Math 110
Winter 2021
Lecture 18

Testing One Population Proportion P:

$H_0: P = P_0$ $\quad H_0: P \leq P_0$ $\quad H_0: P \geq P_0$

$H_1: P \neq P_0$ $\quad H_1: P > P_0$ $\quad H_1: P < P_0$

TTT $\quad$ RTT $\quad$ LTT

C.V. $\quad$ invNorm

Computed Test Statistic $\Rightarrow$ 1-PropZTest

P-Value

Proceed with testing chart

Final Answer

Reject the claim OR Fail-to-Reject the claim

CNN claims that 32% of all voters support Certain law. $p=.32$

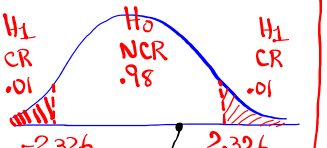
In a Sample of 480 voters, 35% of them Supported that law. $n=480$, $\hat{p}=.35$ $\Rightarrow x=n\hat{p}=480(.35)=168$

Use $\alpha=.02$ to test the claim.

H_0: $p=.32$ claim

H_1: $p\neq.32$ TTT

C.V. invNorm TTT $\alpha=.02$



$z_{.01}=$ invNorm(.99,0,1)

CTS $z=1.409$

P-value $p=.159$

1-Prop Z Test

$p_0=.32$

$x=168$

$n=480$

Prop $\neq p_0$

Traditional:

CTS is in NCR

H_0 valid

P-value:

P-value $>\alpha$ $\Rightarrow$ H_1 invalid

Valid claim

Support The claim

Fail-to-Reject the claim

Fox News claims that at most 60% of all teachers are in support of Zoom lectures. $p\leq.6$

In a Sample of 545 teachers, 68% of them were in support of Zoom lectures. $n=545$, $\hat{p}=.68$

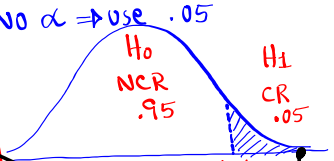
Use this Sample to test the claim. $x=n\hat{p}=545(.68)=371$

H_0: $p\leq.6$ claim

H_1: $p>.6$ RTT

C.V. invNorm RTT

No α $\Rightarrow$ use .05



$z_{.05}=$ invNorm(.95,0,1)

CTS $z=3.847$

P-value $p=5.98\times10^{-5}$

1-Prop Z Test

$p_0=.6$

$x=371$

$n=545$

Prop $>p_0$

calculate

CTS is in CR

P-value $\leq\alpha$ $\Rightarrow$ H_1 valid

H_0 invalid

Invalid claim

Reject the claim

Given: $n=725$, $x=305$, $H_1: p>.4$

$\alpha=.1$ Claim is H_1.

Test the claim.

$H_0: p \le .4$

$H_1: p>.4$ claim, RTT

CTS $z = 1.137$

P-value $P = .128$

1-PropZTest

$P_0 = .4$

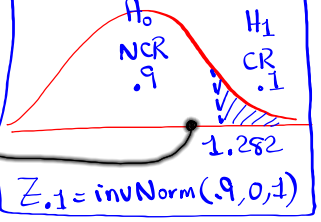
$x = 305$

$n = 725$

Prop $> P_0$

CV invNorm RTT

$\alpha = .1$



$Z_{.1} = \text{invNorm}(.9, 0, 1)$

CTS is in NCR. H_0 valid

P-value $> \alpha$ H_1 invalid.

Invalid claim

Reject the claim

Testing one Population mean μ:

$H_0: \mu = \mu_0$ $H_0: \mu \ge \mu_0$ $H_0: \mu \le \mu_0$

$H_1: \mu \ne \mu_0$ $H_1: \mu < \mu_0$ $H_1: \mu > \mu_0$

TTT LTT RTT

Case I: σ Known

CV invNorm

CTS $z =$ $\Rightarrow$ Z-Test

P-value $P =$

Proceed with Testing Chart

Final Ans:

Reject the claim OR Fail-to-Reject the claim

Given: $n=45$ $\bar{x}=82.5$ $H_0: \mu=79.8$

Claim is H_0, $\sigma=12.5$ $\alpha=.04$

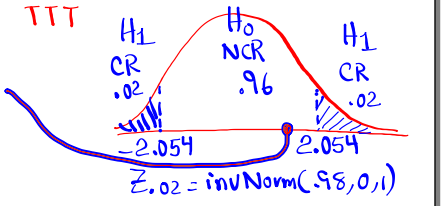
Test the claim.

$H_0: \mu=79.8$ claim

$H_1: \mu \neq 79.8$ TTT

σ Known

CV invNorm $\alpha=.04$ TTT



$z_{.02} = \text{invNorm}(.98,0,1)$

CTS $z=1.449$

P-value $P=.147$

σ Known

Z-Test

inpt:

$\mu_0=79.8$

$\sigma=12.5$

$\bar{x}=82.5$

$n=45$

$\mu \neq \mu_0$

Calculate

STATS

CTS is in NCR

P-value $> \alpha \Rightarrow$ H_0 valid, H_1 invalid

valid claim

Support the claim

FTR

Mt. SAC student club claim that the mean cost of all new textbooks is at least \$95. $\mu \geq 95$

The bookstore manager randomly selected 35 new textbooks, their mean price was \$92. $n=35$ $\bar{x}=92$

It is known that standard deviation of costs of all new textbooks is \$10.75. $\sigma=10.75$ Test the claim.

$H_0: \mu \geq 95$ claim

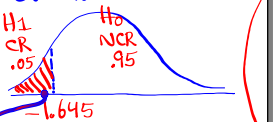
$H_1: \mu < 95$ LTT

No α

$\alpha=.05$

σ Known

CV invNorm LTT $\alpha=.05$



$z_{.05} = \text{invNorm}(.05,0,1)$

CTS $z=-1.651$

P-value $P=.049$

σ Known

Z-Test

inpt: STATS

$\mu_0=95$

$\sigma=10.75$

$\bar{x}=92$

$n=35$

$\mu < \mu_0$

CTS is in CR

P-value $\leq \alpha \Rightarrow$ H_1 valid, H_0 invalid

Invalid claim

Reject the claim

Testing one Population mean μ:

$H_0: \mu = \mu_0$ $\quad H_0: \mu \geq \mu_0$ $\quad H_0: \mu \leq \mu_0$

$H_1: \mu \neq \mu_0$ $\quad H_1: \mu < \mu_0$ $\quad H_1: \mu > \mu_0$

TTT $\quad$ LTT $\quad$ RTT

Case II: σ unknown

CV invT $df = n-1$

CTS $t =$ $\Rightarrow$ T-Test

P-value $P =$

Proceed with Testing Chart

Final Ans:

Reject the claim OR Fail-to-Reject the claim

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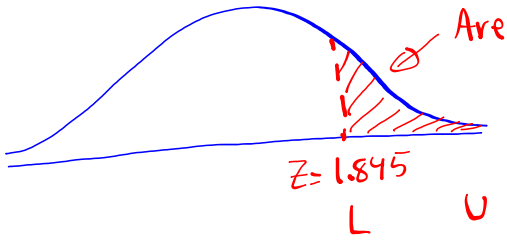
what is P-value ?

It is the area of the tail marked by CTS in the graph of prob. dist.

Area *2 is the P-value only when Performing TTT.

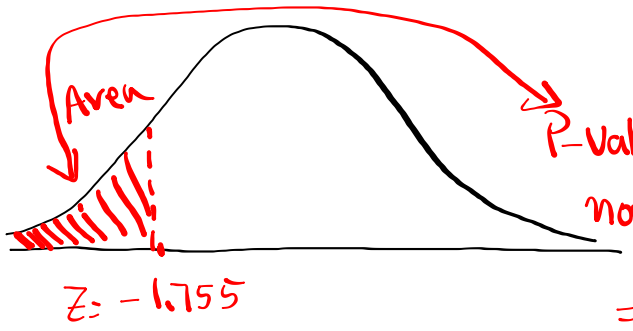
CTS $Z = 1.845$, RTT, find P-value.



= normalcdf(1.845, E99, 0, 1)

= 0.0331

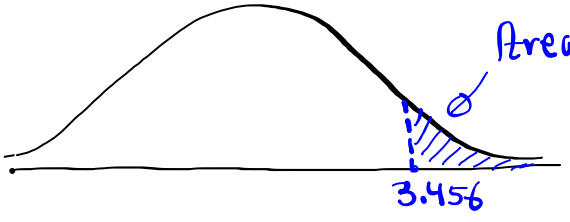
CTS $Z = -1.755$, LTT Find P-value



P-value = normalcdf(-E99, -1.755, 0, 1)

= .040

CTS $Z = 3.456$, TTT, Find P-value

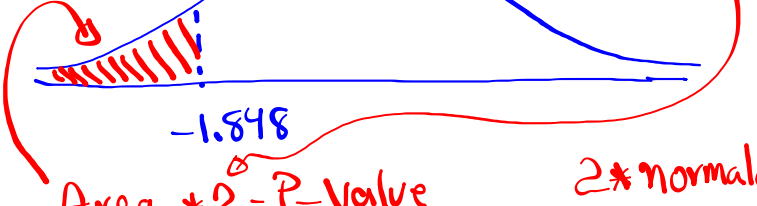


Area * 2 = P-value

2 * normalcdf(3.456, E99, 0, 1)

5.5×10^{-4}

CTS $Z = -1.848$, TTT, Find P-value.

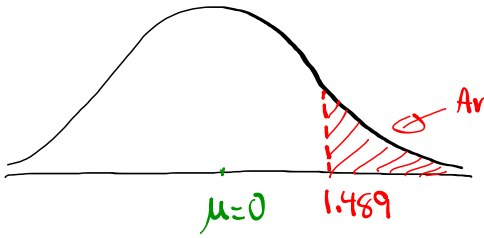


Area * 2 = P-value

2 * normalcdf(-E99, -1.848, 0, 1)

= .065

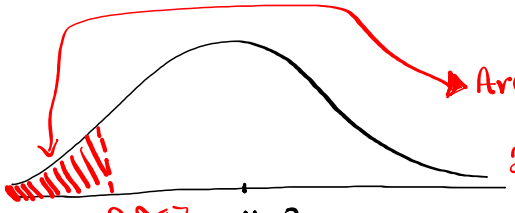
CTS $t = 1.489$ $df = 8$ RTT Find P-value



$= tcdf(1.489, E99, 8)$

$= .087$

CTS $t = -2.987$ $df = 12$ TTT Find P-value.

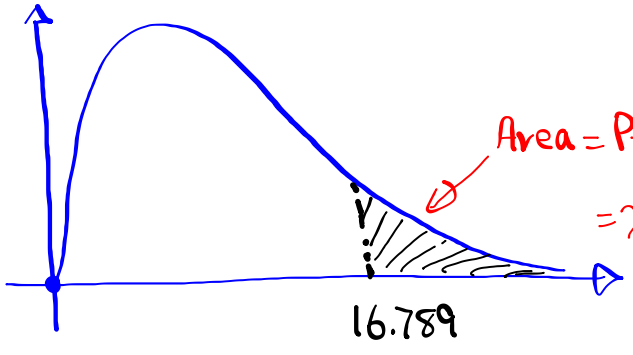


Area * 2 = P-value

$2 * tcdf(-E99, -2.987, 12)$

$= .011$

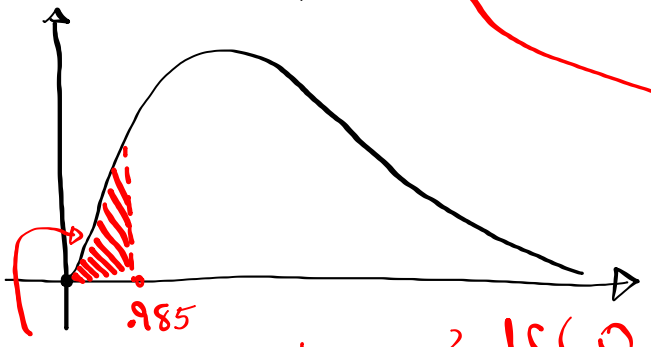
CTS $\chi^2 = 16.789$ $df = 14$ RTT Find P-value.



$= \chi^2 cdf(16.789, E99, 14)$

$= .268$

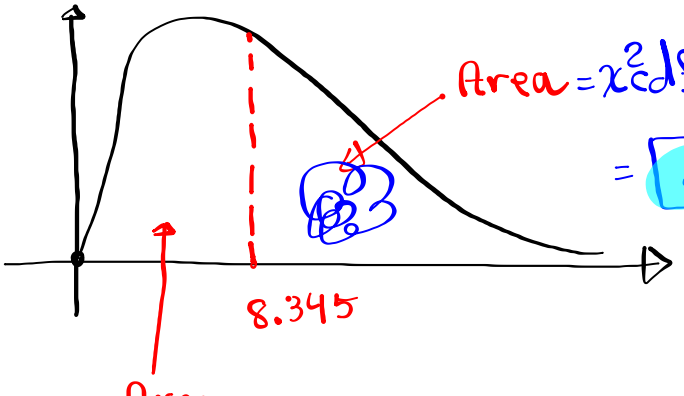
CTS $\chi^2 = .985$, $df = 9$, LTT, Find P-value.



Area = P-Value = $\chi^2cdf(0, .985, 9)$

$= 5.3 \times 10^{-4}$

CTS $\chi^2 = 8.345$, TTT, $df = 9$ Find P-value.



Area $= \chi^2cdf(8.345, E99, 9)$

$= .4998$

Area $= \chi^2cdf(0, 8.345, 9)$

$= .5002$

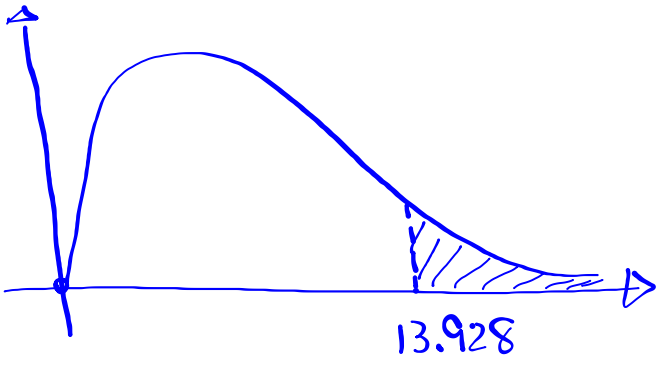
P-Value = 2 * Smaller Area

$= 2 * (.4998)$

$= .9996$

CTS $F = 13.928$ $Ndf = 3$ $Ddf = 25$ RTT

Find P-value.



$fcdf(13.928, E99, 3, 25)$

$= \boxed{1.5 \times 10^{-5}}$