Concept Questions

1. Some of the risk in holding any asset is unique to the asset in question. By investing in a variety of assets, this unique portion of the total risk can be almost completely eliminated at little cost. On the other hand, there are some risks that affect all investments. This portion of the total risk of an asset cannot be costlessly eliminated. In other words, systematic risk can be controlled, but only by a costly reduction in expected returns.

2. If the market expected the growth rate in the coming year to be 2 percent, then there would be no change in security prices if this expectation had been fully anticipated and priced. However, if the market had been expecting a growth rate different than 2 percent and the expectation was incorporated into security prices, then the government’s announcement would most likely cause security prices in general to change; prices would drop if the anticipated growth rate had been more than 2 percent, and prices would rise if the anticipated growth rate had been less than 2 percent.

3. a. systematic
   b. unsystematic
   c. both; probably mostly systematic
   d. unsystematic
   e. unsystematic
   f. systematic

4. a. An unexpected, systematic event occurred; market prices in general will most likely decline.
   b. No unexpected event occurred; company price will most likely stay constant.
   c. No unexpected, systematic event occurred; market prices in general will most likely stay constant.
   d. An unexpected, unsystematic event occurred; company price will most likely decline.
   e. No unexpected, systematic event occurred unless the outcome was a surprise; market prices in general will most likely stay constant.

5. False. Expected returns depend on systematic risk, not total risk.

6. Earnings contain information about recent sales and costs. This information is useful for projecting future growth rates and cash flows. Thus, unexpectedly low earnings lead market participants to reduce estimates of future growth rates and cash flows; price drops are the result. The reverse is often true for unexpectedly high earnings.

7. Yes. It is possible, in theory, for a risky asset to have a beta of zero. Such an asset’s return is simply uncorrelated with the overall market. Based on the CAPM, this asset’s expected return would be equal to the risk-free rate. It is also possible to have a negative beta; the return would be less than the risk-free rate. A negative beta asset would carry a negative risk premium because of its value as a diversification instrument. A negative beta asset can be created by shorting an asset with a positive beta. A portfolio with a zero beta can always be created by combining long and short positions.
8. The rule is always “buy low, sell high.” In this case, we buy the undervalued asset and sell (short) the overvalued one. It does not matter whether the two securities are misvalued with regard to some third security; all that matters is their relative value. In other words, the trade will be profitable as long as the relative misvaluation disappears; however, there is no guarantee that the relative misvaluation will disappear, so the profits are not certain.

9. If every asset has the same reward-to-risk ratio, the implication is that every asset provides the same risk premium for each unit of risk. In other words, the only way to increase your return (reward) is to accept more risk. Investors will only take more risk if the reward is higher, and a constant reward-to-risk ratio ensures this will happen. We would expect every asset in a liquid, well-functioning to have the same reward-to-risk ratio due to competition and investor risk aversion. If an asset has a reward-to-risk ratio that is lower than all other assets, investors will avoid that asset, thereby driving the price down, increasing the expected return and the reward-to-risk ratio. Similarly, if an asset has a reward-to-risk ratio that is higher than other assets, investors will flock to the asset, increasing the price, and decreasing the expected return and the reward-to-risk ratio.

10. AIMR suggested answer:
   a. Systematic risk refers to fluctuations in asset prices caused by macroeconomic factors that are common to all risky assets; hence systematic risk is often referred to as market risk. Examples of systematic risk include the business cycle, inflation, monetary policy, and technological changes. Firm-specific risk refers to fluctuations in asset prices caused by factors that are independent of the market such as industry characteristics or firm characteristics. Examples of firm-specific risk include litigation, patents, management, and financial leverage.

   b. Trudy should explain to the client that picking only the top five best ideas would most likely result in the client holding a much more risky portfolio. The total risk of the portfolio, or portfolio variance, is the combination of systematic risk and firm-specific risk. i.) The systematic component depends on the sensitivity of the individual assets to market movements as measured by beta. Assuming the portfolio is well-diversified, the number of assets will not affect the systematic risk component of portfolio variance. The portfolio beta depends on the individual security betas and the portfolio weights of those securities. ii.) On the other hand, the components of the firm-specific risk (sometimes called nonsystematic risk) are not perfectly positively correlated with each other and as more asset are added to the portfolio those additional assets tend to reduce portfolio risk. Hence, increasing the number of securities in a portfolio reduces firm-specific risk. For example, a patent expiring for one company would not affect the other securities in the portfolio. An increase in oil prices might hurt airline stock but aid an energy stock. As the number of randomly selected securities increases, the total risk (variance) of the portfolio approaches its systematic variance.

Core Questions

1. $E(R_i) = 0.125 = 0.05 + 0.06\beta_i$; $\beta_i = 1.25$

2. $E(R_i) = 0.11 = 0.05 + (E(R_{mk}) - 0.05)(0.9); E(R_{mk}) = 0.1167$

3. $E(R_i) = 0.13 = R_f + (0.11 - R_f)(1.3); R_f = 0.0433$

4. $E(R_i) = 0.17 = 0.06 + 1.3(MRP); MRP = 0.0846$
5. \[ \beta_p = .3(1.2) + .25(.6) + .20(1.5) + .25(.8) = 1.01 \]

6. Portfolio value = $300($50) + 400($70) + 200($25) = $48,000.00
   \[ x_A = \frac{300($50)}{48,000} = .3125 \]
   \[ x_B = \frac{400($70)}{48,000} = .5833 \]
   \[ x_C = \frac{200($25)}{48,000} = .1042 \]
   \[ \beta_p = .3125(1.2) + .5833(.9) + .1042(1.6) = 1.07 \]

7. \[ \beta_p = 1.0 = 1/3(0) + 1/3(1.4) + 1/3(\beta_X) \]
   \[ \beta_X = 1.6 \]

8. \[ E(R_p) = .065 + (.15 - .065)(0.7) = .1245 \]

9. \[ E(R_p) = .05 + (.12 - .05)(1.2) = .1340 \]
   Dividend yield = $3/$60 = .05
   Capital gains yield = .1340 - .05 = .0840
   Price next year = $60(1 + .0840) = $65.04

10. a. \[ E(R_p) = (.12 + .06)/2 = .09 \]
    b. \[ \beta_p = 0.5 = x_S(0.9) + (1 - x_S)(0) \]
    \[ x_S = 0.5/0.9 = .5556 \]
    \[ x_R = 1 - .5556 = .4444 \]
    c. \[ E(R_p) = .11 = .12x_S + .06(1 - x_S); \]
    \[ x_S = .8333; \beta_p = .83333(0.9) + .1667(0) = 0.75 \]
    d. \[ \beta_p = 1.8 = x_S(0.9) + (1 - x_S)(0) \]
    \[ x_S = 1.8/0.9 = 2; x_R = 1 - 2 = -1 \]

The portfolio is invested 200% in the stock and –100% in the risk-free asset. This represents borrowing at the risk-free rate to buy more of the stock.

**Intermediate Questions**

11. \[ \beta_p = x_W(1.4) + (1 - x_W)(0) = 1.4x_W \]
    \[ E(R_W) = .14 = .07 + MRP(1.40) \]
    \[ E(R_p) = .07 + .05 \beta_p; \text{ slope of line } = MRP = .05; E(R_p) = .07 + .05 \beta_p = .07 + .14x_W \]

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12. \[ E[R_i] = .06 + .075 \beta_i \]
    \[ .17 > E[R_Y] = .06 + .075(1.45) = .1688; Y \text{ plots above the SML and is undervalued.} \]
    \[ \text{reward-to-risk ratio } Y = (.17 - .06) / 1.45 = .0759 \]
    \[ .12 < E[R_Z] = .06 + .075(0.85) = .1238; Z \text{ plots below the SML and is overvalued.} \]
    \[ \text{reward-to-risk ratio } Z = (.12 - .06) / .85 = .0706 \]

13. \[ [.17 - R_f]/1.45 = [.12 - R_f]/.85; R_f = .0492 \]
14. \( \frac{(E(R_A) - R_f)}{s_A} = \frac{(E(R_B) - R_f)}{s_B} \)
\( \frac{s_A}{s_B} = \frac{(E(R_A) - R_f)}{(E(R_B) - R_f)} \)

15. Here we have two equations with two unknowns:

\[
E(R_{Oxy Co.}) = .18 = R_f + 1.20(R_m - R_f); \quad E(R_{More-On Co.}) = .14 = R_f + .85(R_m - R_f)
\]
\[
.18 = R_f + 1.20R_m - 1.20R_f = 1.20R_m - .20R_f; \quad .14 = R_f + .85R_m - .85R_f
\]
\[
R_f = (1.20R_m - .18)/.20 \quad R_m = (.14 - .15R_f)/.85 = .16471 - .17647R_f
\]
\[
R_f = [1.20(.16471 - .17647R_f) - .18]/.20
\]
\[
2.05882R_f = .088235
\]
\[
R_f = .0429
\]
\[
R_m = (.14 - .15R_f)/.85 = .16471 - .17647R_f = .16471 - .17647(R_f - .0429) = .1571
\]

16. From the chapter, \( \beta_i = Corr(R_i, R_M) \times (s_i / s_M) \). Also, \( Corr(R_i, R_M) = Cov(R_i, R_M) / (s_i \times s_M) \).

Substituting this second result into the expression for \( \beta_i \) produces the desired result.

17. The relevant calculations can be summarized as follows:

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Average returns: Variances: Standard deviations:
Security: 45/5 = 9.00% 0.10800/4 = 0.02700 \( \sqrt{0.10800} = 16.43\% \)
Market: 20/5 = 4.00% 0.10160/4 = 0.02540 \( \sqrt{0.02540} = 15.94\% \)

Covariance = \( Cov(R_i, R_M) = 0.04200/4 = 0.01050 \)
Correlation = \( Corr(R_i, R_M) = 0.01050/(.1643 \times .1594) = .40 \)

\( Beta = \beta_i = .40(16.43/15.94) = .41 \)

Notice that the security’s beta is only .41 even though its return was higher over this period. This tells us that the security experienced some unexpected high returns due to positive unsystematic events.
18. \[ E[R_p] = .165 = w_X(.28) + w_Y(.14) + (1 - w_X - w_Y)(.07) \]
\[ \beta_p = .7 = w_X(1.7) + w_Y(1.1) + (1 - w_X - w_Y)(0) \]
solving these two equations in two unknowns gives \( w_X = 0.49954, \ w_Y = -0.12946 \)
\( w_R = 0.63393 \)
amount of stock Y to sell short = \( 0.12946(100,000) = $12,946 \)

19. \[ E[R_I] = .25(0.09) + .5(0.42) + .25(0.26) = .2975; \ \beta_I = 3.09 \]
\[ \sigma_I^2 = .25(0.09 - .2975)^2 + .5(0.42 - .2975)^2 + .25(0.26 - .2975)^2 = 0.01862; \ \sigma_I = \sqrt{0.01862} = .1365 \]
\[ E[R_{II}] = .25(-.30) + .5(.12) + .25(.44) = .0950; \ \beta_{II} = 0.56 \]
\[ \sigma_{II}^2 = .25(-.30 - .0950)^2 + .5(.12 - .0950)^2 + .25(.44 - .0950)^2 = 0.06908; \ \sigma_{II} = \sqrt{0.06908} = .2628 \]

Although stock II has more total risk than I, it has much less systematic risk, since its beta is much smaller than I’s. Thus, I has more systematic risk, and II has more unsystematic and more total risk. Since unsystematic risk can be diversified away, I is actually the “riskier” stock despite the lack of volatility in its returns. Stock I will have a higher risk premium and a greater expected return.

20. \[ E(R) = .06 + 1.15[.13 - .06] = 14.05% \]

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<th>R_M - E(R_M)</th>
<th>( \beta \times [R_M - E(R_M)] )</th>
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21. AIMR suggested answer:
Furhman Labs: \( E(R) = 5.0\% + 1.5(11.5\% - 5.0\%) = 14.75\% \) Overvalued
Garten Testing: \( E(R) = 5.0\% + 0.8(11.5\% - 5.0\%) = 10.20\% \) Undervalued

*Supporting calculations
Furhman: Required – Forecast = 13.25% – 14.75% = –1.50% Overvalued
Garten: Required – Forecast = 11.25% – 10.20% = 1.05% Undervalued

If the forecast return is less (greater) than the required rate of return, the security is overvalued (undervalued).

22. AIMR suggested answer:
Subscript OP refers to the original portfolio, ABC to the new stock, and NP to the new portfolio.
\( E(R_{NP}) = .9(.67) + .1(1.25) = 0.728\% \)
\( COV = 0.40(2.37)(2.95) = 2.7966 \)
\( \sigma_{NP}^2 = .9^2(.0237^2) + .1^2(.0295^2) + 2(.9)(.1)(.0237)(.0295)(.40) = 0.000514 \)
\( s_{NP} = 2.27\% \)
23. AIMR suggested answer:
Subscript OP refers to the original portfolio, GS to government securities, and NP to the new portfolio.
\[ E(R_{NP}) = .9(.67) + .1(0.42) = 0.645\% \]
\[ COV = 0(2.37)(0) = 0 \]
\[ \sigma^2_{NP} = .9^2(.0237^2) + .1^2(0^2) + 2(.9)(.1)(.0237)(.0295)(0) = .000455 \]
\[ s_{NP} = 2.13\% \]

24. AIMR suggested answer:
Adding the risk-free government securities would cause the beta of the new portfolio to be lower. The new
portfolio beta will be a weighted average of the individual security betas in the portfolio; the presence of the
risk-free securities would lower the weighted average.

25. AIMR suggested answer:
The comment is not correct. Although the standard deviations and expected returns of the two securities
under consideration are the same, the covariances between each security and the original portfolio are
unknown, making it impossible to draw the conclusion stated. For instance, if the covariances are different,
selecting one security over another may result in a lower standard deviation for the portfolio as a whole. In
such a case, the security would be the preferred investment if all other factors are equal.

Spreadsheet Problem

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