Statistics

Fall 2022

Lecture 15

Feb 19-8:47 AM

Comparing at least 3 pop. means: SG 35

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

H_1: At least one mean is different. RTT

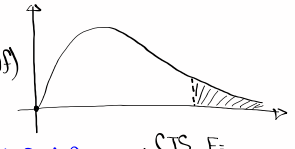
K → # of Samples/Populations Ndf = K-1

n → Total Sample Size Ddf = n-K

Name of Method ⇒ ANOVA (Analysis of Variance)

CTS ⇒ F-dist.

Use fcdf(L, U, Ndf, Ddf)



STAT TESTS

ANOVA(L1, L2, L3, ...) ⇒ CTS F=

P-Value P=

Use P-value Method

P-value > α ⇒ H_0 valid, H_1 invalid

P-value ≤ α ⇒ H_0 invalid, H_1 valid

Final Conclusion:

Reject the claim OR FTR the claim

(when claim is invalid) (when claim is valid)

Dec 6-6:51 PM

Exams were randomly selected from 3 different Colleges. Here are the Scores:

ELAC			West LA			PCC		
75	82	100	88	76	99	72	98	100
80	90	65	69	70	80	60	80	88
	95							

$K=3 \Rightarrow Ndf = K-1 = 2$

$n = 7+6+6 = 19 \Rightarrow Ddf = n-K = 16$

Use $\alpha = .02$ to test the claim that all means are the Same.

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

H_1: At least one mean is different. RTT

ELAC → L1
West LA → L2
PCC → L3

STAT TESTS ANOVA(L1,L2,L3 Enter

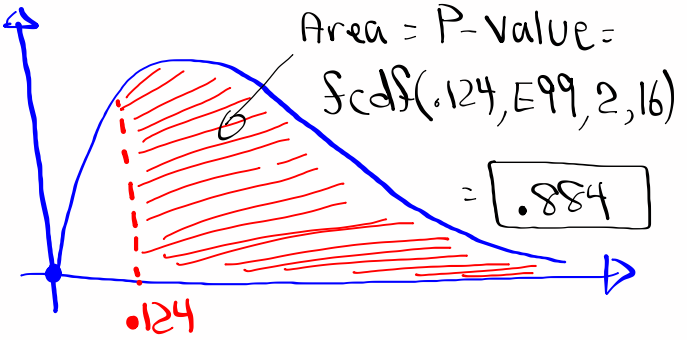
CTS F = .124
P-value P = .884 ✓

P-value > α ⇒ H_0 valid → Valid claim
.884 .02 H_1 invalid FTR the claim

Dec 6-7:00 PM

CTS F = .124 RTT Ndf = 2, Ddf = 16

Find P-value.



Dec 6-7:11 PM

Students were randomly selected from 4 different Colleges. Here are their ages:

L1 ELAC			L2 LA City			L3 West LA			L4 Pierce College		
27	30	19	26	33	17	23	27		18	24	29
25	18	32	18	25	40	33	42		32	30	26
40	38					50			40	40	

$K=4$ $\Rightarrow Ndf = K-1 = 3$

$n = 8+6+5+8 = 27 \Rightarrow Ddf = n-K = 23$

Use $\alpha = .1$ to test the claim that not all means are equal.

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

H_1: At least one mean is different. RTT, claim

CTS $F = .938$

P-value $P = .439$ ✓

ANOVA(L1, L2, L3, L4)

P-value $>$ α

.439 .1

H_0 valid

H_1 invalid

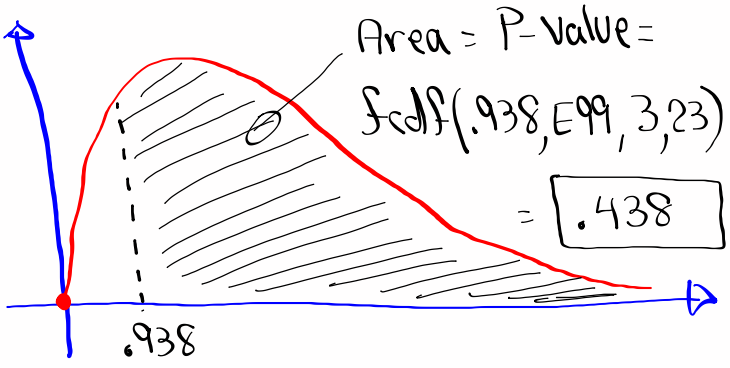
Invalid claim

Reject the claim

Dec 6-7:14 PM

CTS $F = .938$, $Ndf = 3$, $Ddf = 23$, RTT

Find P-value.



SG 35 ✓

Dec 6-7:27 PM

SG 28

Working with two Population Proportions

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

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

$x_1 = n_1 \cdot \hat{p}_1$ $\quad$ $x_2 = n_2 \cdot \hat{p}_2$

when decimal $\Rightarrow$ Round-up

$\bar{p}$ Pooled Proportion

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

Females	Males
$x_1 = 72$	$x_2 = 65$
$n_1 = 100$	$n_2 = 100$

$\hat{p}_1 = \frac{x_1}{n_1} = .72$

$\hat{p}_2 = \frac{x_2}{n_2} = .65$

$\bar{p} = \frac{x_1 + x_2}{n_1 + n_2} = \frac{72+65}{100+100} = .685$

Dec 6-7:44 PM

Confidence Interval for $p_1 - p_2$

STAT

TESTS

2-PropZInt

$< p_1 - p_2 <$

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

use the chart below

to find 99% Conf. Interval for $p_1 - p_2$

Females	Males
$x_1 = 72$	$x_2 = 65$
$n_1 = 100$	$n_2 = 100$

$-.099 < p_1 - p_2 < .239$

$E = \frac{.239 - (-.099)}{2} = .169$

Dec 6-7:51 PM

In a survey of 80 female students, 10% of them were smokers. $n=80$ $\hat{p}=.1$

$x=n\hat{p}=8$

In a survey of 120 male students, 8% of them were smokers. $n=120$ $\hat{p}=.08$

$x=n\hat{p}=9.6$ $x=10$

Females	Males
$x_1=8$	$x_2=10$
$n_1=80$	$n_2=120$

Pooled Proportion

$\bar{p}=\frac{x_1+x_2}{n_1+n_2}=\frac{18}{200}=.09$

Find Conf. interval for the difference of two Pop. Proportions.

$-.066<p_1-p_2<.099$

2-PropZInt

C-level: .95

$E=\frac{.099-(-.066)}{2}=.0825$

Dec 6-7:56 PM

Comparing Two Population Proportions:

$H_0: p_1=p_2$ $H_0: p_1\geq p_2$ $H_0: p_1\leq p_2$

$H_1: p_1\neq p_2$ $H_1: p_1<p_2$ $H_1: p_1>p_2$

TTT LTT RTT

C.V. $\Rightarrow$ $Z=$ invNorm(- - - -

CTS Z

P-Value P $\Rightarrow$ 2-PropZTest

Proceed as before.

Dec 6-8:05 PM

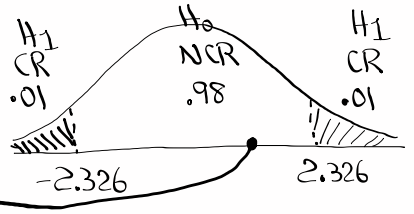
Use the chart below to test the claim at $\alpha = .02$ that two Pop. Proportions are the Same.

Females	Males
$x_1 = 8$	$x_2 = 10$
$n_1 = 80$	$n_2 = 120$

$H_0: P_1 = P_2$ claim

$H_1: P_1 \neq P_2$ TTT

CV Z TTT $\alpha = .02$



CTS $Z = .403$

P-value $P = .687$

2-PropZTest

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

CTS is in NCR $\Rightarrow$ H_0 valid

P-value $> \alpha$ H_1 invalid

Valid claim

FTR the claim

Dec 6-8:10 PM

Among 320 females, 55% of them had instagram account. $n = 320$, $\hat{P} = .55$ $\Rightarrow x = n\hat{P}$ $x = 176$

Among 180 males, 50% of them had istagram account. $n = 180$, $\hat{P} = .5$ $\Rightarrow x = n\hat{P}$ $x = 90$

Females	Males
$x_1 = 176$	$x_2 = 90$
$n_1 = 320$	$n_2 = 180$

$\bar{P} = \frac{x_1 + x_2}{n_1 + n_2} = \frac{266}{500} = .532$

90% Conf. Interval for $P_1 - P_2$:

2-PropZInt

$-.027 < P_1 - P_2 < .126$

$E = \frac{.126 - (-.027)}{2} \approx .08 \approx 8\%$

Dec 6-8:18 PM

Test the claim that prop. of all females is more than the prop. of all males.

$H_0: P_1 \leq P_2$

$H_1: P_1 > P_2$ claim, RTT

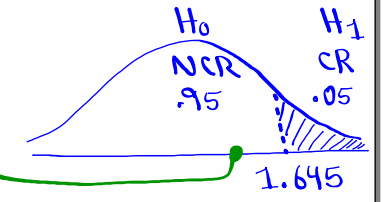
CV Z RTT

No $\alpha \rightarrow .05$

CTS $Z = 1.076$

P-value $P = .141$

2-Prop Z Test



$Z = \text{invNorm}(.95, 0, 1)$

CTS is in NCR $\Rightarrow$ H_0 valid

P-value $> \alpha$

H_1 invalid $\rightarrow$ Invalid claim

Reject the claim

SG 28 ✓

Dec 6-8:25 PM

Final Exam:

1) Next Tuesday 6:30 – 10:30

2) Must be in a view of Camera.

3) After You submit, I will check, then You are good to go.

4) No emails regarding final grade until You get an email from me.

6) Review exams 1 & 2 and recent SG.

7) Final is Cum. exam.

8) You can use notes and materials from this class. Your work must be similar to my lecture.

9) It is about 9 to 10 pages.

10) Office hrs are being held as normal.

Dec 6-8:49 PM