

STATISTICS

$$\bar{x} = \frac{\sum f_i x_i}{\sum f_i} \Rightarrow \bar{x} = \frac{\sum x_i}{N}$$

$$\text{Combined mean} = \frac{n_1 \bar{x} + n_2 \bar{y}}{n_1 + n_2}$$

Median : $\rightarrow$ centre (ac w/o dec order)

$$\begin{cases} (n+1/2)^{\text{th}} \text{ obs, } n \in 2k+1 \\ \text{Avg of middle, } n \in 2k \\ 2 \text{ terms} \end{cases}$$

$$\rightarrow \text{Median} = L + \frac{\left(\frac{N}{2} - c\right)}{f} \times h$$

$L \rightarrow$ lower limit of median class

$N \rightarrow \sum f_i$

$c \rightarrow$ cumulative f class before median class

$f \rightarrow$ freq of median class

$h \rightarrow$ class size

* Median class $\rightarrow$ cf just above $N/2$

* If median class is $a-b$ then $M \in [a, b]$

Mode : Max freq

$$\rightarrow \text{Mode} = L + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right) \times h$$

* Modal class $\rightarrow$ max f

$f_1 \rightarrow$ freq of modal class

$f_0 \rightarrow$ freq of class before modal class

$f_2 \rightarrow$ freq of class after modal class

* If modal class is $a-b$ then $m \in [a, b]$

$$\textcircled{*} 3 \text{ Median} - 2 \text{ mean} = \text{Mode}$$

* For symmetrical distribution, median = Mean = Mode

Deviation :

$$\text{* Deviation of obs abt mean} = \frac{\sum |x_i - \bar{x}|}{N}$$

$$\text{* Deviation of obs abt median} = \frac{\sum |x_i - M|}{N}$$

$$\text{* Deviation of obs abt mode} = \frac{\sum |x_i - m|}{N}$$

$$\text{* Mean deviation of first 'n' natural numbers} = \begin{cases} \frac{n^2-1}{4n}, & n \text{ is odd} \\ n/4, & n \text{ is even} \end{cases}$$

$$\textcircled{*} \frac{n}{4} |d| \text{ (even)}$$

$$\textcircled{*} \frac{n-1}{4n} |d| \text{ (oda)}$$

Variance : (σ^2)

$$\sigma^2 = \frac{\sum (x_i - \bar{x})^2}{N} = \left[\frac{\sum x_i^2}{N} - (\bar{x})^2 \right]$$

$$\text{Variance} = \sigma^2 = \frac{\sum f_i x_i^2}{N} - (\bar{x})^2$$

standard deviation : (σ)

$$\sigma = \sqrt{\frac{\sum (x_i - \bar{x})^2}{N}}$$

NOTE :

x_i	$\bar{x}$	σ^2	σ
$x_i \pm k$	$\bar{x} \pm k$	σ^2	σ
kx_i	$k\bar{x}$	$k^2 \sigma^2$	$ k \sigma$
$ax_i \pm b$	$a\bar{x} \pm b$	$a^2 \sigma^2$	$ a \sigma$

* If a fixed const is added/sub to every obs, then st. deviation & variance remains unchanged.

* Most unstable average is Mode

* Least affected by extreme's is Median.

Rem :

$$\text{* Variance of first 'n' natural numbers} = \frac{n^2-1}{12}$$

$$\rightarrow \text{Variance of n no. in AP} = \left(\frac{n^2-1}{12} \right) |d|^2$$

$$\Rightarrow \text{Variance of n consecutive even / odd numbers} = \left(\frac{n^2-1}{3} \right)$$

$$\text{* Range} = (x_i)_{\max} - (x_i)_{\min}$$

$$\text{* Co-eff of range} = \frac{R}{x_{\max} + x_{\min}} = \frac{x_{\max} - x_{\min}}{x_{\max} + x_{\min}}$$

$$\text{* Co-eff of st. variance} = \sigma / \bar{x}$$

$$\text{* Co-eff of variance / Consistency of obs} = \sigma / \bar{x} \times 100$$