Statistics

Lecture 27

Feb 19-8:47 AM

I randomly Selected 8 Female nurses, their mean age was 44 Yrs with Standard dev. of 5 Yrs.

$n=8$ $\bar{x}=44$ $S=5$

$n=6$ $\bar{x}=38$ $S=9$

I also randomly Selected 6 male nurses, their mean age was 38 Yrs with Standard dev. of 9 Yrs.

No $\alpha \to .05$

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

Males	Females
$n_1=6$	$n_2=8$
$\bar{x}_1=38$	$\bar{x}_2=44$
$S_1=9$	$S_2=5$

$\boxed{S_1 > S_2}$

$H_0: \sigma_1 = \sigma_2$

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

$\boxed{\text{Stat}}$ $\boxed{\text{TESTS}}$ $\boxed{\text{2-SampFTest}}$

CTS $F=3.24$

P-Value $P=.157$

P-Value $> \alpha$

H_0 Valid

H_1 invalid

Invalid claim

Reject

We can assume

$\sigma_1 = \sigma_2$, Pooled: Yes

$df = 6+8-2 = 12$

May 20-6:54 PM

Find 99% Conf. interval for the difference of two pop. means.

σ_1 & σ_2 unknown

2-SampTInt $\quad -17 < \mu_1 - \mu_2 < 5$

Pooled: Yes $\quad -17 < \mu_M - \mu_F < 5$

$-5 < \mu_F - \mu_M < 17$

use $\alpha = .02$ to test the claim that two Pop. means are the Same.

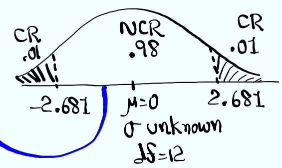
$\boxed{H_0: \mu_1 = \mu_2 \text{ claim}}$ $\quad$ CV t TTT $\alpha = .02$

$H_1: \mu_1 \neq \mu_2$ TTT $\quad$ df = 12

CTS $t = -1.598$

P-Value $P = .136$

2-SampTTest



$t = \text{invT}(.99, 12)$

CTS is in NCR

P-Value $> \alpha$

$\boxed{H_0 \text{ Valid}}$ valid claim $\quad$ FTR the claim

H_1 invalid

May 20-7:06 PM

I randomly Selected 6 students, gave Part I exam before long weekend & Part 2 exam after long weekend.

Before	After	L3
75	70	5
80	90	-10
65	70	-5
70	70	0
90	80	10
100	90	10

clear all lists

Before → L1

After → L2

→ ↑ $\boxed{L3}$

$\boxed{2nd}$ $\boxed{1}$ − $\boxed{2nd}$ $\boxed{2}$ $\boxed{Enter}$

use $\boxed{1\text{-Var Stats}}$ with L3 only

1) $\bar{d} = \bar{x} = 1.\bar{6} \approx 2$ $\quad$ 2) $S_d = 8.165 \approx 8$ $\quad$ 3) $S_d^2 = \frac{200}{3}$

$\bar{x}_d$

4) Find 90% conf. interval for the mean of all differences $\quad$ T Interval

$-5 < \mu_d < 9$ $\quad$ $E = \frac{9 - (-5)}{2} = \boxed{7}$

May 20-7:19 PM

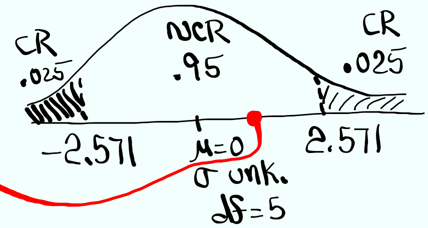
Test the claim that there is no difference for exam score before and after long weekend.

$H_0: \mu_d = 0$ claim

$H_1: \mu_d \neq 0$ TTT

CV t TTT $\alpha = .05$

$df = n-1 = 6-1 = 5$



CTS $t = .612$

P_Value $P = .567$

T-Test

$t = \text{invT}(.975, 5)$

CTS is in NCR

P_Value > α

H_0 Valid → Valid claim → FTR the claim.

H_1 invalid

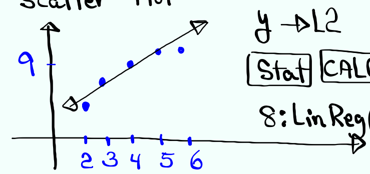
May 20-7:31 PM

Back to SG 9

working with ordered-Pairs

x	y
4	9
3	8
2	5
5	10
6	10

Scatter Plot



$x \to L1$

$y \to L2$

Stat CALC

8: LinReg(a+bx)

$a = 3.6$ $\quad r^2 = .837$

$b = 1.2$ $\quad r = .915$

Regression line

$y = a + bx$

$\boxed{y = 3.6 + 1.2x}$

$r^2(\%) \approx 84\%$

84% of y-values are explained by x-values

$r = .915$ is close to 1 → Linear regression is Significant.

If r is significant → Use regression line for prediction.

If r is not significant → use $\bar{y}$

May 20-7:39 PM

Testing r : rho

$H_0: \rho = 0$ (It is not Significant)

$H_1: \rho \neq 0$ TTT (It is Significant)

$\boxed{\text{STAT}}$ $\boxed{\text{TESTS}}$ ↑ $\boxed{\text{LinRegTTest}}$

Xlist : L1

Ylist : L2

Freq : 1

ρ : $\neq 0$

RegEQ : $\boxed{\text{Clear}}$

$\boxed{\text{Calculate}}$

$\boxed{\begin{array}{l} \text{CTS } t = 3.928 \\ \text{P-Value } P = .029 \end{array}}$

$df = n - 2 = 5 - 2 = 3$

P-Value α

If P-Value $> \alpha$

H_0 valid → Not Significant

If P-Value $\leq \alpha$

H_1 Valid → Significant

If $\alpha = .05$

P-Value $\leq \alpha$

Significant

If $\alpha = .01$

P-Value $> \alpha$

Not Significant

May 20-7:49 PM

Study time	Exam Score
2	70
3	78
4	85
4	90
5	90
8	95

Study time → x → L1

Exam Score → y → L2

Use LinReg (a+bx)

$a \approx 68$ $r^2(\%) \approx 76\%$

$b \approx 4$ $r = .870$

Lin. Reg.

$\boxed{y = 68 + 4x}$

76% of exam Scores are explained by study time.

r is close to 1 → Significant

May 20-8:00 PM

Use $\boxed{\alpha = .1}$ to test the claim that

$\underbrace{\text{Linear regression Correlation}}_{r}$ is Significant.

rho

$H_0: \rho = 0$ (r is not Significant)

$H_1: \rho \neq 0$ (r is Significant) claim, TTT

CTS $t = 3.527$
P-Value $P = .024$

$df = 4$

$\boxed{\text{P-Value} < \alpha}$

$.024 \quad .1$

H_0 invalid, H_1 Valid

r is Significant

Lin Reg T Test

xlist: L1

ylist: L2

Freq: 1

$\rho \neq 0$

Reg EQ: Blank

$\boxed{\text{Calculate}}$

Suggest a value for α to reverse the Conclusion.

we want

P-Value $> \alpha$

$.024 > \alpha$ new α

$\alpha = .02, .01$

May 20-8:06 PM

Formula for CTS t

$$t = \frac{r}{\sqrt{\frac{1-r^2}{n-2}}}$$

$r^2 = .757 \quad r = .870$

$n = 6$

$$t = \frac{.870}{\sqrt{\frac{1-.757}{6-2}}}$$

$$= \frac{.870}{\sqrt{\frac{.243}{4}}}$$

$$= \boxed{3.530}$$

May 20-8:17 PM

QZ Score	Exam Score
8	88
9	94
10	100
7	75
6	75

QZ Score → x → L1

Exam Score → y → L2

Use LinReg$(a+bx)$

$a \approx 31$ $r^2 = .942$

$b \approx 7$ $r = .971$

$\boxed{y \approx 31 + 7x}$

Use LinRegTTest with $\rho \neq 0$, find

CTS $t = 7.006$ P-Value $P = .006$ $df = 3$

Since P-value is very small,

P-value $\leq \alpha$

H_0 invalid

H_1 Valid → r is Significant

CTS t

$$t = \frac{r}{\sqrt{\frac{1-r^2}{n-2}}} = \frac{.971}{\sqrt{\frac{1-.942}{5-2}}} = \frac{.971}{\sqrt{\frac{.058}{3}}} \approx \boxed{6.983}$$

May 20-8:24 PM

Intro to Matrix:

Matrix is a rectangular array of numbers.

It has rows & Columns.

ex: Matrix A has 2 Rows & 3 columns.

$$A = \begin{bmatrix} \square & \square & \square \\ \square & \square & \square \end{bmatrix}$$

Matrix B is 3×2

3 ↑ Rows, 2 ↑ Columns

$$B = \begin{bmatrix} \square & \square \\ \square & \square \\ \square & \square \end{bmatrix}$$

May 20-8:34 PM

I Surveys 100 Voters. I asked them if they are going to vote for CA governor election.

	Yes	NO
Demo.	30	10
Repub.	15	25
Ind.	10	10

$$A = \begin{bmatrix} 30 & 10 \\ 15 & 25 \\ 10 & 10 \end{bmatrix}$$

Using TI:

$\boxed{2nd}$ $\boxed{x^{-1}}$ → $\boxed{Edit}$ $\boxed{1:[A]}$

3×2

30 10
15 25
10 10

$\boxed{2nd}$ $\boxed{MODE}$

Display A

$\boxed{2nd}$ $\boxed{x^{-1}}$ $\boxed{1:[A]}$ $\boxed{Enter}$

$$\begin{bmatrix} 30 & 10 \\ 15 & 25 \\ 10 & 10 \end{bmatrix}$$

May 20-8:38 PM