

Math 110
Winter 2021
Lecture 18



Testing One Population Proportion

$$H_0: P = P_0$$

$$H_0: P \leq P_0$$

$$H_0: P \geq P_0$$

$$H_1: P \neq P_0$$

$$H_1: P > P_0$$

$$H_1: P < P_0$$

TTT

RTT

LTT

C.V. Use invNorm

Computed Test Statistic CTS \Rightarrow 1-Prop Z Test

P-value

P

we Proceed with Testing chart

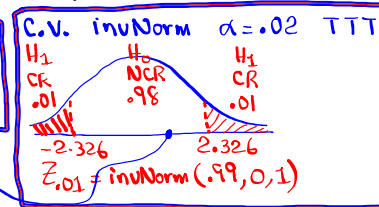
Final Conclusion about the claim.

Reject the claim or Fail-to-Reject the claim

CNN claims that 35% of all students are in favor of Zoom lectures.

In a sample of 450 students, 36% of them were in favor of Zoom lectures.
 $n=450$
 $\hat{p}=0.36 \Rightarrow x=n\hat{p}=450(.36)=162$
 Use $\alpha=.02$ to test the claim.

$H_0: P=.35$ Claim
 $H_1: P \neq .35$ TTT



CTS $Z = .445$
 P-value $P = .657$

1-Prop Z Test

$P_0 = .35$

$x = 162$

$n = 450$

Prop. $\neq P_0$

Calculate

Traditional Method:

CTS is in NCR $\Rightarrow H_0$ Valid
 H_1 invalid

P-value Method:

$.657 > \alpha \Rightarrow H_0$ Valid
 H_1 invalid

Valid Claim

\Rightarrow Fail to Reject the claim

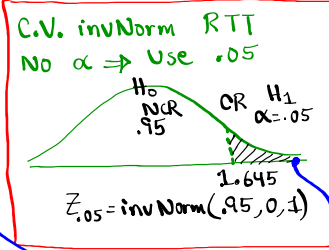
FoxNews claims that at most 60% of all voters support certain law.
 $\leq .6$

In a sample of 835 voters, 64% of them supported that law.

$n=835$
 $\hat{p}=.64 \Rightarrow x=n\hat{p}=835(.64)=534.4$

Use this sample to test the claim. $x=535$

$H_0: P \leq .6$ Claim
 $H_1: P > .6$ RTT



CTS $Z = 2.402$

P-value $P = .008$

1-Prop Z Test

$P_0 = .6$

$x = 535$

$n = 835$

Prop $> P_0$

Calculate

CTS is in CR $\Rightarrow H_0$ invalid
 H_1 valid

P-value $\leq \alpha \Rightarrow H_0$ invalid
 $.008 \leq .05 \Rightarrow H_1$ valid

Invalid Claim

\Rightarrow Reject the claim

Mt. SAC claims that **less than 15%** of all students smoke on campus.
 $P < .15$

In a survey of **320 students**, **42 of them** had smoked on campus.
 $n=320$
 $x=42$

Use **$\alpha=.1$** to test the claim.

$H_0: P \geq .15$
 $H_1: P < .15$ claim, LTT

C.V. invNorm LTT $\alpha=.1$

$\bar{z} = \text{invNorm}(.1, 0, 1)$

CTS $Z = -.939$

P-value $P = .174$

1-PropZTest
 $P_0 = .15$
 $x = 42$
 $n = 320$
 $\text{Prop} < P_0$
Calculate

CTS is in NCR H_0 valid
 $P\text{-value} > \alpha \Rightarrow H_1$ invalid

Final Conclusion
 invalid claim \Rightarrow Reject the claim

Testing one Population mean μ :

$H_0: \mu = \mu_0$	$H_0: \mu \geq \mu_0$	$H_0: \mu \leq \mu_0$
$H_1: \mu \neq \mu_0$	$H_1: \mu < \mu_0$	$H_1: \mu > \mu_0$
TTT	LTT	RTT

Case I: σ known

<p>C.V. invNorm</p> <p>CTS $Z \Rightarrow Z\text{-Test}$</p> <p>P-Value P</p>	<p>Proceed with testing chart</p> <p style="color: red;">Final Conclusion:</p> <p style="color: blue;">Reject the claim or FTR the claim</p>
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CNN claims the mean age of all nurses in USA is 42.5 Yrs. $\mu = 42.5$

In a sample of 48 nurses, their mean age was 40.8 Yrs. $n=48, \bar{x}=40.8, \sigma=10.3$

It is known that standard deviation of ages of all nurses in USA is 10.3 Yrs.

Use $\alpha = .04$ to test the claim.

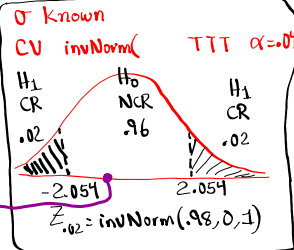
$H_0: \mu = 42.5$ claim
 $H_1: \mu \neq 42.5$ TTT

CTS $Z = -1.143$
 P-value $P = .253$
 σ Known
 Z-Test

inpt:

$\mu_0 = 42.5$
 $\sigma = 10.3$
 $\bar{x} = 40.8$
 $n = 48$
 $\mu \neq \mu_0$
 Calculate

STATS



CTS is in NCR H_0 Valid
 $P\text{-value} > \alpha \Rightarrow H_1$ invalid

Valid claim
 \Rightarrow Fail-To-Reject the claim

Fox News claims the mean salary for all nurses in LA County is at least \$6250/mo. $\mu \geq 6250$

In a sample of 40 nurses, their mean salary was \$6195/mo. $n=40, \bar{x}=6195, \sigma=500$

Dept. of health Services has reported that standard deviation of salaries of all nurses is \$500.

use $\alpha = .01$ to test the claim.

$H_0: \mu \geq 6250$ claim
 $H_1: \mu < 6250$ LTT

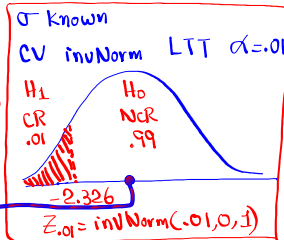
CTS $Z = -.696$
 P-value $P = .243$
 σ Known

Z-Test

inpt:

$\mu_0 = 6250$
 $\sigma = 500$
 $\bar{x} = 6195$
 $n = 40$
 $\mu < \mu_0$

Stats



CTS is in NCR

$P\text{-value} > \alpha$

H_0 Valid $\hat{=}$ H_1 invalid

Valid claim

\Rightarrow Support the claim

FTR

Given: $n=35$, $\bar{x}=94.75$, $H_0: \mu \leq 89.95$,
 $\sigma=12.50$, claim is H_0 .

Test the claim.

$H_0: \mu \leq 89.95$ Claim
 $H_1: \mu > 89.95$ RTT

C.V. invNorm RTT
 No $\alpha \Rightarrow .05$

CTS $Z = 2.272$
 P-value $P = .012$
 σ Known

Z-Test
 $\mu_0 = 89.95$
 $\sigma = 12.50$
 $\bar{x} = 94.75$
 $n = 35$
 $\mu > \mu_0$

CTS is in CR
 P-value $\leq \alpha$
 H_0 invalid, H_1 valid

Invalid claim
 Reject the claim

Testing one Population mean μ :

$H_0: \mu = \mu_0$	$H_0: \mu \geq \mu_0$	$H_0: \mu \leq \mu_0$
$H_1: \mu \neq \mu_0$	$H_1: \mu < \mu_0$	$H_1: \mu > \mu_0$
TTT	LTT	RTT

Case II: σ Unknown

C.V. invT $df = n - 1$ Proceed with testing chart

CTS $t \Rightarrow$ T-Test

P-Value P

Final Conclusion:

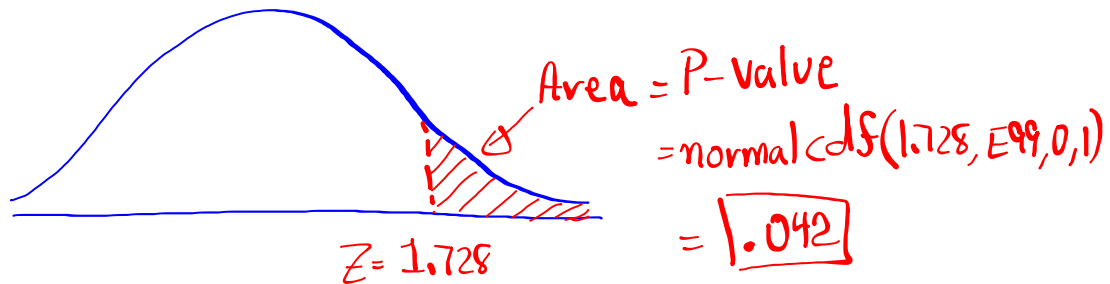
Reject the claim
 or
 FTR the claim

What is P-value?

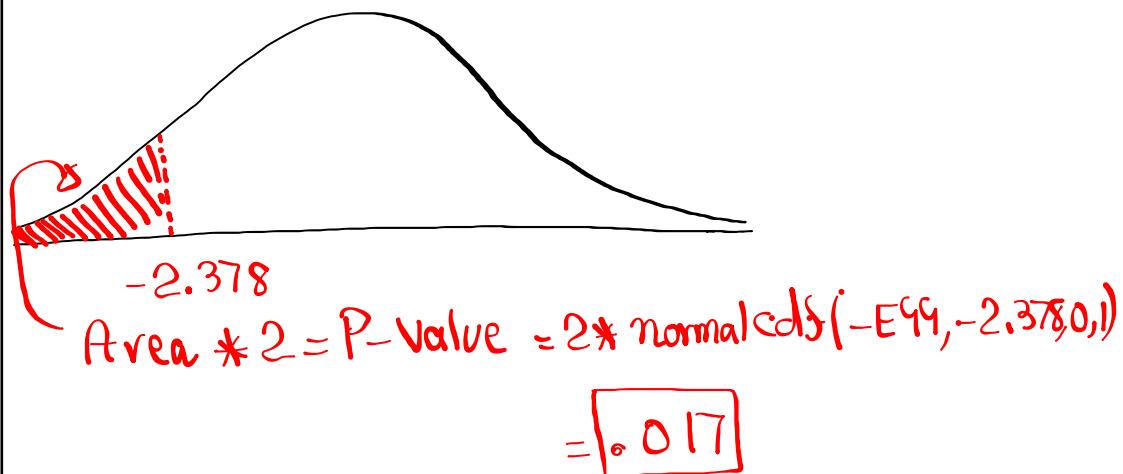
It is the area under the curve of prob. dist. to closest tail marked by the CTS.

Area * 2 is the p-value when doing TTT.

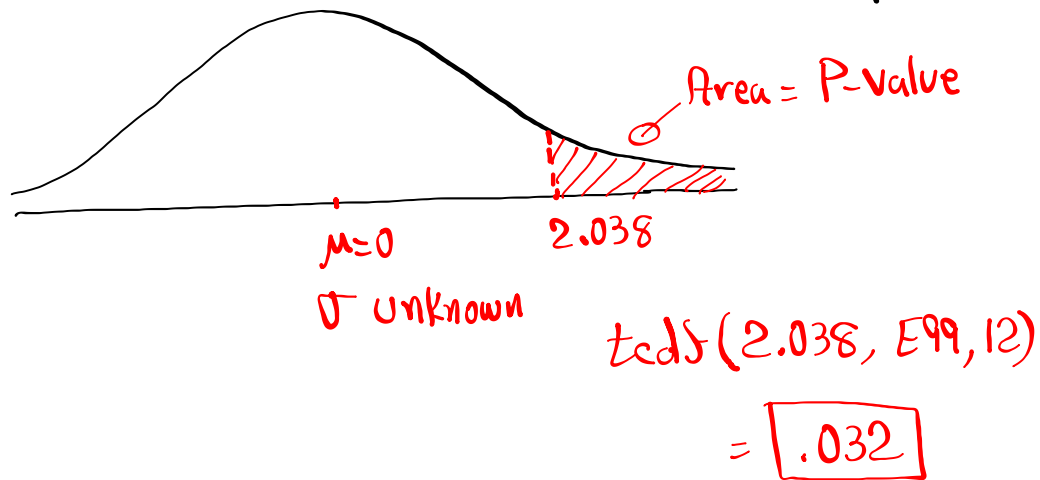
CTS $Z=1.728$ RTT Find P-value.



CTS $Z=-2.378$, TTT, Find P-value



CTS $t=2.038$ RTT $df=12$ Find P-value



CTS $t=-3.728$, TTT, $df=19$, Find P-value

