Statistics

Lecture 50

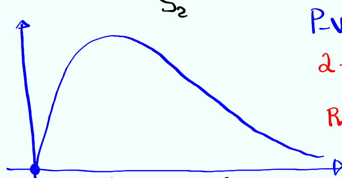
Feb 19-8:47 AM

SG 31

Comparing Two Population Standard deviations:

$H_0: \sigma_1 = \sigma_2$	$H_0: \sigma_1 \geq \sigma_2$	$H_0: \sigma_1 \leq \sigma_2$
$H_1: \sigma_1 \neq \sigma_2$	$H_1: \sigma_1 < \sigma_2$	$H_1: \sigma_1 > \sigma_2$
TTT	LTT	RTT

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



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

Ndf $= n_1 - 1$

Ddf $= n_2 - 1$

$S_1 > S_2$

CTS F

P-value P

2-SampFTest

RTT Fcdf(CTS, E99, Ndf, Ddf)

LTT Fcdf(0, CTS, Ndf, Ddf)

TTT Find area on both sides of CTS, then multiply smaller area by 2.

Proceed with testing chart

Draw final conclusion about the claim.

Dec 3-8:48 AM

Consider the chart below

Group 1	Group 2
$n_1=8$	$n_2=12$
$S_1=10$	$S_2=5$

1) Verify $S_1 > S_2$ ✓

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

3) CTS $F = \frac{S_1^2}{S_2^2} = \frac{10^2}{5^2} = \boxed{4}$

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

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

CTS $F = 4$
P-value $P = .041$

2-SampF Test
Inpt: Stats
$S_1 = 10$
$n_1 = 8$
$S_2 = 5$
$n_2 = 12$
$\sigma_1 \neq \sigma_2$ H_1
Calculate

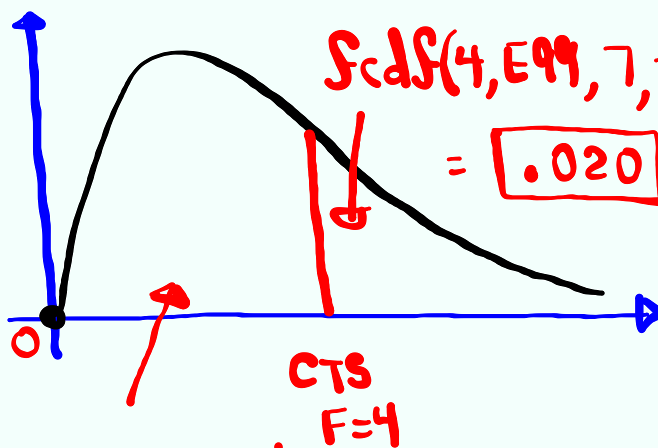
P-value Method only

P-value > α — H_0 valid — H_1 invalid
.041 .02
Valid claim
FTR the claim

If we choose α to be
.05, .06, .07, .08, .09, .1, ...
P-value $\leq \alpha$
H_0 invalid → Invalid claim → Reject it.
H_1 Valid

Dec 3-8:57 AM

CTS $F=4$
$Ndf = 7$
$Ddf = 11$
TTT
find P-value.



fcdf(4, E99, 7, 11) = $\boxed{.020}$

fcdf(0, 4, 7, 11) = $\boxed{.980}$

P-value = 2 · Smaller one = 2(.020) ≈ $\boxed{.04}$

Dec 3-9:08 AM

Consider the chart below

Group 1	Group 2
$n_1=8$	$n_2=8$
$S_1=10$	$S_2=8$

1) Verify $S_1 > S_2$ ✓

2) $Ndf = n_1 - 1 = 8-1 = 7$

$Ddf = n_2 - 1 = 8-1 = 7$

3) CTS $F = \frac{S_1^2}{S_2^2} = \frac{10^2}{8^2} = 1.5625$

4) $\boxed{\text{Test the claim}}$ that there is a difference between two Pop. standard deviations.

No $\alpha \to .05$

$\sigma_1 \neq \sigma_2$

$H_0: \sigma_1 = \sigma_2$

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

$\boxed{\begin{array}{l} \text{CTS } F = 1.5625 \\ \text{P-value } P = .570 \end{array}}$ ✓

P-value $>$ α

.570 .05

H_0 valid

H_1 invalid

Invalid claim

Reject the claim

2-Samp F Test

inpt: $\boxed{\text{Stats}}$

$S_1 = 10$

$n_1 = 8$

$S_2 = 8$

$n_2 = 8$

$\sigma_1 \neq \sigma_2$

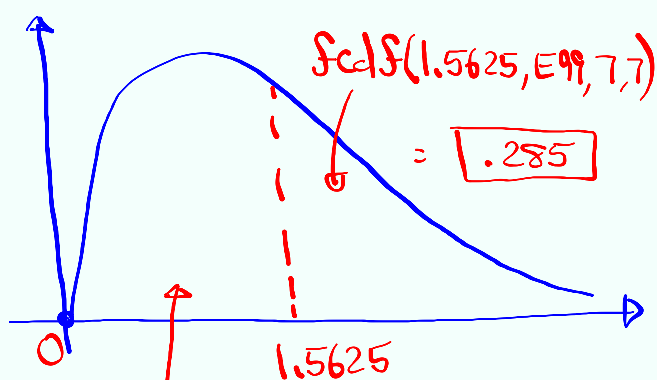
Dec 3-9:13 AM

CTS $F = 1.5625$

$Ndf = 7$, $Ddf = 7$

TTT

Find P-value.



Fcdf(1.5625, E99, 7, 7) $= \boxed{.285}$

P-value = 2 · Smaller area

Fcdf(0, 1.5625, 7, 7) $= \boxed{.715}$

$= 2(.285)$

$\approx \boxed{.570}$

Dec 3-9:23 AM

Standard deviation of ages of 7 female students was 8 yrs. $n=7$, $S=8$

Standard deviation of ages of 10 male students was 5 yrs. $n=10$, $S=5$

Females	Males
$n_1=7$	$n_2=10$
$S_1=8$	$S_2=5$

1) Verify $S_1 > S_2$ ✓

2) Ndf $= n_1 - 1 = 6$

Ddf $= n_2 - 1 = 9$

3) CTS $F = \frac{S_1^2}{S_2^2} = 2.56$

4) Use $\alpha = .1$ to test the claim that there is no difference between two Pop. standard deviations.

$H_0: \sigma_1 = \sigma_2$ claim

$H_1: \sigma_1 \neq \sigma_2$ TTT

$\boxed{\begin{array}{l}\text{CTS } F = 2.56 \\ \text{P-value } P = .198\end{array}}$

2-SampF Test

P-value $>$ α

.198 .1

H_0 valid $\to$ valid claim

H_1 invalid

FTR the claim

Dec 3-9:27 AM

Exams were randomly selected, here are scores:

Daily class			MW class		
75	82	100	80	95	100
90	95	68	100	70	70

$\bar{x} = 85$ $\bar{x} = 86$

$S = 12$ $S = 14$

$n = 6$ $n = 6$

Round to whole #

MW	Daily
$n_1=6$	$n_2=6$
$S_1=14$	$S_2=12$

Test the claim that $\boxed{\sigma_1 > \sigma_2}$

No $\alpha \to .05$

$H_0: \sigma_1 \leq \sigma_2$

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

$\boxed{\begin{array}{l}\text{CTS } F = 1.361 \\ \text{P-value } P = .372\end{array}}$ ✓

2-Samp F Test

P-value $>$ α

.372 .05

H_0 Valid, H_1 invalid

Invalid claim

Reject the claim

$\boxed{\text{SG 31}✓}$

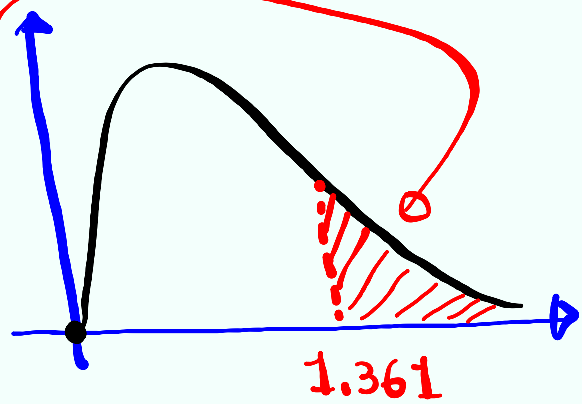
Dec 3-9:38 AM

CTS $F = 1.361$

$Ndf = 5$, $Ddf = 5$

RTT

find $\boxed{\text{p-value.}}$



$\text{fcdf}(1.361, E99, 5, 5)$

$= \boxed{.372}$

Dec 3-9:47 AM