

## Sample problems\*

1. A three-asset portfolio has the following characteristics:

Asset	Expected return	Standard deviation	weight
X	15%	22%	0.50
Y	10	8	0.40
Z	6	3	0.10

What is the expected return on this three-asset portfolio?

2. Calculate the mean return and standard deviation for the stock fund. Calculate the covariance between the stock and bond funds.

Scenario	Probability	Rate of return	
		Stock fund	Bond fund
Recession	1/3	-9%	17%
Normal	1/3	12	7
Boom	1/3	30	-3

3. Calculate the mean return and standard deviation for the stock fund. Calculate the covariance between the stock and bond funds.

Scenario	Probability	Rate of return	
		Stock fund	Bond fund
Recession	0.4	-7%	17%
Normal	0.2	12	7
Boom	0.4	28	-3

4. Calculate the covariance and correlation coefficient between the stock and bond funds.

Scenario	Probability	Rate of return	
		Stock fund	Bond fund
Recession	0.4	-7%	10%
Normal	0.2	12	7
Boom	0.4	28	-2

Use the following data to work problems 5, 6 and 7.

	Expected return	Standard deviation
Stock fund (S)	22%	32%
Bond fund (B)	13	23

The correlation between the fund returns is 0.15.

4. Tabulate and draw the investment opportunity set of the two risky funds. Use investment proportions for the stock fund of 0 to 100% in increments of 20%. What expected return and standard deviation does your graph show for the minimum variance portfolio?
5. Draw a tangent from the risk-free rate to the opportunity set. What does your graph show for the expected return and standard deviation of the optimal risky portfolio?
6. Now assume that the weight of the bond fund in the optimal risky portfolio is 34%. What is the reward-to-variability ratio of the best feasible CAL?

A universe of securities includes a risky stock (X), a stock index fund (M), and T-bills. The data for the universe are:

	Expected return	Standard deviation
X	15%	50%
M	10	20
T-bills	5	0

The correlation between X and M is -0.2.

7. Draw the opportunity set of securities X and M.
8. If the optimal risky portfolio has a weight in security X of 18%, what is the expected return and standard deviation of the portfolio?
9. Find the slope of the CAL generated by T-bills and the optimal risky portfolio.
10. Suppose an investor places  $\frac{2}{9}$  (that is, 22.22%) of his wealth in the risky portfolio and the remainder in T-bills. Calculate the composition of the complete portfolio.
11. What is the relationship of the portfolio standard deviation to the weighted average of the standard deviations of the component assets?
12. A project has a 0.7 chance of doubling your investment in a year and a 0.3 chance of halving your investment in a year. What is the standard deviation of the rate of return on this investment?
13. Suppose the risk premium of the market portfolio is 9%, and we estimate the beta of security A as 1.3. If the T-bill rate were 5%, what is the expected rate of return on security A?
14. Suppose the risk premium on the market portfolio is estimated at 8% with a standard deviation of 22%. What is the risk premium on a portfolio invested 25% in GM with a beta of 1.15 and 75% in Ford with a beta of 1.25?

15. Stock XYZ has an expected return of 12% and risk of  $\beta=1.0$ . Stock ABC is expected to return 13% with a beta of 1.5. The market's expected return is 11% and  $r_f = 5\%$ . According to the CAPM, which stock is a better buy? What is the alpha of each stock? Plot the SML and the two stocks and show the alphas of each on the graph.
16. What is the beta of a portfolio with  $E(R_p) = 20\%$ , if  $r_f = 5\%$  and  $E(R_m) = 15\%$ ?

Assume a risk-free rate of 8% and the expected rate of return on the market is 18% for the next two problems.

17. A share of stock is now selling for \$100. It will pay a dividend of \$9 per share at the end of the year. Its beta is 1.0. What do investors expect the stock to sell for at the end of the year?
18. A stock has an expected return of 6%. What is its beta?
19. Two investment advisers are comparing performance. One averaged a 19% return and the other a 16% return. However, the beta of the first adviser was 1.5, while that of the second was 1.0. Can you tell which adviser was a better selector of individual stocks? If the T-bill rate were 6% and the market return during the period were 14%, which adviser would be superior stock selector? What is the T-bill rate were 3% and the market return 15%?
20. In 2000, the yield on short-term government securities (perceived to be risk-free) was about 5%. Suppose the expected return required by the market for a portfolio with a beta of 1.0 is 12%. Suppose you consider buying a share of stock at a price of \$40. The stock is expected to pay a dividend of \$3 next year and to sell then for \$41. The stock risk has been evaluated at  $\beta=-0.5$ . Is the stock overpriced or underpriced?

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\* The sample problems are taken from Essentials of Investments, 4<sup>th</sup> edition, by Bodie, Kane and Marcus.