MEASURES OF CENTRAL TENDENCY

Average (Central Tendency)

In the words of Croxton and Cowden, "An average value is a single value within the range of the data that is used to represent all the values in the series."

The value of average lies between the maximum and minimum values of the series. That is why it is also called measure of central tendency.

Properties of a Good Average

The following are the important properties which a good average should satisfy:

1. It should be easy to understand.

2. It should be simple to compute.

3. It should be based on all the items.

4. It should not be affected by extreme values.

5. It should be rigidly defined.

6. It should be capable of further algebraic treatment.

The following are the five measures of average or central tendency that are in common use :

(i)   Arithmetic average or arithmetic mean or simple mean

(ii)   Median

(iii)   Mode

(iv)   Geometric mean

(v)   Harmonic mean

Arithmetic mean, Geometric mean and Harmonic means are usually called Mathematical averages while Mode and Median are called Positional averages.

Arithmetic Mean: It is a value obtained by adding together all the items and by dividing the total by the number of items. It is also called average. It is the most popular and widely used measure for representing the entire data by one value.

Arithmetic mean may be either:

1. Simple arithmetic mean, or

2. Weighted arithmetic mean.

Properties of Arithmetic Mean:

1. The sum of deviations of the items from the arithmetic mean is always zero i.e.

$\sum(X–X) =0$.

2. The Sum of the squared deviations of the items from A.M. is minimum, which is less than the sum of the squared deviations of the items from any other values.

3. If each item in the series is replaced by the mean, then the sum of these substitutions will be equal to the sum of the individual items.

Merits of A.M.:

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

2. It is affected by the value of every item in the series.

3. It is rigidly defined.

4. It is capable of further algebraic treatment.

5. It is calculated value and not based on the position in the series.

Demerits of A.M.:

1. It is affected by extreme items i.e., very small and very large items.

2. It can hardly be located by inspection.

3. In some cases A.M. does not represent the actual item. For example, average patients admitted in a hospital is 10.7 per day.

4. A.M. is not suitable in extremely asymmetrical distributions.

Geometric Mean (G.M)

It is defined as nth root of the product of n items or values.

i.e., G.M. = $n\sqrt{}$ (x1. x2. x3 ……xn)

Merits of G.M.:

1. It is not affected by the extreme items in the series.

2. It is rigidly defined and its value is a precise figure.

3. It is capable of further algebraic treatment.

4. It is Useful in calculating index number.

Demerits of G.M.:

1. It is difficult to understand and to compute.

2. It cannot be computed when one of the values is 0 or negative.

Uses of G.M.:

1. It is used to find average of the rates of changes.

2. It is Useful in measuring growth of population.

3. It is considered to be the best average for the construction of index numbers.

Harmonic Mean: It is defined as the reciprocal of the arithmetic mean of the reciprocal of the individual observations.

$$H.M. = \frac{N}{(1/x1 + 1/x2 + 1/x3 + \ldots\ldots +1/xn)}$$

Merits of H.M.:

1. Like AM and GM, it is also based on all observations.

2. It is most appropriate average under conditions of wide variations among the items of a series since it gives larger weight to smaller items.

3. It is capable of further algebraic treatment.

4. It is extremely useful while averaging certain types of rates and ratios.

Demerits of H.M.:

1. It is difficult to understand and to compute.

2. It cannot be computed when one of the values is 0 or negative.

3. It is necessary to know all the items of a series before it can be calculated.

4. It is usually a value which may not be a member of the given set of numbers.

Uses of H.M.:

If there are two measurements taken together to measure a variable, HM can be used. For example, tonne mileage, speed per hour. In the above example tonne mileage, tonne is one measurement and mileage is another measurement. HM is used to calculate average speed.

Median: Median may be defined as the size (actual or estimated) to that item which falls in the middle of a series arranged either in the ascending order or the descending order of their magnitude. It lies in the centre of a series and divides the series into two equal parts. Median is also known as an average of position.

Merits of Median:

1. It is simple to understand and easy to calculate, particularly is individual and discrete series.

2. It is not affected by the extreme items in the series.

3. It can be determined graphically.

4. For open-ended classes, median can be calculated.

5. It can be located by inspection, after arranging the data in order of magnitude.

Demerits of Median:

1. It does not consider all variables because it is a positional average.

2. The value of median is affected more by sampling fluctuations

3. It is not capable of further algebraic treatment. Like mean, combined median cannot be calculated.

4. It cannot be computed precisely when it lies between two items.

Mode: Mode is that value a dataset, which is repeated most often in the database. In other words, mode is the value, which is predominant in the series or is at the position of greatest density. Mode may or may not exist in a series, or if it exists, it may not be unique, or its position may be somewhat uncertain.

Merits of Mode:

1. Mode is the most representative value of distribution, it is useful to calculate model wage.

2. It is not affected by the extreme items in the series.

3. It can be determined graphically.

4. For open-ended classes, Mode can be calculated.

5. It can be located by inspection.

Demerits of Mode:

1. It is not based on all observations.

2. Mode cannot be calculated when frequency distribution is ill-defined

3. It is not capable of further algebraic treatment. Like mean, combined mode cannot be calculated.

4. It is not rigidly defined measure because several formulae to calculate mode is used.