

# Statistics

## Lecture 25



Feb 19-8:47 AM

LA Times claims that the mean age of all nurses in LA county is 48 yrs.  
 $\mu = 48$

In a sample of 20 nurses, their mean age was 45 yrs with standard deviation of 8.

Use  $\alpha = .02$  to test the claim.  $n = 20$   
 $\bar{x} = 45$   
 $S = 8$

$H_0: \mu = 48$  claim  
 $H_1: \mu \neq 48$  TTT

$\sigma$  unknown

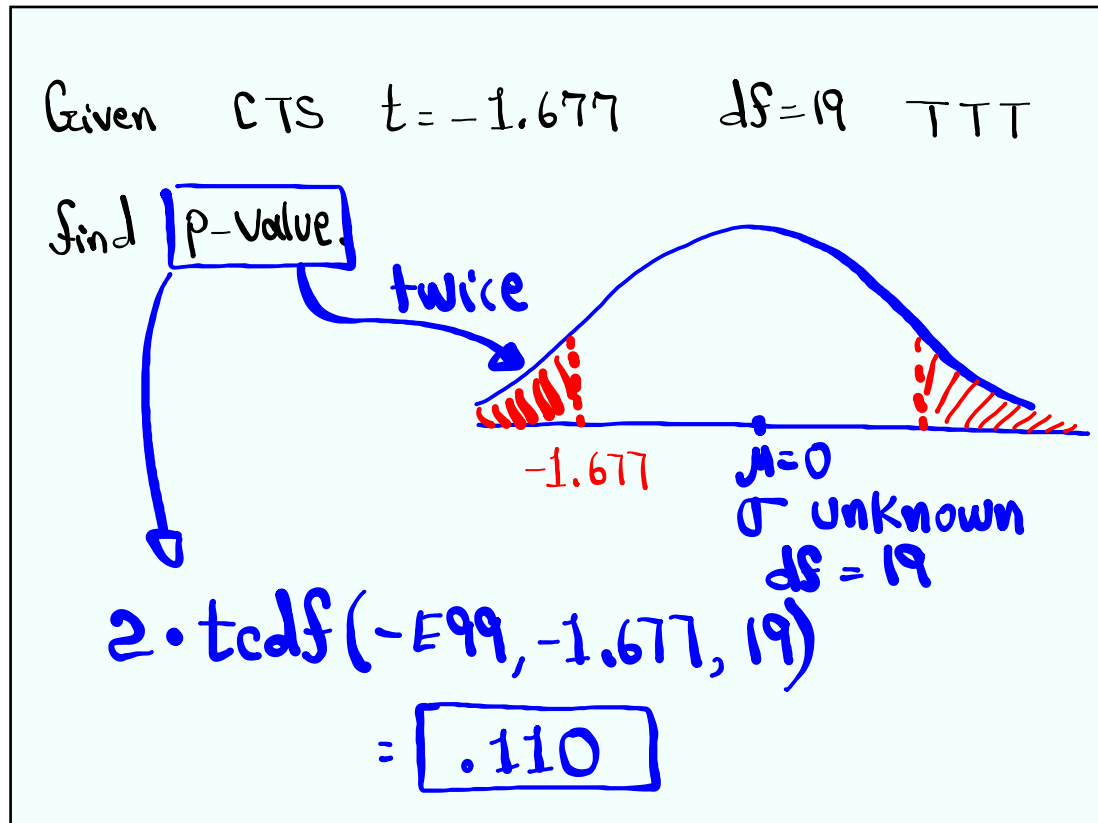
CV t TTT  $\alpha = .02$   
 $df = n - 1 = 19$   
 $t = \text{invT}(.99, 19)$

CTS  $t = -1.677$   
 P-value  $P = .110$

T-Test  
 inpt: Stats  
 $\mu_0 = 48$   $H_0$   
 $\bar{x} = 45$   
 $S = 8$   
 $n = 20$   
 $\mu \neq \mu_0$   $H_1$   
Calculate

CTS is in NCR  
 $P\text{-value} > \alpha$   
 $H_0$  valid,  $H_1$  invalid  
 Valid claim  
 FTR the claim

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Testing one population standard deviation:

|                             |                             |                             |
|-----------------------------|-----------------------------|-----------------------------|
| $H_0: \sigma = \sigma_0$    | $H_0: \sigma \geq \sigma_0$ | $H_0: \sigma \leq \sigma_0$ |
| $H_1: \sigma \neq \sigma_0$ | $H_1: \sigma < \sigma_0$    | $H_1: \sigma > \sigma_0$    |
| TTT                         | LTT                         | RTT                         |

Use P-value Method:

CTS  $\chi^2 = \frac{(n-1) \cdot S^2}{\sigma^2}$

P-value  $\rightarrow \chi^2_{cdf}$   $df = n - 1$

- 1) RTT  $\chi^2_{cdf}(\text{CTS}, E99, df)$
- 2) LTT  $\chi^2_{cdf}(0, \text{CTS}, df)$
- 3) TTT Find area on both sides of CTS  
 $P\text{-value} = 2(\text{smaller area})$

Proceed with testing chart (P-value Method)  
 Draw final conclusion about the claim.

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Given:  $H_0: \sigma \leq 8$       Claim is  $H_0$   
 $n=12$  ,  $S=10$        $\alpha=.1$

Test the claim.  $\rightarrow df = n-1 = 11$

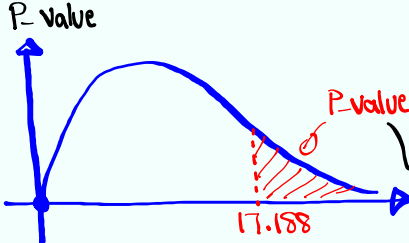
$H_0: \sigma \leq 8$  claim  
 $H_1: \sigma > 8$  RTT

CTS  

$$\chi^2 = \frac{(n-1) \cdot S^2}{\sigma^2}$$

$$= \frac{(12-1) \cdot 10^2}{8^2}$$

$$= 17.188$$

P-value  

 $\rightarrow \chi^2_{cdf}(17.188, \infty, 11)$ 

$$= .102$$

$P\text{-value} > \alpha$   
 Valid claim .102 > .1  
 FTR the claim

$H_0$  valid  
 $H_1$  invalid

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Given:  $H_0: \sigma \geq 15$       Claim is  $H_0$   
 $n=10$  ,  $S=12$  ,  $\alpha=.02$

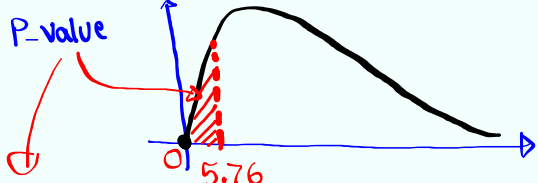
Test the claim.  $\rightarrow df = n-1 = 9$

$H_0: \sigma \geq 15$  claim  
 $H_1: \sigma < 15$  LTT

CTS  

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

$$\chi^2 = 5.76$$

P-value  

 $\chi^2_{cdf}(0, 5.76, 9) = .236$

$P\text{-value} > \alpha$   
 .236 > .02

$H_0$  valid  $\rightarrow$  Valid claim  
 $H_1$  invalid

FTR the claim

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I claim standard deviation of ages of all students is 8 yrs.  $\sigma = 8$

A sample of 15 students, standard dev. of their ages was 10 yrs.  $n = 15$   
 $s = 10$

Test the claim.  $\alpha = 0.05$

$H_0: \sigma = 8$  claim

$H_1: \sigma \neq 8$  TTT

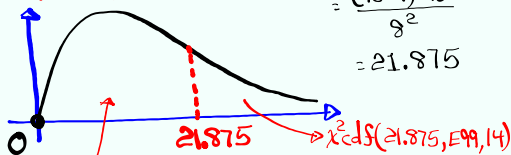
CTS

$$\chi^2 = \frac{(n-1) \cdot s^2}{\sigma^2}$$

$$= \frac{(15-1) \cdot 10^2}{8^2}$$

$$= 21.875$$

$df = n - 1 = 14$



$$\chi^2_{cdf}(0, 21.875, 14) = .919$$

$$= .081$$

$$P\text{-value} = 2(.081) = .162$$

P-value  $>$   $\alpha$   
 $.162 > .05$

$H_0$  Valid,  $H_1$  invalid

Valid claim

Fail to reject the claim

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