Testing of Hypothesis

***Introduction***

In layman language, hypothesis can be understood as guessing or assumption. It is a testable assumption. It is a statement which you make before any research which you further verify that it should be rejected or accepted.

There is always some contention about the value (s) of parameter are the relationship between parameters. When parametric values are unknown, we estimate them through sample values. If the sample value is exactly the same as per our contention, there is no hitch in accepting it. And if it is far from our contention, there is no reason to accept it. But the problem arises when the sample provides a value which is neither exactly equal to the parametric value nor too far. In that situation one has developed some procedure (s) which enables one to decide whether to accept a contended (hypothetical) value or not on the basis of sample values such a procedure is known as testing of hypothesis.

            There can be more than one procedure to test a hypothesis. If so, which one to choose out of many tests at hand. For this purpose, many properties of tests have been put forward. A test with maximum virtues is most preferred one. So we have to deal with hypothesis, test procedure and their properties. The theory of testing parametric statistical hypotheses was originally set forth by J. Neyman (1928) and Karl Pearson (1933).

            Hypothesis testing is used to assess the plausibility of a hypothesis by using sample data. The test provides evidence concerning the plausibility of the hypothesis, given the data. Statistical analysts test a hypothesis by measuring and examining a random sample of the population being analyzed.

*Coming towards the* *definition*…..

***Definition***

A statistical test of hypothesis is a rule or procedure which makes one to decide about the acceptance or rejection of the hypothesis. A statistical hypothesis is some statement or assertion about a population or equivalently about the probability distribution characterizing a population, which we want to verify on the basis of information available from the sample.

**e.g.**  Suppose in a crime scenario, a Judge assumes that a person charged with a crime is innocent and subject this assumption (hypothesis) to verification by reviewing the evidence and hearing testimony before reaching to any decision.

If the evidence are against that person it means that the person is not innocent i.e. the hypothesis was rejected.

*Coming towards the terminologies*…..

***Terminologies***

*Null Hypothesis and Alternative Hypothesis*

* ***Null Hypothesis*** :- According to *Fischer*, any hypothesis tested for its possible rejection is called a *Null Hypothesis*. Or in layman language the hypothesis of “No Difference” is called Null Hypothesis.

It is denoted by H0.

* ***Alternative Hypothesis*** :- *Alternative Hypothesis* is a statement about the population parameter(s) which provides an alternative to Null Hypothesis within the range of parameters.

It is denoted by H1 or HA.

In the above example, for the Judge, the hypotheses maybe compared as

H0 : The person is innocent

Vs

H1 : The person is not innocent

Let us take another simple example

The life of electric bulb in general is 2000 hours. Here the hypotheses will be

H0 : µ = 2000

Vs

H1 : µ < 2000 or

H1 : µ > 2000 or

H1 : µ ≠ 2000

*Simple Hypothesis and Composite Hypothesis*

These terms can easily be understood by their notations as compared to their definitions.

* ***Simple Hypothesis*** :- If a statistical hypothesis completely specifies a distribution, it is known as *Simple Hypothesis.*

**e.g.** H0 : µ = µ0

Vs

H1 : µ = µ1

Here, H0 and H1 both are Simple Hypotheses.

* ***Composite Hypothesis*** :- If a statistical hypothesis does not completely specifies a distribution, it is known as *Composite Hypothesis.*

**e.g.** H0 : µ = µ0

Vs

H1 : µ > µ0  or

H1 : µ < µ0

Here, H0 is Simple Hypothesis but H1 is Composite Hypothesis.