Statistics

Fall 2022

Lecture 29

Comparing Two Population standard deviations to determine whether or not they are equal:

$H_0: \sigma_1 = \sigma_2$

$H_1: \sigma_1 \neq \sigma_2$ TTT

Form a chart

Sample 1	Sample 2
n_1	n_2
S_1	S_2

$S_1 > S_2$

Using P-Value Method only:

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

we can use 2-SampF Test to find CTS & P-Value.

To verify P-Value, we find the area on each Side of CTS F by using TI Command fcdf(L, U, Ndf, Ddf), then multiply the Smaller area by 2.

$Ndf = n_1 - 1$

$Ddf = n_2 - 1$

we proceed with testing Chart, and make final Conclusion.

Consider the chart below:

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

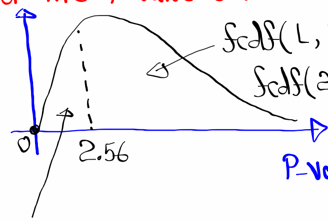
$Ndf = n_1 - 1 = 11$
$Ddf = n_2 - 1 = 7$

① Verify that $S_1 > S_2$. ✓

② Find CTS $F = \frac{S_1^2}{S_2^2}$

$F = \frac{8^2}{5^2} = 2.56$

③ Find the P-Value for TTT.



$fcdf(L, U, Ndf, Ddf) =$
$fcdf(2.56, E99, 11, 7) = \boxed{.111}$

$fcdf(0, 2.56, 11, 7) = \boxed{.889}$

P-Value = 2 * Smaller area
$= 2(.111)$
$= \boxed{.222}$

Verify these answers using 2-SampFTest

STAT TESTS 2-SampFTest

inpt: Stats
$S_1=8$ $n_1=12$ $S_2=5$ $n_2=8$
$\sigma_1 \neq \sigma_2$ Calculate

CTS $F = 2.56$
P-Value $P = .222$

Consider the chart below:

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

$Ndf = n_1 - 1 = 7$
$Ddf = n_2 - 1 = 9$

1) Verify that $S_1 > S_2$ ✓

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

$H_0: \sigma_1 = \sigma_2$ Claim
$H_1: \sigma_1 \neq \sigma_2$ TTT

CTS $F = 2.25$
P-Value $P = .256$ ✓✓✓

2-SampFTest
inpt: STATS
$S_1=12$
$n_1=8$
$S_2=8$
$n_2=10$
$\sigma_1 \neq \sigma_2$ TTT

P-Value > α
.256 .02

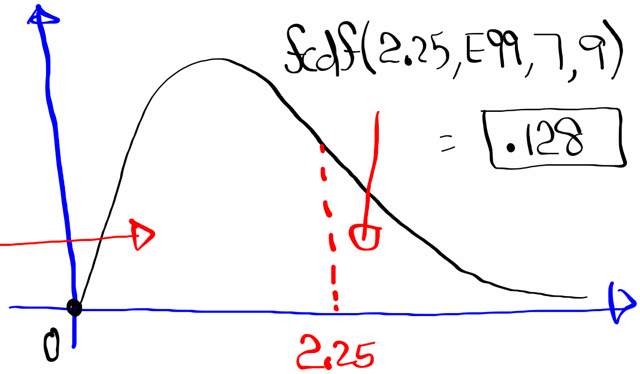
H_0 Valid, H_1 invalid

Valid claim

Fail-To-Reject the claim

Given CTS $F = 2.25$, TTT, Ndf$=7$, Ddf$=9$

Find P-value.



fcdf(2.25, E99, 7, 9) $= \boxed{.128}$

fcdf(0, 2.25, 7, 9) $= \boxed{.872}$

P-value = 2 * Smaller area

$= 2(.128) = \boxed{.256}$

I randomly selected 10 exams from female students and 10 exams from male students. Scores are given below:

Females				Males			
75	82	95	78	86	78	94	90
100	80	65	90	100	88	60	58
88	95			72	85		
$\bar{x}=84.8$		$S=10.8$		$\bar{x}=81.1$		$S=14.0$	

Find $\bar{x}$ & S for both groups, Round to 1-decimal.

Use $\boxed{\alpha=.1}$ to test the claim that there is a difference between two pop. standard dev.

$H_0: \sigma_1 = \sigma_2$

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

Males	Females
$n_1 = 10$	$n_2 = 10$
$S_1 = 14.0$	$S_2 = 10.8$

Ndf=9 Ddf=9

$S_1 > S_2$

CTS $F = 1.680$

P-value $P = .451$

2-SampF Test

P-value $>$ α

$.451$ $\quad$ $.1$

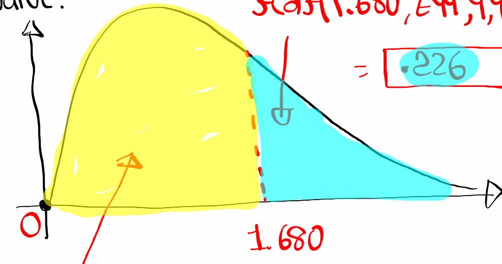
H_0 Valid, H_1 invalid

Invalid claim

$\boxed{\text{Reject the claim}}$

Given CTS $F = 1.680$ TTT $Ndf = 9$, $Ddf = 9$

Find the p-value.



$\text{fcdf}(1.680, E99, 9, 9) = \boxed{.226}$

$\text{fcdf}(0, 1.680, 9, 9) = \boxed{.774}$

P-Value = 2 * Smaller area

$= 2(.226) = \boxed{.452}$

Final Exam
Expect a couple of Problems from lecture So far.

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

$K \to$ # of groups $\quad Ndf = K - 1$

$n \to$ Total Sample Size $\quad Ddf = n - K$

To find
CTS F
P-Value p
$\Rightarrow$ STAT TESTS ANOVA(L1, L2, L3, ...

To Confirm P-Value $\Rightarrow$ fcdf(CTS, E99, Ndf, Ddf)

ANOVA $\Rightarrow$ Analysis of Variance

I randomly Selected exams from 3 different Colleges:

ELAC			West LA		LA city		
72	85	93	88	95	65	83	100
60	100	88	75	55	70	90	95
	75			100		85	

$K=3$, $n=7+5+7=19$ $Ndf = K-1 = 2$

$Ddf = n-K = 16$

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

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

H_1: At least one mean is different. RTT

ELAC → L1, West LA → L2, LA City → L3

$\boxed{STAT}$ $\boxed{TESTS}$ $\boxed{\uparrow}$ $\boxed{ANOVA}$ (L1, L2, L3 $\boxed{Enter}$

CTS	F= .039
P-Value	P= .962

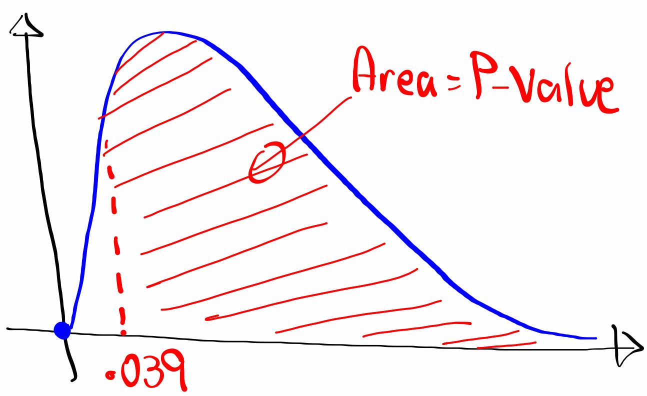
P-Value > α H_0 Valid
.962   .1 H_1 invalid

Valid claim

Fail-to-Reject the claim

CTS F=.039 $\boxed{RTT}$ $Ndf=2$, $Ddf=16$

Find P-Value



$\text{P-Value} = Fcdf(.039, E99, 2, 16)$

$= \boxed{.962}$

I randomly Selected students from 4 different Schools. Here are their ages:

ELAC	PCC	SMC	UCLA
21, 30	20, 19	17, 23	28, 24, 32
32, 25	33, 37	34, 25	45, 25, 20
18, 28	30	20, 30	50, 48
35			

$K=4$ $n=7+5+6+8=26$ $Ndf=K-1=3$

$Ddf=n-K=22$

No $\alpha \to$ use .05

Test the claim that not all pop. means are the Same.

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

H_1: At least one mean is different. claim RTT

ELAC → L1, PCC → L2, SMC → L3, UCLA → L4

ANOVA(L1, L2, L3, L4)

CTS $F=1.492$
P-value $P=.244$ √√√

P-value > α
.244 .05

H_0 Valid

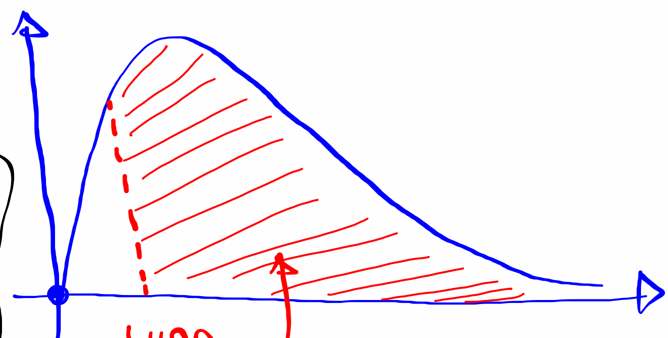
H_1 Invalid → Invalid claim

Reject the claim

CTS $F=1.492$ RTT $Ndf=3$, $Ddf=22$

Find p-Value.

Expect a problem on ANOVA for the final exam.



1.492

P-Value = Area

$= Fcdf(1.492, E99, 3, 22)$

$= \boxed{.244}$