CHAPTER 6: EFFICIENT DIVERSIFICATION

18. The expected rate of return on the stock will change by beta times the unanticipated change in the market return: \(1.2 \times (8\% - 10\%) = -2.4\%\)

Therefore, the expected rate of return on the stock should be revised to:

\[12\% - 2.4\% = 9.6\%\]

19. a. The risk of the diversified portfolio consists primarily of systematic risk. Beta measures systematic risk, which is the slope of the SCL. The two figures depict the stocks' security characteristic lines (SCL). Stock B's SCL is steeper, and hence Stock B's systematic risk is greater. The slope of the SCL, and hence the systematic risk, of Stock A is lower. Thus for this investor stock B is the riskiest.

b. The undiversified investor is exposed primarily to firm-specific risk. Stock A has higher firm-specific risk because the deviations of the observations from the SCL are larger for Stock A than for Stock B. Deviations are measured by the vertical distance of each observation from the SCL. Stock A is therefore riskiest to this investor.

CHAPTER 7: CAPM and APT

3. \(\text{E}(r_P) = r_f + \beta \left[ \text{E}(r_M) - r_f \right] \)

\[20\% = 5\% + \beta (15\% - 5\%) \Rightarrow \beta = 15/10 = 1.5\]

4. If the beta of the security doubles, then so will its risk premium. The current risk premium for the stock is: \((13\% - 7\%) = 6\%\), so the new risk premium would be 12\%, and the new discount rate for the security would be: \(12\% + 7\% = 19\%\)

If the stock pays a constant dividend in perpetuity, then we know from the original data that the dividend, \(D\), must satisfy the equation for a perpetuity:

\[\text{Price} = \frac{\text{Dividend}}{\text{Discount rate}}\]

\[40 = \frac{D}{0.13} \Rightarrow D = 40 \times 0.13 = \$5.20\]

At the new discount rate of 19\%, the stock would be worth: \((5.20/0.19) = \$27.37\)

The increase in stock risk has lowered the value of the stock by 31.58\%. 
6. a. False. $\beta = 0$ implies $E(r) = r_f$, not zero.

b. False. Investors require a risk premium for bearing systematic (i.e., undiversifiable or market) risk.

c. False. You should invest 0.75 of your portfolio in the market portfolio, and the remainder in T-bills. Then:

$$\beta_P = (0.75 \times 1) + (0.25 \times 0) = 0.75$$

8. Not possible. Portfolio A has a higher beta than Portfolio B, but the expected return for Portfolio A is lower.

9. Possible. If the CAPM is valid, the expected rate of return compensates only for systematic (market) risk as measured by beta, rather than the standard deviation, which includes nonsystematic risk. Thus, Portfolio A's lower expected rate of return can be paired with a higher standard deviation, as long as Portfolio A's beta is lower than that of Portfolio B.

10. Not possible. The reward-to-variability ratio for Portfolio A is better than that of the market, which is not possible according to the CAPM, since the CAPM predicts that the market portfolio is the most efficient portfolio. Using the numbers supplied:

$$S_A = \frac{16 - 10}{12} = 0.5$$

$$S_M = \frac{18 - 10}{24} = 0.33$$

These figures imply that Portfolio A provides a better risk-reward tradeoff than the market portfolio.

20. a. Since the market portfolio, by definition, has a beta of 1, its expected rate of return is 12%.

b. $\beta = 0$ means the stock has no systematic risk. Hence, the portfolio's expected rate of return is the risk-free rate, 4%.

c. Using the SML, the *fair* rate of return for a stock with $\beta = -0.5$ is:

$$E(r) = 4\% + (-0.5)(12\% - 4\%) = 0\%$$

The *expected* rate of return, using the expected price and dividend for next year:
E(r) = ($44/$40) – 1 = 0.10 = 10%

Because the expected return exceeds the fair return, the stock must be under-priced.

23. Since the beta for Portfolio F is zero, the expected return for portfolio F equals the risk-free rate. For Portfolio A, the ratio of risk premium to beta is: (10% – 4%)/1 = 6%. The ratio for Portfolio E is higher: (9% – 4%)/(2/3) = 7.5%. This implies that an arbitrage opportunity exists. For instance, you can create a Portfolio G with beta equal to 1 (the same as the beta for Portfolio A) by taking a long position in Portfolio E and a short position in Portfolio F (that is, borrowing at the risk-free rate and investing the proceeds in Portfolio E). For the beta of G to equal 1, the proportion, w, of funds invested in E must be 3/2 = 1.5. The expected return of G is then:

E(r_G) = [(-0.50) × 4%] + (1.5 × 9%) = 11.5%

β_G = 1.5 × (2/3) = 1.0

Comparing Portfolio G to Portfolio A, G has the same beta and a higher expected return. Now, consider Portfolio H, which is a short position in Portfolio A with the proceeds invested in Portfolio G:

β_H = 1β_G + (-1)β_A = (1 × 1) + [(-1) × 1] = 0

E(r_H) = (1 × r_G) + [(-1) × r_A] = (1 × 11.5%) + [(- 1) × 10%] = 1.5%

The result is a zero investment portfolio (all proceeds from the short sale of Portfolio A are invested in Portfolio G) with zero risk (because β = 0 and the portfolios are well diversified), and a positive return of 1.5%. Portfolio H is an arbitrage portfolio.