Covariance

Let X and Y be two r.v.s. We define the covariance of X and Y to be

$$\mathrm{Cov}(X,Y) \equiv \langle (X-m_X)(Y-m_Y)\rangle$$

The sample covariance is (with N the sample size)

The covariance is a measure of the strength of the correlation between two r.v.s. That is, it indicates the degree to which they vary together.

If X and Y are independant, $\langle XY\rangle = \langle X\rangle\langle Y\rangle = m_X m_Y$. This implies $\mathrm{Cov}(XY) = m_X m_Y - m_X m_Y = 0$. So if two r.v.s are independant, they are uncorrelated. The converse is not necessarily true.

Properties

Correlation

The correlation of r.v.s X and Y is