Measures of dispersion

Dispersion indicates how scatted the values of a data set or frequency distribution are. A higher value of a measure of dispersion will indicate volatility or inconsistency in the data.

Measures of dispersion can be **absolute** (which have units) and **relative** (without units)

Range

It is the simplest measure of dispersion given by difference between the largest and the smallest observations in a distribution. It is an absolute measure

Quartile Deviation

$QD = (Q_3 - Q_1) / 2$, where Q_3 and Q_1 are the third and first quartile respectively.
This is an absolute measure

Coefficient of Quartile Deviation $= (Q_3 - Q_1) / (Q_3 + Q_1)$
This is a relative measure

Mean Deviation

$MD = \Sigma(x - A) / n$, for ungrouped data
$MD = \Sigma f(x - A) / N$, for frequency distribution, where $N = \Sigma f$

Here A can be any of the measures of central tendency, but the Mean Deviation from Arithmetic Mean is commonly used.

Standard Deviation

$\sigma = \sqrt{ (\Sigma(x - AM)^2 / n)}$, for ungrouped data (AM = Arithmetic Mean)
$\sigma = \sqrt{ (\Sigma f(x - AM)^2 / N)}$, for frequency distribution, where $N = \Sigma f$

For convenience, the following formula can be used:

$\sigma = \sqrt{ (\Sigma (x^2) / n - (\Sigma x / n)^2))}$, for ungrouped data
$\sigma = \sqrt{ (\Sigma (fx^2) / n) - (\Sigma x / n)^2))}$, for frequency distribution

Standard deviation is the most popular measure of dispersion and is an absolute measure. Square of standard deviation (σ^2) is known as variance.

Ratio of standard deviation to Arithmetic mean (σ / AM) is known as co-efficient of variation and is a relative measure for dispersion.