

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Calculating covariance and correlation between two random variables												
2													
3	Economic outcome	Probability	GM Return	Gold Return									
4	Depression	0.05	-20%	5%									
5	Recession	0.30	10%	20%									
6	Normal	0.50	30%	-12%									
7	Boom	0.15	50%	9%									
8													
9													
10			GM	Gold									
11	Means		0.245	0.016	=SUMPRODUCT(D4:D7,B4:B7)								
12	Variances		0.027475	0.020284	=SUMPRODUCT((D4:D7-D11)^2,\$B4:\$B7)								
13	Standard deviations		0.16575584	0.142421908	=SQRT(D12)								
14													
15	Covariance	-0.00967	=SUMPRODUCT(C4:C7-C11,D4:D7-D11,B4:B7)										
16	Correlation	-0.40961969	=B15/(C13*D13)										
17	CORRELATION >0 COV=	0.00967											
18	CORRELATION =0	0											
19													
20		weights:	0.4	0.6									
21	Portfolio mean		0.1076	=SUMPRODUCT(C20:D20,C11:D11)									
22	Portfolio variance		0.00705664	=C20^2*C12+D20^2*D12+2*C20*D20*B15									
23	Portfolio var. (corr >0)		0.01633984										
24	Portfolio var. (corr =0)		0.01169824										
25													
26													
27													
28													

$$\text{corr}(X, Y) = \frac{\text{cov}(X, Y)}{\sigma_X \cdot \sigma_Y}$$

$$\text{cov}(X, Y) = \sum_{i=1}^N (x_i - E(X))(y_i - E(Y))p(x_i, y_i)$$

$$E(Y) = a_1 E(X_1) + a_2 E(X_2)$$

$$\text{var}(Y) = a_1^2 \text{var}(X_1) + a_2^2 \text{var}(X_2) + 2a_1 a_2 \text{cov}(X_1, X_2)$$

Variance (X=dependant)

Expected value