11 Stock Valuation and Risk

Since the values of stocks change continuously, so do stock prices. Institutional and individual investors constantly value stocks so that they can capitalize on expected changes in stock prices.

**Stock Valuation Methods**

Investors conduct valuations of stocks when making their investment decisions. They consider investing in undervalued stocks and selling their holdings of stocks that they consider to be overvalued. There are many different methods of valuing stocks. **Fundamental analysis** relies on fundamental financial characteristics (such as earnings) of the firm and its corresponding industry that are expected to influence stock values. **Technical analysis** relies on stock price trends to determine stock values. Our focus is on fundamental analysis. Investors who rely on fundamental analysis commonly use the price–earnings method, the dividend discount model, or the free cash flow model to value stocks. Each of these methods is described in turn.

**Price–Earnings Method**

A relatively simple method of valuing a stock is to apply the mean price–earnings (PE) ratio (based on expected rather than recent earnings) of all publicly traded competitors in the respective industry to the firm’s expected earnings for the next year.

Consider a firm that is expected to generate earnings of $3 per share next year. If the mean ratio of share price to expected earnings of competitors in the same industry is 15, then the valuation of the firm’s shares is

\[
\text{Valuation per share} = \frac{\text{Expected earnings of firm per share}}{\text{Mean industry PE ratio}}
\]

\[
= \frac{3}{15} = 0.20
\]

The logic of this method is that future earnings are an important determinant of a firm’s value. Although earnings beyond the next year are also relevant, this method implicitly assumes that the growth in earnings in future years will be similar to that of the industry.

**Reasons for Different Valuations**

This method has several variations, which can result in different valuations. For example, investors may use different forecasts for the firm’s earnings or the mean industry earnings over the next year. The previous year’s earnings are often used as a base for forecasting future earnings, but recent earnings do not always yield an accurate forecast.
A second reason for different valuations when using the PE method is that investors disagree on the proper measure of earnings. Some investors prefer to use operating earnings or exclude some unusually high expenses that result from onetime events. A third reason is that investors may disagree on which firms represent the industry norm. Some investors use a narrow industry composite composed of firms that are similar (in terms of size, lines of business, etc.) to the firm being valued; other investors prefer a broader industry composite. Consequently, even if investors agree on a firm’s forecasted earnings, they may still derive different values for that firm as a result of applying different PE ratios. Furthermore, even if investors agree on the firms to include in the industry composite, they may disagree on how to weight each firm.

**Limitations of the PE Method** The PE method may result in an inaccurate valuation of a firm if errors are made in forecasting the firm’s future earnings or in choosing the industry composite used to derive the PE ratio. In addition, there are some who question whether an investor should trust a PE ratio, regardless of how it is derived. In 1994, the mean PE ratio for a composite of 500 large firms was 14. In 1998, the mean PE ratio for this same group of firms was 28, which implies that the valuation for a given level of earnings had doubled. Some investors may interpret such increases in PE ratios as a sign of irrational optimism in the stock market. As of January 2009 (during the credit crisis), the mean PE ratio of these firms was about 12.

**Dividend Discount Model**

One of the first models used for pricing stocks was developed by John B. Williams in 1931. This model is still applicable today. Williams stated that the price of a stock should reflect the present value of the stock’s future dividends, or

$$\text{Price} = \sum_{t=1}^{\infty} \frac{D_t}{(1 + k)^t}$$

where

- \( t = \) period
- \( D_t = \) dividend in period \( t \)
- \( k = \) discount rate

The model can account for uncertainty by allowing \( D_t \) to be revised in response to revised expectations about a firm’s cash flows or by allowing \( k \) to be revised in response to changes in the required rate of return by investors.

To illustrate how the dividend discount model can be used to value a stock, consider a stock that is expected to pay a dividend of $7 per share annually forever. This constant dividend represents a perpetuity, or an annuity that lasts forever. Hence the present value of the cash flows (dividend payments) to investors in this example is the present value of a perpetuity. Assuming that the required rate of return \( k \) on the stock of concern is 14 percent, the present value (PV) of the future dividends is

$$\text{PV of stock} = \frac{D}{k} = \frac{7}{0.14} = \$50 \text{ per share}$$

Unfortunately, the valuation of most stocks is not this simple because their dividends are not expected to remain constant forever. If the dividend is expected to grow at a constant rate, however, the stock can be valued by applying the constant-growth dividend discount model:

$$\text{PV of stock} = \frac{D_t}{(k - g)}$$
where $D_1$ is the expected dividend per share to be paid over the next year, $k$ is the required rate of return by investors, and $g$ is the rate at which the dividend is expected to grow. For example, if a stock is expected to provide a dividend of $7 per share next year, the dividend is expected to increase by 4 percent per year, and the required rate of return is 14 percent, the stock can be valued as

$$PV\text{ of stock} = \frac{7}{0.14 - 0.04} = \$70\text{ per share}$$

**Relationship with PE Ratio for Valuing Firms** The dividend discount model and the PE ratio may seem to be unrelated, given that the dividend discount model is highly dependent on the required rate of return and the growth rate whereas the PE ratio is driven by the mean multiple of competitors’ stock prices relative to their earnings expectations and by the earnings expectations of the firm being valued. Nevertheless, the PE multiple is influenced by the required rate of return on stocks of competitors and the expected growth rate of competitor firms. When using the PE ratio for valuation, the investor implicitly assumes that the required rate of return and the growth rate for the firm being valued are similar to those of its competitors. When the required rate of return on competitor firms is relatively high, the PE multiple will be relatively low, which results in a relatively low valuation of the firm for its level of expected earnings. When the competitors’ growth rate is relatively high, the PE multiple will be relatively high, which results in a relatively high valuation of the firm for its level of expected earnings. Thus, the inverse relationship between required rate of return and value exists when applying either the PE method or the dividend discount model. In addition, there is a positive relationship between a firm’s growth rate and its value when applying either method.

**Limitations of the Dividend Discount Model** The dividend discount model may result in an inaccurate valuation of a firm if errors are made in estimating the dividend to be paid over the next year or in estimating the growth rate or the required rate of return by investors. The limitations of this model are more pronounced when valuing firms that retain most of their earnings, rather than distributing them as dividends, because the model relies on the dividend as the base for applying the growth rate. For example, many Internet-related stocks retain all earnings to support growth and thus are not expected to pay any dividends.

**Adjusted Dividend Discount Model** The dividend discount model can be adapted to assess the value of any firm, even those that retain most or all of their earnings. From the investor’s perspective, the value of the stock is equal to (1) the present value of the future dividends to be received over the investment horizon plus (2) the present value of the forecasted price at which the stock will be sold at the end of the investment horizon. To forecast this sales price, investors must estimate the firm’s earnings per share (after removing any nonrecurring effects) in the year that they plan to sell the stock. This estimate is derived by applying an annual growth rate to the prevailing annual earnings per share. Then, the estimate can be used to derive the expected price per share at which the stock can be sold.

**EXAMPLE** Assume that a firm currently has earnings of $12 per share. Future earnings can be forecast by applying the expected annual growth rate to the firm’s existing earnings ($E$):

$$\text{Forecasted earnings in } n \text{ years} = E (1 + G)^n$$
where \( G \) is the expected growth rate of earnings and \( n \) is the number of years until the stock is to be sold.

If investors expect that the earnings per share will grow by 2 percent annually and expect to sell the firm’s stock in three years, the earnings per share in three years are forecast to be

\[
\text{Earnings in three years} = 12 \times (1 + 0.02)^3 = 12 \times 1.0612 = 12.73
\]

The forecasted earnings per share can be multiplied by the PE ratio of the firm’s industry to forecast the future stock price. If the mean PE ratio of all other firms in the same industry is 6, the stock price in three years can be forecast as follows:

\[
\text{Stock price in three years} = (\text{Earnings in three years}) \times (\text{PE ratio of industry}) = 12.73 \times 6 = 76.38
\]

This forecasted stock price can be used along with expected dividends and the investor’s required rate of return to value the stock today. If the firm is expected to pay a dividend of $4 per share over the next three years and if the investor’s required rate of return is 14 percent, then the present value of expected cash flows to be received by the investor is

\[
PV = 4/(1.14)^1 + 4/(1.14)^2 + 4/(1.14)^3 + 76.38/(1.14)^3 = 3.51 + 3.08 + 2.70 + 51.55 = 60.84
\]

In this example, the present value of the cash flows is based on (1) the present value of dividends to be received over the three-year investment horizon, which is $9.29 per share ($3.51 + $3.08 + $2.70), and (2) the present value of the forecasted price at which the stock can be sold at the end of the three-year investment horizon, which is $51.55 per share.

**Limitations of the Adjusted Dividend Discount Model** This model may result in an inaccurate valuation if errors are made in deriving the present value of dividends over the investment horizon or the present value of the forecasted price at which the stock can be sold at the end of the investment horizon. Since the required rate of return affects both of these factors, using an improper required rate of return will lead to inaccurate valuations. Methods for determining the required rate of return are discussed later in the chapter.

**Free Cash Flow Model**

For firms that do not pay dividends, a more suitable valuation may be the free cash flow model, which is based on the present value of future cash flows. The first step is to estimate the free cash flows that will result from operations. Second, subtract existing liabilities to determine the value of the firm. Third, divide the value of the firm by the number of shares to derive a value per share.

**Limitations** The limitation of this model is the difficulty of obtaining an accurate estimate of free cash flow per period. One possibility is to start with forecasted earnings and then add a forecast of the firm’s noncash expenses and capital investment and working capital investment required to support the growth in the forecasted earnings. Obtaining accurate earnings forecasts can be difficult, however. Even if earnings can be forecast accurately, the flexibility of accounting rules can cause major errors in estimating free cash flow based on earnings.
**Required Rate of Return on Stocks**

When investors attempt to value a firm based on discounted cash flows, they must determine the required rate of return by investors who invest in that stock. Investors require a return that reflects the risk-free interest rate plus a risk premium. Although investors generally require a higher return on firms that exhibit more risk, there is not complete agreement on the ideal measure of risk or the way risk should be used to derive the required rate of return.

**Capital Asset Pricing Model**

The capital asset pricing model (CAPM) is sometimes used to estimate the required rate of return for any firm with publicly traded stock. The CAPM is based on the premise that the only important risk of a firm is **systematic risk**, or the risk that results from exposure to general stock market movements. The CAPM is not concerned with so-called unsystematic risk, which is specific to an individual firm, because investors can avoid that type of risk by holding diversified portfolios. That is, any particular adverse condition (such as a labor strike) affecting one particular firm in an investor’s stock portfolio should be offset in a given period by some favorable condition affecting another firm in the portfolio. In contrast, the systematic impact of general stock market movements on stocks in the portfolio cannot be diversified away because most of the stocks would be adversely affected by a general market decline.

The CAPM suggests that the return of a stock ($R_j$) is influenced by the prevailing risk-free rate ($R_f$), the market return ($R_m$), and the beta ($B_j$), as follows:

$$R_j = R_f + B_j(R_m - R_f)$$

where $B_j$ is measured as the covariance between $R_j$ and $R_m$, which reflects the asset’s sensitivity to general stock market movements. The CAPM implies that, given a specific $R_f$ and $R_m$, investors will require a higher return on a stock that has a higher beta. A higher beta implies a higher covariance between the stock’s returns and market returns, which reflects a greater sensitivity of the stock’s return to general market movements.

**Estimating the Market Risk Premium**

The yield on newly issued Treasury bonds is commonly used as a proxy for the risk-free rate. The term within parentheses in the previous equation is the market risk premium: the return of the market in excess of the risk-free rate. Historical data for 30 or more years can be used to determine the average market risk premium over time. This serves as an estimate of the market risk premium that will exist in the future.

**Estimating the Firm’s Beta**

A stock’s beta is typically measured by applying regression analysis to determine the sensitivity of the asset’s return to the market return based on monthly or quarterly data over the last four years or so. The stock’s return is the dependent variable, and the market’s return (as measured by the S&P 500 index or some other suitable proxy) is the independent variable over those same periods. A computer spreadsheet package such as Excel can be used to run the regression analysis. This analysis focuses specifically on estimating the slope coefficient, which represents the estimate of each stock’s beta (see Appendix B for more information on using regression analysis). If the slope coefficient of an individual stock is estimated to be 1.2, this means that, for a given return in the market, the stock’s expected return is 1.2 times that amount.

The estimated betas for many stocks are reported on many financial websites and in investment services such as *Value Line*, and betas can be computed by the individual investor who understands how to apply regression analysis. Since a stock’s sensitivity to
market conditions may change over time in response to changes in the firm’s operating characteristics, the stock’s beta may also change over time.

**Application of the CAPM** Given the risk-free rate as well as estimates of the firm’s beta and the market risk premium, it is possible to estimate the required rate of return from investing in the firm’s stock.

The beta of the stock for Vaxon, Inc., is estimated as 1.2 according to the regression analysis just explained. The prevailing risk-free rate is 6 percent, and the market risk premium is estimated to be 7 percent based on historical data. A stock’s risk premium is computed as the market risk premium multiplied by the stock’s beta, so Vaxon stock’s risk premium (above the risk-free rate) is $0.07 \times 1.2 = 8.4$ percent. Therefore, the required rate of return on Vaxon stock is

$$R_t = 6\% + 1.2(7\%)$$

$$= 14.4\%$$

Because the required rate of return on this stock is 14.4 percent, Vaxon’s estimated future cash flows can be discounted at that rate when deriving the firm’s present value.

At any given time, the required rates of return estimated by the CAPM will vary across stocks because of differences in their risk premiums, which are due to differences in their systematic risk (as measured by beta).

**Factors that Affect Stock Prices**

Stock prices are driven by three types of factors: (1) economic factors, (2) market-related factors, and (3) firm-specific factors.

**Economic Factors**

A firm’s value should reflect the present value of its future cash flows. Investors therefore consider various economic factors that affect a firm’s cash flows when valuing a firm to determine whether its stock is over- or undervalued.

**Impact of Economic Growth** An increase in economic growth is expected to increase the demand for products and services produced by firms and thereby increase a firm’s cash flows and valuation. Participants in the stock markets monitor economic indicators such as employment, gross domestic product, retail sales, and personal income because these indicators may signal information about economic growth and therefore affect cash flows. In general, unexpected favorable information about the economy tends to cause a favorable revision of a firm’s expected cash flows and hence places upward pressure on the firm’s value. Because the government’s fiscal and monetary policies affect economic growth, they are also continually monitored by investors.

Exhibit 11.1 shows U.S. stock market performance based on the S&P 500, an index of 500 large U.S. stocks. The stock market’s strong performance in the 2006–2007 period was partially due to the strong economic conditions in the United States at that time. Likewise, the stock market’s weak performance in 2008 was partially due to weak economic conditions.

**Impact of Interest Rates** One of the most prominent economic forces driving stock market prices is the risk-free interest rate. Investors should consider purchasing a risky asset only if they expect to be compensated with a risk premium for the risk incurred. Given a choice of risk-free Treasury securities or stocks, investors should purchase stocks only if they are appropriately priced to reflect a sufficiently high expected return above the risk-free rate.
The relationship between interest rates and stock prices can vary over time. In theory, a high interest rate should raise the required rate of return by investors and therefore reduce the present value of future cash flows generated by a stock. However, interest rates commonly rise in response to an increase in economic growth, so stock prices may rise in response to an increase in expected cash flows even if investors’ required rate of return rises.

Conversely, a lower interest rate should boost the present value of cash flows and therefore boost stock prices. However, lower interest rates commonly occur in response to weak economic conditions, which tend to reduce expected cash flows of firms. Overall, the effect of interest rates should be considered along with economic growth and other factors when seeking a more complete explanation of stock price movements.

**Impact of the Dollar’s Exchange Rate Value** The value of the dollar can affect U.S. stock prices for a variety of reasons. First, foreign investors prefer to purchase U.S. stocks when the dollar is weak and to sell them when the dollar is near its peak. Thus, the foreign demand for any given U.S. stock may be higher when the dollar is expected to strengthen, other things being equal. Stock prices are also affected by the impact of the dollar’s changing value on cash flows. The stock prices of U.S. firms primarily involved in exporting could be favorably affected by a weak dollar and adversely affected by a strong dollar, whereas U.S. importing firms could be affected in the opposite manner.

Stock prices of U.S. companies may also be affected by exchange rates if stock market participants measure performance by reported earnings. A multinational corporation’s consolidated reported earnings will be affected by exchange rate fluctuations even if the company’s cash flows are not affected. A weaker dollar tends to inflate the reported earnings of a U.S. based company’s foreign subsidiaries. Some analysts argue that any effect of exchange rate movements on financial statements is irrelevant unless cash flows are also affected.

The changing value of the dollar can also affect stock prices by affecting expectations of economic factors that influence the firm’s performance. For example, if a weak dollar stimulates the U.S. economy, it may enhance the value of a U.S. firm whose sales depend

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**Exhibit 11.1** Stock Market Trend Based on the S&P 500 Index

![Stock Market Index Graph](image)

Source: Federal Reserve.

The changing value of the dollar can also affect stock prices by affecting expectations of economic factors that influence the firm’s performance. For example, if a weak dollar stimulates the U.S. economy, it may enhance the value of a U.S. firm whose sales depend...
on the U.S. economy. A strong dollar, however, could adversely affect this firm if it damps U.S. economic growth. Because inflation affects some firms, a weak dollar could indirectly affect a firm’s stock by putting upward pressure on inflation. A strong dollar would have the opposite indirect impact. Some companies attempt to insulate their stock price from the dollar’s changing value, but other companies purposely remain exposed with the intent to benefit from any changes.

**Market-Related Factors**

Market-related factors also drive stock prices. These factors include investor sentiment and the so-called January effect.

**Investor Sentiment** A key market-related factor is investor sentiment, which represents the general mood of investors in the stock market. Since stock valuations reflect expectations, in some periods the stock market performance is not highly correlated with existing economic conditions. Even though the economy is weak, stock prices may rise if most investors expect that the economy will improve in the near future. In other words, there is a positive sentiment because of optimistic expectations.

Movements in stock prices may be partially attributed to investors’ reliance on other investors for stock market valuation. Rather than making their own assessment of a firm’s value, many investors appear to focus on the general investor sentiment. This can result in “irrational exuberance,” whereby stock prices increase without reason.

**January Effect** Because many portfolio managers are evaluated over the calendar year, they prefer investing in riskier, small stocks at the beginning of the year and then shifting to larger, more stable companies near the end of the year in order to lock in their gains. This tendency places upward pressure on small stocks in January each year, resulting in the January effect. Some studies have found that most of the annual stock market gains occur in January. Once investors discovered the January effect, they attempted to take more positions in stocks in the prior month. This has placed upward pressure on stocks in mid-December, causing the January effect to begin in December.

**Firm-Specific Factors**

A firm’s stock price is affected not only by macroeconomic and market conditions but also by firm-specific conditions. Some firms are more exposed to conditions within their own industry than to general economic conditions, so participants monitor industry sales forecasts, entry into the industry by new competitors, and price movements of the industry’s products. Stock market participants may focus on announcements by specific firms that signal information about a firm’s sales growth, earnings, or other characteristics that may cause a revision in the expected cash flows to be generated by that firm.

**Change in Dividend Policy** An increase in dividends may reflect the firm’s expectation that it can more easily afford to pay dividends. In contrast, a decrease in dividends may reflect the firm’s expectation that it will not have sufficient cash flow.

**Earnings Surprises** Recent earnings are used to forecast future earnings and thus to forecast a firm’s future cash flows. When a firm’s announced earnings are higher than expected, some investors raise their estimates of the firm’s future cash flows and hence revalue its stock upward. However, an announcement of lower-than-expected earnings can cause investors to reduce their valuation of a firm’s future cash flows and its stock.
Acquisitions and Divestitures  The expected acquisition of a firm typically results in an increased demand for the target’s stock, which raises its price. Investors recognize that the target’s stock price will be bid up once the acquiring firm attempts to acquire the target’s stock. The effect on the acquiring firm’s stock is less clear, as it depends on the perceived synergies that could result from the acquisition. Divestitures tend to be regarded as a favorable signal about a firm if the divested assets are unrelated to the firm’s core business. The typical interpretation by the market in this case is that the firm intends to focus on its core business.

Expectations  Investors do not necessarily wait for a firm to announce a new policy before they revalue the firm’s stock. Instead, they attempt to anticipate new policies so that they can make their move in the market before other investors. In this way, they may be able to pay a lower price for a specific stock or sell the stock at a higher price. For example, they may use the firm’s financial reports or recent statements by the firm’s executives to speculate on whether the firm will adjust its dividend policy. The disadvantage of trading based on incomplete information is that an investor may not correctly anticipate the firm’s future policies.

Integration of Factors Affecting Stock Prices  Exhibit 11.2 illustrates the underlying forces that cause a stock’s price to change over time. As with the pricing of debt securities, the required rate of return is relevant, as are the economic factors that affect the risk-free interest rate. Stock market participants...
also monitor indicators that can affect the risk-free interest rate, which in turn affects the required return by investors who invest in stocks. Indicators of inflation (such as the consumer price index and producer price index) and of government borrowing (such as the budget deficit and the volume of funds borrowed at upcoming Treasury bond auctions) also affect the risk-free rate and thereby the required return of investors. In general, whenever these indicators signal the expectation of higher interest rates, there is upward pressure on the required rate of return by investors and downward pressure on a firm’s value.

In addition, it is common to estimate expected future cash flows when deriving a firm’s value, and these cash flows are influenced by economic conditions, industry conditions, and firm-specific conditions. Exhibit 11.2 provides an overview of what stock market participants monitor when attempting to anticipate future stock price movements.
**Stock Risk**

A stock’s risk reflects the uncertainty about future returns, since the actual return may be less than expected. The return from investing in stock over a particular period is measured as

\[ R = \frac{(SP - INV) + D}{INV} \]

where

- \( INV \) = initial investment
- \( D \) = dividend
- \( SP \) = selling price of the stock

The main source of uncertainty is the price at which the stock will be sold. Dividends tend to be much more stable than stock prices. Dividends contribute to the immediate return received by investors but reduce the amount of earnings reinvested by the firm, which limits its potential growth.

The risk of a stock can be measured by using its price volatility, its beta, and the value-at-risk method. Each of these is discussed in turn.

**Volatility of a Stock**

A stock’s volatility serves as a measure of risk because it may indicate the degree of uncertainty surrounding the stock’s future returns. The volatility is often referred to as total risk because it reflects movements in stock prices for any reason, not just movements attributable to stock market movements. Assuming that stock returns are normally distributed, there is a 68 percent probability that the stock’s returns will be within 1 standard deviation of the expected outcome and a 95 percent probability that they will be within 2 standard deviations.

**Forecasting Stock Price Volatility**

One way to forecast stock price volatility is by using the historical method: a historical period is used to derive a stock’s standard deviation of returns, and that estimate is then used as the forecast over the future. Although a stock price’s level of volatility may change over time, this method can be useful when there is no obvious trend in volatility. A second method for forecasting stock price volatility is to use a time series of volatility patterns in previous periods.

**EXAMPLE**

The standard deviation of daily stock returns is determined for each of the last three months. Then, a time-series trend of these standard deviation levels is used to form an estimate for the standard deviation of daily stock returns over the next month. This method differs from the historical method in that it uses information beyond that contained in the previous month. For example, the forecast for September might be based on the following weighting scheme: 50 percent of the standard deviation in the most recent month (August) plus 30 percent of the standard deviation in the month before that (July) plus 20 percent of the standard deviation in the month before that (June).

Normally the weights and the number of previous periods (lags) that were most accurate (i.e., had the lowest forecast error) in previous periods are used. However, various economic and political factors can cause stock price volatility to change abruptly, so even a sophisticated time-series model does not necessarily generate accurate forecasts of stock price volatility.

A third method for forecasting stock price volatility is to derive the stock’s implied standard deviation (ISD) from the stock option pricing model (options are discussed in detail in Chapter 14). The premium on a call option for a stock depends on various factors, including the stock’s volatility as anticipated by investors. By considering the actual
option premium paid by investors for a specific stock along with the values of all other factors that affect the premium, it is possible to derive the anticipated volatility of that stock.

For market participants who want to forecast volatility of the stock market in general, there is a volatility index (VIX) derived from stock options on the S&P 500 index. Exhibit 11.3 shows the VIX level over time. Notice how it increased during the credit crisis in 2008, when there was much uncertainty about the U.S. economy and about stock valuations in general. By 2010, economic conditions had stabilized and the VIX level declined substantially.

**Volatility of a Stock Portfolio** Participants in the stock market tend to invest in a portfolio of stocks rather than a single stock, so they are more concerned with the risk of a portfolio than with the risk of an individual stock. A portfolio’s volatility depends on the volatility of the individual stocks in the portfolio, on the correlations between returns of the stocks in the portfolio, and on the proportion of total funds invested in each stock. The portfolio’s volatility can be measured by the standard deviation:

\[
\sigma_p = \sqrt{w_i^2 \sigma_i^2 + w_j^2 \sigma_j^2 + \sum_{i=1}^{n} \sum_{j=1}^{n} w_i w_j \sigma_i \sigma_j \text{CORR}_{ij}}
\]

where

- \(\sigma_i\) = standard deviation of returns of the \(i\)th stock
- \(\sigma_j\) = standard deviation of returns of the \(j\)th stock
- CORR\(_{ij}\) = correlation coefficient between the \(i\)th and \(j\)th stocks
- \(w_i\) = proportion of funds invested in the \(i\)th stock
- \(w_j\) = proportion of funds invested in the \(j\)th stock
For portfolios containing more securities, the formula for the standard deviation contains the standard deviation of each stock and the correlation coefficients between all pairs of stocks in the portfolio, weighted by the proportion of funds invested in each stock. The equation for a two-stock portfolio is sufficient to demonstrate that, when other factors are held constant, a stock portfolio has more volatility when its individual stock volatilities are high and when its individual stock returns are highly correlated. As an extreme example, if the returns of the stocks are all perfectly positively correlated (correlation coefficients = 1.0), the portfolio will have a relatively high degree of volatility because all stocks will experience peaks or troughs simultaneously. Conversely, a stock portfolio containing some stocks with low or negative correlation will exhibit less volatility because the stocks will not experience peaks and troughs at the same time. Some offsetting effects will occur, smoothing the returns of the portfolio over time.

Because the volatilities and correlations of a portfolio’s individual stocks can change over time, so too can the volatility of the portfolio. One method of forecasting portfolio volatility starts with deriving forecasts of individual volatility levels (as described previously); then the correlation coefficient for each pair of stocks in the portfolio is forecast by estimating the correlation in recent periods. Finally, the forecasted volatilities of individual stocks and the correlation coefficients are used to estimate the portfolio’s future volatility.

**Beta of a Stock**

As explained earlier, a stock’s beta measures the sensitivity of its returns to market returns. This measure of risk is used by many investors who have a diversified portfolio of stocks and believe that the unsystematic risk of the portfolio is therefore diversified away (because favorable firm-specific characteristics will offset unfavorable firm-specific characteristics).

Exhibit 11.4 shows how the probability distribution of a stock’s returns depends on its beta. At one extreme, Stock A (with a very low beta) is less responsive to market movements in either direction, so its possible returns range only from −4.8 percent under poor market conditions to 6 percent under the most favorable market conditions. At the other extreme, Stock D (with a very high beta) has possible returns that range from −11.2 percent under poor market conditions to 14 percent under the most favorable market conditions. This stock is perceived to be risky because it experiences large losses when stock market conditions decline.

**Beta of a Stock Portfolio**

Portfolio risk is commonly measured by beta or volatility (standard deviation), just as the risk of individual stocks is.

The beta of a stock portfolio can be measured as

\[ \beta_p = \sum w_i \beta_i \]

That is, the portfolio beta is a weighted average of the betas of stocks that make up the portfolio, where the weights reflect the proportion of funds invested in each stock. The equation is intuitive because it simply suggests that a portfolio consisting of high-beta stocks will have a relatively high beta. This type of portfolio normally performs poorly relative to other stock portfolios in a period when the market return is negative.

The beta of each individual stock may be forecast in a subjective manner; for example, a portfolio manager may forecast that a stock’s beta will increase from its existing level of 0.8 to 0.9 because the firm has initiated a more aggressive growth strategy. Alternatively, the manager can assess a set of historical periods to determine whether there is a trend in the beta over those periods and then apply the trend.
Exhibit 11.4 How Beta Influences Probability Distributions

<table>
<thead>
<tr>
<th>PROBABILITY</th>
<th>$R_m$</th>
<th>STOCK A'S EXPECTED RETURNS, $E(R)$, IF $B_f = 0.6$</th>
<th>STOCK B'S EXPECTED RETURNS, $E(R)$, IF $B_f = 0.9$</th>
<th>STOCK C'S EXPECTED RETURNS, $E(R)$, IF $B_f = 1.2$</th>
<th>STOCK D'S EXPECTED RETURNS, $E(R)$, IF $B_f = 1.4$</th>
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</thead>
<tbody>
<tr>
<td>10%</td>
<td>-8%</td>
<td>-4.8%</td>
<td>-7.2%</td>
<td>-9.6%</td>
<td>-11.2%</td>
</tr>
<tr>
<td>20%</td>
<td>-6%</td>
<td>-3.6%</td>
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The beta of a stock and its volatility are typically related. High-beta stocks are expected to be relatively volatile because they are more sensitive to market returns over time. Likewise, low-beta stocks are expected to be less volatile because they are less responsive to market returns.

**Value at Risk**

Value at risk is a measurement that estimates the largest expected loss to a particular investment position for a specified confidence level. It is intended to warn investors about the potential maximum loss that could occur. If the investors are uncomfortable with the potential loss that could occur in a day or a week, they can revise their investment portfolio to make it less risky.

The value-at-risk measurement focuses on the pessimistic portion of the probability distribution of returns from the investment of concern. For example, a portfolio manager might use a confidence level of 90 percent, which estimates the maximum daily expected loss for a stock in 90 percent of the trading days over an upcoming period. The higher the level of confidence desired, the larger the maximum expected loss that could occur for a given type of investment. That is, one may expect that the daily loss from holding a particular stock will be no worse than $-5$ percent when using a 90 percent confidence level but as much as $-8$ percent when using a 99 percent confidence level. In essence, the more confidence investors have that the actual loss will be no greater than the expected maximum loss, the further they move into the left tail of the probability distribution.

**Application Using Historical Returns**  An obvious way of using value at risk is to assess historical data. For example, an investor may determine that, out of the last 100 trading days, a stock experienced a decline of greater than 7 percent on 5 different days, or 5 percent of the days assessed. This information could be used to infer a maximum daily loss of no more than 7 percent for that stock based on a 95 percent confidence level for an upcoming period.

**Application Using the Standard Deviation**  An alternative approach is to measure the standard deviation of daily returns over the previous period and then apply it to derive boundaries for a specific confidence level.

Assume that the standard deviation of daily returns for a particular stock in a recent historical period is 2 percent. Also assume that the 95 percent confidence level is desired for the maximum loss. If the daily returns are normally distributed, the lower boundary (the left tail of the probability distribution) is about 1.65 standard deviations away from the expected outcome. For an expected daily return of 0.1 percent, the lower boundary is

$$0.1\% - [1.65 \times (2\%)] = -3.2\%$$

The expected daily return of 0.1 percent may reflect subjective information, or it could be the average daily return during the recent historical period assessed. The lower boundary for a given confidence level can easily be derived for any expected daily return. For example, if the expected daily return is 0.14 percent, the lower boundary is

$$0.14\% - [1.65 \times (2\%)] = -3.16\%$$

**Application Using Beta**  A third method of estimating the maximum expected loss for a given confidence level is to apply the stock’s beta.

Assume that a stock’s beta over the last 100 days is 1.2. Also assume that the stock market is expected to perform no worse than $-2.5$ percent on a daily basis based on a 95 percent confidence
level. Given the stock’s beta of 1.2 and a maximum market loss of −2.5 percent, the maximum loss to the stock over a given day is estimated to be

\[
1.2 \times (-2.5\%) = -3\%
\]

The maximum expected market loss for the 95 percent confidence level can be derived subjectively or by assessing the last 100 days or so (in the same manner described for the two previous methods that can be used to derive the maximum expected loss for an individual stock).

**Deriving the Maximum Dollar Loss**  Once the maximum percentage loss for a given confidence level is determined, it can be applied to derive the maximum dollar loss of a particular investment.

**Example**  Assume that an investor has a $20 million investment in a stock. The maximum dollar loss is determined by applying the maximum percentage loss to the value of the investment. If the investor used beta to measure the maximum expected loss as explained previously, the maximum percentage loss over one day would be −3 percent. Hence the maximum daily loss in dollars is

\[
(-3\%) \times 20,000,000 = 600,000
\]

**Application to a Stock Portfolio**  Value at risk is also commonly used to measure the risk of a stock portfolio. The same three methods used to derive the maximum expected loss of one stock can be applied to derive the maximum expected loss of a stock portfolio for a given confidence level. For instance, the returns of a stock portfolio over the past 100 days or so can be assessed to derive the maximum expected loss. Alternatively, the standard deviation of the portfolio’s returns can be estimated over the past 100 days to derive a lower boundary at a specified confidence level. Still another alternative is to estimate the beta of the portfolio’s returns over the past 100 days and then apply that beta to a maximum expected daily loss in the stock market to derive a maximum expected loss in the stock portfolio over a given day.

**Adjusting the Investment Horizon Desired**  An investor who wants to assess the maximum loss over a week or a month can apply the same methods. However, it is important in this case to use a historical series that matches the investment horizon. In order to assess the maximum loss over a given week in the near future, a historical series of weekly returns of that stock (or stock portfolio) can be used.

**Adjusting the Length of the Historical Period**  The previous examples used a historical series of 100 trading days, but if conditions have changed such that only the most recent 70 days reflect the general state of market conditions, then those 70 days should be used. However, a subperiod of weak market performance should not be discarded because a similar one could occur again.

**Limitations of the Value-at-Risk Method**  A common criticism of using historical periods to measure value at risk is that portfolio managers may be using a relatively calm historical period when assessing possible future risk. If, for example, the distribution of returns has been narrow because the economy was unusually stable in the previous period, the maximum loss expected in a future period (when the economy is not as stable) may be underestimated. In the language of portfolio managers, the distribution of possible returns used to estimate value at risk may have short tails (edge of the distribution) whereas the distribution of returns over the future period may have long tails. This implies that the actual loss of a portfolio may be more pronounced than the expected maximum loss. For instance, estimating the maximum loss during the stable period just prior to the credit crisis would have underestimated the risk of a stock portfolio during the credit crisis, when stocks actually experienced major losses.
Risk-Adjusted Stock Performance

The performance of a stock or a stock portfolio over a particular period can be measured by its excess return (return above the risk-free rate) for that period divided by its risk. Two common methods of measuring performance are the Sharpe index and the Treynor index.

**Sharpe Index**

If total variability is thought to be the appropriate measure of risk, a stock’s risk-adjusted returns can be determined by the reward-to-variability ratio (also called the *Sharpe index*):

\[
\text{Sharpe index} = \frac{\overline{R} - \overline{R}_f}{\sigma}
\]

where

- \( \overline{R} \) = average return on the stock
- \( \overline{R}_f \) = average risk-free rate
- \( \sigma \) = standard deviation of the stock’s return

The higher the stock’s mean return relative to the mean risk-free rate and the lower the standard deviation, the higher the Sharpe index. This index measures the excess return above the risk-free rate per unit of risk.

**Example**

Assume the following information for two stocks:

- Average return for Sooner stock = 16%
- Average return for Longhorn stock = 14%
- Average risk-free rate = 10%
- Standard deviation of Sooner stock returns = 15%
- Standard deviation of Longhorn stock returns = 8%

Then

\[
\text{Sharpe index for Sooner stock} = \frac{16\% - 10\%}{15\%} = 0.40
\]

\[
\text{Sharpe index for Longhorn stock} = \frac{14\% - 10\%}{8\%} = 0.50
\]

Even though Sooner stock had a higher average percentage return, Longhorn stock had a higher performance because of its lower risk. If a stock’s average return is less than the average risk-free rate, the Sharpe index for that stock will be negative.

**Treynor Index**

If beta is thought to be the most appropriate type of risk, a stock’s risk-adjusted returns can be determined by the *Treynor index*, computed as

\[
\text{Treynor index} = \frac{\overline{R} - \overline{R}_f}{B}
\]

where \( B \) is the stock’s beta. The Treynor index differs from the Sharpe index only in that it uses beta rather than the standard deviation to measure the stock’s risk. The higher the Treynor index, the higher the return (per unit of risk) relative to the risk-free rate.
EXAMPLE

Using the information provided earlier on Sooner and Longhorn stock and assuming that Sooner’s stock beta is 1.2 and Longhorn’s beta is 1.0, the Treynor index is computed for each stock as follows:

Treynor index for Sooner stock = \( \frac{16\% - 10\%}{1.2} \)
= \( \frac{0.05}{1.2} \)
= 0.05

Treynor index for Longhorn stock = \( \frac{14\% - 10\%}{1.0} \)
= \( \frac{0.04}{1.0} \)
= 0.04

Based on the Treynor index, Sooner stock experienced higher performance.

A comparison of this example and the previous one shows that which stock performs better depends on the measure of risk and thus on the index used. In some cases, different indexes will lead to the same conclusions. Like the Sharpe index, the Treynor index is negative for a stock whose average return is less than the average risk-free rate.

**Stock Market Efficiency**

If stock markets are efficient, the prices of stocks at any point in time should fully reflect all available information. As investors attempt to capitalize on new information that is not already accounted for, stock prices should adjust immediately. Investors commonly over- or underreact to information. This does not mean that markets are inefficient unless the reaction is biased (i.e., consistently over- or underreacting). Investors who can recognize such bias will be able to earn abnormally high risk-adjusted returns.

**Forms of Efficiency**

Efficient markets can be classified into three forms: weak, semistrong, and strong.

**Weak-Form Efficiency**  Weak-form efficiency suggests that security prices reflect all market-related information, such as historical security price movements and volume of securities trades. Thus, investors will not be able to earn abnormal returns on a trading strategy that is based solely on past price movements.

**Semistrong-Form Efficiency**  Semistrong-form efficiency suggests that security prices fully reflect all public information. The difference between public information and market-related information is that public information also includes announcements by firms, economic news or events, and political news or events. Market-related information is a subset of public information. Therefore, if semistrong-form efficiency holds, weak-form efficiency must also hold. It is possible, however, for weak-form efficiency to hold even though semistrong-form efficiency does not. In this case, investors could earn abnormal returns by using the relevant information that was not immediately accounted for by the market.

**Strong-Form Efficiency**  Strong-form efficiency suggests that security prices fully reflect all information, including private or insider information. If strong-form efficiency holds, semistrong-form efficiency must hold as well. If insider information leads to abnormal returns, however, semistrong-form efficiency could hold even though strong-form efficiency does not.

Inside information gives insiders (such as some employees or board members) an unfair advantage over other investors. For example, if employees of a firm are aware of favorable news about the firm that has not yet been disclosed to the public, they may
consider purchasing shares or advising their friends to purchase the firm’s shares. Although such actions are illegal, they do occur and can create market inefficiencies.

**Tests of the Efficient Market Hypothesis**
Tests of market efficiency are segmented into three categories, as discussed next.

*Test of Weak-Form Efficiency*  Weak-form efficiency has been tested by searching for a nonrandom pattern in security prices. If the future change in price is related to recent changes, historical price movements could be used to earn abnormal returns. In general, studies have found that historical price changes are independent over time. This means that historical information is already reflected by today’s price and cannot be used to earn abnormal profits. Even when some dependence was detected, the transaction costs offset any excess return earned.

There is some evidence that stocks have performed better in certain time periods. For example, as mentioned earlier, small stocks have performed unusually well in the month of January (the “January effect”). Second, stocks have historically performed better on Fridays than on Mondays (the “weekend effect”). Third, stocks have historically performed well on the trading days just before holidays (the “holiday effect”). To the extent that a given pattern continues and can be used by investors to earn abnormal returns, market inefficiencies exist. In most cases, there is no clear evidence that such patterns persist once they are recognized by the investment community.

One could use the number of *market corrections* to evaluate stock market inefficiency. During the twentieth century, there were more than 100 days on which the market (as measured by the Dow Jones Industrial Average) declined by 10 percent or more. On more than 300 days, the market declined by more than 5 percent. These abrupt declines frequently followed a market runup, which suggests that the runup might have been excessive. In other words, a market correction was necessary to counteract the excessive runup.

*Test of Semistrong-Form Efficiency*  Semistrong-form efficiency has been tested by assessing how security returns adjust to particular announcements. Some announcements are specific to a firm, such as an announced dividend increase, an acquisition, or a stock split. Other announcements are related to the economy, such as an announced decline in the federal funds rate. In general, it was found that security prices immediately reflected the information from the announcements. Hence the securities were not consistently over- or undervalued, so abnormal returns could not consistently be achieved. This is especially true when transaction costs are accounted for.

There is evidence of unusual profits from investing in initial public offerings (IPOs). In particular, the return over the first day following the IPO tends to be abnormally high. One reason for this underpricing is that the securities firms underwriting an IPO intentionally underprice to ensure that the entire issue can be placed. Underwriters also are required to exercise due diligence in ensuring the accuracy of the information they provide to investors about the corporation. For this reason, underwriters tend to err on the low side when setting a price for IPOs.

Some analysts contend that, given the imperfect information associated with IPOs, investors would not participate unless prices are low. In other words, the potential return must be high enough to compensate not only for the risk incurred but also for the lack of information about these corporations. From this perspective, IPO underpricing does not imply market inefficiencies but rather reflects the high degree of uncertainty involved.
Test of Strong-Form Efficiency  Tests of strong-form efficiency are difficult because the inside information used is not publicly available and cannot be properly tested. Nevertheless, many forms of insider trading could easily result in abnormally high returns. For example, there is clear evidence that share prices of target firms rise substantially when the acquisition is announced. If insiders purchased stock of targets prior to other investors, they would normally achieve abnormally high returns. Insiders are discouraged from using this information because it is illegal, not because markets are strong-form efficient.

Foreign Stock Valuation and Performance

Some of the key concepts in this chapter can be adjusted so that they apply on a global basis, as explained next.

Valuation of Foreign Stocks

Foreign stocks can be valued by using the price–earnings method or the dividend discount model with an adjustment to reflect international conditions.

Price–Earnings Method  The expected earnings per share of the foreign firm are multiplied by the appropriate PE ratio (based on the firm’s risk and local industry) to determine the appropriate price of the firm’s stock. Though easy to use, this method is subject to some limitations when valuing foreign stocks. The PE ratio for a given industry may change continuously in some foreign markets, especially when the industry consists of just a few firms. It is therefore difficult to determine what ratio should be applied to a specific foreign firm. In addition, the PE ratio for any particular industry may need to be adjusted for the firm’s country because reported earnings can be influenced by national accounting guidelines and tax laws.

Furthermore, even if U.S. investors are comfortable with their estimate of the proper PE ratio, the value derived by this method is denominated in the local foreign currency (since the estimated earnings are denominated in that currency). Therefore, U.S. investors must also consider exchange rate effects. Even if the stock is undervalued in the foreign country, it may not generate a reasonable return for U.S. investors if the foreign currency depreciates against the dollar.

Dividend Discount Model  The dividend discount model can be applied to the valuation of foreign stocks by discounting the stream of expected dividends while adjusting to account for expected exchange rate movements. Foreign stocks pay dividends in the currency of their denomination. Thus, the cash flow per period to U.S. investors is the dividend (denominated in the foreign currency) multiplied by the value of that foreign currency in dollars. An expected appreciation of the currency denoting the foreign stocks will result in higher expected dollar cash flows and a higher present value. The dividend can normally be forecast with more accuracy than can the value of the foreign currency. Because of exchange rate uncertainty, the value of foreign stock from a U.S. investor’s perspective is subject to more uncertainty than the value of that stock from a local investor’s perspective.

International Market Efficiency

Some foreign markets are likely to be inefficient because of the relatively small number of analysts and portfolio managers who monitor stocks in those markets. It is easier to find undervalued stocks when a smaller number of market participants monitor the market. Research has documented that some foreign markets are inefficient, basing these
conclusions on slow price responses to new information (e.g., earnings announcements) about specific firms. Such inefficiencies are more common in smaller foreign stock markets. Some emerging stock markets are relatively new and small, so they are unlikely to be as efficient as the U.S. stock market. Hence some stocks may be undervalued, a possibility that has attracted investors to these markets. Yet precisely because some of these markets are small, they may be susceptible to manipulation by large traders. Furthermore, insider trading is more prevalent in many foreign markets because rules against it are not enforced. In general, large institutional investors and insiders based in the foreign markets may have some advantages.

**Measuring Performance from Investing in Foreign Stocks**

The returns from investing in foreign stocks is most properly measured in terms of the investor’s objectives. For example, if portfolio managers are assigned to select stocks in Europe, their performance should be compared to that of a European index measured in U.S. dollars. In this way, the performance measurement controls for general market movements and exchange rate movements in the region where the portfolio manager has been assigned to invest funds. Thus, if the entire European market experiences poor performance over a particular quarter, or if the main European currency (the euro) depreciates against the dollar over the period, the portfolio managers assigned to Europe are not automatically penalized. Conversely, if the entire European market experiences strong performance over a particular quarter or the euro appreciates against the dollar, managers are not automatically rewarded. Instead, the performance of portfolio managers is measured relative to the general market conditions of the region to which they are assigned.

**Performance from Global Diversification**

A substantial amount of research has demonstrated that investors in stocks can benefit by diversifying internationally. Most stocks are strongly influenced by the country in which their firms are located (although some firms are more vulnerable to local economic conditions than others).

Since a stock market partially reflects the current and/or forecasted state of its country’s economy and since economies do not generally move in tandem, particular stocks of the various markets are not highly correlated. This contrasts with the case of a purely domestic portfolio (e.g., one consisting entirely of U.S. stocks), in which most stocks often move in the same direction and by a similar magnitude.

Nevertheless, stock price movements among international stock markets are correlated to some degree because some underlying economic factors reflecting the world’s general financial condition may systematically affect all markets. One country’s economy can influence the economies of other countries, so expectations about economies across countries may be similar. Thus, stock markets across countries may respond to some of the same expectations. Integration is an important concept because of what it implies about the potential benefits of international diversification. A high degree of international economic integration implies that stock returns of different countries are affected by common factors. In that case, the returns of stocks from various countries would move in concert and therefore allow only modest benefits from international diversification.

In general, correlations between stock indexes have been higher in recent years than they were several years ago. One reason for the increased correlations is the increased integration of business between countries. This results in more intercountry trade flows and capital flows, which causes each country to have more influence on other countries. In particular, many European countries have become more integrated because of the
movement to standardize regulations throughout Europe and the use of a single currency (the euro) to facilitate trade between countries.

**Diversification among Emerging Stock Markets**  Emerging markets provide an alternative outlet for investors from the United States and other countries to invest their funds. The potential economic growth rate is relatively high. In addition, investors may achieve extra diversification benefits from investing in emerging markets because their respective economies may not move in tandem with those of the more developed countries. Hence the correlation between these stocks and those of other countries is low, so investors can reduce risk by including some stocks from these markets in their portfolios.

However, emerging market stocks tend to exhibit a high degree of volatility, which partially offsets the advantage of their low correlations with stocks of other countries. Stocks in emerging markets are more exposed to major government turnovers and other forms of political risk. They also expose U.S. investors to a high degree of exchange rate risk because the local currencies involved are typically volatile.

**Summary**

- Stocks are commonly valued using the price–earnings (PE) method, the dividend discount model, or the free cash flow model. The PE method applies the industry PE ratio to the firm’s earnings to derive its value. The dividend discount model estimates the value as the present value of expected future dividends. The free cash flow model is based on the present value of future cash flows.
- When applying the free cash flow model to value a stock, a required rate of return must be estimated. One method of estimating the required rate of return is to apply the capital asset pricing model, in which the required return depends on the risk-free interest rate and the firm’s beta.
- Stock prices are affected by those factors that affect future cash flows or the required rate of return by investors. Economic conditions, market conditions, and firm-specific conditions can affect a firm’s cash flows or the required rate of return.
- The risk of a stock is measured by its volatility, its beta, or its value-at-risk estimate. Investors are giving more attention to risk measurement in light of abrupt downturns in the prices of some stocks in recent years.
- Stock market efficiency implies that stock prices reflect all available information. Weak-form efficiency suggests that security prices reflect all trade-related information, such as historical security price movements and the volume of securities trades. Semistrong-form efficiency suggests that security prices fully reflect all public information. Strong-form efficiency suggests that security prices fully reflect all information, including private or insider information. Evidence supports weak-form efficiency to a degree, but there is less support for semistrong- or strong-form efficiency.

**Point Counter-Point**

**Is the Stock Market Efficient?**

**Point** Yes. Investors fully incorporate all available information when trading stocks. Thus, the prices of stocks fully reflect all information.

**Counter-Point** No. The high degree of stock price volatility offers evidence of how much disagreement there is among stock prices. The fact that many stocks declined by more than 40 percent during the end of 2008 and beginning of 2009 suggests that stock prices are not always properly valued to reflect available information.

**Who Is Correct?** Use the Internet to learn more about this issue and then formulate your own opinion.
Questions and Applications

1. **Price–Earnings Model** Explain the use of the price–earnings ratio for valuing a stock. Why might investors derive different valuations for a stock when using the PE method? Why might investors derive an inaccurate valuation of a firm when using the PE method?

2. **Dividend Discount Model** Describe the dividend discount valuation model. What are some limitations of the dividend discount model?

3. **Impact of Economic Growth** Explain how economic growth affects the valuation of a stock.

4. **Impact of Interest Rates** How are the interest rate, the required rate of return on a stock, and the valuation of a stock related?

5. **Impact of Inflation** Assume that the expected inflation rate has just been revised upward by the market. Would the required return by investors who invest in stocks be affected? Explain.

6. **Impact of Exchange Rates** Explain how the value of the dollar affects stock valuations.

7. **Investor Sentiment** Explain why investor sentiment can affect stock prices.

8. **January Effect** Describe the January effect.

9. **Earnings Surprises** How do earnings surprises affect valuations of stocks?

10. **Impact of Takeover Rumors** Why can expectations of an acquisition affect the value of the target’s stock?

11. **Emerging Markets** What are the risks of investing in stocks in emerging markets?

12. **Stock Volatility during the Credit Crisis** Explain how stock volatility changed during the credit crisis.

13. **Stock Portfolio Volatility** Identify the factors that affect a stock portfolio’s volatility and explain their effects.

14. **Beta** Explain how to estimate the beta of a stock. Explain why beta serves as a measure of the stock’s risk.

15. **Wall Street** In the movie *Wall Street*, Bud Fox is a broker who conducts trades for Gordon Gekko’s firm. Gekko purchases shares of firms he believes are undervalued. Various scenes in the movie offer excellent examples of concepts discussed in this chapter.

   a. Bud Fox comments to Gordon Gekko that a firm’s breakup value is twice its market price. What is Bud suggesting in this statement? How would employees of the firm respond to Bud’s statement?

   b. When Bud informs Gekko that another investor, Mr. Wildman, is secretly planning to acquire a target firm in Pennsylvania, Gekko tells Bud to buy a large amount of this stock. Why?

   c. Gekko says, “Wonder why fund managers can’t beat the S&P 500? Because they are sheep.” What is Gekko’s point? How does it relate to market efficiency?

16. **Market Efficiency** Explain the difference between weak-form, semistrong-form, and strong-form efficiency. Which of these forms of efficiency is most difficult to test? Which is most likely to be refuted? Explain how to test weak-form efficiency in the stock market.

17. **Market Efficiency** A consulting firm was hired to determine whether a particular trading strategy could generate abnormal returns. The strategy involved taking positions based on recent historical movements in stock prices. The strategy did not achieve abnormal returns. Consequently, the consulting firm concluded that the stock market is weak-form efficient. Do you agree? Explain.

Advanced Questions

18. **Value at Risk** Describe the value-at-risk method for measuring risk.

19. **Implied Volatility** Explain the meaning and use of implied volatility.

20. **Leveraged Buyout** At the time a management group of RJR Nabisco initially considered engaging in a leveraged buyout, RJR’s stock price was less than $70 per share. Ultimately, RJR was acquired by the firm Kohlberg Kravis Roberts (KKR) for about $108 per share. Does the large discrepancy between the stock price before an acquisition was considered and after the acquisition mean that RJR’s price was initially undervalued? If so, does this imply that the market was inefficient?

21. **How Stock Prices May Respond to Prevailing Conditions** Consider the prevailing conditions that could affect the demand for stocks, including inflation,
the economy, the budget deficit, the Fed’s monetary policy, political conditions, and the general mood of investors. Based on these conditions, do you think stock prices will increase or decrease during this semester? Offer some logic to support your answer. Which factor do you think will have the biggest impact on stock prices?

22. **Application of CAPM to Stock Pricing** Explain (using intuition instead of math) why stock prices may decrease in response to a higher risk-free rate according to the CAPM. Explain (using intuition instead of math) why stock prices may increase in this situation even though the risk-free rate increases.

23. **Impact of SOX on Stock Valuations** Use a stock valuation framework to explain why the Sarbanes-Oxley Act (SOX) could improve the valuation of a stock. Why might SOX cause a reduction in the valuation of a stock? (See the Appendix.)

**Interpreting Financial News**

Interpret the following statements made by Wall Street analysts and portfolio managers.

a. “The stock market’s recent climb has been driven by falling interest rates.”

b. “Future stock prices are dependent on the Fed’s policy meeting next week.”

c. “Given the recent climb in stocks that cannot be explained by fundamentals, a correction is inevitable.”

**Managing in Financial Markets**

Stock Portfolio Dilemma As an investment manager, you frequently make decisions about investing in stocks versus other types of investments and about types of stocks to purchase.

a. You have noticed that investors tend to invest more heavily in stocks after interest rates have declined. You are considering this strategy as well. Is it rational to invest more heavily in stocks once interest rates have declined?

b. Assume that you are about to select a specific stock that will perform well in response to an expected runup in the stock market. You are very confident that the stock market will perform well in the near future. Recently, a friend recommended that you consider purchasing stock of a specific firm because it had decent earnings over the last few years, it has a low beta (reflecting a low degree of systematic risk), and its beta is expected to remain low. You normally rely on beta as a measurement of a firm’s systematic risk. Should you seriously consider buying that stock? Explain.

c. You are considering an investment in an initial public offering by Marx Company, which has performed very well recently, according to its financial statements. The firm will use some of the proceeds from selling stock to pay off some of its bank loans. How can you apply stock valuation models to estimate this firm’s value when its stock is not yet publicly traded? Once you estimate the value of the firm, how can you use this information to determine whether to invest in it? What are some limitations in estimating the value of this firm?

d. In the past, your boss assessed your performance based on the actual return on the portfolio of U.S. stocks that you manage. For each quarter in which your portfolio generated an annualized return of at least 20 percent, you received a bonus. Now your boss wants you to develop a method for measuring your performance from managing the portfolio. Offer a method that accurately measures your performance.

e. Assume that you were also asked to manage a portfolio of European stocks. How would your method for measuring your performance in managing this portfolio differ from the method you devised for the U.S. stock portfolio in the previous question?

**Problems**

1. **Risk-Adjusted Return Measurements** Assume the following information over a five-year period:

   - Average risk-free rate = 6%
   - Average return for Crane stock = 11%
   - Average return for Load stock = 14%
   - Standard deviation of Crane stock returns = 2%
   - Standard deviation of Load stock returns = 4%
   - Beta of Crane stock = 0.8
   - Beta of Load stock = 1.1

Determine which stock has higher risk-adjusted returns according to the Sharpe index. Which stock has higher risk-adjusted returns according to the Treynor index? Show your work.
2. **Measuring Expected Return** Assume Mess stock has a beta of 1.2. If the risk-free rate is 7 percent and the market return is 10 percent, what is the expected return of Mess stock?

3. **Using the PE Method** You found that Verto stock is expected to generate earnings of $4.38 per share this year and that the mean PE ratio for its industry is 27.195. Use the PE valuation method to determine the value of Verto shares.

4. **Using the Dividend Discount Model** Suppose that you are interested in buying the stock of a company that has a policy of paying a $6 per share dividend every year. Assuming no changes in the firm’s policies, what is the value of a share of stock if the required rate of return is 11 percent?

5. **Using the Dividend Discount Model** Micro, Inc., will pay a dividend of $2.30 per share next year. If the company plans to increase its dividend by 9 percent per year indefinitely, and you require a 12 percent return on your investment, what should you pay for the company’s stock?

6. **Using the Dividend Discount Model** Suppose you know that a company just paid an annual dividend of $1.75 per share on its stock and that the dividend will continue to grow at a rate of 8 percent per year indefinitely. If the required return on this stock is 10 percent, what is the current share price?

7. **Deriving the Required Rate of Return** The next expected annual dividend for Sun, Inc., will be $1.20 per share, and analysts expect the dividend to grow at an annual rate of 7 percent indefinitely. If Sun stock currently sells for $22 per share, what is the required rate of return?

8. **Deriving the Required Rate of Return** A share of common stock currently sells for $110. Current dividends are $8 per share annually and are expected to grow at 6 percent per year indefinitely. What is the rate of return required by investors in the stock?

9. **Deriving the Required Rate of Return** A stock has a beta of 2.2, the risk-free rate is 6 percent, and the expected return on the market is 12 percent. Using the CAPM, what would you expect the required rate of return on this stock to be? What is the market risk premium?

10. **Deriving a Stock’s Beta** You are considering investing in a stock that has an expected return of 13 percent. If the risk-free rate is 5 percent and the market risk premium is 7 percent, what must the beta of this stock be?

11. **Measuring Stock Returns** Suppose you bought a stock at the beginning of the year for $76.50. During the year, the stock paid a dividend of $0.70 per share and had an ending share price of $99.25. What is the total percentage return from investing in that stock over the year?

12. **Measuring the Portfolio Beta** Assume the following information:
   - Beta of IBM = 1.31
   - Beta of LUV = 0.85
   - Beta of ODP = 0.94

   If you invest 40 percent of your money in IBM, 30 percent in LUV, and 30 percent in ODP, what is your portfolio’s beta?

13. **Measuring the Portfolio Beta** Using the information from Problem 12, suppose that you instead decide to invest $20,000 in IBM, $30,000 in LUV, and $50,000 in ODP. What is the beta of your portfolio now?

14. **Value at Risk** Assume that Quitar Co. has a beta of 1.31.

   a. If you assume that the stock market has a maximum expected loss of −3.2 percent on a daily basis (based on a 95 percent confidence level), what is the maximum daily loss for the Quitar Co. stock?

   b. If you have $19,000 invested in Quitar Co. stock, what is your maximum daily dollar loss?

15. **Value at Risk** If your portfolio beta is 0.89 and the stock market has a maximum expected loss of −2.5 percent on a daily basis, what is the maximum daily loss to your portfolio?

16. **Dividend Model Relationships**

   a. When computing the price of a stock with the dividend discount model, how would the price be affected if the required rate of return is increased? Explain the logic of this relationship.

   b. When computing the price of a stock using the constant-growth dividend discount model, how would the price be affected if the growth rate is reduced? Explain the logic of this relationship.

17. **CAPM Relationships**

   a. When using the CAPM, how would the required rate of return on a stock be affected if the risk-free rate were lower?

   b. When using the CAPM, how would the required rate of return on a stock be affected if the market return were lower?
c. When using the CAPM, how would the required rate of return on a stock be affected if the beta were higher?

18. Value at Risk

a. How is the maximum expected loss on a stock affected by an increase in the volatility (standard deviation), based on a 95 percent confidence interval?

b. Determine how the maximum expected loss on a stock would be affected by an increase in the expected return of the stock, based on a 95 percent confidence interval.

Flow of Funds Exercise

Valuing Stocks

Recall that if the economy continues to be strong, Carson Company may need to increase its production capacity by about 50 percent over the next few years to satisfy demand. It would need financing to expand and accommodate the increase in production. Recall that the yield curve is currently upward sloping. Also recall that Carson is concerned about a possible slowing of the economy because of potential Fed actions to reduce inflation. It is also considering issuing stock or bonds to raise funds in the next year. If Carson goes public, it might even consider using its stock as a means of acquiring some target firms. It would also consider engaging in a secondary offering at a future point in time if the IPO is successful and if its growth continues over time. It would also change its compensation system so that most of its managers would receive about 30 percent of their compensation in shares of Carson stock and the remainder as salary.

a. At the present time, the price-earnings ratio (stock price per share divided by earnings per share) of other firms in Carson’s industry is relatively low but should rise in the future. Why might this information affect the time at which Carson issues its stock?

b. Assume that Carson Company believes that issuing stock is an efficient means of circumventing the potential for high interest rates. Even if long-term interest rates have increased by the time it issues stock, Carson thinks that it would be insulated by issuing stock instead of bonds. Is this view correct?

c. Carson Company recognizes the importance of a high stock price at the time it engages in an IPO (if it goes public). But why would its stock price be important to Carson Company even after the IPO?

d. If Carson Company goes public, it may be able to motivate its managers by granting them stock as part of their compensation. Explain why the stock may motivate them to perform well. Then explain why the use of stock as compensation may motivate them to focus on short-term goals even though they are supposed to focus on maximizing shareholder wealth over the long run. How can a firm provide stock as motivation but prevent its managers from using a short-term focus?

Internet/Excel Exercises

1. Go to http://finance.yahoo.com/indices. Compare the performance of the Dow, Nasdaq, and S&P 500 indexes. Click on each of these indexes and describe the trend for that index since January. Which index has had the best performance?

2. Go to http://finance.yahoo.com/, type in the symbol DELL (for Dell, Inc.) and click on “Get Quotes.” Then go to the bottom of the stock price chart and retrieve the end-of-month stock price of Dell over the last 12 months. Record this information on an Excel spreadsheet and estimate the standard deviation of the stock’s price movements. (See Appendix B for guidance on how to estimate the standard deviation of a stock’s price movements.) Repeat the process for Oracle Corporation (its symbol is ORCL). Which stock does your analysis show to be riskier?

3. Assume that the expected return on Dell stock and Oracle stock is 0 percent for the next month. Use the value-at-risk method to determine the maximum expected loss of Dell and Oracle for the next month, based on a 95 percent confidence level.
WSJ Exercise

Reviewing Abrupt Shifts in Stock Valuation

Review Section C of a recent issue of *The Wall Street Journal*. Notice that the stocks with the largest one-day gains and losses are shown. Do an Internet search for news about the stock with the biggest gain. What is the reason for the gain? Repeat the exercise for the stock with the biggest loss.

Online Articles with Real-World Examples

Find a recent practical article available online that describes a real-world example regarding a specific financial institution or financial market that reinforces one or more concepts covered in this chapter.

If your class has an online component, your professor may ask you to post your summary of the article there and provide a link to the article so that other students can access it. If your class is live, your professor may ask you to summarize your application of the article in class. Your professor may assign specific students to complete this assignment or may allow any students to do the assignment on a volunteer basis.

For recent online articles and real-world examples related to this chapter, consider using the following search terms (be sure to include the prevailing year as a search term to ensure that the online articles are recent):

1. stock AND valuation
2. price-earnings AND valuation
3. free cash flow AND valuation
4. stock AND investor sentiment
5. stock AND risk
6. stock valuation AND uncertainty
7. stock valuation AND beta
8. stock AND value at risk
9. stock AND volatility
10. stock market AND efficient