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MEASURES OF DISPERSION



Why Study Dispersion?

- ✓ An average, such as the mean or the median only locates the center of the data.
- ✓ An average does not tell us anything about the spread of the data.



What is Dispersion

- ✓ Dispersion (also known as Scatter, spread or variation) measures the items vary from some central value.
- ✓ It measures the degree of variation.



Significance of Measuring Dispersion

- ✓ To determine the reliability of an average.
- ✓ To facilitate comparison.
- ✓ To facilitate control.
- ✓ To facilitate the use of other statistical measures.



Properties of Good Measure of Dispersion

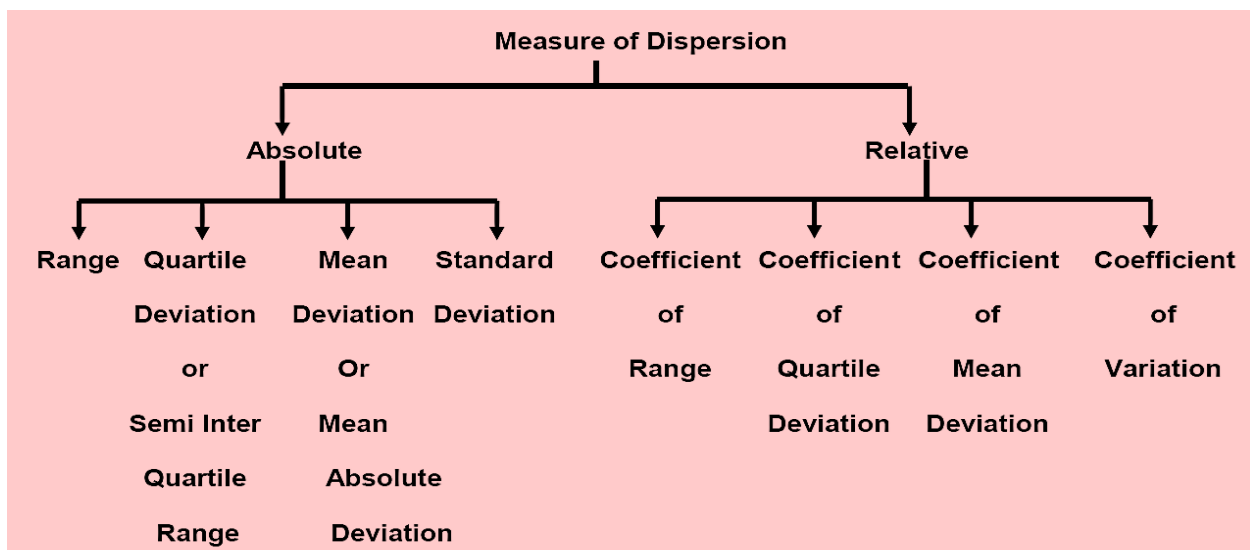
- ✓ Simple to understand and easy to calculate
- ✓ Rigidly defined
- ✓ Based on all items
- ✓ Amenable to algebraic treatment

- ✓ Sampling stability and not unduly affected by Extreme items.

Types of Measures of Dispersion

There are two types of measures of dispersion

Absolute Measure	Relative Measure
These measures of dispersion will have the same units as those of the variables	These are usually expressed as ratios or percentages and hence unit free
Absolute measures are related to the distribution itself.	Relative measures are used ✓ to compare variability between two or more series. ✓ To check the relative accuracy of the data



- ✓ A small value for a measure of dispersion indicates that the data are clustered closely (the mean is, therefore, representative of the data).
- ✓ A large measure of dispersion indicates that the mean is not

reliable (it is not representative of the data).



Range

- ✓ The simplest measure of dispersion is the range.
- ✓ For ungrouped data, the range is the difference between the highest and lowest values in a set of data.

Range = Highest Value - Lowest Value

$$R = H - L$$

- ✓ The range only takes into account the most extreme values.
- ✓ This may not be representative of the population.

Example:

A sample of five accounting graduates revealed the following starting salaries:

22,000, 28,000, 31,000, 23,000, 24,000

Solution:

Range = Highest Value - Lowest Value

$$\text{Range} = 31,000 - 22,000 = 9,000$$



Coefficient of Range

Coefficient of Range is calculated as,

$$\text{Coefficient of Range} = \frac{H - L}{H + L}$$

Highest Value (H)

Lowest Value (L)

Example:

Find the range and coefficient of range of the data.

63, 89, 98, 125, 79, 108, 117, 68

Solution:

Range $R = H - L$.

$$\text{Coefficient of Range} = \frac{H - L}{H + L}$$

Highest Value (H)

Lowest Value (L)

$$H = 125$$

$$L = 63$$

$$R = H - L = 125 - 63 = 62$$

$$\text{Coefficient of Range} = \frac{H - L}{H + L} = \frac{125 - 63}{125 + 63} = \frac{62}{188} = 0.33$$

Example:

Find range of the data 8, 8, 8, 8, 8 . . . 8.

Solution:

Range $R = H - L$.

Highest Value (H)

Lowest Value (L)

$$H = 8$$

$$L = 8$$

$$R = H - L = 8 - 8 = 0$$

Example:

Calculate the range of the following data.

Income	400-450	450-500	500-550	550-600	600-650
Number of workers	8	12	30	21	6

Solution:

Range $R = H - L$.

Highest Value (H)

Lowest Value (L)

$H = 650$

$L = 400$

$$R = H - L = 650 - 400 = 250$$

Homework

1. If the range and coefficient of range of the data are 20 and 0.2 respectively, then find the largest and smallest values of the data.
2. If the range and the smallest value of a set of data are 36.8 and 13.4 respectively, then find the largest value.