Statistics

Lecture 14

Feb 19-8:47 AM

College claims that the mean GPA for all students is at least 2.85.

$\geq$ H_0 $\mu \geq 2.85$

A sample of 32 students had a mean GPA of 2.65.

$n = 32$, $\bar{x} = 2.65$ $\sigma = .75$

It is known that standard deviation of all GPA for all students is .75.

No $\alpha \rightarrow .05$

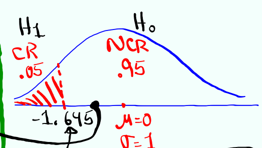
Test the claim.

σ Known $\rightarrow$ Case I

H_0: $\mu \geq 2.85$ claim

H_1: $\mu < 2.85$ LTT

CV Z LTT $\alpha = .05$



CV $Z =$ invNorm(.05,0,1)

CTS $Z = -1.508$

P-Value $P = .066$ ✓

Z-Test

inpt: Stats

μ_0: 2.85 H_0

σ: .75

$\bar{x} = 2.65$

$n = 32$

μ $\boxed{<}$ μ_0 H_1

Calculate

CTS is in NCR

P-Value $> \alpha$

Testing Chart: H_0 Valid, H_1 invalid

Valid claim

Fail to Reject

Dec 5-11:43 AM

Suggest a value for α to reverse the Conclusion.

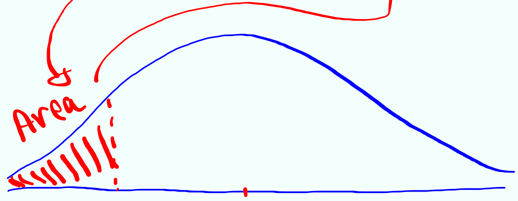
We have P-Value $> \alpha$

To reverse, we need P-value $\leq \alpha$

$.066 \leq \alpha$

choose α to be .07, .08, .09, or .1.

CTS $Z = -1.508$ LTT Find P-value.



P-Value = normalcdf$(-E99, -1.508, 0, 1) = \boxed{.066}$

Dec 5-11:58 AM

I randomly Selected 15 exams. → $n=15$

Here are the Scores:

72	88	100	95	80
55	70	90	75	58
67	100	98	82	78

Find

1) $\bar{x} \approx 81$
2) $S \approx 15$

Round to whole #

Use $\boxed{\alpha=.02}$ to test the claim that the mean of all exam Scores is 88. $\mu = 88$ ← H_0

$H_0: \mu = 88$ claim

$H_1: \mu \neq 88$ TTT

σ Unknown → Case II

CV t $\alpha=.02$ TTT

$df = n-1 = 14$

CV t=invT$(.99, 14)$=

CTS $t = -1.807$

P-Value $P = .092$ ✓

T-Test

inpt: STATS

μ_0: 88 H_0

$\bar{x} = 81$

$S = 15$

$n = 15$

μ $\boxed{\neq \mu_0}$ H_1

CTS is in NCR

P-value $> \alpha$

Testing chart: H_0 Valid, H_1 invalid

F T R the claim

Valid claim

Dec 5-12:04 PM

Suggest values for α to reverse the Conclusion

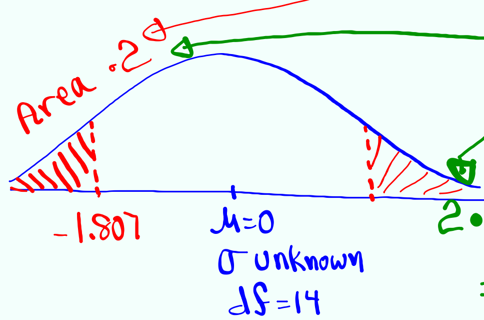
we have $\quad$ P-Value $> \alpha$

we need $\quad$ P-Value $\leq \alpha$ to reverse the Conclusion

$.092 \leq \alpha$

Pick $\alpha = .093, .095, .1$

CTS $t = -1.807$ TTT $df = 14$, find P-Value.

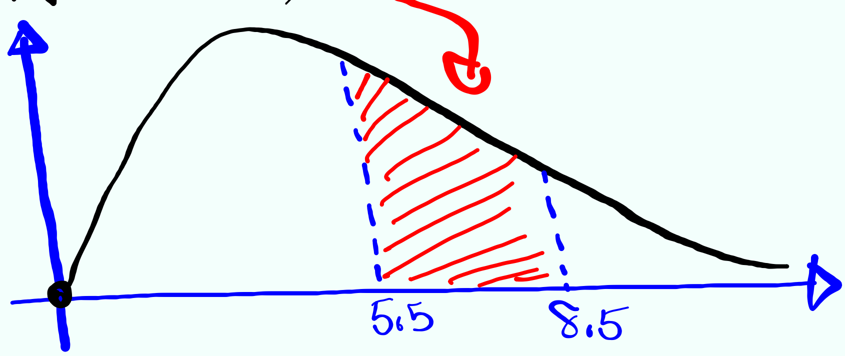


$2 \cdot tcdf(-E99, -1.807, 14)$

$= \boxed{.092}$

Dec 5-12:20 PM

find $P(5.5 < F < 8.5)$ Ndf = 4, Ddf = 20.



2nd VARS

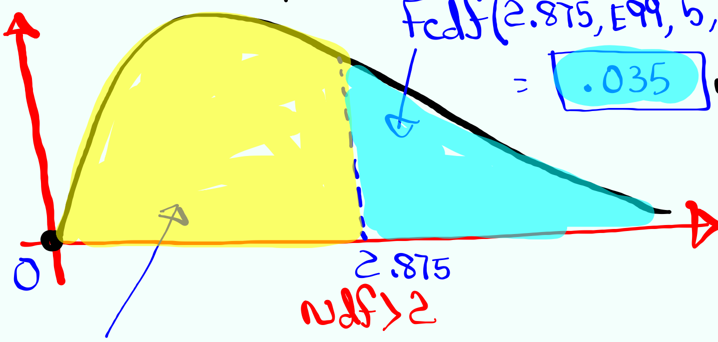
Ndf > 2

$Fcdf(5.5, 8.5, 4, 20) = \boxed{.003}$

Dec 5-12:26 PM

Find the area on each side of $\boxed{F = 2.875}$ with $\boxed{Ndf = 5}$ and $Ddf = 25$, then multiply the smaller area by 2.

$Fcdf(2.875, E99, 5, 25) = \boxed{.035}$ ✓



$Fcdf(0, 2.875, 5, 25) = \boxed{.965}$ ✓

$2 \cdot$ Smaller Are $= 2(.035) = \boxed{.070}$

Dec 5-12:30 PM

Comparing $\underbrace{\text{two Population Standard deviations}}_{\sigma_1 \,\&\, \sigma_2}$ SG 29

TTT	RTT	LTT
$H_0: \sigma_1 = \sigma_2$	$H_0: \sigma_1 \le \sigma_2$	$H_0: \sigma_1 \ge \sigma_2$
$H_1: \sigma_1 \ne \sigma_2$	$H_1: \sigma_1 > \sigma_2$	$H_1: \sigma_1 < \sigma_2$

Sample 1	Sample 2
n_1	n_2
S_1	S_2

1) $S_1 > S_2$ ✓

2) $Ndf = n_1 - 1$, $Ddf = n_2 - 1$

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

CTS F
P-value p $\Rightarrow$ STAT TESTS 2-SampF Test

Proceed with testing chart & P-value Method.

Dec 5-12:54 PM

Use the chart below to $\boxed{\text{test the claim}}$ → NO α that

$\sigma_1 = \sigma_2$.

$H_0: \sigma_1 = \sigma_2$ claim

$H_1: \sigma_1 \neq \sigma_2$ TTT

Sample 1	Sample 2
$n_1 = 8$	$n_2 = 12$
$S_1 = 10$	$S_2 = 4$

1) $S_1 > S_2$ ✓

2) $Ndf = n_1 - 1 = 7$

$Ddf = n_2 - 1 = 11$

3) CTS $F = \dfrac{S_1^2}{S_2^2} = \dfrac{10^2}{4^2} = \boxed{6.25}$ ✓

4) Use 2-SampFTest

$\boxed{\begin{array}{l}\text{CTS } F = 6.25 \\ \text{P-Value } P = .008\end{array}}$ ✓

P-Value $\leq \alpha$

.008 .05

H_0 invalid

H_1 Valid

Invalid claim

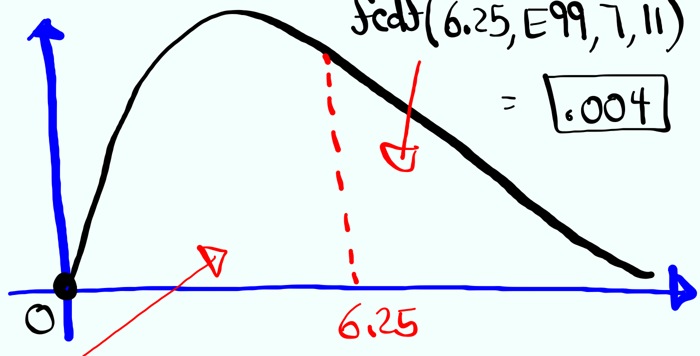
Reject the claim

Dec 5-1:01 PM

CTS $F = 6.25$ TTT $Ndf = 7$, $Ddf = 11$

Find P-Value

fcdf(6.25, E99, 7, 11) $= \boxed{.004}$



Ndf > 2

fcdf(0, 6.25, 7, 11) $= \boxed{.996}$

TTT → P-value = 2 · Smaller area = 2(.004) $= \boxed{.008}$

Dec 5-1:10 PM

Standard deviation of ages of 10 Female Students was 8. $n=10$ $\boxed{S=8}$

Standard deviation of ages of 15 male Students was 10. $n=15$ $\boxed{S=10}$

No $\alpha \rightarrow .05$

Test the claim that two pop. Standard deviations are different. $\sigma_1 \neq \sigma_2 \leftarrow H_1$

$H_0: \sigma_1 = \sigma_2$

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

$S_1 > S_2$ ✓

Ndf $= 15 - 1 = 14$

Ddf $= 10 - 1 = 9$

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

Male	Female
$n_1 = 15$	$n_2 = 10$
$S_1 = 10$	$S_2 = 8$

Use 2-SampF Test

CTS $F = 1.5625$

P-value $p = .507$ ✓

P-Value $>$ α

$.507$ $\quad$ $.05$

H_0 Valid

H_1 invalid $\rightarrow$ Invalid claim $\rightarrow$ Reject the claim

Dec 5-1:15 PM

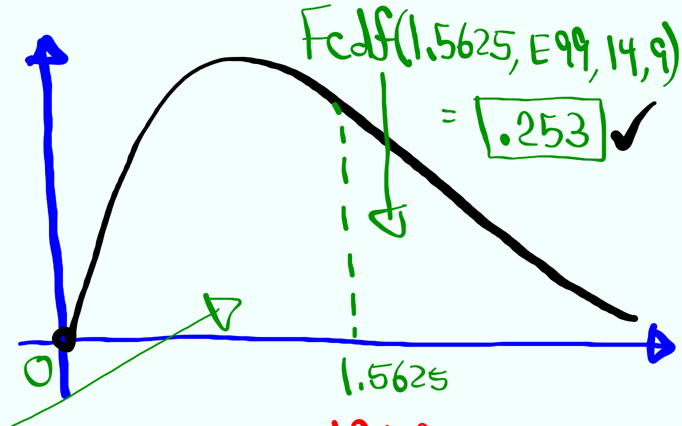
CTS $F = 1.5625$

T T T

Ndf $= 14$ ✓

Ddf $= 9$

find P-Value.



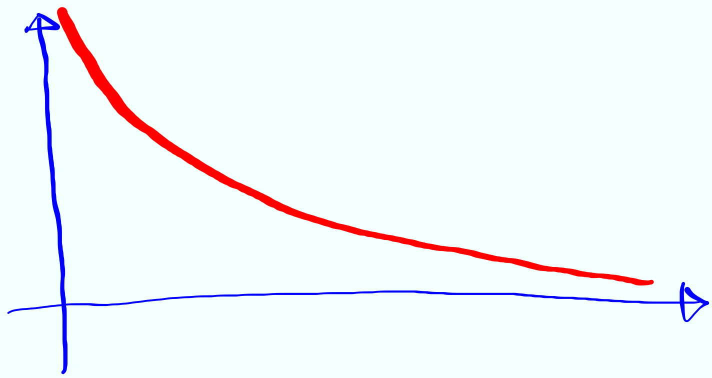
Fcdf(1.5625, E99, 14, 9) $= \boxed{.253}$ ✓

Ndf > 2

Fcdf(0, 1.5625, 14, 9) $= \boxed{.747}$ ✓

P-Value $= 2 \cdot$ Smaller area $= 2(.253) = \boxed{.506}$

Dec 5-1:25 PM



As $F \to 0$, curve $\to \infty$

Ndf=2

Dec 5-1:31 PM

Use the chart below to test the claim at $\alpha = .1$ that $\sigma_1 > \sigma_2$.

H_1

Sample 1	Sample 2
$n_1 = 5$	$n_2 = 10$
$S_1 = 9$	$S_2 = 2$

H_0: $\sigma_1 \le \sigma_2$

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

$S_1 > S_2$ ✓

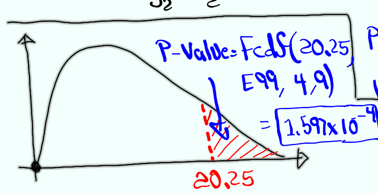
Ndf=4 , Ddf=9

CTS $F = \frac{S_1^2}{S_2^2} = \frac{9^2}{2^2} = 20.25$

Use 2-SampF Test

CTS $F = 20.25$

P-Value $P = 1.597 \times 10^{-4}$



P-Value $\le \alpha$

H_0 invalid, H_1 Valid

valid claim

F T R the claim

SG 29 Double Points

Dec 5-1:32 PM