

Variance vs Standard deviation?

For samples:

$$\text{variance} = s^2 = \frac{\sum (x - \bar{x})^2}{n - 1}$$

$$\text{standard deviation} = s = \sqrt{s^2}$$

Calculating Formula

$$s^2 = \frac{\sum x^2 - \frac{(\sum x)^2}{n}}{n - 1}$$

For populations:

$$\text{variance} = \sigma^2 = \frac{\sum (x - \bar{x})^2}{n}$$

$$\text{standard deviation} = \sigma = \sqrt{\sigma^2}$$

Calculating Formula

$$\sigma^2 = \frac{\sum x^2 - \frac{(\sum x)^2}{n}}{n}$$

The standard deviation is expressed in the same units as the mean is, whereas the variance is expressed in squared units, thus std is more readily to interpret!

However, variance is usually much more useful mathematically. For example, the sum of uncorrelated distributions (random variables) also has a variance that is the sum of the variances of those distributions.

$$\text{Var}\left(\sum_{i=1}^N X_i\right) = \sum_{i=1}^N \text{Var}(X_i).$$
