FIN 303
Professor Dow

Risk Problem Set

1. You are given the following probabilities of payouts for three securities (A, B and C). For each security, calculate the expected payout and the standard deviation. Draw the histograms for the distributions of the payouts.

	Probabilities		
Payout	A	B	C
0	0.2	0.1	0.3
1	0.2	0.2	0.2
2	0.2	0.4	0.0
3	0.2	0.2	0.2
4	0.2	0.1	0.3

2. Plot the securities listed below on a risk-return diagram. Which securities can we be sure that people would not want to hold if given the choice of picking one?

Security	Expected Return	Standard Deviation
A	3.1	3.1
B	2.5	2.7
C	1.7	1.4
D	4.2	5.5
E	2.6	1.3
F	3.7	2.9

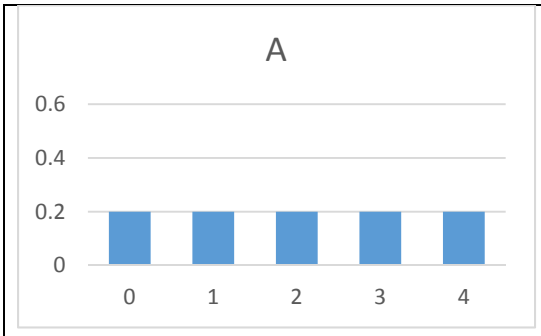
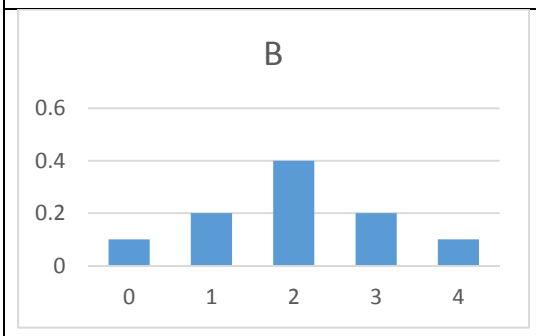
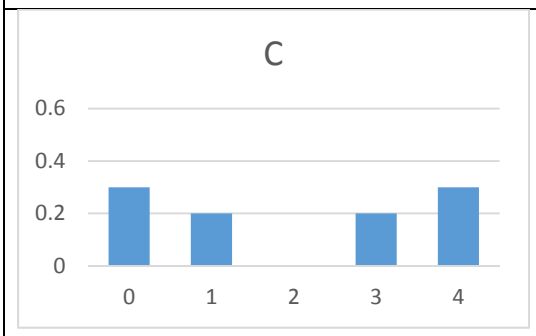
3. There are two equally-probable states of the world; call them “good” and “bad”. There are two securities: A and B.

State of the world	Return to A	Return to B
Good	6	4
Bad	4	8

Calculate the expected returns and standard deviations of three portfolios: one consisting of security A, one consisting of security B, and one consisting of ½ security A plus ½ security B. Compare the desirability of the portfolios. Calculate the covariance and correlation coefficient between A and B.

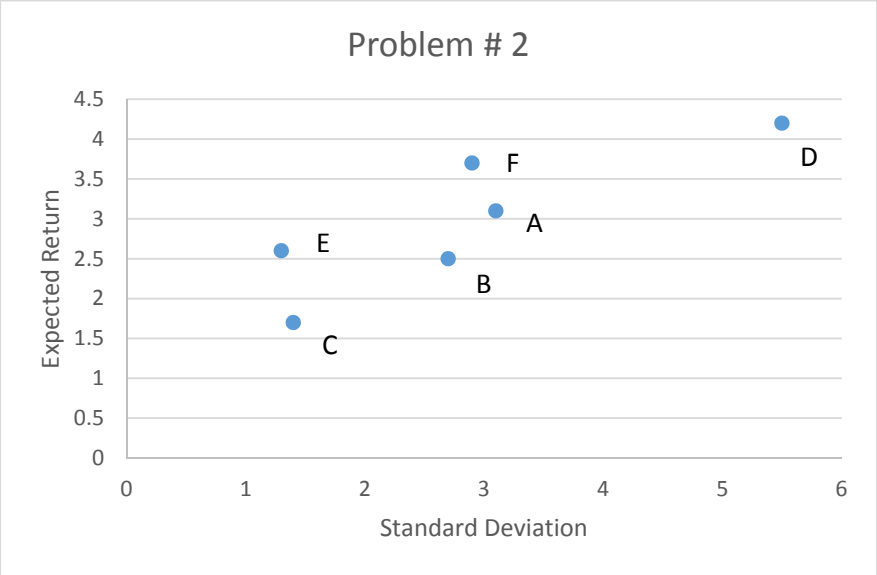
Answers

1.

	E()=0.2*0+0.2*1+0.2*2+0.2*3+0.2*4 = 2 SD()=SQRT(0.2*(0-2)^2+0.2*(1-2)^2+0.2*(2-2)^2+0.2*(3-2)^2+0.2*(4-2)^2) = 1.41
	E()=0.1*0+0.2*1+0.4*2+0.2*3+0.1*4 = 2 SD()=SQRT(0.1*(0-2)^2+0.2*(1-2)^2+0.4*(2-2)^2+0.2*(3-2)^2+0.1*(4-2)^2) = 1.10
	E()=0.3*0+0.2*1+0.0*2+0.2*3+0.3*4 = 2 SD()=SQRT(0.3*(0-2)^2+0.2*(1-2)^2+0.0*(2-2)^2+0.2*(3-2)^2+0.3*(4-2)^2) = 1.67

All three distributions are symmetrical around 2 which is the expected payout. B has a lower standard deviation which can be seen on the histogram as the probability is more towards the middle of the distribution. C has a higher standard distribution and the probability is more towards the tails.

2.



You would not want to choose C or B since E has lower risk and a higher expected return. You would not want to choose A because F has lower risk and a higher expected return. Without more information you cannot choose between E, F and D since it depends on your individual risk tolerance.

3.
Expected Return for A = 0.5*6 + 0.5*4 = 5
Standard Deviation for A = $(0.5*(6-5)^2+0.5*(4-5)^2)^{0.5} = 1$

Expected Return for B = 0.5*4 + 0.5*8 = 6
Standard Deviation for B = $(0.5*(4-6)^2+0.5*(8-6)^2)^{0.5} = 2$

Portfolio (1/2)A+(1/2)B. Returns are 5 in the good state and 6 in the bad state.

Expected Return = 0.5*5+0.5*6 = 5.5
Standard Deviation = $(0.5*(5-5.5)^2+0.5*(6-5.5)^2)^{0.5} = 0.5$

This portfolio is better than A since it has lower risk and a higher expected return
Compared with B, the portfolio has lower risk but also a lower expected return.

Covariance between A and B = 0.5(6-5)*(4-6)+0.5(4-5)*(8-6) = -2
Correlation coefficient = -2/(2*1) = -1