

c] STANDARD DEVIATION %

Meaning:

Standard deviation usually denoted by Greek alphabet σ (small sigma) is defined as the positive square root of the arithmetic mean of the squares of the deviation of the given observations from their arithmetic mean.

Calculation of Standard Deviation %(i) Individual Observations:

(a) Deviation taken from Actual Mean.

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

Where, \bar{x} = Arithmetic Mean.

N = No. of observations.

(b) Deviation taken from Assumed mean

$$\sigma = \sqrt{\frac{\sum d^2}{N} - \left[\frac{\sum d}{N}\right]^2}$$

Where, $d = x - A$

A = Assumed Average.

(2) Calculation of Standard Deviation:

(a) Discrete Series : (from Actual Mean)

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

where,

N = Sum of observations

\bar{x} = Arithmetic Mean.

(b) Deviation from Assumed Mean Method.

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

where $d = x - A$

(3) Calculation of Standard deviation - Continuous Series.

(a) Deviation from Actual mean.

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

where x = mid point.

(b) Deviation from Assumed Mean.

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

(c) Step-Deviation Method.

$$\sigma = \sqrt{\frac{\sum f dx^2}{N} - \left[\frac{\sum f dx'}{N} \right]^2 \times i}$$

where,

$$dx' = \frac{x - A}{i}$$

i = class-interval

A = Assumed Mean.

E) STANDARD ERROR OF AN ESTIMATE

Sampling Distribution of a statistic is generated from a population distribution. known or assumed. The same population may generate an infinite number of sampling distribution for the statistic, each for special sample size n .

A population may generate sampling distributions for two or more different statistics.

The standard deviation of sampling distribution of a statistic is known as Standard Error of an Estimate.

Characteristics :

- It is used as an instrument in testing a given hypothesis.
- Standard error provides an idea about the unreliability of a sample.
- The reciprocal of S.E. $1/S.E.$ is the measure of reliability or precision.
- The S.E. can also be used to determine the limits within which the parameter values are expected to lie.

Exercise

Calculate standard deviation of following series

Weight (kg)
62
56
62
59
54
67

2.

40-44
45-49
50-54
55-59
60-64
65-69
70-74
75-79
80-84
85-89
90-94