Measures of Central Tendency

Multiple Choice Type Questions

- 1. Which of the following are methods under measures of dispersion?
- a. Standard deviation
- b. Mean deviation
- c. Range
- d. All of the above
- 2. Which of the following are characteristics of a good measure of dispersion?
- a. It should be easy to calculate
- b. It should be based on all the observations within a series
- c. It should not be affected by the fluctuations within the sampling
- d. All of the above
- 3. If all the observations within a series are multiplied by five, then ______.
- a. The new standard deviation would be decreased by five
- b. The new standard deviation would be increased by five
- c. The new standard deviation would be half of the previous standard deviation
- d. The new standard deviation would be multiplied by five

4. The coefficient of variation is a percentage expression for ______.

- a. Standard deviation
- b. Quartile deviation
- c. Mean deviation
- d. None of the above
- 5. While calculating the standard deviation, the deviations are only taken from ______.
- a. The mode value of a series
- b. The median value of a series
- c. The quartile value of a series
- d. The mean value of a series

ANSWER

1. (d) 2. (d) 3. (d) 4. (a) 5. (d)

SHORT ANSWER QUESTIONS

1. A measure of dispersion is a good supplement to the central value in understanding a frequency distribution. Comment.

ANSWER:

The study of the averages is only one sided distribution story. In order to understand the frequency distribution fully, it is essential to study the variability of the observations. The average measures center of the data whereas the quantum of the variation is measured by the measures of dispersion like range, quartile deviation, mean deviation and Standard Deviation. For example, if a country has very high income group people, then we can say that the country has large income disparity.

2. Which measure of dispersion is the best and how?

ANSWER:

Standard Deviation is the best measure of dispersion as it satisfies the most essentials of the good measure of dispersion. The following points make Standard Deviation the best measure of dispersion:

1. Most of the statistical theory is based on Standard Deviation. It helps to make comparison between variability of two or more sets of data. Also, Standard Deviation helps in testing the significance of random samples and in regression and correlation analysis.

2. It is based on the values of all the observations. In other words, Standard Deviation makes use of every item in a particular distribution.

3. Standard Deviation has a precise value and is a well-defined and definite measure of dispersion. That is, it is rigidly defined.

4. It is independent of the origin.

5. It is widely used measure of dispersion as all data distribution is nearer to the normal distribution.

6. It enables algebraic treatment. It has correct mathematical processes in comparison to range, quartile deviation and mean deviation.

3. Some measures of dispersion depend upon the spread of values whereas some calculate the variation of values from a central value. Do you agree?

<u>ANSWER:</u> Yes, it is true that some measures of dispersion depend upon the spread of values, whereas some calculate the variation of values from the central value. The spread of values is determined by the absolute measures of dispersion like Range, Quartile Mean Deviation, and Standard Deviation. These measures express dispersion in terms of original unit of the series and it cannot be used for the comparison of statistical data having different units. On the other hand, the relative measures of the dispersion calculate the variability of the values from a central value. The relative measure includes coefficient of Range, Mean Deviation and Variation. It is used when the comparison has to be made between two statistical sets. These measures are free from any units.

4. In a town, 25% of the persons earned more than Rs 45,000 whereas 75% earned more than 18,000. Calculate the absolute and relative values of dispersion.

ANSWER: Absolute Value of Dispersion

Range =L-S =45,000-18,000= Rs 27,000

Relative Value of Dispersion

Coefficient of Range = $\frac{L-S}{L+S}$ = $\frac{45000-18000}{45000+18000}$ = 0.428

LONG ANSWER QUESTION

1. What are the objectives of computing dispersion?

ANSWER: (1) Comparative study

- Measures of dispersion give a single value indicating the degree of consistency or uniformity of distribution. This single value helps us in making comparisons of various distributions.
- The smaller the magnitude (value) of dispersion, higher is the consistency or uniformity and vice-versa.
- (2) Reliability of an average
- A small value of dispersion means low variation between observations and average. It means that the average is a good representative of observation and very reliable.
- A higher value of dispersion means greater deviation among the observations. In this case, the average is not a good representative and it cannot be considered reliable.

(3) Control the variability

- Different measures of dispersion provide us data of variability from different angles, and this knowledge can prove helpful in controlling the variation.
- Especially in the financial analysis of business and medicine, these measures of dispersion can prove very useful.
- (4) Basis for further statistical analysis
- Measures of dispersion provide the basis for further statistical analysis like computing correlation, regression, test of hypothesis, etc.
- 2. What are the various 'absolute measures' of Dispersion?

ANSWER: Following are the different 'absolute measures' of dispersion:

(1) <u>Range</u>

- It is the simplest method of measurement of dispersion.
- It is defined as the difference between the largest and the smallest item in a given distribution.
- Range = Largest item (L) Smallest item (S)
- (2) Interquartile Range
- It is defined as the difference between the Upper Quartile and Lower Quartile of a given distribution. Interquartile Range = Upper Quartile (Q₃)–Lower Quartile(Q₁)

(3) Quartile Deviation

- It is known as Semi-Inter-Quartile Range, i.e. half of the difference between the upper quartile and lower quartile.
- Quartile Deviation =

Upper Quartile (Q_3) – Lower Quartile (Q_1)

(4) Mean Deviation

- Mean deviation is the arithmetic mean (average) of deviations $\left| D \right|$ of observations from a central value {Mean or Median}.
- (5) Standard Deviation
- Standard deviation is the Square Root of the Arithmetic Average of the squared of the deviations measured from the mean.
- (6) Lorenz Curve
- The Lorenz Curve is a graphic method of measuring estimated dispersion.
- This curve is often used to measure the inequalities of income or wealth in a society.

3. What are the various 'relative measures' of Dispersion?

<u>ANSWER:</u> Following Are the Relative Measures of Dispersion:

(1) Coefficient of Range

It refers to the ratio of the difference between two extreme items of the distribution to their sum.

Coefficient of Range =

(largest item-smallest item) (largest item+smallest item)

(2) Coefficient of Quartile Deviation

It refers to the ratio of the difference between Upper Quartile and Lower Quartile of a distribution to their sum.

$$rac{Q_3-Q_1}{Q_3+Q_1}$$

Coefficient of Quartile Deviation =

(3) Coefficient of Mean Deviation

- Mean deviation is an absolute measure of dispersion.
- In order to transform it into a relative measure, it is divided by the particular average, from which it has been calculated.
- It is then known as the Coefficient of Mean Deviation.
- Coefficient of Mean Deviation from Mean

$$\left(\bar{X}\right) = \frac{MD_{\bar{X}}}{\bar{X}}$$

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• Coefficient of Mean Deviation from Median

$$(ME) = \frac{MD_{Mc}}{Me}$$

4. What Are the merits and demerits of range?

ANSWER: Merits

- 1. It is very easy to calculate and simple to understand.
- 2. No special knowledge is needed while calculating range.
- 3. It takes the least time for computation.
- 4. It provides a broad picture of the data at a glance.

Demerits

- 1. It is a crude measure because it is only based on two extreme values (highest and lowest).
- 2. It cannot be calculated in the case of open-ended series.
- 3. Range is significantly affected by fluctuations of sampling, i.e. it varies widely from sample to sample.

Merits and demerits of Quartile Deviation

<u>Merits</u>

- 1. It is also quite easy to calculate and simple to understand.
- 2. It can be used even in case of open-end distribution.
- 3. It is less affected by extreme values so, it a superior to 'Range'.
- 4. It is more useful when the dispersion of the middle 50% is to be computed.

Demerits

- 1. It is not based on all the observations.
- 2. It is not capable of further algebraic treatment or statistical analysis.
- 3. It is affected considerably by fluctuations of sampling.
- 4. It is not regarded as a very reliable measure of dispersion because it ignores 50% observations.