# Assignment - 3

## T-shirt Examples

**Ans)**

Let us assume that we are given 500 data out of which 200 out of 500 are L size t-shirt & 300 out of 500 are XL T-shirt.

We assume that $\alpha = 0.05$.

1) We set the null hypothesis as -

$$H_0 : p_1 = p_2$$

i.e $p_1 = 200 = p_2 = 300$.

i.e $L = 200 = XL = 300$.

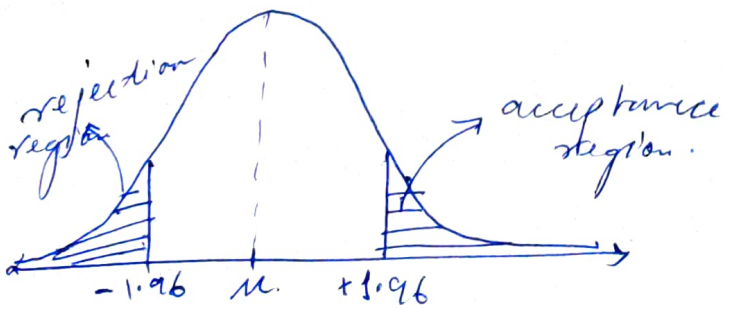
against

$$H_1 : p_1 \neq p_2$$

i.e $p_1 = L = 200 \neq p_2 = XL = 300$.

2) $\alpha = 0.05$, C.I = 95%

3)



4) Calculate test statistic

$$Z = \frac{(\hat{p}_1 - \hat{p}_2)}{\sqrt{\hat{p}(1-\hat{p})}\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

Where

$$\hat{p}_1 = \frac{200}{500} = 0.4$$

$$\hat{p}_2 = \frac{300}{500} = 0.6$$

$$n_1 = 500$$

$$n_2 = 500$$

Now $\hat{p} = \frac{x_1 + x_2}{n_1 + n_2} = \frac{200 + 300}{500 + 500} = 0.5$

Now

$$Z = \frac{0.4 - 0.6}{\sqrt{0.5(1-0.5)}\sqrt{\frac{1}{500} + \frac{1}{500}}}$$

$$= \frac{-0.2}{0.707} = -0.28$$

Conclusion: The cal. Z value $= -0.28$ } Tabulated Z-value $= -1.96$. So we accept the null hypothesis which means that the proportion of 200 & 300 student out of 500 is same.

So to calculate the proportion of L-shirt for 100k Employees we have -

$$\frac{p_1}{} = \frac{p_1}{}$$

$$\Rightarrow \frac{200}{} = \frac{300}{} \rightarrow (i)$$

Now we multiply by 100 and 2 on both sides to Equate for 100k Employees we have -

$$\Rightarrow 200 \times 100 \times 2 = 300 \times 100 \times 2$$

$$\Rightarrow 40000 = 60000$$

$$\Rightarrow p_1 = p_2 \text{ for (100k Employees)}$$

Therefore we need 40000 L T-shirt & 60000 XL tshirt for 100k Employees.

## Assignment 4

# A car company believes that the % of residents in city ABC that owns a vehicles is 60% or less. A sale manager disagrees with this. He conduct a hypothesis testing surveying 250 resident and found that 170 responded. Yes to owning a vehicles.

a) State the Null and alternate hypothesis.

b) At 10% significance level, is there enough evidence to the suppose the idea that vehicles ownership is IABC is 60% or less?

Sol$^{n}$ We are to set the null hypothesis as —

$$\left.\begin{array}{l} H_0: p_0 \geq 60\% \\ \text{against} \\ H_1: p_0 < 60\% \end{array}\right\}$$

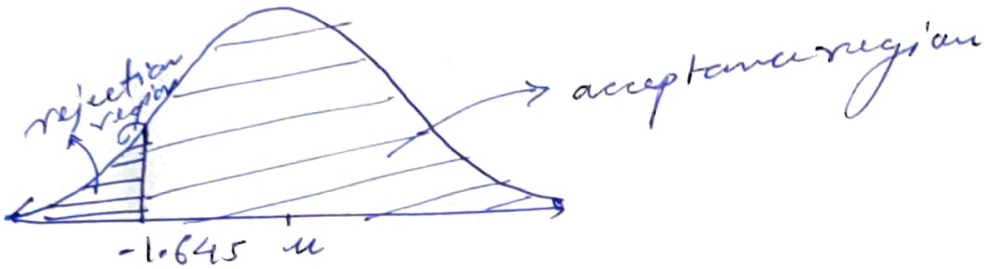
$n = 250, \quad x = 170.$

$$\hat{p} = \frac{x}{n} = \frac{170}{250} = 0.68$$

$$q_0 = 1 - p_0 = 1 - 0.60 = 0.40$$

$$\alpha = 0.10, \quad C.I = 0.90$$

Decision rule




$$Z\ test = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0 q_0}{n}}} = \frac{0.68 - 0.60}{\sqrt{\frac{0.60 \times 0.40}{250}}}$$

$$= \frac{0.08}{0.0309} = 2.588$$

$2.588 > -1.645$, we accept the $H_0$

p-value.


$1 - 0.99506 = 0.00494$

$= 0.0049$

i.e $0.0049 < 0.10$, we reject the null $H_0$.