



TOPIC : 3.2 Large sample test based on Normal distribution for single mean

Large Sample :

If the size of the sample $n > 30$, then that sample is called large sample.

z-Test.

Test of significance for single mean:

Null hypothesis $H_0 : \mu = \mu_0$

Alternative hypothesis $H_1 : \mu \neq \mu_0$

Test statistic : [calculated value, Z]

$$|Z| = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$$

where σ is the S.D of the population.

If the population S.D is not known then

$$|Z| = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}}$$

where s is the sample S.D

Level of Significance :

5% or 1%

Tabulated value Z_α :

	LOS	
	1%	5%
Two tailed test	2.58	1.96
one tailed test	2.33	1.645

Conclusion:

If calculated value $Z <$ Tabulated value Z_α

(ie) $|Z| < Z_\alpha$

\Rightarrow we accept the null hypothesis H_0

If $|Z| > Z_\alpha$

\Rightarrow we reject the null hypothesis H_0 .



1. A sample of 900 members has a mean of 3.4 cms and S.D 2.61 cms. Is the sample from a large population of mean 3.25 cm and S.D 2.61 cms.

Solo.

Null hypothesis H_0 :

Assume that the sample has been drawn from the population with mean $\mu = 3.25$

Alternative hypothesis H_1 :

$$\mu \neq 3.25$$

Test statistic:

$$|Z| = \left| \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}} \right|$$

Given $n = 900$

$$\mu = 3.25 \text{ cm} \quad \bar{x} = 3.4 \text{ cm}$$

$$\sigma = 2.61 \text{ cm} \quad s = 2.61 \text{ cm}$$

$$|Z| = \left| \frac{3.4 - 3.25}{\frac{2.61}{\sqrt{900}}} \right|$$
$$= 1.724$$

Level of Significance: [LOS]

LOS = 5% (Two tailed test)

$$Z_{\alpha} = 1.96$$

Conclusion:

$$1.724 < 1.96$$

$$|Z| < Z_{\alpha}$$

we accept the null hypothesis H_0 .

The sample has been drawn from the population with mean $\mu = 3.25$



Q. A random sample of 200 employees at a large corporation showed their average age to be 42.8 yrs with a S.D of 6.8 yrs. Test the hypothesis $H_0: \mu = 40$ against $H_1: \mu > 40$ at $\alpha = 0.01$ L.O.S.

Null hypothesis $H_0: \mu = 40$
Alternative hypothesis $H_1: \mu > 40$
(one-tailed Right).
 $\mu = 40, n = 200, \bar{x} = 42.8$ yrs

$$\sigma = 6.8 \text{ yrs}$$

Test statistic:

$$|Z| = \left| \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} \right| = \left| \frac{42.8 - 40}{6.8/\sqrt{200}} \right| = 5.747$$

$$\text{L.O.S} = 1\%$$

Critical value (calculated value)

At 1% (one-tailed test)

$$Z_{\alpha} = 2.33$$

Conclusion:

$$5.747 > 2.33$$

$$|Z| > Z_{\alpha}$$

we reject the null hypothesis H_0 .