Chapter Four
Interval Estimation Theory

6 - Confidence intervals for the binomial proportion parameter p.

- The CI For the Proportion p (Probability for succeed in binomial Trials). can be given as:-

$$P - Z\sqrt{\frac{P(1-P)}{n}} < p < P + Z\sqrt{\frac{P(1-P)}{n}}$$

Ex:- Consider a random Sample of 144 Families, 48 have 2 or more cars. Compute the 95% CI for the Population proportion of families with 2 or mor cars.

Sol:- $n = 144$, $P = \frac{48}{144} = \frac{1}{3}$

From Table → 95% CI ⟶ $Z_\alpha = 1.96$

$$1 - P = 1 - \frac{1}{3} = \frac{2}{3}$$

↘ general Eq.

$$P - Z_\alpha\sqrt{\frac{P(1-P)}{n}} < p < P + Z_\alpha\sqrt{\frac{P(1-P)}{n}}$$

$$\frac{1}{3} - (1.96)\cdot\sqrt{\frac{\frac{1}{3}\cdot(\frac{2}{3})}{144}} < p < \frac{1}{3} + (1.96)\sqrt{\frac{(\frac{1}{3})(\frac{2}{3})}{144}}$$

$$0.333 - 0.077 < p < 0.333 + 0.077$$

$$0.256 < p < 0.410$$

* Interval Estimation Theory *

Ex2) A random Sample of 100 People shows that 25 are left-handerd from a 95% CI for the True Proportion of left-handers.

Sol) $n=100$ $\quad P=\frac{25}{100}=0.25$

$1-P=1-\frac{1}{4}=\frac{3}{4}$, $95\% \longrightarrow Z_\alpha = 1.96$

by using general Eq:-

$$P - Z_\alpha \sqrt{\frac{P(1-P)}{n}} < P < P + Z_\alpha \sqrt{\frac{P(1-P)}{n}}$$

$$\Rightarrow \frac{1}{4} - (1.96)\sqrt{\frac{\frac{1}{4}\cdot\left(\frac{3}{4}\right)}{100}} < P < \frac{1}{4} + (1.96)\sqrt{\frac{\frac{1}{4}\cdot\left(\frac{3}{4}\right)}{100}}$$

$$\Rightarrow 0.1651 < P < 0.3349$$