**Problems in Hypothesis Testing**

**Testing Involving Population Mean**

This type of testing involves decisions to check whether a reported population mean is reasonable or not, compared to the sample mean computed from the sample taken from the same population.

A random sample is taken from the population and its statistic x̅ is computed.

An assumption is made about the population mean μas being equal to the sample mean and a test is conducted to see if the difference (x̅ - μ) is significant or not.

This difference is not significant if it falls within the acceptance region and this difference is considered significant if its falls within the rejection region or the critical region at a given level of significance α.

**Example**

Assume that the average annual income for govt employees in Washington city, US (is $ 18, 750. There was some doubt whether the yearly income of govt employees in Washington was representative of the national average.

A random sample of 100 government employees in Washington was taken and it was found that their average salary ws $19, 240 with a standard deviation of $2,610.00.

At a level of significance = 005, can we conclude that the average salary of govt employees in Washington is representative of the national average?

**Example** (one-Tailed Test : Left Tail)

The manufacturer of light bulbs claims that a light bulb lasts on an average 1600 hours. We want to test his claim. We will not reject his claim if the average of the sample taken lasts considerably more than 1600 hours, but we will reject his claim if it lasts considerably less than 1600 hours. Hence it is a one-tailed test and the area of rejection is the left-end tail of the curve.

A sample of 100 light bulbs was taken at random and the average bulb life of this sample was computed to be 1570 hours with a standard deviation of 120 hours. At α = 0.01, let us test the validity of the claim this manufacturer.

**Example** (One-tailed – Right Tail)

An insurance company claims that it takes 2 weeks (14 days), on an average, to process an auto accident claims. The standard deviation is 6 days. To test the validity of this claim, an investigator randomly selected 36 people who recently filed claims. This sample revealed that it took the company an average of 16 days to process these claims. At 99% level of confidence, check if it takes the company more than 14 days on an average to process a claim.

**Two-Sample Tests**

**Theory**

In some decision making situations, comparison of two population means or two population proportions becomes an area of interest. For example, we may be interested in comparing the effectiveness of two different teaching methods where the effectiveness would be measured by the difference in the average student achievement under two different techniques.

Or we may be interested to know if there is any significant difference in the average age of life for men and women in this country.

For this purpose, we can test one population mean against the other and draw conclusions for the purpose of making rational decisions.

**Standard Error Means**

We take the differences in the sample means. We have a distribution of the differences in the sample means. This is known as the sampling distribution of (x̅1 – x̅2). Based on the central limit theorem, if two independent samples of size n1 and n2 are taken from the populations with mean μ1 andμ2 and standard deviation σ1 andσ2 , then the sampling distribution of (x̅1 – x̅2) follows approximately a normal distribution.

The standard error of mean differences is given by SQRT(σ1/n1 + σ2/ n2 ).

**Example**

A potential buyer of electric bulbs bought 100 bulbs each of two famous brands, A and B. Upon testing both these samples, he found that brand A had a mean life of 1500 hours with a standard deviation of 50 hours whereas brand B had an average life of 1530 hours with a standard deviation of 60 hours. Can it be conclude at 5% level of significance (α = 0.05) that the two brands differ significantly in quality.