

FM 2555A

Chapter 8 *Practice Exercises*

Problems below, unless indicated otherwise, were taken from Brealey, R. (2017), *Principles of Corporate Finance*, 12th edition, McGraw-Hill Education, New York.
N.B.: *You will learn and benefit more if you attempt solving them first before looking at their solutions.*

NOTE: **Problem number format:** [x/y], where x is the number of the problem and y is the page number in the 12th ed of the Brealey et al. textbook.

Problem [1/212]

Here are the returns and standard deviations for four investments.

	Return (%)	Standard Deviation (%)
Treasury bills	6	0
Stock P	10	14
Stock Q	14.5	28
Stock R	21	26

Calculate the standard deviations of the following portfolios.

- 50% in Treasury bills, 50% in stock P.
- 50% each in Q and R, assuming the shares have
 - perfect positive correlation.
 - perfect negative correlation.
 - no correlation.
- Plot the return-risk profile for Q and R, assuming a correlation coefficient of 0.5
- Stock Q has a lower return than R but a higher standard deviation. Does that mean that Q's price is too high or that R's price is too low? [Hint: Relate this to the concept of risk measurement.]

Problem [2/212]

For each of the following pairs of investments, state which would always be preferred by a rational investor (assuming that these are the *only* investments available to the investor):

- Portfolio A $r = 18\%$ $\sigma = 20\%$
Portfolio B $r = 14\%$ $\sigma = 20\%$
- Portfolio C $r = 15\%$ $\sigma = 18\%$

- Portfolio D $r = 13\%$ $\sigma = 8\%$
 c. Portfolio E $r = 14\%$ $\sigma = 16\%$
 Portfolio F $r = 14\%$ $\sigma = 10\%$

Problem [3/213]

In Chapter 7, you are given the long-term risk premium of 7.7% and the long-term standard deviation of 19.9% for long-term security returns. Calculate the historical level of the Sharpe ratio of the market portfolio.

Problem [5/213]

- a. Plot the following risky portfolios on the graph.

PORTFOLIO

Year	A	B	C	D	E	F	G	H
Expected return (r), (%)	10	12.5	15	16	17	18	18	20
SD (σ), (%)	23	21	25	29	29	32	35	45

- b. Five of these portfolios are efficient, and three are not. Which are inefficient ones?
 c. Suppose you can also borrow and lend at an interest rate of 12%. Which of the above portfolios has the highest Sharpe ratio?
 d. Suppose you are prepared to tolerate a standard deviation of 25%. What is the maximum expected return that you can achieve if you cannot borrow or lend?
 e. What is your optimal strategy if you can borrow or lend at 12% and are prepared to tolerate a standard deviation of 25%? What is the maximum expected return that you can achieve with this risk?

Problem [6/213]

Suppose that the Treasury bill rate is 6%. Assume that the expected return on the market stays at 9%. You are given the info below.

Stock	Beta
Caterpillar	1.66
Dow Chemical	1.65
Ford	1.44
Microsoft	0.98
Apple	0.91
Johnson & Johnson	0.53
Walmart	0.45
Campbell Soup	0.39
Consolidated Edison	0.17

Newmont	0
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- Calculate the expected return from Johnson & Johnson.
- Find the highest expected return that is offered by one of these stocks.
- Find the lowest expected return that is offered by one of these stocks.
- Would Ford offer a higher or lower expected return if the interest rate were 2% rather than 6%? Assume that the expected market return stays at 9%.
- Would Walmart offer a higher or lower expected return if the interest rate were 8%?

Problem [7/214]

True or False?

- The CAPM implies that if you could find an investment with a negative beta, its expected return would be less than the interest rate.
- The expected return on an investment with a beta of 2.0 is twice as high as the expected return on the market.
- If a stock lies below the security line, it is undervalued.

Problem [8/214]

Consider a three-factor APT model. The factors and associated risk premiums are:

Factor	Risk Premium (%)
Change in GNP	+5
Change in energy prices	-1
Change in long-term interest rates	+2

Calculate expected rates of return on the following stocks. The risk-free interest rate is 7%.

- A stock whose return is uncorrelated with all three factors.
- A stock with average exposure to each factor (i.e., with $b = 1$ for each).
- A pure-play energy stock with high exposure to the energy factor ($b = 2$) but zero exposure to the other two factors.
- An aluminum company stock with average sensitivity to changes in interest rates and GNP, but negative exposure of $b = -1.5$ to the energy factor. (The aluminum company is energy-intensive and suffers when energy prices rise.)

Problem [9/214]

True or False? Explain or qualify as necessary.

- Investors demand higher expected rates of return on stocks with more variable rates of return.

- b. The CAPM predicts that a security with a beta of 0 will offer a zero expected return.
- c. An investor who puts \$10,000 in Treasury bills and \$20,000 in the market portfolio will have a beta of 2.0.
- d. Investors demand higher expected rates of return from stocks with returns that are highly exposed to macroeconomic risks.
- e. Investors demand higher expected rates of return from stocks with returns that are very sensitive to fluctuations in the stock market.

Problem [11/214]

Mark Harrywitz proposes to invest in two shares, X and Y. He expects a return of 12% from X and 8% from Y. The standard deviation of returns is 8% for X and 5% for Y. The correlation coefficient between the returns is 0.2.

- a. Compute the expected return and standard deviation of the following portfolios:

Portfolio	Percentage in X	Percentage in Y
1	50	50
2	25	75
3	75	25

- b. Sketch the set of portfolios composed of X and Y.
- c. Suppose that Mr. Harrywitz can also borrow or lend at an interest rate of 5%. Show on your sketch how this alters his opportunities. Given that he can borrow or lend, what proportions of the common stock portfolio should be invested in X and Y?

Problem [13/215]

You are given the following data:

	2010	2011	2012	2013	2014
Ms. Sauros	24.90	−.90	18.60	42.10	15.20
S&P 500	17.20	1.00	16.10	33.10	12.70
Interest rate	.12	.04	.06	.02	.02

Calculate the average return and standard deviation of returns for Ms Sauros's portfolio and for the market. Then, calculate the Sharpe ratio for the portfolio and the market. On this measure did Ms Sauros perform better or worse than the market?

Problem [14/215]

Refer to the info in Problem [6/213] above.

- a. What is the beta of the portfolio that has 40% invested in Ford and 60% in Johnson & Johnson?

- b. Would you invest in this portfolio if you had no superior information about the prospects for these stocks? Devise an alternative portfolio with the same expected return and less risk.
- c. Now repeat parts (a) and (b) with a portfolio that has 40% invested in Apple and 60% in Walmart.

Problem [15/215]

The Treasury bill rate is 4%, and the expected return on the market portfolio is 12%.

Using CAPM:

- a. Draw a graph showing how the expected return varies with beta.
- b. What is the risk premium on the market?
- c. What is the required return on investment with a beta of 1.5?
- d. If an investment with a beta of 0.8 offers an expected return of 9.8%, does it have a positive NPV?
- e. If the market expects a return of 11.2% from stock X, what is beta?

Problem [16/216]

Percival Hygiene has \$10 million invested in long-term corporate bonds. This bond portfolio's expected annual rate of return is 9%, and the annual standard deviation is 10%.

Amanda Reckonwith, Percival's financial adviser, recommends that Percival consider investing in an index fund that closely tracks the Standard & Poor's 500 Index. The index has an expected return of 14%, and its standard deviation is 16%.

- a. Suppose Percival puts all his money in a combination of the index fund and Treasury bills. Can he thereby improve his expected rate of return without changing the risk of his portfolio? The Treasury bill yield is 6%.
- b. Could Percival do even better by investing equal amounts in the corporate bond portfolio and the index fund? The correlation between the bond portfolio and the index fund is +0.1.