1 invalid

Invalid claim

Reject the claim

If we change α to .03, .04, .05, ...

P-Value $\le \alpha$

FTR the claim

May 11-7:18 PM

12 females had a mean score of 88 with standard dev. of 10,

15 males " " " " 80 "

" " " 15.

Females	Males
$n_1 = 12$	$n_2 = 15$
$\bar{x}_1 = 88$	$\bar{x}_2 = 80$
$s_1 = 10$	$s_2 = 15$

2-Samp TInt

Assume $\sigma_1 \neq \sigma_2$

$\Rightarrow$ Pooled: NO

df = Smaller $n - 1 = 11$

Find 98% Conf. interval for $\mu_1 - \mu_2$.

$-4 < \mu_1 - \mu_2 < 20$

$E = \frac{20 - (-4)}{2} = 12$

May 11-7:28 PM

use $\alpha = .1$ to test the claim that there is no difference between Pop. means.

$H_0: \mu_1 = \mu_2$ claim

$H_1: \mu_1 \neq \mu_2$ TTT

$t_{.05} = \text{invT}(.95, 11)$

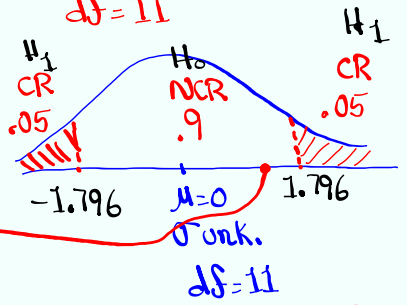
CTS $t = 1.656$

P-Value $P = .111$

2-SampTTest

CV t TTT $\alpha = .1$

$df = 11$



σ unk.

$df = 11$

CTS t is in NCR

P-value $> \alpha$

H_0 valid, H_1 invalid

FTR the claim

May 11-7:36 PM

Consider the chart below

Sample 1	Sample 2
$n_1 = 10$	$n_2 = 12$
$\bar{x}_1 = 125$	$\bar{x}_2 = 140$
$s_1 = 15$	$s_2 = 12$

Assume $\sigma_1 = \sigma_2$

$\Rightarrow$ Pooled Yes

$df = n_1 + n_2 - 2 = 20$

Find C.I. for $\mu_1 - \mu_2$

2-SampTInt

$-27 < \mu_1 - \mu_2 < -3$

$E = \frac{-3 - (-27)}{2} = 12$

May 11-7:45 PM

Test the claim that $\mu_1 < \mu_2$.

$H_0: \mu_1 \geq \mu_2$

$H_1: \mu_1 < \mu_2$ claim, LTT

CTS $t = -2.608$

P-Value $P = .008$

2-SampTTest

CTS is in CR

P-value $\leq \alpha$

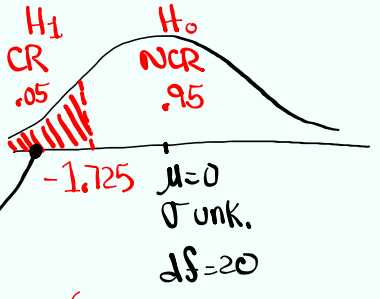
H_0 invalid

H_1 valid

Valid claim

CV t LTT df=20

No $\alpha \rightarrow .05$



invT(.05, 20)

FTR the claim

May 11-7:50 PM

Comparing Two Pop. Standard deviations:

$H_0: \sigma_1 = \sigma_2$

$H_1: \sigma_1 \neq \sigma_2$

Sample 1	Sample 2
$n_1 =$	$n_2 =$
$S_1 =$	$S_2 =$

$S_1 > S_2$

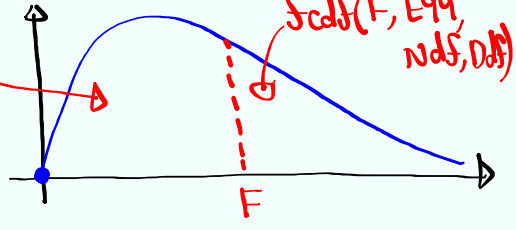
CTS $F = \frac{S_1^2}{S_2^2}$

Ndf $= n_1 - 1$

Ddf $= n_2 - 1$

fcdf(0, F, Ndf, Ddf)

fcdf(F, E99, Ndf, Ddf)



P-Value = 2 · Smaller area

P-Value $> \alpha \rightarrow H_0$ valid, H_1 invalid

P-Value $\leq \alpha \rightarrow H_0$ invalid, H_1 valid

May 11-7:57 PM

Consider the chart below

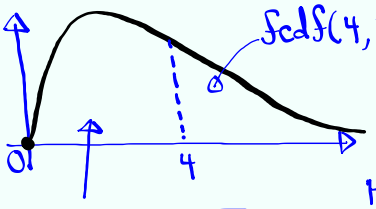
Sample 1	Sample 2
$n_1 = 6$	$n_2 = 10$
$S_1 = 8$	$S_2 = 4$

1) $S_1 > S_2$ Yes

2) CTS $F = \frac{S_1^2}{S_2^2} = \frac{8^2}{4^2} = 4$

3) $Ndf = 6-1 = 5$, $Ddf = 10-1 = 9$

4)



fcdf(4, E99, 5, 9) = .035

P-Value = 2·(.035) = .07

fcdf(0, 4, 5, 9) = .965

Test the claim that $\sigma_1 = \sigma_2$.

H_0: $\sigma_1 = \sigma_2$ claim

H_1: $\sigma_1 \neq \sigma_2$ TTT

P-Value > α

.07 .05

H_0 valid FTR

STAT TESTS ↑ 2-SampF Test

May 11-8:09 PM

Females: $n = 10$ $\bar{x} = 80$ $s = 12$ 12 > 5

Males: $n = 8$ $\bar{x} = 78$ $s = 5$

Use $\alpha = .02$ to test the claim that $\sigma_1 \neq \sigma_2$.

1) $S_1 > S_2$ Yes

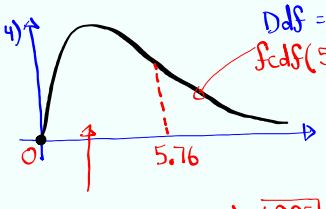
Females	Males
$n_1 = 10$	$n_2 = 8$
$S_1 = 12$	$S_2 = 5$

2) CTS $F = \frac{S_1^2}{S_2^2} = \frac{12^2}{5^2} = 5.76$

3) $Ndf = 10-1 = 9$

$Ddf = 8-1 = 7$

4)



fcdf(5.76, E99, 9, 7) = .015

P-Value = 2 (.015) = .03

fcdf(0, 5.76, 9, 7) = .985

H_0: $\sigma_1 = \sigma_2$

H_1: $\sigma_1 \neq \sigma_2$ Claim, TTT

P-Value > α

.03 .02

H_0 valid, H_1 invalid

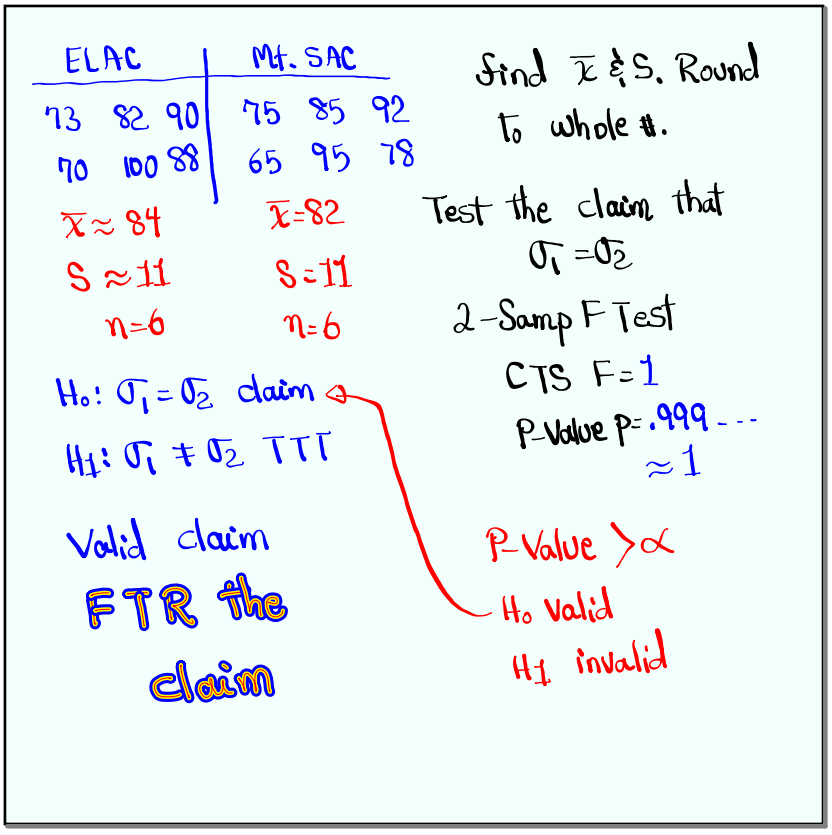
Reject the claim

2-SampF Test

CTS $F = 5.76$

P-Value $P = .031$ ✓

May 11-8:19 PM


ELAC
73 82 90
70 100 88
$\bar{x} \approx 84$
$S \approx 11$
$n = 6$
Mt. SAC
75 85 92
65 95 78
$\bar{x} = 82$
$S = 11$
$n = 6$
$H_0: \sigma_1 = \sigma_2$ claim
$H_1: \sigma_1 \neq \sigma_2$ TTT
Valid claim
FTR the claim
Find $\bar{x}$ & S. Round to whole #.
Test the claim that $\sigma_1 = \sigma_2$
2-Samp F Test
CTS $F = 1$
P-Value $P = .999\ldots \approx 1$
P-Value $> \alpha$
H_0 valid
H_1 invalid

May 11-8:31 PM