# Statistics

# Fall 2022

# Lecture 29

Feb 19-8:47 AM

Use the chart below to test the $\boxed{\text{claim}}$ that $\boxed{\sigma_1 > \sigma_2}$.

No $\alpha$ → use .05

SG 31

| Sample 1 | Sample 2 |
|---|---|
| $n_1 = 8$ | $n_2 = 10$ |
| $S_1 = 12$ | $S_2 = 5$ |

① Make Sure $S_1 > S_2$

$12 > 5$ ✓

② $Ndf = n_1 - 1 = 7$

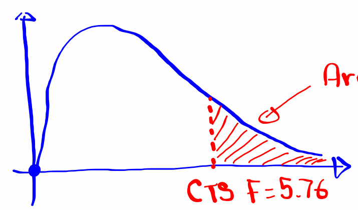
$Ddf = n_2 - 1 = 9$

③ CTS $F = \frac{S_1^2}{S_2^2} = \frac{12^2}{5^2} = \boxed{5.76}$ ✓

④ $H_0: \sigma_1 \leq \sigma_2$

$H_1: \sigma_1 > \sigma_2$ claim, RTT

⑤



Area = P-Value

$= fcdf(5.76, E99, 7, 9)$

$= \boxed{.009}$ ✓

CTS $F = 5.76$

⑥ Verify CTS & P-Value using 2-Samp F Test for $\sigma_1 > \sigma_2$ RTT.

CTS $F = 5.76$

P-Value $P = .009$

⑦ P-Value $\leq \alpha$

$.009 \quad .05$

$H_0$ invalid, $H_1$ Valid

Valid claim

→ $\boxed{\text{FTR the claim}}$

Dec 14-6:00 AM

I randomly Selected Students from 5 different Schools. Here are their ages:

Comparing at least 3 Pop. means ⇒ ANOVA

| L1 ELAC | | L2 West LA | | L3 PCC | | L4 Mt. SAC | | L5 UCLA | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 19 | 25 | 20 | 35 | 21 | 28 | 24 | 17 | 28 | 34 | 42 |
| 32 | 40 | 24 | 32 | 33 | 37 | 33 | 28 | 38 | 22 | 45 |
| 18 | 30 | 41 | 18 | | 40 | 30 | 20 | | 50 | 55 |

Use $\boxed{\alpha=.1}$ to test the claim that all pop. means are equal.

$H_0: \mu_1=\mu_2=\mu_3=\mu_4=\mu_5$ claim

$H_1$: At least one pop. mean is different. RTT

SG 35

$K=5$

$n=6+6+5+6+8=31$ ⇒ $NdF=K-1=4$, $DdF=n-K=26$

$\boxed{\text{CTS } F=2.757 \quad \text{P-Value } P=.049}$

ANOVA(L1,L2,L3,L4,L5)

P-value $\leq \alpha$
.049 .1

$H_0$ invalid
$H_1$ Valid

Invalid claim ⇒ Reject the claim

Suggest a value for $\alpha$ that reverses this conclusion.

P-value $> \alpha$
$.049 > \alpha$

Choose $\alpha$ to be .04, .03, .02, .01.

$H_0$ Valid → Valid claim → FTR the claim

Dec 14-6:12 AM

Working with two Population Proportions $P_1$ & $P_2$:

SG 28

| Sample 1 | Sample 2 |
|---|---|
| $x_1=$ | $x_2=$ |
| $n_1=$ | $n_2=$ |

$\hat{p}_1$ Sample Proportion 1

$\hat{p}_2$ Sample Proportion 2

$\hat{p}_1=\frac{x_1}{n_1}$ , $\hat{p}_2=\frac{x_2}{n_2}$

$\bar{p}$ Pooled Proportion

$$\bar{p}=\frac{x_1+x_2}{n_1+n_2}$$

Dec 14-6:31 AM

In a Sample of 45 females, 20 were Smokers.

In a Sample of 55 males, 25 " ".

| Females | Males |
|---|---|
| $x_1 = 20$ | $x_2 = 25$ |
| $n_1 = 45$ | $n_2 = 55$ |

$\hat{P}_1 = \frac{x_1}{n_1} = \frac{20}{45} = .444$

$\hat{P}_2 = \frac{x_2}{n_2} = \frac{25}{55} = .455$

Pooled Proportion $\bar{P} = \frac{x_1 + x_2}{n_1 + n_2} = \frac{20+25}{45+55} = \frac{45}{100} = \boxed{.45}$

Dec 14-6:36 AM

In a Sample of 200 females, 55% of them were fan of LA Dodgers. $n = 200$, $\hat{P} = .55 \Rightarrow x = n\hat{p} = 200(.55)$ $\boxed{x = 110}$

In a Sample of 300 males, 50% of them were fan of LA Dodgers. $n = 300$, $\hat{P} = .50 \Rightarrow x = n\hat{p} = 300(.5)$ $\boxed{x = 150}$

| Females | Males |
|---|---|
| $x_1 = 110$ | $x_2 = 150$ |
| $n_1 = 200$ | $n_2 = 300$ |

Pooled Proportion

$\bar{P} = \frac{x_1 + x_2}{n_1 + n_2} = \frac{110+150}{200+300} = \frac{260}{500} = \boxed{.52}$

Conf. Interval for $P_1 - P_2$:

STAT TESTS $\boxed{\text{2-PropZInt}}$

Find 98% Conf. Interval for $P_1 - P_2$:

$\boxed{-.056 < P_1 - P_2 < .156}$

$E = \frac{.156 - (-.056)}{2} = \boxed{.106}$

Dec 14-6:40 AM

15% of 240 females were in favor of abortions.

$n = 240$
$\hat{p} = .15$ $\Rightarrow x = n\hat{p} = 240(.15)$ $x = 36$

10% of 260 males " " " " ".

$n = 260$
$\hat{p} = .1$ $\Rightarrow x = n\hat{p} = 260(.1)$ $x = 26$

| Females | Males |
|---|---|
| $x_1 = 36$ | $x_2 = 26$ |
| $n_1 = 240$ | $n_2 = 260$ |

Pooled Proportion

$$\bar{p} = \frac{x_1 + x_2}{n_1 + n_2} = \frac{36+26}{240+260} = \frac{62}{500} = \boxed{.124}$$

Find $\boxed{\text{Conf. interval}}$ for the difference of two Pop. Proportions.

↳ NO C-level ⇒ .95

2-PropZInt

$$\boxed{-.008 < P_1 - P_2 < .108}$$

$$E = \frac{.108 - (-.008)}{2} = \boxed{.058}$$

Dec 14-6:50 AM

Testing claims about two Pop. Proportions $P_1$ & $P_2$:

| | | |
|---|---|---|
| $H_0: P_1 = P_2$ | $H_0: P_1 \geq P_2$ | $H_0: P_1 \leq P_2$ |
| $H_1: P_1 \neq P_2$ | $H_1: P_1 < P_2$ | $H_1: P_1 > P_2$ |
| TTT | LTT | RTT |

**Always identify the claim & testing type**

CV invNorm

CTS $Z$ ⇒ 2-PropZTest

P-value P

Proceed with testing chart

Final conclusion must be made about the claim.

**Reject the claim OR FTR the claim**

Dec 14-6:58 AM

Given: $n_1 = 120$, $\hat{p}_1 = .32$, $n_2 = 80$, $\hat{p}_2 = .26$

Test the $\boxed{\text{claim}}$ that $\boxed{p_1 = p_2}$.

NO $\alpha \Rightarrow .05$

$x_1 = 120(.32)$
$\boxed{x_1 = 39}$

$x_2 = 80(.26)$
$\boxed{x_2 = 21}$

$H_0: p_1 = p_2$ claim

$H_1: p_1 \neq p_2$ TTT

CV Z TTT

NO $\alpha \Rightarrow$ use .05


| Sample 1 | Sample 2 |
|---|---|
| $x_1 = 39$ | $x_2 = 21$ |
| $n_1 = 120$ | $n_2 = 80$ |

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

CTS $Z = .945$
P-value $P = .345$

2-PropZTest
$p_1 \neq p_2$

CTS is in NCR
P-value > $\alpha$
$\Rightarrow$ $H_0$ Valid
$H_1$ invalid
$\Rightarrow$ Valid claim
FTR the claim

Dec 14-7:16 AM

Among 275 female students, 40% of them had a full-time job. $n = 275$, $\hat{p} = .4$ $\Rightarrow x = n\hat{p} = 275(.4) \Rightarrow \boxed{x = 110}$

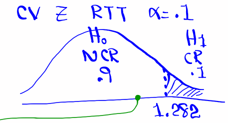
Among 225 male students, 36% of them had a full-time job. $n = 225$, $\hat{p} = .36$ $\Rightarrow x = n\hat{p} = 225(.36) \Rightarrow \boxed{x = 81}$

Use $\boxed{\alpha = .1}$ to test the claim that prop. of all females with full-time job is $\boxed{\text{greater than}}$ the prop. of all males that have full-time job.

$H_0: p_1 \leq p_2$

$H_1: p_1 > p_2$ claim, RTT

CV Z RTT $\alpha = .1$




| Females | Males |
|---|---|
| $x_1 = 110$ | $x_2 = 81$ |
| $n_1 = 275$ | $n_2 = 225$ |

$Z = \text{invNorm}(.9, 0, 1)$

CTS $Z = .916$
P-value $P = .180$

2-PropZTest
$p_1 > p_2$

CTS is in NCR. $H_0$ Valid.
P-value > $\alpha$ $\Rightarrow$ $H_1$ invalid.
.18 .1

Invalid claim $\Rightarrow$ Reject the claim

If we choose $\alpha$ to be .19, .20, .21, ----, then
P-value $\leq \alpha \Rightarrow$ $H_0$ invalid
$H_1$ valid $\Rightarrow$ Valid claim $\Rightarrow$ FTR the claim

SG 28 as extra Credit.

No lecture Thursday

Final Exam
Friday, start as early as 5:30 AM.

Dec 14-7:26 AM