VARIANCE AND COVARIANCE RULES

Let x and y be random variables.

Let a and b be constants.

Covariance Rules

Assume that x and y are not independent. (i.e. there is some dependent relationship between them)

cov(a, b) = 0

cov(a, y) = 0

cov(x, b) = 0

cov(ax, y) = acov(x,y)

cov(x, by) = bcov(x,y)

cov(ax, by) = abcov(x,y)

cov(x+a, y) = cov(x,y) + cov(a,y) = cov(x,y) because cov(a,y)=0

cov(x+a, y+b) = cov(x,y) + cov(a,y) + cov(x,b) + cov(a,b) = cov(x,y) because cov(a,y)=cov(x,b)=cov(a,b) = 0

cov(x,x) = var(x)

cov(ax, ax) = a^2var(x)

[Note: if x and y are independent, then cov(x,y) = 0 since there is no dependent relationship between the two variables]

Variance Rules

var(ax) = a^2var(x)

var(a) = 0

var(x + y) = var(x) + var(y) + 2 cov(x,y) [Note: if x and y are independent, then var(x + y) = var(x) + var(y)]

var(ax + by) = a^2var(x) + b^2var(y) + 2abcov(x,y)

NOTE: The sample standard deviation/sample variance can be treated as a constant once it is calculated since it does not change.