# Chapter 8

# Measures of

# Central Tendency

## MEANING

The value always falls between the lowest and height values of the data. It is generally located in the centre or middle of the observation. Average is a figure that represents the whole group is called a measure of central tendency, or measure of location or average.

## OBJECTS AND FUNCTIONS OF AVERAGES

**1. To represent the salient Features of a mass Complex data: -** It is helpful in reducing the mass information into a single value for drawing conclusion.

**2. To facilitate Comparison: -** The average of one group can be compared with average of other groups.

**3. To help in decision making: -** Average are helpful for making decisions in planning in various fields.

**4. Statistical Analysis: -** Average Constitute the basis of statistical analysis.

**5. To know about universe from sample: -** Average represent the universe or the mass of statistical data. Accordingly, conclusion can be drawn in respect of the universe as a whole.

## CHARACTERISTICS OF GOOD AVERAGE

1. It should be simple to calculate and easy to understand.

2. The definition should be clear and Unambiguous so that it leads to one and only one interpretation by different persons.

3. An average should be based on all the items of a series.

4. It should be least affected by fluctuations of sample.

5. It should be capable of further algebraic treatment.

6. It should not be affected much by extreme values of data.

## KINDS OF STATISTICAL AVERAGES

In statistics different kinds of averages are discussed. Statistical averages are broadly classified into 3 groups:

(1) Mean. There are three different types of mean namely Arithmetic mean ($\overline{X}$), Geometric mean (GM) and Harmonic mean (HM). These are also called mathematical averages.

(2) Median and Mode and other partition values are called positional averages.

(3) Other averages. It includes moving average, progressive average, composite average etc.

## ARITHMETIC AVERAGE OR MEAN

This is the most popular and widely used measure of central tendency, representing the entire data by a single value. "The arithmetic mean of series of items is obtained by adding values of the items and dividing by the number of items."

The arithmetic mean is of two kinds:

(i) Simple arithmetic mean.

(ii) Weighted arithmetic mean.

# 1. SIMPLE ARITHMETIC MEAN

**CALCULATION OF SIMPLE ARITHMETIC AVERAGE OR MEAN IN INDIVIDUAL SERIES**

The arithmetic mean in individual series can be computed by the following three methods:
(i) Direct method
(ii) Short-cut met
(iii) Step-deviation method

The results from all the methods will be the same.

## (i) Direct method

$$\overline{X} = \frac{\sum X}{N}$$

Arithmetic Average and Mean

$\sum X$ = Total Number of items

N = Number of items

## (ii) Short Cut Method

$$\overline{X} = A + \frac{\sum dx}{N}$$

A = Assumed Mean

$\sum dx$ = Total of deviation taken from assumed means

## (iii) Step deviation Method

$\overline{X}$ = A + $\frac{\sum dx}{N}$ x $i$

**CALCULATION OF SIMPLE ARITHMETIC AVERAGE OR MEAN IN DISCRETE SERIES**

The arithmetic mean in discrete series can be computed by the following three methods:

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

## (i) Direct method.

$\overline{X}$ = $\frac{\sum fX}{N}$

N = $\sum f$ or Total of frequencies

## (ii) Short Cut Method

$\overline{X}$ = A + $\frac{\sum fdx}{N}$

## (iii) Step deviation Method

$$\overline{X} = A + \frac{\sum fdx}{N} \times i$$

dx = Deviation from assumed mean by step deviation

i = Total of frequencies

A = Assumed mean

## CALCULATION OF SIMPLE ARITHMETIC AVERAGE OR MEAN IN CONTINUOUS SERIES

The arithmetic mean in Continuous series can be computed by the following three methods:
(i) Direct method
(ii) Short-cut method
(iii) Step-deviation method

### (i) Direct method

Mid value (m) = $\dfrac{Upper\ limit + lower\ limit}{2}$

$$\overline{X} = \frac{\sum fm}{N}$$

m = mid value

f = Frequency

N = $\sum f$ Total of frequencies

### (ii) Short Cut Method

$$\overline{X} = A + \frac{\sum fdx}{N}$$

$\overline{X}$ = Arithmetic average or Mean

A= Assumed Mean

f = Frequency

dx= Deviation of assumed Mean

N = $\sum fx$ Total of frequencies

## (iii) Step deviation Method

$$\bar{x} = A + \frac{\sum f dx\prime}{N} \times i$$

## MERITS AND DEMERITS OF ARITHMETIC MEAN

### Merits

1. It is simple to understand and easy to calculate.

2. It is based on all the items in a series.

3. Its values is always definite. It is rigidly defined and not affected by personal bias.

4. The calculation of arithmetic mean does not require any specific arrangement of data.

5. It is a good base for comparison

6 Arithmetic mean can be tested for its accuracy as a representative Value of the series.

### Demerits

1. Arithmetic mean sometime gives most absurd results which cannot possibly exist.

2. Arithmetic is affected by extreme items.

3. Arithmetic mean cannot be calculated in the absence of one of the items.

4. Arithmetic mean can be a value that does not exist in the series at all.

5. Arithmetic mean gives more importance to the bigger items and less importance to the small items of the series.

6. Arithmetic means sometimes offers misleading conclusion.

## CHARLIER'S ACCURACY CHECK

The accuracy of calculations can be checked up by the formula given by Charlier while Computing arithmetic mean by short cut method and step deviation method in a frequency distribution (ie in discrete and Continuous series)

$$\Sigma f (d'+1) = \Sigma fd' + \Sigma f$$

Equal values on both sides of formula is a proof of correct calculation.

## WEIGHTED ARITHMETIC AVERAGE

Weighted Arithmetic mean is obtained after giving weight as

figures to different values of data to indicate the relative importance of items.

## Uses of Weighted Average

1. It is used for calculation of wages by factory authorities or contractor

2. It is used for comparison of results of two or more universities or boards.

3. It is used to calculate standardized birth rate and death rate

4. It is used in construction of Index number