Measures of Variability

The measures of central tendency are the estimates of the average of a set of observations. While, interpreting this average value, we assume that the estimated values are uniform. The average value does not explain the differences between observations.

Let us take the case of two different salesman (X and Y) operating in two different regions of a company. Let the monthly sales revenue generated by these two salesmen are mentioned below:

Sales Revenue of Salesman

Year	Salesman X	Salesman Y
1	75000/-	10,000/-
2	75000/-	15,000/-
3	75000/-	20,000/-
4	75000/-	30,000/-
5	75000/-	40,000/-
6	75000/-	3,35,000/-
Total Sales	4,50,000	4,50,000/-
Mean Sales	75,000/-	75,000/-

It is clear from this table that mean sales of each of the salesman is Rs. 75,000/-. So, if the mean alone is taken to judge the performance of the salesmen, it is not possible to discriminate them, though there is a strong evidence of poor performance of the salesman-Y during initial years.

Hence, the differences between sales figures of a salesman should be studied in the form of variation which alternatively called as ~~Spread~~ Spread. In this case, the sales revenues of the salesman-X is consistent when compared to that of the salesman-Y.

The variation (spread) is a measure of the extent to which the individual observations vary with reference to the average of the given set of observations.

Again the variation or dispersion can be seen at the level of scatteredness among the observations or scores.

The level of variation or dispersion can be measured mainly by the help of four types of measures. (a) Range, (b) Quartile deviation (c) Mean deviation (d) Standard deviation.

Formula: — i) Range — Higher score — Lowest score

H.S. — L.S.

ii) Quartile Deviation (Q.D.)

$$Q.D. = \frac{Q_3 - Q_1}{2}$$

$$Q_1 = L_1 + \frac{(N/4) - F}{f} \times c$$

$$Q_3 = L_3 + \frac{3N/4 - F}{f_1} \times c$$

F : cumf.
f : Normal frequency

iii) Mean Deviation (M.D.):

$$AD = \frac{\Sigma |x - \bar{x}|}{n}$$

$\bar{x}$ = Mean of the observations.

iv) Standard Deviation (S.D.):

$$\sigma = \sqrt{\frac{\Sigma f n^2}{N} - \left(\frac{\Sigma f n}{N}\right)^2}$$

Here: σ = Sigma.

Ref: i) N.G. Das — Statistics Vol-1
ii) Elhance & other — Elementary Statistics.