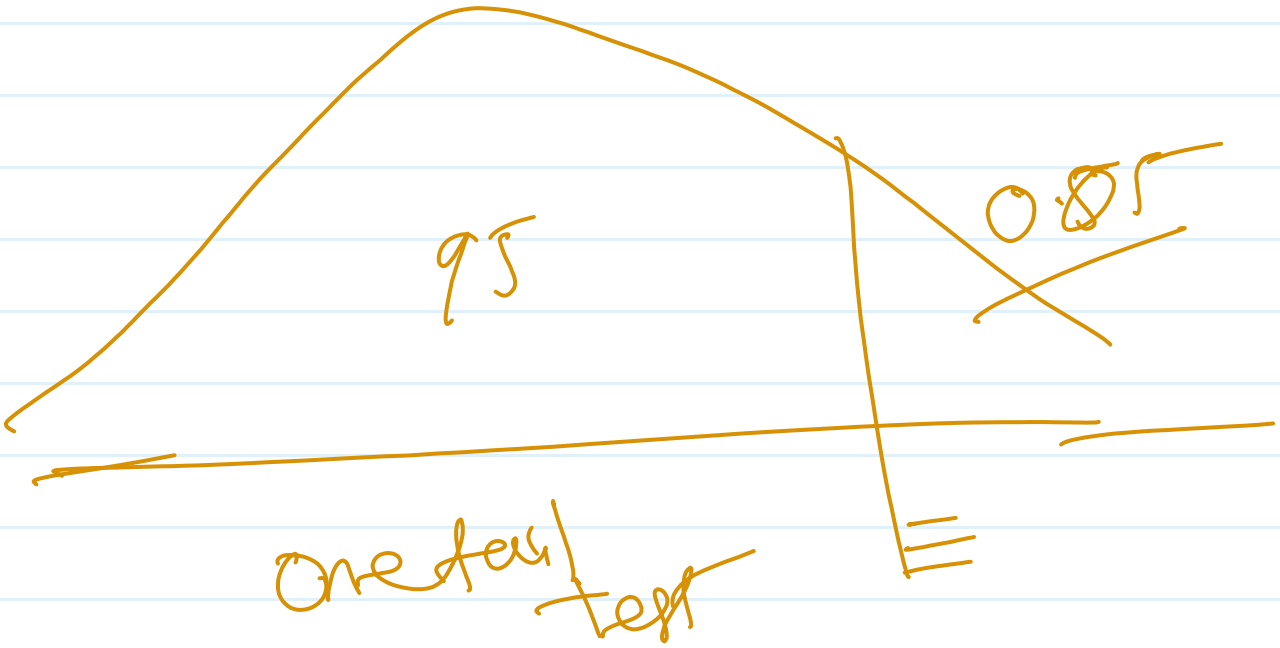
✱ critical value / area / Rejion

Domain expert -

critical value = α (significant value)

by default 0.05

critical Rejion



Hypothesis testing

=> what is the avg height of people in India?

" It isnot possible to go every one and ask them. the population N with some info.

out of this N we take some sample

n → to perform some experiment

like T - test ✓
Z - test ✓
chi-square test ✓

Hypothesis testing :-

$H_0 = ll$ - null hypothesis

→ we fail to reject null Hypo.

$H_1 \neq ll$

→ we reject null hypo. and accept Alternet hypo.

Z - test

Prob:- In a population the avg IQ. $\mu = 100$ with $\sigma = 15$ than the doctor tested a new medication to find out wheather it increase the IQ or decrease the IQ.

$>$ IQ

$<$ IQ

After one month sample of 30 - participant were taken and 30 participant had $\bar{x}$ mean is 140.

Did this medication effect intelligence given is significant value α is 0.05

Sol^n

$H_0 = \mu$ -

$H_1 \neq \mu$ -

$\alpha = 0.05$

$/2$

$= 0.025$

C.I. = $1 - 0.025$

$= 0.975$

value of 0.975 in z table is 1.96 to -1.96 for negative.

< -1.96 } H_1

> 1.96 }

Z test

$$z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}}$$

$$= \frac{140 - 100}{15/\sqrt{30}}$$

$$\boxed{Z = 14.65}$$

state result is 14.65 is not fall b/w -1.96 to $+1.96$ so we reject null hypo and Accept alternet hypo.

Z-test

$n, \mu, \sigma,$

sample size => 30

T-test

$n, \bar{x}, s$

Sample size < 30

Eg (2)

$$z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}}$$

$\bar{x} = 92$

$\sigma = 15$

$n = 40$

$\mu = 120$

$\alpha = 0.05$

C.I. = 0.975

$z_{table} = 1.96$

$$= \frac{92 - 120}{15/\sqrt{40}}$$

$$= -11.80$$

Reject null hypothesis and Accept Altanet hypothesis.

T-test

✡ On the verbal section of CAT sample of 25 test taken has a mean of 520 with standard deviation of sample is 80. Confidence Interval 95%.

Soln

$\bar{X} = 520$

$n = 25$

$s = 80$

$\alpha = 0.05/2 = 0.025$

$Z_{0.975} = 1.96$

t-test

(+ve) $\Rightarrow \quad \bar{x} \pm t_{\alpha/2}\left(\frac{s}{\sqrt{n}}\right)$

$= \quad 520 + t_{0.025}\left(\frac{80}{\sqrt{25}}\right)$

$\Rightarrow \quad 520 + 2.064 \times \frac{80}{5}$

$\Rightarrow \quad 553.02$

(-ve)

$= \quad 520 - t_{0.025}\left(\frac{80}{\sqrt{25}}\right)$

$= \quad 520 - 2.064 \times 80/5$

$\Rightarrow \quad 486.97$

553.02 — 486.97

$H_0 = \mu$ ✓

$H_1 \neq \mu$

520 is fall b/w 486 to 553 so that we fail to reject null hypo.

chi-square test.

E.g. In the 2000 USA census the age of individual in a small town were found to be the following.

Less than 18	18-35	Greater 35
20%	30%	50%

In 2010 age of $n = 500$ individual were sample below are result

<18	18-35	>35
121	288	91

is there any change in distribution.

Sol $H_0 = ll$

$H_1 \neq ll$

$\alpha = 0.05$

C.I. = 95%

Degree of freedom $= (n-1)$

$= 3 - 1$

$= 2$

There are three category $= 3 - 1 = 2$

Decision rule

$\chi^2 = 5.99$

$> 5.99 = H_1$

Chi-square test

$$\chi^2 = \sum \frac{(f_o - f_e)^2}{f_e}$$

f_o	<18	$18-35$	>35
	121	288	91

f_e	$\frac{500 \times 20}{100}$	$\frac{500 \times 30}{100}$	$\frac{500 \times 50}{100}$
$\Rightarrow$	100	150	250

$$\chi^2 \Rightarrow \frac{(121-100)^2}{100} + \frac{(288-150)^2}{150} + \frac{(91-250)^2}{250}$$

$$\chi^2 \Rightarrow 232.94$$

$$> 5.99$$

State $\Rightarrow$ We fail null hypothesis and Accept alternet hypothesis.