Method of moments :-

This method simply makes use of the relationship between the parameters and the moments of the distribution.

For a distribution with K no. of parameters, we need to compute the first 'K' moments about origin.

for example :- if the assumed distribution is log-normal, its two parameters μ_n and σ_n^2 are related to the mean and variance of the distribution μ_x and σ_x^2.

These are given by

$$\mu_n = \frac{1}{2} \ln \left[\frac{\mu_x^4}{\mu_x^2 + \sigma_x^2} \right]$$

$$\sigma_n^2 = \ln \left[\frac{\sigma_x^2 + \mu_x^2}{\mu_x^2} \right]$$

(2)

~~Simple~~ Similarly taking Sample mean ($\bar{x}$) and S.D. (S_x) to be estimated of μ_x and σ_x respectively. The estimate μ_x and σ_x can be denoted by $\hat{\mu}_x$ and $\hat{\sigma}_x$.

These are given by

$$\hat{\mu}_x = \frac{1}{2} \ln \left[\frac{(\bar{x})^4}{(\bar{x})^2 + S_x^2} \right]$$

$$\hat{\sigma}_x = \ln \left[\frac{S_x^2 + (\bar{x})^2}{(\bar{x})^2} \right]$$

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P- values :—

Priorities

In test of hypothesis, pre selection of a significance level α does not account for values of test statistics

that are "close" to the critical region

Thus a test statistic value that is non-significant say for $\alpha = 0.05$ may become significant for $\alpha = 0.01$.

In applied statistics p-value approach is designed to give the user an alternative (in terms of probability) to a mere "reject" or "do not reject" conclusion.

p-value is the lowest level of significance at which the observed value of the test statistic is significant.

Priorities

In the significance testing by p-value approach 'α' is not predetermined but the conclusion is

(4)

- based on the size of the p-value which is computed using the value of test statistics

Testing of Hypothesis :-

Q Define Hypothesis.

Ans A hypothesis is a statement about population parameter.
In other word " It is a conclusion which is tentatively drawn on logical basis.

Q Define testing of hypothesis.

Ans. It is a procedure which helps us to ascertain the likelyhood of hypothesized population parameter being

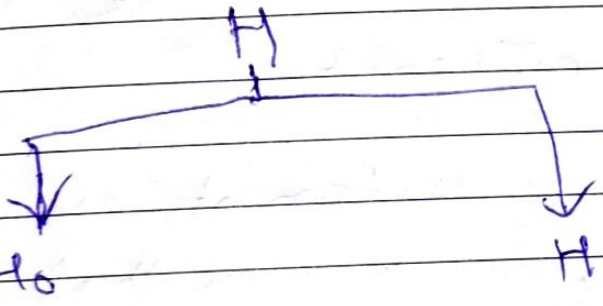
Priorities

(5)

Correct by making use of sample statistics.
It is also known as test of significance.
Here hypothesis are two types.

(I) Null hypothesis (H_0)

(II) Alternative hypothesis (H_1 / H_a)



(Null hypothesis) (Alternative hypothesis)

Q. Define Null hypothesis.

Ans. The stastical hypothesis which is set up for testing a hypothesis is called Null hypothesis.

It is denoted by (H_0).

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The following steps are taken while setting up Null hypothesis.

(I) In order to test the significance of the difference between sample statistic and the population parameter or between two sample statistic, we set H_0 for which the difference is not significant.

(II) To test any statement about the population, we assume that H_0 is true.

Ex If we want to find the population mean has a specified value μ_0. we can write

$$H_0 : \mu = \mu_0$$

Q Define Alternative hypothesis.

Priorities

Ans The negation of Null hypothesis is called alternative hypothesis. It is denoted by (H_1) or (H_a).

(7)

The rejection of Null hypothesis
⇒ Acceptance of alternative hypothesis

i.e. $H_1 : \mu \neq \mu_0$ (i.e $\mu > \mu_0$ or $\mu < \mu_0$)

Also alternative hypothesis can be expressed as

$H_1 : \mu > \mu_0$

$H_1 : \mu < \mu_0$

∴ There can be more than one alternative hypothesis.

Q Define Critical region.

Ans The critical region is the region of the Stand normal Curve corresponding to a predetermined level of significance (LOS) & [which is fixed for knowing the probability of making a Type-I error

Priorities

i.e rejecting the null hypothesis (H_0) when it is true]

It is also called rejection region.

It is denoted by R or C.

The region under the normal curve which is not covered by the rejection region is known as

Acceptance region.

It is also called non-critical region.

It is denoted by (A).

Q Define critical value./ significant value.

Ans The value of the test statistic computed to the test of null hypothesis H_0 is known as critical value.

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The critical value separates the rejection region from the acceptance region.

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Q Define Errors in Sampling

The main objectives in sampling theory is to draw valid inferences about the population parameters on the basis of the sample results.

In practice we decide to accept or reject the lot after examining a sample from it.

Error

Type-I error — Type-II error

When a null hypothesis is tested against an alternative hypothesis then there exists two types of error.

(a) Rejecting null hypothesis (H_0) when it is actually true

(b) Failing to reject null hypothesis

Priorities

(10)

When H_0 is false.

These (a) and (b) are called Type-I and Type-II errors respectively.

i.e. Type-I error: Reject H_0 when it is true.

Type-II error: Accept H_0 when it is wrong.

i.e. accept H_0 when H_1 is true.

Let $P\{\text{Reject } H_0 \text{ when it is true}\}$

$= P\{\text{reject } \frac{H_0}{H_1}\} = \alpha$

$P\{\text{Accept } H_0 \text{ when it is wrong}\}$

$= P\{\text{Accept } \frac{H_0}{H_1}\} = \beta$

∴ Size of Type-I error is α.

and Size of Type-II error is β.

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i.e. $P(\text{Type-I}) = \alpha$

$P(\text{Type-II}) = \beta$

(11)

In practice, Type-I error measures to reject a lot when it is good.

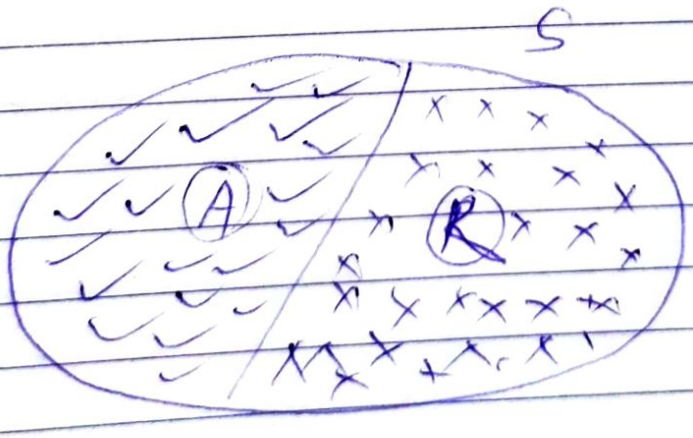
Type-II error measures to accept a lot when it is bad.

i.e. P(Reject a lot when it is good) $= \alpha$

P(Accept a lot when it is bad) $= \beta$

$\alpha \rightarrow$ producer's risk

$\beta \rightarrow$ Consumer's risk.



Critical region RCS and $A \cup R = S$

Acceptance region ACS

Priorities