

CHAPTER #05

Statistical Inference

Estimation Hypothesis Inference:-

Statistical Inference:-

It is the branch of statistics in which we gain information from sample data and draw some result about the characteristics of population parameter.

Statistical inference is based on the principles of sampling

Types

- ⇒ Estimation of parameter
- ⇒ Testing of Hypothesis-

Testing of Hypothesis:-

It is a process which enables us to take decision about the unknown value of population parameter on the basis of sample observation at

α level of significance-

In it we either accept or reject the statement about parameter

7 Estimation :-

It is the procedure by which we estimate the unknown value of the population parameter by using the sample observation $x_1, x_2, x_3, \dots, x_n$

Types :-

- ▶ point estimation
- ▶ interval estimation.

> Statistical Hypothesis :-

It is a statement about the unknown value of one or more population parameters. This statement may be true or false.

Example:-

Average marks of Federal Board students are higher than Punjab board.

> Simple Hypothesis:-

A hypothesis in which all the parameters of distribution are specified is called simple hypothesis.

Example:-

If average age of ICS students is 16 years i.e., $H_0: \mu = 16$

Composite Hypothesis:-

A hypothesis in which all the parameters of the distribution are not completely specified is called composite hypothesis.

Denoted by :-

H_0

e.g:-

The hypothesis $H_0: \mu \leq 16$ or
 $H_0: \mu \geq 16$

→ Alternative Hypothesis:- Research Hypothesis:-

The hypothesis which is opposite from the Null hypothesis & which is automatically accepted when the null hypothesis is rejected is called alternative Hypothesis.

Example:-

if Null Hypothesis is $H_0: \mu = 15$
then alternative hypothesis may be
 $H_1: \mu \neq 15$

→ Null Hypothesis:-

- The hypothesis which we wish to test is called null hypothesis.
- It is denoted by H_0 and it is tested for the purpose of possible rejection.
- It always contain the sign of equality:-

Example:-

If we state The average age of first year student is "15" years then $H_0: \mu = 15$ is Null Hypothesis-

↳ **Level of Significance:-**

Significance Level

The probability of rejecting the null Hypothesis - called level of significance
It is denoted by α

Example:-

Teacher fail the student in exam but actually he/she pass the exam-

↳ **Test Statistics:-**

A statistics used as a basis for deciding whether null hypothesis should be rejected is called test statistics.

↳ **Critical Region:-**

A set of values for test statistics that lead to rejection

of null hypothesis is called critical region or rejection region -

↳ Acceptance Region:-

The set of values for test statistics that lead to accept the null hypothesis is called acceptance region -

↳ Critical region:-

A value which separates rejection and acceptance region is called critical value

↳ Type I Error: Size of test.

- Probability of rejecting true null Hypothesis is called type I error.
- It is denoted by α

• Example:-

Teacher fail the student in exams but actually he/she pass the exam -

Range :- 0-1

↳ Type II Error:

probability of accepting false null hypothesis is known as type II error

- It is denoted by β

• Example:-

Teacher pass the student in exams but actually he/she fail the exam.

↳ Power of test:-

The power of a test is the probability of rejecting a null hypothesis when it is false

Examples:-

Teacher fail the student who actually fail in test.

General procedure for testing Hypothesis about μ or mean \bar{x} (known)

1 - Formulation of Hypothesis

null Hypothesis $H_0 : \mu = \mu_0$ \rightarrow given ho ga
 \rightarrow nhi ho ga to 0 put
kren ga
alternative hypothesis $H_1 : \mu \neq \mu_0$ \rightarrow general notation

2 Level of Significance

$\alpha = 0.05$ or 5% \rightarrow if not given than we put 5%

3. Test statistics.

$$Z = \frac{\bar{X} - \mu_0}{\sigma / \sqrt{n}}$$

\rightarrow given ho ga

4 - Critical region:

Rejection of H_0 if

5 - Calculation:

6 - Conclusion:

\rightarrow Critical region hum na H_0 ko chkh ky banana ha