1. Suppose that two factors have been identified for the U.S. economy: the growth rate of industrial production, IP, and the inflation rate, IR. IP is expected to be 3%, and IR 5%. A stock with a beta of 1 on IP and .5 on IR currently is expected to provide a rate of return of 12%. If industrial production actually grows by 5%, while the inflation rate turns out to be 8%, what is your revised estimate of the expected rate of return on the stock?

2. Suppose that there are two independent economic factors, \( F_1 \) and \( F_2 \). The risk-free rate is 6%, and all stocks have independent firm-specific components with a standard deviation of 45%. The following are well-diversified portfolios:

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>Beta on ( F_1 )</th>
<th>Beta on ( F_2 )</th>
<th>Expected Return</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1.5</td>
<td>2.0</td>
<td>31</td>
</tr>
<tr>
<td>B</td>
<td>2.2</td>
<td>-0.2</td>
<td>27</td>
</tr>
</tbody>
</table>

What is the expected return–beta relationship in this economy?

3. Consider the following data for a one-factor economy. All portfolios are well diversified.

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>( E(r) )</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>12%</td>
<td>1.2</td>
</tr>
<tr>
<td>B</td>
<td>6%</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Suppose that another portfolio, portfolio \( E \), is well diversified with a beta of .6 and expected return of 8%. Would an arbitrage opportunity exist? If so, what would be the arbitrage strategy?

4. Jeffrey Bruner, CFA, uses the capital asset pricing model (CAPM) to help identify mispriced securities. A consultant suggests Bruner use arbitrage pricing theory (APT) instead. In comparing CAPM and APT, the consultant made the following arguments:
   a. Both the CAPM and APT require a mean-variance efficient market portfolio.
   b. Neither the CAPM nor APT assumes normally distributed security returns.
   c. The CAPM assumes that one specific factor explains security returns but APT does not.

State whether each of the consultant’s arguments is correct or incorrect. Indicate, for each incorrect argument, why the argument is incorrect.

5. Assume that both portfolios \( A \) and \( B \) are well diversified, that \( E(r_A) = 12\% \) and \( E(r_B) = 9\% \). If the economy has only one factor, and \( \beta_A = 1.2 \) whereas \( \beta_B = .8 \), what must be the risk-free rate?

6. Assume that stock market returns have the market index as a common factor, and that all stocks in the economy have a beta of 1 on the market index. Firm-specific returns all have a standard deviation of 30%.

   Suppose that an analyst studies 20 stocks, and finds that one-half have an alpha of 2%, and the other half an alpha of -2%. Suppose the analyst buys $1 million of an equally weighted portfolio of the positive alpha stocks, and shorts $1 million of an equally weighted portfolio of the negative alpha stocks.

   a. What is the expected profit (in dollars) and standard deviation of the analyst’s profit?
   b. How does your answer change if the analyst examines 50 stocks instead of 20 stocks? 100 stocks?

7. Assume that security returns are generated by the single-index model,

\[
R_i = \alpha_i + \beta_i R_M + e_i
\]

where \( R_i \) is the excess return for security \( i \) and \( R_M \) is the market’s excess return. The risk-free rate is 2%. Suppose also that there are three securities \( A \), \( B \), and \( C \), characterized by the following data:
PART III Equilibrium in Capital Markets

<table>
<thead>
<tr>
<th>Security</th>
<th>( \beta_i )</th>
<th>( E(R_i) )</th>
<th>( \sigma(e_i) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.8</td>
<td>10%</td>
<td>25%</td>
</tr>
<tr>
<td>B</td>
<td>1.0</td>
<td>12%</td>
<td>10%</td>
</tr>
<tr>
<td>C</td>
<td>1.2</td>
<td>14%</td>
<td>20%</td>
</tr>
</tbody>
</table>

a. If \( \sigma_M = 20\% \), calculate the variance of returns of securities A, B, and C.

b. Now assume that there are an infinite number of assets with return characteristics identical to those of A, B, and C, respectively. If one forms a well-diversified portfolio of type A securities, what will be the mean and variance of the portfolio’s excess returns? What about portfolios composed only of type B or C stocks?

c. Is there an arbitrage opportunity in this market? What is it? Analyze the opportunity graphically.

8. The SML relationship states that the expected risk premium on a security in a one-factor model must be directly proportional to the security’s beta. Suppose that this were not the case. For example, suppose that expected return rises more than proportionately with beta as in the figure below.

![Graph showing the relationship between expected return (E(r)) and beta (\( \beta \))]

a. How could you construct an arbitrage portfolio? (Hint: Consider combinations of portfolios A and B, and compare the resultant portfolio to C.)

b. Some researchers have examined the relationship between average return on diversified portfolios and the \( \beta \) and \( \beta^2 \) of those portfolios. What should they have discovered about the effect of \( \beta^2 \) on portfolio return?

9. The APT itself does not provide guidance concerning the factors that one might expect to determine risk premiums. How should researchers decide which factors to investigate? Why, for example, is industrial production a reasonable factor to test for a risk premium?

10. If the APT is to be a useful theory, the number of systematic factors in the economy must be small. Why?

11. Consider the following multifactor (APT) model of security returns for a particular stock.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Factor Beta</th>
<th>Factor Risk Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflation</td>
<td>1.2</td>
<td>6%</td>
</tr>
<tr>
<td>Industrial production</td>
<td>0.5</td>
<td>8</td>
</tr>
<tr>
<td>Oil prices</td>
<td>0.3</td>
<td>3</td>
</tr>
</tbody>
</table>

a. If T-bills currently offer a 6% yield, find the expected rate of return on this stock if the market views the stock as fairly priced.
b. Suppose that the market expected the values for the three macro factors given in column 1 below, but that the actual values turn out as given in column 2. Calculate the revised expectations for the rate of return on the stock once the "surprises" become known.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Expected Rate of Change</th>
<th>Actual Rate of Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflation</td>
<td>5%</td>
<td>4%</td>
</tr>
<tr>
<td>Industrial production</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Oil prices</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

12. Suppose that the market can be described by the following three sources of systematic risk with associated risk premiums.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Risk Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial production (I)</td>
<td>6%</td>
</tr>
<tr>
<td>Interest rates (R)</td>
<td>2</td>
</tr>
<tr>
<td>Consumer confidence (C)</td>
<td>4</td>
</tr>
</tbody>
</table>

The return on a particular stock is generated according to the following equation:

\[ r = 15\% + 1.0I + .5R + .75C + e \]

Find the equilibrium rate of return on this stock using the APT. The T-bill rate is 6%. Is the stock over- or underpriced? Explain.

13. Assume that both X and Y are well-diversified portfolios and the risk-free rate is 8%.

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>Expected Return</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>16%</td>
<td>1.00</td>
</tr>
<tr>
<td>Y</td>
<td>12</td>
<td>0.25</td>
</tr>
</tbody>
</table>

In this situation you would conclude that portfolios X and Y:

a. Are in equilibrium.
b. Offer an arbitrage opportunity.
c. Are both underpriced.
d. Are both fairly priced.

14. A zero-investment portfolio with a positive alpha could arise if:

a. The expected return of the portfolio equals zero.
b. The capital market line is tangent to the opportunity set.
c. The Law of One Price remains unviolated.
d. A risk-free arbitrage opportunity exists.

15. According to the theory of arbitrage:

a. High-beta stocks are consistently overpriced.
b. Low-beta stocks are consistently overpriced.
c. Positive alpha investment opportunities will quickly disappear.
d. Rational investors will pursue arbitrage consistent with their risk tolerance.

16. The arbitrage pricing theory (APT) differs from the single-factor capital asset pricing model (CAPM) because the APT:

a. Places more emphasis on market risk.
b. Minimizes the importance of diversification.
c. Recognizes multiple unsystematic risk factors.
d. Recognizes multiple systematic risk factors.
17. An investor takes as large a position as possible when an equilibrium price relationship is violated. This is an example of:
   a. A dominance argument.
   b. The mean-variance efficient frontier.
   c. Arbitrage activity.
   d. The capital asset pricing model.

18. The feature of arbitrage pricing theory (APT) that offers the greatest potential advantage over the simple CAPM is the:
   a. Identification of anticipated changes in production, inflation, and term structure of interest rates as key factors explaining the risk-return relationship.
   b. Superior measurement of the risk-free rate of return over historical time periods.
   c. Variability of coefficients of sensitivity to the APT factors for a given asset over time.
   d. Use of several factors instead of a single market index to explain the risk-return relationship.

19. In contrast to the capital asset pricing model, arbitrage pricing theory:
   a. Requires that markets be in equilibrium.
   b. Uses risk premiums based on micro variables.
   c. Specifies the number and identifies specific factors that determine expected returns.
   d. Does not require the restrictive assumptions concerning the market portfolio.

20. As a finance intern at Pork Products, Jennifer Wainwright’s assignment is to come up with fresh insights concerning the firm’s cost of capital. She decides that this would be a good opportunity to try out the new material on the APT that she learned last semester. She decides that three promising factors would be (i) the return on a broad-based index such as the S&P 500; (ii) the level of interest rates, as represented by the yield to maturity on 10-year Treasury bonds; and (iii) the price of hogs, which are particularly important to her firm. Her plan is to find the beta of Pork Products against each of these factors by using a multiple regression and to estimate the risk premium associated with each exposure factor. Comment on Jennifer’s choice of factors. Which are most promising with respect to the likely impact on her firm’s cost of capital? Can you suggest improvements to her specification?

1. The GDP beta is 1.2 and GDP growth is 1% better than previously expected. So you will increase your forecast for the stock return by $1.2 \times 1\% = 1.2\%$. The revised forecast is for an 11.2% return.

2. With these lower risk premiums, the expected return on the stock will be lower:
   \[ E(r) = 4\% + 1.2 \times 4\% + (-3\%) \times (-2\%) = 9.4\% \]

3. a. This portfolio is not well diversified. The weight on the first security does not decline as $n$ increases. Regardless of how much diversification there is in the rest of the portfolio, you will not shed the firm-specific risk of this security.
   b. This portfolio is well diversified. Even though some stocks have three times the weight as other stocks (1.5/n versus .5/n), the weight on all stocks approaches zero as $n$ increases. The impact of any individual stock’s firm-specific risk will approach zero as $n$ becomes ever larger.

4. The SML says that the expected return on the portfolio should be $4\% + (\frac{1}{5})(10 - 4) = 6\%$. The return actually expected is only 3%, implying that the stock is overpriced and that there is an arbitrage opportunity. Buy $1$ of a portfolio that is $\frac{1}{5}$ invested in T-bills and $\frac{3}{5}$ in the market. The return on this portfolio is $\frac{3}{5} r_y + \frac{1}{5} r_M = \frac{3}{5} \times 4\% + \frac{1}{5} r_M$. Sell $1$ of portfolio $G$. The net return on the combined position is:
1. Collect the following data for 25 firms from Market Insight (www.mhhe.com/edumarketinsight):
   a. Price/Book ratio.
   b. Price/EPS from Ops ratio.
   c. Market capitalization (size).
   d. Price/Cash Flow ratio
   e. Another criterion that interests you.

   You can find this information by choosing a company, then clicking on the Financial Hits. link in the Compustat Reports section. Rank the firms based on each of the criteria separately and divide the firms into five groups based on their ranking for each criterion. Calculate the average rate of return for each group of firms.

   Do you confirm or reject any of the anomalies cited in this chapter? Can you uncover a new anomaly? Note: For your test to be valid, you must form your portfolios based on criteria observed at the beginning of the period when you form the stock groups. Why?

2. Use the price history from Market Insight (www.mhhe.com/edumarketinsight) to calculate the beta of each of the firms in the previous question. Use this beta, the T-bill rate, and the return on the S&P 500 to calculate the risk-adjusted abnormal return of each stock group. Does any anomaly uncovered in the previous question persist after controlling for risk?

3. Now form stock groups that use two criteria simultaneously. For example, form a portfolio of stocks that are both in the lowest quintile of price-earnings ratios and in the lowest quintile of market-to-book ratio. Does selecting stocks based on more than one characteristic improve your ability to devise portfolios with abnormal returns? Repeat the analysis by forming groups that meet three criteria simultaneously. Does this yield any further improvement in abnormal returns?

1. If markets are efficient, what should be the correlation coefficient between stock returns for two non-overlapping time periods?

2. Which of the following most appears to contradict the proposition that the stock market is weakly efficient? Explain.
   a. Over 25% of mutual funds outperform the market on average.
   b. Insiders earn abnormal trading profits.
   c. Every January, the stock market earns abnormal returns.

3. Suppose that, after conducting an analysis of past stock prices, you come up with the following observations. Which would appear to contradict the weak form of the efficient market hypothesis? Explain.
   a. The average rate of return is significantly greater than zero.
   b. The correlation between the return during a given week and the return during the following week is zero.
   c. One could have made superior returns by buying stock after a 10% rise in price and selling after a 10% fall.
   d. One could have made higher-than-average capital gains by holding stocks with low dividend yields.

4. Which of the following statements are true if the efficient market hypothesis holds?
   a. It implies that future events can be forecast with perfect accuracy.
   b. It implies that prices reflect all available information.
   c. It implies that security prices change for no discernible reason.
   d. It implies that prices do not fluctuate.
5. Which of the following observations would provide evidence against the semistrong form of the efficient market theory? Explain.

a. Mutual fund managers do not on average make superior returns.

b. You cannot make superior profits by buying (or selling) stocks after the announcement of an abnormal rise in dividends.

c. Low P/E stocks tend to have positive abnormal returns.

d. In any year approximately 50% of pension funds outperform the market.

Problems 6-12 are taken from past CFA exams.

6. The semistrong form of the efficient market hypothesis asserts that stock prices:

a. Fully reflect all historical price information.

b. Fully reflect all publicly available information.

c. Fully reflect all relevant information including insider information.

d. May be predictable.

7. Assume that a company announces an unexpectedly large cash dividend to its shareholders. In an efficient market without information leakage, one might expect:

a. An abnormal price change at the announcement.

b. An abnormal price increase before the announcement.

c. An abnormal price decrease after the announcement.

d. No abnormal price change before or after the announcement.

8. Which one of the following would provide evidence against the semistrong form of the efficient market theory?

a. About 50% of pension funds outperform the market in any year.

b. All investors have learned to exploit signals about future performance.

c. Trend analysis is worthless in determining stock prices.

d. Low P/E stocks tend to have positive abnormal returns over the long run.

9. According to the efficient market hypothesis:

a. High-beta stocks are consistently overpriced.

b. Low-beta stocks are consistently overpriced.

c. Positive alphas on stocks will quickly disappear.

d. Negative alpha stocks consistently yield low returns for arbitrageurs.

10. A "random walk" occurs when:

a. Stock price changes are random but predictable.

b. Stock prices respond slowly to both new and old information.

c. Future price changes are uncorrelated with past price changes.

d. Past information is useful in predicting future prices.

11. Two basic assumptions of technical analysis are that security prices adjust:

a. Gradually to new information, and study of the economic environment provides an indication of future market movements.

b. Rapidly to new information, and study of the economic environment provides an indication of future market movements.

c. Rapidly to new information, and market prices are determined by the interaction between supply and demand.

d. Gradually to new information, and prices are determined by the interaction between supply and demand.

12. When technical analysts say a stock has good "relative strength," they mean:

a. The ratio of the price of the stock to a market or industry index has trended upward.

b. The recent trading volume in the stock has exceeded the normal trading volume.

c. The total return on the stock has exceeded the total return on T-bills.

d. The stock has performed well recently compared to its past performance.
13. Which one of the following would be a bullish signal to a technical analyst using contrary opinion rules?
   a. The level of credit balances in investor accounts declines.
   b. The ratio of bearish investment advisors to the number of advisory services expressing an optimistic opinion is historically quite high.
   c. A large proportion of speculators expect the price of stock index futures to rise.
   d. The ratio of over the counter (OTC) volume to New York Stock Exchange (NYSE) volume is relatively high.

14. A successful firm like Microsoft has consistently generated large profits for years. Is this a violation of the EMH?

15. Suppose you find that prices of stocks before large dividend increases show on average consistently positive abnormal returns. Is this a violation of the EMH?

16. "If the business cycle is predictable, and a stock has a positive beta, the stock’s returns also must be predictable." Respond.

17. Which of the following phenomena would be either consistent with or a violation of the efficient market hypothesis? Explain briefly.
   a. Nearly half of all professionally managed mutual funds are able to outperform the S&P 500 in a typical year.
   b. Money managers that outperform the market (on a risk-adjusted basis) in one year are likely to outperform in the following year.
   c. Stock prices tend to be predictably more volatile in January than in other months.
   d. Stock prices of companies that announce increased earnings in January tend to outperform the market in February.
   e. Stocks that perform well in one week perform poorly in the following week.

18. "If all securities are fairly priced, all must offer equal expected rates of return." Comment.

19. An index model regression applied to past monthly returns in General Motors’ stock price produces the following estimates, which are believed to be stable over time:

   \[ r_{GM} = .10\% + 1.1r_M \]

   If the market index subsequently rises by 8% and General Motors’ stock price rises by 7%, what is the abnormal change in General Motors’ stock price?

20. The monthly rate of return on T-bills is 1%. The market went up this month by 1.5%. In addition, AmbChaser, Inc., which has an equity beta of 2, surprisingly just won a lawsuit that awards it $1 million immediately.
   a. If the original value of AmbChaser equity were $100 million, what would you guess was the rate of return of its stock this month?
   b. What is your answer to (a) if the market had expected AmbChaser to win $2 million?

21. In a recent closely contested lawsuit, Apex sued Bpex for patent infringement. The jury came back today with its decision. The rate of return on Apex was \( r_A = 3.1\% \). The rate of return on Bpex was only \( r_B = 2.5\% \). The market today responded to very encouraging news about the unemployment rate, and \( r_M = 3\% \).
   a. If the historical relationship between returns on these stocks and the market portfolio has been estimated from index model regressions as:
      \[ \text{Apex: } r_A = .2\% + 1.4r_M \]
      \[ \text{Bpex: } r_B = -.1\% + .6r_M \]
      Based on these data, which company do you think won the lawsuit?

22. Investors expect the market rate of return in the coming year to be 12%. The T-bill rate is 4%.
   a. What is your best guess currently as to the expected rate of return on Changing Fortunes’ stock? You believe that the stock is fairly priced.
b. If the market return in the coming year actually turns out to be 10%, what is your best guess as to the rate of return that will be earned on Changing Fortunes' stock?

c. Suppose now that Changing Fortunes wins a major lawsuit during the year. The settlement is $5 million. Changing Fortunes' stock return during the year turns out to be 10%. What is your best guess as to the settlement the market previously expected Changing Fortunes to receive from the lawsuit? (Continue to assume that the market return in the year turned out to be 10%.) The magnitude of the settlement is the only unexpected firm-specific event during the year.

23. Dollar-cost averaging means that you buy equal dollar amounts of a stock every period, for example, $500 per month. The strategy is based on the idea that when the stock price is low, your fixed monthly purchase will buy more shares, and when the price is high, fewer shares. Averaging over time, you will end up buying more shares when the stock is cheaper and fewer when it is relatively expensive. Therefore, by design, you will exhibit good market timing. Evaluate this strategy.

24. Steady Growth Industries has never missed a dividend payment in its 94-year history. Does this make it more attractive to you as a possible purchase for your stock portfolio?

25. We know that the market should respond positively to good news and that good-news events such as the coming end of a recession can be predicted with at least some accuracy. Why, then, can we not predict that the market will go up as the economy recovers?

26. If prices are as likely to increase as decrease, why do investors earn positive returns from the market on average?

27. You know that firm XYZ is very poorly run. On a scale of 1 (worst) to 10 (best), you would give it a score of 3. The market consensus evaluation is that the management score is only 2. Should you buy or sell the stock?

28. Examine the accompanying figure, which presents cumulative abnormal returns both before and after dates on which insiders buy or sell shares in their firms. How do you interpret this figure? What are we to make of the pattern of CARs before and after the event date?

---

29. Suppose that during a certain week the Fed announces a new monetary growth policy, Congress surprisingly passes legislation restricting imports of foreign automobiles, and Ford comes out with a new car model that it believes will increase profits substantially. How might you go about measuring the market's assessment of Ford's new model?

30. Good News, Inc., just announced an increase in its annual earnings, yet its stock price fell. Is there a rational explanation for this phenomenon?

31. Your investment client asks for information concerning the benefits of active portfolio management. She is particularly interested in the question of whether active managers can be expected to consistently exploit inefficiencies in the capital markets to produce above-average returns without assuming higher risk.

   The semistrong form of the efficient market hypothesis asserts that all publicly available information is rapidly and correctly reflected in securities prices. This implies that investors cannot expect to derive above-average profits from purchases made after information has become public because security prices already reflect the information's full effects.

   a. Identify and explain two examples of empirical evidence that tend to support the EMH implication stated above.
   b. Identify and explain two examples of empirical evidence that tend to refute the EMH implication stated above.
   c. Discuss reasons why an investor might choose not to index even if the markets were, in fact, semistrong-form efficient.

32. a. Briefly explain the concept of the efficient market hypothesis (EMH) and each of its three forms—weak, semistrong, and strong—and briefly discuss the degree to which existing empirical evidence supports each of the three forms of the EMH.
   b. Briefly discuss the implications of the efficient market hypothesis for investment policy as it applies to:
      i. Technical analysis in the form of charting.
      ii. Fundamental analysis.
   c. Briefly explain the roles or responsibilities of portfolio managers in an efficient market environment.

33. Growth and value can be defined in several ways. "Growth" usually conveys the idea of a portfolio emphasizing or including only issues believed to possess above-average future rates of per-share earnings growth. Low current yield, high price-to-book ratios, and high price-to-earnings ratios are typical characteristics of such portfolios. "Value" usually conveys the idea of portfolios emphasizing or including only issues currently showing low price-to-book ratios, low price-to-earnings ratios, above-average levels of dividend yield, and market prices believed to be below the issues' intrinsic values.

   a. Identify and provide reasons why, over an extended period of time, value-stock investing might outperform growth-stock investing.
   b. Explain why the outcome suggested in (a) should not be possible in a market widely regarded as being highly efficient.

---

SOLUTIONS TO CONCEPT CHECKES

1. a. A high-level manager might well have private information about the firm. Her ability to trade profitably on that information is not surprising. This ability does not violate weak-form efficiency: The abnormal profits are not derived from an analysis of past price and trading data. If they were, this would indicate that there is valuable information that can be gleaned from such analysis. But this ability does violate strong-form efficiency. Apparently, there is some private information that is not already reflected in stock prices.