CHAPTER # 10
HYPOTHESES TESTING

"A statistical hypothesis is a conjecture about a population parameter which may or may not be true."

NULL HYPOTHESIS (H_0):
- A hypothesis to be tested.

ALTERNATIVE HYPOTHESIS (H_1):
- A hypothesis to be considered as an alternative to the null hypothesis.

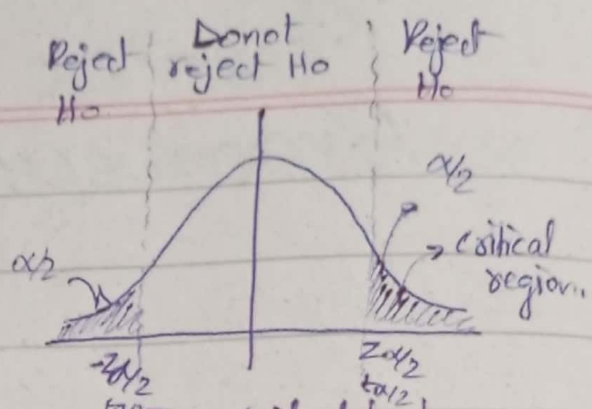
"CHOOSIN THE HYPOTHESIS"

- Null Hypothesis:
  We can express null Hypothesis as,
  $$H_0 : \mu = \mu_0$$

- Alternative Hypothesis: (ismein kabhi equal sign nhi aayeg like $=, \geq, \leq$)
  The choice of alternative hypothesis depends on and should reflect the purpose of the test.

If the primary concern is deciding whether a population mean μ, is DIFFERENT from a specified value μ_0, we express, $\boxed{H_1 : \mu \neq \mu_0}$ (Decision)

↳ Two tailed test

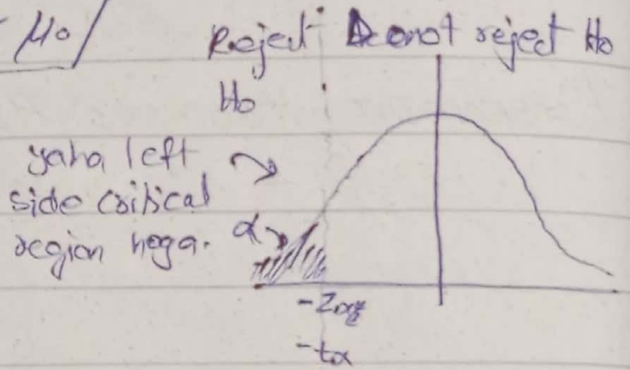


Two tailed test

② If the primary concern is deciding whether a population mean μ, is less than μ_0, then H_1 is

$\boxed{H_1 : \mu < \mu_0}$

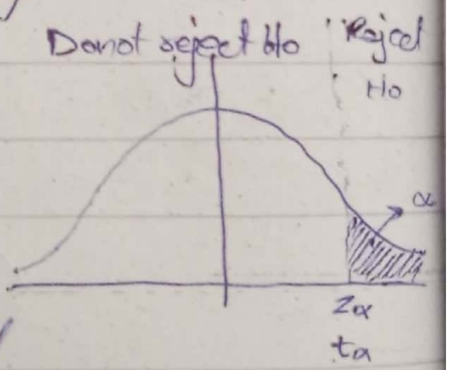
↳ Left Tailed test
↳ Validity (claim)



③ If the primary concern is deciding whether μ is greater than μ_0, we express

$\boxed{H_1 : \mu > \mu_0}$

↳ Right Tailed test
↳ Research



⇒ A hypothesis test is called one-tailed if it is either left or right tailed

Q. A snack food company produces a 454-g bag of pretzels. Although the actual net weighs deviate slightly from $454g & vary from one bag to another, the company insist that the mean net weight of the bag is 454g. As part of Quality Assurance periodically performs a hypothesis test to decide whether the packaging machine is working properly, that is to decide whether the mean net wt of all bag is 454g.

$H_0 : \mu = 454g$ (packaging machine working properly)

$H_1 : \mu \neq 454g$ (" " not " " ")

Two tailed test.

Q: A manufacture of a certain brand of rice cereal claims that the avg saturated fat contents doesnot exceed 1.5 grams per serving. State H_0 & H_1.

$H_0 : \mu \leq 1.5$ means less than equal to

$H_1 : \mu > 1.5$

"TYPE-I & TYPE-II ERROR"

→ There are two types of incorrect decisions.

① TYPE I Error : Rejecting H_0 when it is infact TRUE

② TYPE II Error : Not Rejecting (means accepting) H_0 when it is FALSE

Decision	TRUE	FALSE
Do not Reject H_0	Correct Decision	TYPE II error
Reject H_0	TYPE I error	Correct Decision

$\mu = 275$, $\alpha = 0.05$

$H_0 : \mu = 275$

$\mu < 275$

→ The probability of happening a type I error is called "significance level" of the hypothesis test. denoted by "α"

"METHODS TO TEST HYPOTHESIS"

→ How to select Correct Test?

↳ If σ is known, use the "z-test". The variable must normally distributed if $n < 30$.

↳ If σ is unknown but $n \geq 30$, use "t-test"

↳ If σ is unknown and $n < 30$, use "t-test. (The population must be approximately normaly distributed).

"Z - TEST"

Q: Test the claim that true mean no. of TV sets in US homes is equal to 3. Assume $\sigma = 0.8$, $\alpha = 0.05$, $n = 100$, $\bar{x} = 2.84$

① $H_0 : \mu = 3$

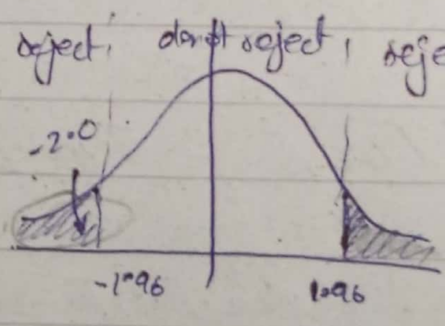
$H_1 : \mu \neq 3$

② $\boxed{\alpha = 0.05}$ $Z_{\alpha/2} = Z_{0.025} = 1.96$

③ $z = \dfrac{\bar{x} - \mu}{\sigma/\sqrt{n}}$

④ $z = \dfrac{2.84 - 3}{\frac{0.8}{\sqrt{100}}} = -2.0$

⑤



⑥ Conclusion :

Reject H_0.

agr critical region mein aata "z" value to reject warna accept H_0.

Critical Value Approach:

Q: Jack tells Jean that his average drive of a golf ball is 275 yards. Jean is doubtful. To that end, Jack hits 25 drives. The result in yrds is given below. The sample mean of Jack's 25 drive is only 264.4 yrds. Jack still maintains that on avg he drives a golf ball 275 yd. At 5% significance level, do the data provide sufficient evidence to conclude that Jack's mean driving distance is less than 275 yds.

as σ is unknown so we use "t-test"

① $H_0 : \mu = 275$ (Jack's claim)

$H_1 : \mu < 275$ (Jean's suspicion)

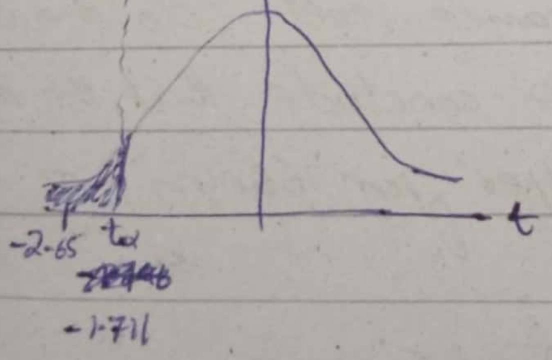
② $\alpha = 0.05$ (5% sign level) ∴ $t_\alpha = -1.711$

③ $t = \dfrac{\bar{x} - \mu}{s/\sqrt{n}} = \dfrac{264.4 - 275}{4} = -2.65$

↳ ye data se nikal tha humne (20)

↳ lies in critical region

④



⑤ Conclusion: Reject H_0