Math 227
Spring 2021
Lecture 26

38 randomly Selected SAT exams had a mean of 1200.

$n=38$

$\bar{x}=1200$

Dept. of education claims that the mean of all SAT exams is 1225.

$\mu=1225$

Assume standard deviation of all exams is 150, test the claim.

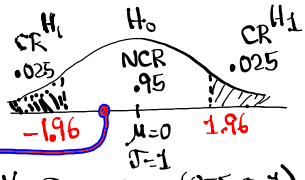
$\sigma=150$

No $\alpha \rightarrow .05$

$H_0: \mu=1225$ claim

$H_1: \mu \neq 1225$ TTT

C.V. Z-Dist, TTT $\alpha=.05$



CTS $Z=-1.027$

P-Value $P=.304$

Z-Test

CV $Z=\text{invNorm}(.975,0,1)$

CTS is in NCR

P-Value $>\alpha$ $\Rightarrow$ H_0 Valid $\rightarrow$ Valid Claim

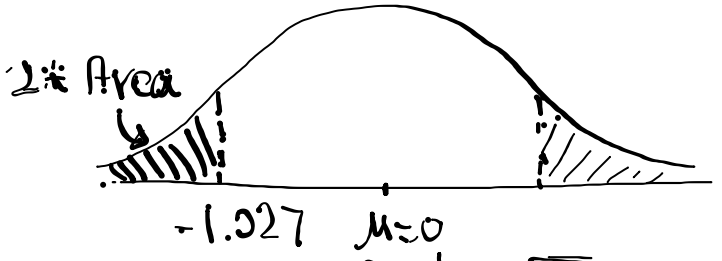
H_1 invalid

Support it

: FTR the claim

Given CTS $Z = -1.027$, TTT

Find P-value



2* normalcdf(-E99, -1.027, 0, 1) = .304

LA County claims that the mean rent of all 2B2B apartments in the county is at most $2000. $\mu \leq 2000$

In a sample of 20 such apartments in the county, their mean rent was $2250 with standard deviation of $100.

test the claim at $\alpha = .1$.

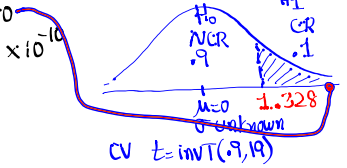
$n = 20$, $\bar{x} = 2250$
$s = 100$
σ Unknown

H_0: $\mu \leq 2000$ claim

H_1: $\mu > 2000$ RTT

C.V. T-Dist RTT
$\alpha = .1$ $df = n-1 = 19$

CTS $t = 11.180$
P-Value $P = 4.2 \times 10^{-10}$
T-Test



CTS is in CR
P-Value $\leq \alpha$

CV $t = \text{invT}(.9, 19)$

H_0 invalid, H_1 Valid

Invalid claim
Reject the claim

Testing one population Standard deviation:

$H_0: \sigma = \sigma_0$ $\quad H_0: \sigma \leq \sigma_0$ $\quad H_0: \sigma \geq \sigma_0$

$H_1: \sigma \neq \sigma_0$ $\quad H_1: \sigma > \sigma_0$ $\quad H_1: \sigma < \sigma_0$

TTT $\quad$ RTT $\quad$ LTT

P-value Method:

CTS $\chi^2 = \dfrac{(n-1)s^2}{\sigma^2}$

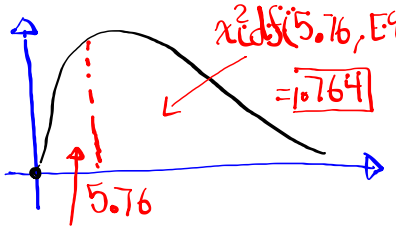
to find P-value use χ^2 cdf with $df = n-1$

Given $H_0: \sigma = 5$ claim H_0

$n = 10$, $S = 4$, $\alpha = .02$

$H_0: \sigma = 5$ claim CTS $\chi^2 = \dfrac{(n-1)s^2}{\sigma^2} = \dfrac{9 \cdot 4^2}{5^2}$

$H_1: \sigma \neq 5$ TTT $\quad \chi^2 = 5.76$



χ^2cdf(0, 5.76, 9) = .236

P-value = 2 * Smaller Area

= 2(.236)

= .472

P-value $> \alpha$ $\quad$ H0 valid $\quad$ Valid claim

H1 invalid $\quad$ FTR the claim

LA times has reported that Standard deviation of all rentals is at most $250. $\sigma \leq 250$

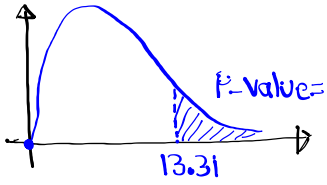
In a survey of 12 rentals, their Stand. dev. was $275.

Test the claim at $\alpha = .1$

H_0: $\sigma \leq 250$ Report CTS $\chi^2 = \frac{(n-1)s^2}{\sigma^2}$

H_1: $\sigma > 250$ RTT $= \frac{(12-1)\cdot 275^2}{250^2}$

$= 13.31$



P-value = χ^2cdf(13.31, E99, 11)

$= .274$

P-value $> \alpha$ H_0 valid H_1 invalid ∴ FTR the Report

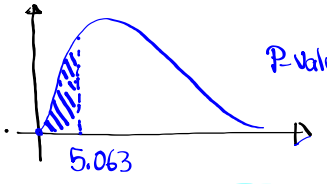
CNN claims that stand. dev. of ages of all voters is at least 8 yrs. $\sigma \geq 8$

In a Sample of 10 voters, the stand. dev. of their ages was 6 yrs.

Test the claim. C.T.S. $\chi^2 = \frac{(n-1)s^2}{\sigma^2}$

H_0: $\sigma \geq 8$ claim ↳NO α → .05 $= \frac{(10-1)\cdot 6^2}{8^2}$

H_1: $\sigma < 8$ LTT $= 5.063$



P-value = χ^2cdf(0, 5.063, 9)

$= .171$

P-Value $> \alpha$ H_0 Valid → Valid claim

.171 > .05 H_1 invalid Support the claim

FTR The claim