Statistics

Lecture 15

The department claims that standard deviation of all math final exam scores is 12.

$\sigma = 12$ claim → H_0

I took a sample of 10 final exams and standard deviation of the scores was 15.

No α → .05

Test the claim.

$n = 10$, $S = 15$

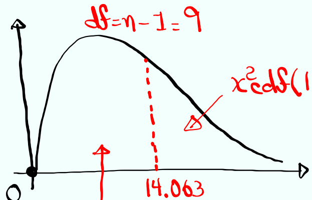
$H_0: \sigma = 12$ claim

$H_1: \sigma \neq 12$ TTT

$df = n - 1 = 9$

CTS

$\chi^2 = \frac{(n-1)\cdot S^2}{\sigma^2} = \frac{(10-1)\cdot 15^2}{12^2} = \boxed{14.063}$



$\chi^2cdf(14.063, E99, 9) = \boxed{.120}$

$\chi^2cdf(0, 14.063, 9) = \boxed{.880}$

P-Value = 2 · Smaller area

= 2(.120)

= $\boxed{.240}$

P-Value > α

.240 > .05

H_0 Valid, H_1 invalid

Valid claim

FTR the claim

I randomly selected 8 females students, standard deviation of their ages was 12 yrs.
$n=8$, $S=12$

I also randomly selected 12 male students, standard deviation of their ages was 8 yrs.
$n=12$ $S=8$

Test the claim at $\alpha=.1$ that there is no difference between standard deviations of ages of all female and all male students.

$\sigma_1=\sigma_2$ claim
↑ H_0

$H_0: \sigma_1=\sigma_2$ claim

$H_1: \sigma_1 \neq \sigma_2$ TTT

Females	Males
$n_1=8$	$n_2=12$
$S_1=12$	$S_2=8$

$S_1 > S_2$

$F=\frac{S_1^2}{S_2^2}=\frac{12^2}{8^2}=2.25$

CTS $F=2.25$
P-Value $P=.221$ ✓

2-Samp F Test
inpt: Stats

NdF $= n_1-1=7$
DdF $= n_2-1=11$

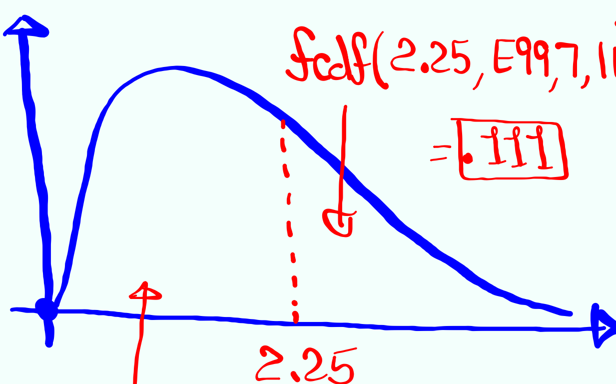
P-Value $>$ α
.221 $>$ .1

H_0 Valid, H_1 invalid
Valid claim
FTR the claim

Jun 6-8:28 AM

CTS F= 2.25
NdF=7
DdF= 11
TTT
Find P-Value.

fcdf(2.25, E99, 7, 11) = .111



fcdf(0, 2.25, 7, 11) = .889

P-Value = 2 · Smaller area
= 2 (.111) = .222

Jun 6-8:41 AM

I randomly selected exams from two different classes. Here are the scores:

In Person			Online		
75	82	68	96	100	55
90	88	95	40	85	88
	78	100		78	95
$\bar{x}=85$	$S=11$	$n=8$	$\bar{x}=80$	$S=21$	$n=8$

1) Find $\bar{x}$, S, and n for each class. Round to whole #.

NO $\alpha \to .05$

2) Test the claim that there is a difference between two Pop. Standard deviations

$\sigma_1 \neq \sigma_2$ claim ← H_1

$H_0: \sigma_1 = \sigma_2$

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

CTS F = 3.645
P-Value P = .110 ✓

2-SampF Test

Online	in Person
$n_1=8$	$n_2=8$
$S_1=21$	$S_2=11$

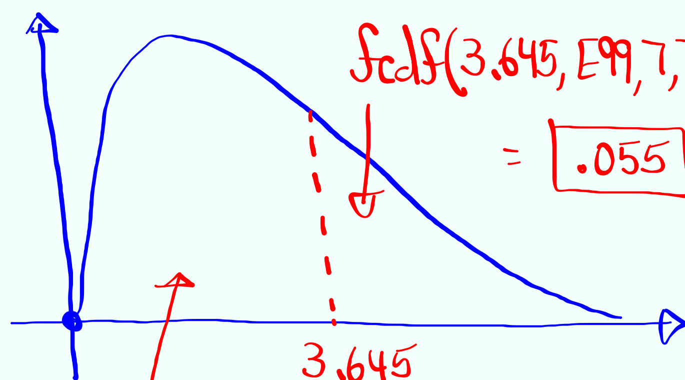
P-Value > α
.110   .05

H_0 Valid, H_1 invalid
Invalid claim
Reject the claim

If we choose α to be .12, .13, .14, .15, ---,
P-Value $\leq \alpha$ H_0 invalid, H_1 Valid
Valid claim
FTR the claim

Jun 6-8:45 AM

CTS F = 3.645
Ndf = 7
Ddf = 7
TTT
Find P-Value.



fcdf(3.645, E99, 7, 7) = .055

fcdf(0, 3.645, 7, 7) = .945

P-Value = 2 · Smaller area
= 2 (.055) = .110

Jun 6-8:59 AM

Comparing at least 3 pop. means (SG 33)

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

H_1: At least one mean is different. RTT

Method → ANOVA (use it when Comparing at least 3 pop. means)

→ Analysis of Variance

K → # of groups NdF = K−1

n → Total Sample Size DdF = n−K

CTS F [STAT] [TESTS]

P-Value P [ANOVA] L1, L2, L3, ...

Final Conclusion must be made about the claim.

Reject or FTR the claim

we do P-Value method.

Jun 6-9:17 AM

Randomly selected students from 3 different Colleges had following ages:

L1 Mt. SAC			L2 ELAC			L3 Chaffey		
21	28	18	27	33	17	19	25	33
30	32	25	20	25	28	38	20	28
19	24	35						

K = 3 → NdF = K−1 = 2

n = 9 + 6 + 6 = 21 DdF = n−K = 18

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

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

H_1: At least one mean is different. RTT

[STAT]

[TESTS]

[↑] [ANOVA] (L1, L2, L3) [Enter]

CTS F = .182

P-Value P = .835 ✓

P-Value > α

H_0 valid

H_1 invalid

Valid claim

F T R the claim

Jun 6-9:24 AM

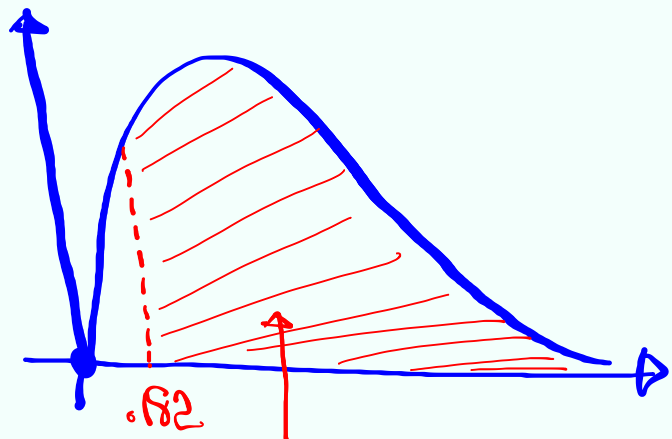
CTS F = .182

Ndf = 2

Ddf = 18

RTT

Find P-Value



fcdf(.182, E99, 2, 18)

= .835

Jun 6-9:35 AM

I randomly selected exams from 4 different classes. Here are the scores.

L1 Morning	L2 Evening	L3 Weekend	L4 Online
82 95 100	80 78 96	78 65	79 88 100
75 88 65	68 100 85	55 80	90 95 100
90	70	40 64	98
		70	

K = 4

n = 7+7+7+7 = 28

⇒ Ndf = K−1 = 3

Ddf = n−K = 24

SG 33

Test the claim that not all means are equal.

No α → .05

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

H_1: At least one mean is different claim, RTT

CTS F = 7.366

P-Value P = .001

ANOVA(L1, L2, L3, L4)

P-Value ≤ α

.001 .05

H_0 invalid

H_1 Valid

VALID claim

FTR the claim

Jun 6-9:37 AM