Mean Variance Analysis: Assumptions

The rate of return of a Large-Cap Stock is -11% in a recession, 13% in a normal period, 27% in a boom.
The rate of return of a bond is 16% in a recession, 6% in a normal period, -4% in a boom.
What are the covariance and correlation coefficient between the rates of return?

Asset 1

Large-Cap Stocks

	Prob	Rate of Return	Expected Return	Deviation from Expected Return	Variance	Weighted Variance
Recession	0.3	-11	-3.3	-21	441	132.3
Normal	0.4	13	5.2	3	9	3.6
Boom	0.3	27	8.1	17	289	86.7
			10			222.6
					s	14.9198

Asset 2

Bond

	Prob	Rate of Return	Expected Return	Deviation from Expected Return	Variance	Weighted Variance
Recession	0.3	16	4.8	10	100	30
Normal	0.4	6	2.4	0	0	0
Boom	0.3	-4	-1.2	-10	100	30
			6			60
					s	7.74597

Covariance

Cross-Product of Deviation	Weighted
-210	-63
0	0
-170	-51
	-114

Correlation Coefficient ρ

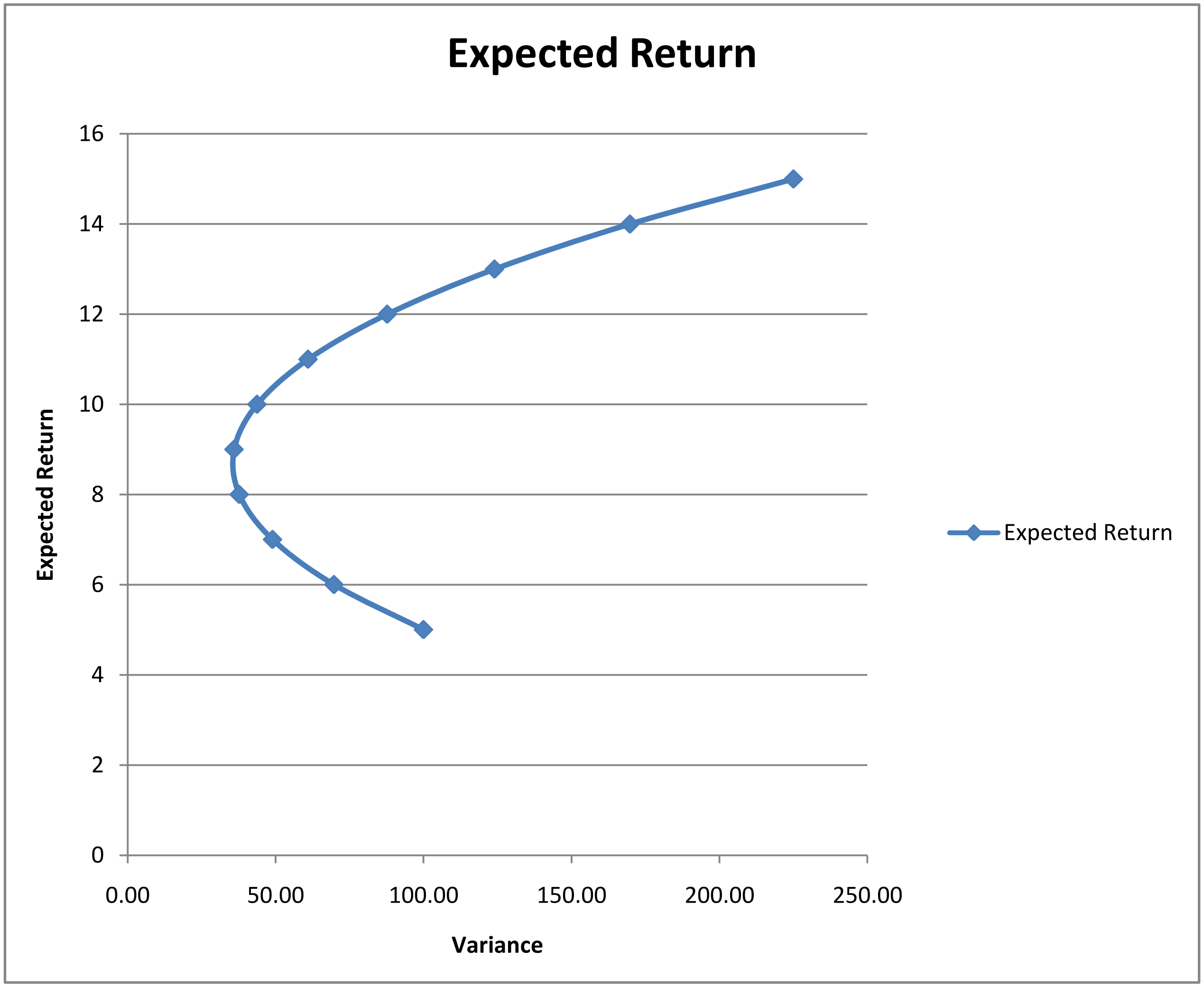
-0.98643

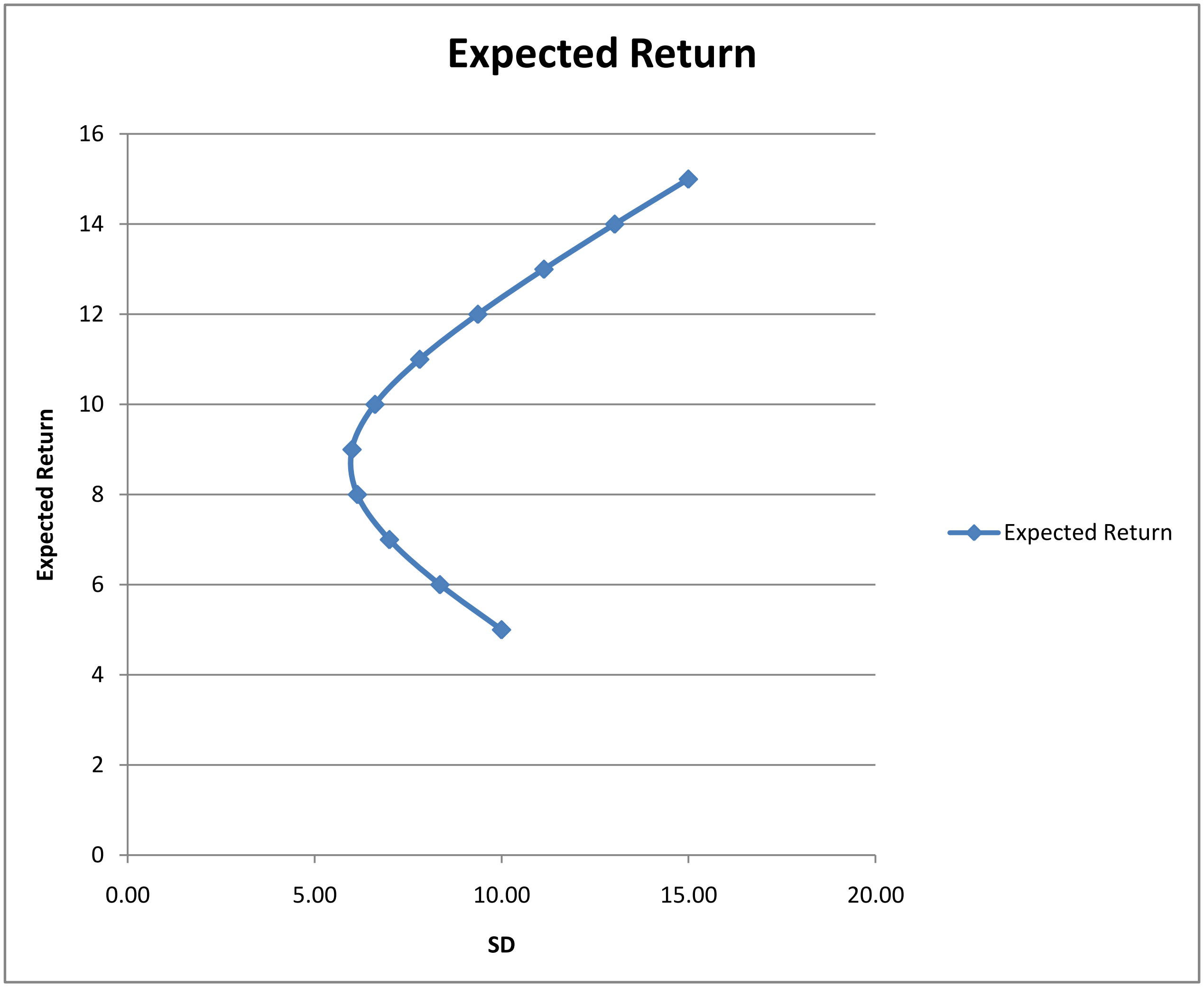
Compute Portfolio Expected Return, Variance and Standard Deviation Given Weights

	Asset 1 Large-Cap Stocks	Asset 2 Bonds
Expected Return	15	5
Variance	225	100
Standard Deviation	15	10
Correlation	-0.5	

w1	10%	**Portfolio**	
w2	90%	Expected Return	6
		s^2	69.75
		s	8.351647

Expected Return (%)	Portfolio Variance	Portfolio standard deviation	Large-Cap Stocks w1	Bonds w2
5	100.00	10.00	0	1
6	69.75	8.35	0.1	0.9
7	49.00	7.00	0.2	0.8
8	37.75	6.14	0.3	0.7
9	36.00	6.00	0.4	0.6
10	43.75	6.61	0.5	0.5
11	61.00	7.81	0.6	0.4
12	87.75	9.37	0.7	0.3
13	124.00	11.14	0.8	0.2
14	169.75	13.03	0.9	0.1
15	225.00	15.00	1	0


Expected Return
16
14
12
10
8
6
4
2
0
0.00
50.00
100.00
150.00
200.00
250.00
Variance
Expected Return
Expected Return


Expected Return
16
14
12
10
8
6
4
2
0
0.00
5.00
10.00
15.00
20.00
SD
Expected Return
Expected Return

Optimal Risky Portfolio

Rate of return on risk-free asset (T-bill):	5
Weight invested in bonds	0.428571
Weight invested in stocks	0.571429

	Asset 1 Large-Cap Stocks	Asset 2 Bonds
Expected Return	15	5
Variance	225	100
Standard Deviation	15	10
Correlation	-0.5	

Composition of Complete Portfolio

Weight in risk-free ass	45%
Weight in bond fund	24%
Weight in stock fund	31%