PROBLEMS

Easy Problems 1–5

8-1 **EXPECTED RETURN** A stock's returns have the following distribution:

Demand for the Company's Products	Probability of This Demand Occurring	Rate of Return If This Demand Occurs
Weak	0.1	(50%)
Below average	0.2	(5)
Average	0.4	16
Above average	0.2	25
Strong	0.1	60
	1.0	

Calculate the stock's expected return, standard deviation, and coefficient of variation.

8-2 **PORTFOLIO BETA** An individual has $35,000 invested in a stock with a beta of 0.8 and another $40,000 invested in a stock with a beta of 1.4. If these are the only two investments in her portfolio, what is her portfolio's beta?

8-3 **REQUIRED RATE OF RETURN** Assume that the risk-free rate is 6% and the expected return on the market is 13%. What is the required rate of return on a stock with a beta of 0.7?

8-4 **EXPECTED AND REQUIRED RATES OF RETURN** Assume that the risk-free rate is 5% and the market risk premium is 6%. What is the expected return for the overall stock market? What is the required rate of return on a stock with a beta of 1.2?

8-5 **BETA AND REQUIRED RATE OF RETURN** A stock has a required return of 11%, the risk-free rate is 7%, and the market risk premium is 4%.

a. What is the stock's beta?
b. If the market risk premium increased to 6%, what would happen to the stock's required rate of return? Assume that the risk-free rate and the beta remain unchanged.

Intermediate Problems 6–12

8-6 **EXPECTED RETURNS** Stocks X and Y have the following probability distributions of expected future returns:

Probability	X	Y
0.1	(10%)	(35%)
0.2	2	0
0.4	12	20
0.2	20	25
0.1	38	45

a. Calculate the expected rate of return, $\hat{r}_Y$, for Stock Y ($\hat{r}_X = 12\%$).
b. Calculate the standard deviation of expected returns, σ_X, for Stock X ($\sigma_Y = 20.35\%$). Now calculate the coefficient of variation for Stock Y. Is it possible that most investors will regard Stock Y as being less risky than Stock X? Explain.

8-7 **PORTFOLIO REQUIRED RETURN** Suppose you are the money manager of a $4 million investment fund. The fund consists of four stocks with the following investments and betas:

Stock	Investment	Beta
A	$ 400,000	1.50
B	600,000	(0.50)
C	1,000,000	1.25
D	2,000,000	0.75

If the market's required rate of return is 14% and the risk-free rate is 6%, what is the fund's required rate of return?

8-8 **BETA COEFFICIENT** Given the following information, determine the beta coefficient for Stock J that is consistent with equilibrium: $\hat{r}_J = 12.5\%$; $r_{RF} = 4.5\%$; $r_M = 10.5\%$.

8-9 **REQUIRED RATE OF RETURN** Stock R has a beta of 1.5, Stock S has a beta of 0.75, the expected rate of return on an average stock is 13%, and the risk-free rate of return is 7%. By how much does the required return on the riskier stock exceed the required return on the less risky stock?

8-10 **CAPM AND REQUIRED RETURN** Bradford Manufacturing Company has a beta of 1.45, while Farley Industries has a beta of 0.85. The required return on an index fund that holds the entire stock market is 12.0%. The risk-free rate of interest is 5%. By how much does Bradford's required return exceed Farley's required return?

8-11 **CAPM AND REQUIRED RETURN** Calculate the required rate of return for Manning Enterprises assuming that investors expect a 3.5% rate of inflation in the future. The real risk-free rate is 2.5%, and the market risk premium is 6.5%. Manning has a beta of 1.7, and its realized rate of return has averaged 13.5% over the past 5 years.

8-12 **REQUIRED RATE OF RETURN** Suppose $r_{RF} = 9\%$, $r_M = 14\%$, and $b_i = 1.3$.

a. What is r_i, the required rate of return on Stock i?
b. Now suppose that r_{RF} (1) increases to 10% or (2) decreases to 8%. The slope of the SML remains constant. How would this affect r_M and r_i?
c. Now assume that r_{RF} remains at 9% but r_M (1) increases to 16% or (2) falls to 13%. The slope of the SML does not remain constant. How would these changes affect r_i?

Challenging Problems 13-21

8-13 **CAPM, PORTFOLIO RISK, AND RETURN** Consider the following information for three stocks, Stocks X, Y, and Z. The returns on the three stocks are positively correlated, but they are not perfectly correlated. (That is, each of the correlation coefficients is between 0 and 1.)

Stock	Expected Return	Standard Deviation	Beta
X	9.00%	15%	0.8
Y	10.75	15	1.2
Z	12.50	15	1.6

Fund Q has one-third of its funds invested in each of the three stocks. The risk-free rate is 5.5%, and the market is in equilibrium. (That is, required returns equal expected returns.)

a. What is the market risk premium ($r_M - r_{RF}$)?
b. What is the beta of Fund Q?
c. What is the expected return of Fund Q?
d. Would you expect the standard deviation of Fund Q to be less than 15%, equal to 15%, or greater than 15%? Explain.

8-14 **PORTFOLIO BETA** Suppose you held a diversified portfolio consisting of a $7,500 investment in each of 20 different common stocks. The portfolio's beta is 1.12. Now suppose you decided to sell one of the stocks in your portfolio with a beta of 1.0 for $7,500 and use the proceeds to buy another stock with a beta of 1.75. What would your portfolio's new beta be?

8-15 **CAPM AND REQUIRED RETURN** HR Industries (HRI) has a beta of 1.8, while LR Industries' (LRI) beta is 0.6. The risk-free rate is 6%, and the required rate of return on an average stock is 13%. The expected rate of inflation built into r_{RF} falls by 1.5 percentage points, the real risk-free rate remains constant, the required return on the market falls to 10.5%, and all betas remain constant. After all of these changes, what will be the difference in the required returns for HRI and LRI?

8-16 **CAPM AND PORTFOLIO RETURN** You have been managing a $5 million portfolio that has a beta of 1.25 and a required rate of return of 12%. The current risk-free rate is 5.25%. Assume that you receive another $500,000. If you invest the money in a stock with a beta of 0.75, what will be the required return on your $5.5 million portfolio?

8-17 **PORTFOLIO BETA** A mutual fund manager has a $20 million portfolio with a beta of 1.5. The risk-free rate is 4.5%, and the market risk premium is 5.5%. The manager expects to receive an additional $5 million, which she plans to invest in a number of stocks. After investing the additional funds, she wants the fund's required return to be 13%. What should be the average beta of the new stocks added to the portfolio?

8-18 **EXPECTED RETURNS** Suppose you won the lottery and had two options: (1) receiving $0.5 million or (2) taking a gamble in which at the flip of a coin you receive $1 million if a head comes up but receive zero if a tail comes up.

a. What is the expected value of the gamble?

b. Would you take the sure $0.5 million or the gamble?
c. If you chose the sure $0.5 million, would that indicate that you are a risk averter or a risk seeker?
d. Suppose the payoff was actually $0.5 million—that was the only choice. You now face the choice of investing it in a U.S. Treasury bond that will return $537,500 at the end of a year or a common stock that has a 50-50 chance of being worthless or worth $1,150,000 at the end of the year.
   (1) The expected profit on the T-bond investment is $37,500. What is the expected dollar profit on the stock investment?
   (2) The expected rate of return on the T-bond investment is 7.5%. What is the expected rate of return on the stock investment?
   (3) Would you invest in the bond or the stock? Why?
   (4) Exactly how large would the expected profit (or the expected rate of return) have to be on the stock investment to make you invest in the stock, given the 7.5% return on the bond?
   (5) How might your decision be affected if, rather than buying one stock for $0.5 million, you could construct a portfolio consisting of 100 stocks with $5,000 invested in each? Each of these stocks has the same return characteristics as the one stock—that is, a 50-50 chance of being worth zero or $11,500 at year-end. Would the correlation between returns on these stocks matter? Explain.

8-19 **EVALUATING RISK AND RETURN** Stock X has a 10% expected return, a beta coefficient of 0.9, and a 35% standard deviation of expected returns. Stock Y has a 12.5% expected return, a beta coefficient of 1.2, and a 25% standard deviation. The risk-free rate is 6%, and the market risk premium is 5%.

a. Calculate each stock's coefficient of variation.
b. Which stock is riskier for a diversified investor?
c. Calculate each stock's required rate of return.
d. On the basis of the two stocks' expected and required returns, which stock would be more attractive to a diversified investor?
e. Calculate the required return of a portfolio that has $7,500 invested in Stock X and $2,500 invested in Stock Y.
f. If the market risk premium increased to 6%, which of the two stocks would have the larger increase in its required return?

8-20 **REALIZED RATES OF RETURN** Stocks A and B have the following historical returns:

Year	Stock A's Returns, r_A	Stock B's Returns, r_B
2004	(18.00%)	(14.50%)
2005	33.00	21.80
2006	15.00	30.50
2007	(0.50)	(7.60)
2008	27.00	26.30

a. Calculate the average rate of return for each stock during the period 2004 through 2008.
b. Assume that someone held a portfolio consisting of 50% of Stock A and 50% of Stock B. What would the realized rate of return on the portfolio have been each year? What would the average return on the portfolio have been during this period?
c. Calculate the standard deviation of returns for each stock and for the portfolio.
d. Calculate the coefficient of variation for each stock and for the portfolio.
e. Assuming you are a risk-averse investor, would you prefer to hold Stock A, Stock B, or the portfolio? Why?

8-21 **SECURITY MARKET LINE** You plan to invest in the Kish Hedge Fund, which has total capital of $500 million invested in five stocks:

Stock	Investment	Stock's Beta Coefficient
A	$160 million	0.5
B	120 million	1.2
C	80 million	1.8
D	80 million	1.0
E	60 million	1.6

Kish's beta coefficient can be found as a weighted average of its stocks' betas. The risk-free rate is 6%, and you believe the following probability distribution for future market returns is realistic:

Probability	Market Return
0.1	−28%
0.2	0
0.4	12
0.2	30
0.1	50

a. What is the equation for the Security Market Line (SML)? (Hint: First, determine the expected market return.)
b. Calculate Kish's required rate of return.
c. Suppose Rick Kish, the president, receives a proposal from a company seeking new capital. The amount needed to take a position in the stock is $50 million, it has an expected return of 15%, and its estimated beta is 1.5. Should Kish invest in the new company? At what expected rate of return should Kish be indifferent to purchasing the stock?

COMPREHENSIVE/SPREADSHEET PROBLEM

8-22 **EVALUATING RISK AND RETURN** Bartman Industries' and Reynolds Inc.'s stock prices and dividends, along with the Winslow 5000 Index, are shown here for the period 2003–2008. The Winslow 5000 data are adjusted to include dividends.

	BARTMAN INDUSTRIES		REYNOLDS INC.		WINSLOW 5000
Year	Stock Price	Dividend	Stock Price	Dividend	Includes Dividends
2008	$17.250	$1.15	$48.750	$3.00	$11,663.98
2007	14.750	1.06	52.300	2.90	8,785.70
2006	16.500	1.00	48.750	2.75	8,679.98
2005	10.750	0.95	57.250	2.50	6,434.03
2004	11.375	0.90	60.000	2.25	5,602.28
2003	7.625	0.85	55.750	2.00	4,705.97

a. Use the data to calculate annual rates of return for Bartman, Reynolds, and the Winslow 5000 Index. Then calculate each entity's average return over the 5-year period. (Hint: Remember, returns are calculated by subtracting the beginning price from the ending price to get the capital gain or loss, adding the dividend to the capital gain or loss, and dividing the result by the beginning price. Assume that dividends are already included in the index. Also, you cannot calculate the rate of return for 2003 because you do not have 2002 data.)
b. Calculate the standard deviations of the returns for Bartman, Reynolds, and the Winslow 5000. (Hint: Use the sample standard deviation formula, Equation 8-2a, to this chapter, which corresponds to the STDEV function in Excel.)
c. Calculate the coefficients of variation for Bartman, Reynolds, and the Winslow 5000.
d. Construct a scatter diagram that shows Bartman's and Reynolds' returns on the vertical axis and the Winslow 5000 Index's returns on the horizontal axis.
e. Estimate Bartman's and Reynolds' betas by running regressions of their returns against the index's returns. (Hint: Refer to Web Appendix 8A.) Are these betas consistent with your graph?
f. Assume that the risk-free rate on long-term Treasury bonds is 6.04%. Assume also that the average annual return on the Winslow 5000 is *not* a good estimate of the market's required return—it is too high. So use 11% as the expected return on the market. Use the SML equation to calculate the two companies' required returns.
g. If you formed a portfolio that consisted of 50% Bartman and 50% Reynolds, what would the portfolio's beta and required return be?