The manager at Trion Electric Co-op is concerned about the rise in the number of late payments. If more than 10% of the accounts are behind in their payments, the manager will initiate a costly monitoring program. A random sample of 75 accounts shows that 9 were behind in their payments.

a. Does the sample data provide evidence to conclude that more than 10% of all accounts are delinquent (using ?=0.01)?

1.Formulate the null and alternative hypotheses.

Solution:

a. Does the sample data provide evidence to conclude that more than 10% of all accounts are delinquent (using ?=0.01)?

The information given in the above problem can be represented with the following notations.

Sample size = n = 75

P_0= 0.1

Q_0= 0.9 (since Q_0= 1- P_0)

The number of persons behind their payments is x = 9

$$\hat{p} = \frac{x}{n} = \frac{9}{75} = 0.12$$

Significance level = 0.01

1.Null hypothesis:

H_0: P $\leq$ 0.1

That is, not more than 10 % of all accounts are delinquent

Alternate hypothesis:

H_1: P > 0.1

That is, more than 10 % of all accounts are delinquent

2. Criterion for rejection of the null hypothesis:

If the P-value of the test statistic is less than 0.05 we reject the null hypothesis.

3. Test statistic:

$$Z = \frac{\hat{p} - P_0}{\sqrt{\frac{P_0 * Q_0}{n}}}$$

$$= \frac{0.12 - 0.1}{\sqrt{\frac{0.1*0.9}{75}}}$$

$$= \frac{0.02}{\sqrt{0.0012}}$$

$$= \frac{0.02}{0.034641}$$

= 0.57735

Hence the test statistic value is 0.57735

4. P-value:

P-value = P [Z > 0.57735]

= 1 – P [Z <0.57735]

= 1 - 0.718148

= 0.281852

Hence the P- value of the test statistic is 0.281852

5.Statistical decision:

Since the P-value of the test statistic is greater than the significance level (that is 0.281852 > 0.01) we conclude that there is no enough evidence to reject the null hypothesis at 0.01 level. Thus we conclude that not more than 10 % of all accounts are delinquents.