Statistics

Lecture 24

Feb 19-8:47 AM

12 females were randomly selected and standard deviation of their ages was 7.5 yrs.

10 males " " " " " = 5 yrs.

Use $\alpha = .02$ to test the claim that there is no difference between pop. standard deviation

Females	Males
$n_1 = 12$	$n_2 = 10$
$S_1 = 7.5$	$S_2 = 5$

1) $S_1 > S_2$ ✓

$H_0: \sigma_1 = \sigma_2$ claim

$H_1: \sigma_1 \neq \sigma_2$ TTT

2-SampFTest

CTS $F = 2.25$

P-Value $P = .234$

P-Value $> \alpha$

H_0 Valid, H_1 invalid

Valid claim ⇒ FTR the claim

Jun 1-1:47 PM

In a Sample of 275 females, 10% of them had a full-time job. $n=275$, $\hat{p}=.1$ $\rightarrow x=n\hat{p}=275(.1)=27.5 \approx 28$

In a " " 125 males, 8% " " "

" " " " . $n=125$, $\hat{p}=.08$ $\rightarrow x=n\hat{p}=125(.08)=10$

Females	Males
$x_1=28$	$x_2=10$
$n_1=275$	$n_2=125$

Pooled Proportion

$$\bar{p}=\frac{x_1+x_2}{n_1+n_2}=\frac{38}{400}=.095$$

Find 99% Conf. interval for p_1-p_2

2-PropZInt

$$-.06<p_1-p_2<.10$$

$$E=\frac{.10-(-.06)}{2}=.08$$

Jun 1-1:55 PM

Use $\alpha=.1$ to test the claim that $p_1>p_2$.

$H_0: p_1 \le p_2$

H_1

$H_1: p_1>p_2$ claim, RTT

2-Prop Z Test

CTS $Z=.690$

P-Value $P=.245$

P-Value $>\alpha$

H_0 valid, H_1 invalid

Invalid claim $\rightarrow$ Reject the claim

Jun 1-2:04 PM

working with two population means:

Case I: σ_1 & σ_2 Known

Conf. interval → 2-SampZInt

$E = \frac{\quad}{2}$

Females	Males
$\bar{x}_1 = 86$	$\bar{x}_2 = 80$
$n_1 = 32$	$n_2 = 30$
$\sigma_1 = 12$	$\sigma_2 = 10$

Find 90% Conf. interval for $\mu_1 - \mu_2$

$1 < \mu_1 - \mu_2 < 11$

$E = \frac{11 - 1}{2} = 5$

Jun 1-2:10 PM

Now Testing:

$H_0: \mu_1 = \mu_2$ $\quad H_0: \mu_1 \geq \mu_2$ $\quad H_0: \mu_1 \leq \mu_2$

$H_1: \mu_1 \neq \mu_2$ $\quad H_1: \mu_1 < \mu_2$ $\quad H_1: \mu_1 > \mu_2$

TTT $\quad$ LTT $\quad$ RTT

CV $\quad$ Z $\quad$ invNorm

CTS $\quad$ Z $\quad$ 2-SampZTest

P-Value $\quad$ P

Proceed like before.

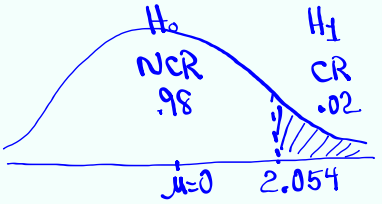
Jun 1-2:16 PM

Females	Males
$\bar{x}_1 = 86$	$\bar{x}_2 = 80$
$n_1 = 32$	$n_2 = 30$
$\sigma_1 = 12$	$\sigma_2 = 10$

Use $\alpha = .02$ to test the claim that $\mu_1 > \mu_2$.

H_0: $\mu_1 \leq \mu_2$

H_1: $\mu_1 > \mu_2$ claim, RTT



$z = \text{invNorm}(.98, 0, 1)$

2-Samp Z Test

CTS $z = 2.144$

P-Value $P = .016$

CTS is in CR

P-Value $\leq \alpha$

H_0 invalid, H_1 valid

Valid claim

FTR the claim

what α value will reverse the Conclusion?

P-value $> \alpha$

$.016 > \alpha$

choose α to be .01

Jun 1-2:20 PM

35 female nurses had a mean age of 48.5 yrs.

30 male " " " " " " 40.2 yrs.

It is known that standard deviation of ages of all female nurses is 8.5 yrs and for all male nurses is 10.2 yrs.

Females	Males
$\bar{x}_1 = 48.5$	$\bar{x}_2 = 40.2$
$n_1 = 35$	$n_2 = 30$
$\sigma_1 = 8.5$	$\sigma_2 = 10.2$

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

2-Samp Z Int

$2.2 < \mu_1 - \mu_2 < 14.4$

$E = \frac{14.4 - 2.2}{2} = 6.1$

Jun 1-2:28 PM

Test the claim that two pop. means are equal. NO $\alpha \neq .05$

$H_0: \mu_1 = \mu_2$ claim

$H_1: \mu_1 \neq \mu_2$ TTT

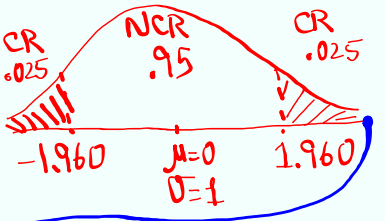
σ_1 & σ_2 known

2-SampZTest

CTS $Z = 3.529$

P-Value $P = 4.2 \times 10^{-4}$

CV Z TTT $\alpha = .05$



$Z = invNorm(.975, 0, 1)$

CTS is in CR

P-Value $\leq \alpha$

H_0 invalid & H_1 valid

Invalid claim

Reject the claim

SE 26 & 27

√√

Jun 1-2:36 PM

Working with two Population means:

Case II: σ_1 & σ_2 unknown

for Conf. interval → 2-SampTInt

for CV t → invT

for CTS t → 2-SampTTest
P-Value P

what about degrees of freedom?

If $\sigma_1 = \sigma_2$ ⇒ Pooled: Yes
$df = n_1 + n_2 - 2$

If $\sigma_1 \neq \sigma_2$ ⇒ Pooled: No
df = Smaller n − 1

Jun 1-2:55 PM

Given

Females	Males
$\bar{x}_1 = 35$	$\bar{x}_2 = 32$
$s_1 = 10$	$s_2 = 8$
$n_1 = 15$	$n_2 = 12$

Assume $\sigma_1 = \sigma_2$

Pooled: Yes

$df = 15 + 12 - 2 = 25$

Find 90% Conf. interval for $\mu_1 - \mu_2$.

$-3 < \mu_1 - \mu_2 < 9$

2-SampTInt

$E = \frac{9 - (-3)}{2} = 6$

Jun 1-3:01 PM

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

~~no $\alpha \rightarrow .05$~~

$H_0: \mu_1 = \mu_2$ claim

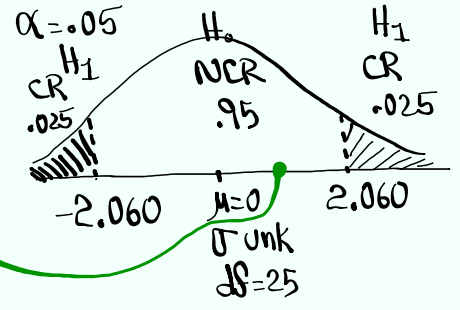
$H_1: \mu_1 \neq \mu_2$ TTT

CTS $t = .844$

P-Value $P = .406$

2-SampTTest

CV t TTT $df = 25$



$t = invT(.975, 25)$

CTS is in NCR

P-Value $> \alpha$

H_0 valid, H_1 invalid

Valid claim → FTR the claim

Jun 1-3:06 PM

Consider the chart below

Females	Males
$\bar{x}_1 = 88$	$\bar{x}_2 = 80$
$s_1 = 12$	$s_2 = 5$
$n_1 = 10$	$n_2 = 15$

Assume $\sigma_1 \neq \sigma_2$

Pooled: No

df = Smaller $n - 1 = 9$

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

2-SampTInt

$$-3 < \mu_1 - \mu_2 < 19$$

$$E = \frac{19 - (-3)}{2} = 11$$

Jun 1-3:14 PM

Use $\alpha = .02$ to test the claim that $\mu_1 > \mu_2$.

$H_0: \mu_1 \leq \mu_2$

$H_1: \mu_1 > \mu_2$ claim, RTT

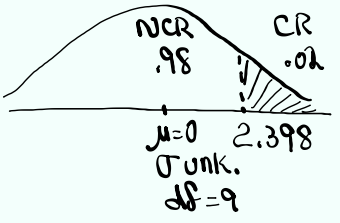
CV t RTT $\alpha = .02$

$df = 9$

CTS $t = 1.996$

P-Value $P = .036$

2-SampTTest



$t = invT(.98, 9)$

CTS is in NCR

P-Value $> \alpha$

H_0 valid, H_1 invalid

Invalid claim → Reject the claim

Jun 1-3:20 PM

8 exams from morning class had a mean of 82 with standard dev. 10.

10 exams from online class had a mean of 80 with standard dev. 5.

Morning	Online
$\bar{x}_1 = 82$	$\bar{x}_2 = 80$
$s_1 = 10$	$s_2 = 5$
$n_1 = 8$	$n_2 = 10$

Assume $\sigma_1 \neq \sigma_2$

Pooled: NO

df = 7

Find Conf. interval for

$-7 < \mu_1 - \mu_2 < 11$

2-SampTInt

$E = \frac{11-(-7)}{2} = 9$

Jun 1-3:28 PM

Test the claim that there is a difference (not equal) between Pop. means.

$H_0: \mu_1 = \mu_2$

$H_1: \mu_1 \neq \mu_2$ claim, TTT

CTS $t = .516$

P-Value $P = .617$

2-SampTTest

CTS is in NCR

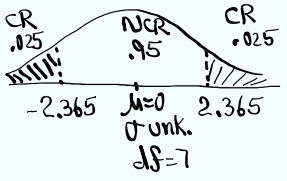
P-value $> \alpha$

H_0 valid, H_1 invalid

Invalid claim → Reject the claim

CV t TTT $\alpha = .05$

df = 7



t=invT(.975,7)

SE 26, 27, and 28

Jun 1-3:35 PM