

## Standard Deviation

Standard deviation is a most satisfactory scientific method of dispersion. Accordingly, it is a widely used method in statistical analysis.

This was first used by Karl Pearson. This is sometimes called as 'Root Mean Square Deviation.'

In the words of Spiegel, "The standard deviation is the square root of the arithmetic mean of the squares of all deviations. Deviations being measured from arithmetic mean of the items.

### \* Coefficient of Standard Deviation.

This is a relative measure of the dispersion of series.

It is generally used whenever variation in different series is compared. Coefficient of standard deviation is estimated by dividing the value of standard deviation by the mean of the series.

Coefficient of Standard Deviation

$$\frac{\sigma}{\bar{X}}$$

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## Calculation of Standard Deviation

### (I) Individual Series and Standard Deviation.

There are three methods of calculating standard deviation in case of individual series.

- (i) Direct method.
- (ii) Short-cut method.
- (iii) Step-deviation method.

#### (i) Direct method

Formulae

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

Here

$\sigma$  = Standard deviation.

$\sum x^2$  = Sum total of the squares of deviation.

$\bar{x}$  = Mean value

$x - \bar{x}$  = Deviation from mean value

$N$  = Number of items.

#### (ii) Short-cut Method

Formulae

$$\sigma = \sqrt{\frac{\sum dx^2}{N} - \left(\frac{\sum dx}{N}\right)^2}$$

#### (iii) Step-Deviation Method.

$$\sigma = \sqrt{\frac{\sum dx_i^2}{N} - \left(\frac{\sum dx_i}{N}\right)^2} \times C$$