Chapter 13 Equity Valuation

Chapter Objectives

- Use financial statements and market comparables to estimate firm value.
- Calculate the intrinsic value of a firm using either a constant-growth or multistage dividend discount model.
- Assess the growth prospects of a firm, and relate growth opportunities to the P/E ratio.
- Value a firm using free cash flow models.

13.1 VALUATION BY COMPARABLES

- The purpose of fundamental analysis is to identify stocks that are mispriced relative to some measure of "true" value that can be derived from observable financial data.
  - Of course, true value can only be estimated.
  - In practice, stock analysts use models to estimate the fundamental value of a corporation's stock from observable market data and from the financial statements of the firm and its competitors.
  - These valuation models differ in the specific data they use and in the level of their theoretical sophistication.
  - But, at their heart, most of them use the notion of valuation by comparables.
    - ✓ They look at the relationship between price and various determinants of value for similar firms, and then extrapolate that relationship to the firm in question.

- The Securities and Exchange Commission provides information available on companies at its EDGAR Web site **www.sec.gov/edgar.shtml**.
  - The SEC requires all public companies (except foreign companies and companies with less than $10 million in assets and 500 shareholders) to file registration statements, periodic reports, and other forms electronically through EDGAR.
  - Many Web sites, such as **finance.yahoo.com, money.msn.com,** and **finance.google.com** also provide analysis and data derived from the EDGAR reports.
- Table 13.1 shows some financial highlights for Microsoft as well as some comparable data for other firms in the software applications industry
  - The price per share of Microsoft's common stock is $45.95, and the total market value or capitalization of those shares (called *market cap* for short) is $378.6 billion.
  - Under the heading "Valuation," Table 13.1 reports the ratios of Microsoft's stock price to five benchmarks.
    - ✓ Its share price is 18.0 times its (per share) earnings in the most recent 12 months, 4.2 times its recent book value, 4.2 times its sales, and 11.7 times its cash flow.

TABLE 13.1 Financial highlights for Microsoft

Price per share	$45.95	
Common shares outstanding (billion)	8.24	
Market capitalization ($ billion)	378.64	
Latest 12 months		
Sales ($ billion)	91.5	
EBITDA ($ billion)	33.26	
Net income ($ billion)	21.37	
Earnings per share	$2.55	
Valuation	**Microsoft**	**Industry Avg**
Price/Earnings	18.0	19.4
Price/Book	4.2	7.0
Price/Sales	4.2	
Price/Cash flow	11.7	
PEG	2.6	
Profitability		
ROE (%)	24.9	21.8
ROA (%)	11.4	
Operating profit margin (%)	31.2	
Net profit margin (%)	23.4	20.5

Source: Compiled from data available at **finance.yahoo.com**, October 27, 2014.

- ✓ The last valuation ratio, PEG, is the P/E ratio divided by the growth rate of earnings.
  - ➢ We would expect more rapidly growing firms to sell at higher multiples of *current* earnings (more on this to come), so PEG normalizes the P/E ratio by the growth rate.

■ These valuation ratios are commonly used to assess the valuation of one firm compared to others in the same industry, and we will consider all of them.

◆ The column to the right gives, where available, comparable ratios for other firms in the software applications industry.

- ✓ For example, an analyst might note that Microsoft's price/earnings ratio is a bit below the industry average.
- ✓ Microsoft's ratio of market value to book value, the net worth of the company as reported on the balance sheet, is also below industry norms, 4.2 versus 7.0.

◆ These ratios might indicate that its stock underpriced.

◆ However, Microsoft is a more mature firm than many in the industry, and perhaps this discrepancy reflects a lower expected future growth rate.

- Clearly, rigorous valuation models will be necessary to sort through these sometimes conflicting signals of value.

Limitations of Book Value

- Shareholders in a firm are sometimes called "residual claimants," which means that the value of their stake is what is left over when the liabilities of the firm are subtracted from its assets.
  - Shareholders' equity is this net worth.
- However, the values of both assets and liabilities recognized in financial statements are based on historical—not current—values.
  - For example, the book value of an asset equals the *original* cost of acquisition less some adjustment for depreciation, even if the market price of that asset has changed over time.
  - Moreover, depreciation allowances are used to allocate the original cost of the asset over several years, but do not reflect loss of actual value.

- Whereas book values are based on original cost, market values measure *current* values of assets and liabilities.
  - The market value of the shareholders' equity investment equals the difference between the current values of all assets and liabilities.
  - We've emphasized that current values generally will not match historical ones.
  - Equally or even more important, many assets such as the value of a good brand name or specialized expertise developed over many years may not even be included on the financial statements but certainly influence market price.
  - Market prices reflect the value of the firm as a going concern.
- Can book value represent a "floor" for the stock's price, below which level the market price can never fall?
  - Although Microsoft's book value per share is considerably less than its market price, other evidence disproves this notion.

- ◆ While it is not common, there are always some firms selling at a market price below book value.
  - ✓ In late 2014, for example, such troubled firms included Barclays, Citigroup, Mitsubishi, and Bank of America.

■ A better measure of a floor for the stock price is the firm's **liquidation value** per share.

- ◆ This represents the amount of money that could be realized by breaking up the firm, selling its assets, repaying its debt, and distributing the remainder to the shareholders.
- ◆ If the market price of equity drops below the liquidation value of the firm, the firm becomes attractive as a takeover target. 侵入者
  - ✓ A corporate raider would find it profitable to buy enough shares to gain control and then actually liquidate because the liquidation value exceeds the value of the business as a going concern.

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- Another measure of firm value is the **replacement cost** of assets less liabilities.
  - Some analysts believe the market value of the firm cannot get too far above its replacement cost for long because, if it did, competitors would enter the market.
    - ✓ The resulting competitive pressure would drive down the market value of all firms until they fell to replacement cost.
  - This idea is popular among economists, and the ratio of market price to replacement cost is known as **Tobin's *q*,** after the Nobel Prize-winning economist James Tobin.
    - ✓ In the long run, according to this view, the ratio of market price to replacement cost will tend toward 1.
    - ✓ But the evidence is that this ratio can differ significantly from 1 for very long periods of time.
- Although focusing on the balance sheet can give some useful information about a firm's liquidity value or its replacement cost, the analyst usually must turn to expected future cash flows for a better estimate of the firm's value as a going concern.
  - We therefore turn to the quantitative models that analysts use to value common stock based on forecasts of future earnings and dividends.

13.2 INTRINSIC VALUE VERSUS MARKET PRICE

- The most popular model for assessing the value of a firm as a going concern starts from the observation that the return on a stock investment comprises cash dividends and capital gains or losses.
  - We begin by assuming a one-year holding period and supposing that ABC stock has an expected dividend per share, $E(D_1)$, of \$4; that the current price of a share, P_0, is \$48; and that the expected price at the end of a year, $E(P_1)$, is \$52.
    - ✓ For now, don't worry about how you derive your forecast of next year's price.
    - ✓ At this point we ask only whether the stock seems attractively priced *today* given your forecast of *next year's* price.
  - The expected holding-period return is $E(D_1)$ plus the expected price appreciation, $E(P_1) - P_0$, all divided by the current price P_0.

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$$\text{Expected HPR} = E(r) = \frac{E(D_1) + [E(P_1) - P_0]}{P_0} = \frac{\$4 + (\$52 - \$48)}{\$48} = .167 = 16.7\%$$

Note that $E(\ )$ denotes an expected future value.

- ✓ Thus, $E(P_1)$ represents the expectation today of the stock price one year from now.
- ✓ $E(r)$ is referred to as the stock's expected holding-period return.
  - ➢ It is the sum of the expected dividend yield, $E(D_1)/P_0$, and the expected rate of price appreciation, the capital gains yield, $[E(P_1) - P_0]/P_0$.

■ But what is the required rate of return for ABC stock?

- ◆ The capital asset pricing model (CAPM) asserts that when stock market prices are at equilibrium levels, the rate of return that investors can expect to earn on a security is $r_f + \beta[\ E(r_M) - r_f]$.
- ◆ Thus, the CAPM may be viewed as providing the rate of return an investor can expect to earn on a security given its risk as measured by beta.
  - ✓ This is the return that investors will require of any other investment with equivalent risk.
    - ➢ We will denote this required rate of return as k.
  - ✓ If a stock is priced "correctly," it will offer investors a "fair" return, i.e., its *expected* return will equal its *required* return.

- ✓ Of course, the goal of a security analyst is to find stocks that are mispriced.
  - ➢ For example, an underpriced stock will provide an expected return greater than the required return.

◆ Suppose that $r_f = 6\%$, $E(r_M) - r_f = 5\%$, and the beta of ABC is 1.2. Then the value of k is

$k = 6\% + 1.2 \times 5\% = 12\%$

- ✓ The rate of return the investor expects exceeds the required rate based on ABC's risk by a margin of 4.7%.
  - ➢ Naturally, the investor will want to include more of ABC stock in the portfolio than a passive strategy would dictate.

- Another way to see this is to compare the intrinsic value of a share of stock to its market price.
  - The **intrinsic value,** denoted V_0, of a share of stock is defined as the present value of all cash payments to the investor in the stock, including dividends as well as the proceeds from the ultimate sale of the stock, discounted at the appropriate risk-adjusted interest rate, k.
- Whenever the intrinsic value, or the investor's own estimate of what the stock is really worth, exceeds the market price, the stock is considered undervalued and a good investment.
  - For ABC, using a one-year investment horizon and a forecast that the stock can be sold at the end of the year at price $P_1 = \$52$, the intrinsic value is

$$V_0 = \frac{E(D_1) + E(P_1)}{1+k} = \frac{\$4 + \$52}{1.12} = \$50$$

    - ✓ Equivalently, at a price of \$50, the investor would derive a 12% rate of return—just equal to the required rate of return—on an investment in the stock.

- ✓ However, at the current price of $48, the stock is underpriced compared to intrinsic value.
  - ➢ At this price, it provides better than a fair rate of return relative to its risk.
  - ➢ Using the terminology of the CAPM, it is a positive-alpha stock, and investors will want to buy more of it than they would following a passive strategy.
- ✓ In contrast, if the intrinsic value turns out to be lower than the current market price, investors should buy less of it than under the passive strategy.
  - ➢ It might even pay to go short on ABC stock, as we discussed in Chapter 3.

■ In market equilibrium, the current market price will reflect the intrinsic value estimates of all market participants.

- ◆ This means the individual investor whose V_0 estimate differs from the market price, P_0, in effect must disagree with some or all of the market consensus estimates of $E(D_1)$, $E(P_1)$, or k.
- ◆ A common term for the market-consensus value of the required rate of return, k, is the **market capitalization rate,** which we use often throughout this chapter.

13.3 DIVIDEND DISCOUNT MODELS

- Consider an investor who buys a share of Steady State Electronics stock, planning to hold it for one year.
  - The intrinsic value of the share is the present value of the dividend to be received at the end of the first year, D_1, and the expected sales price, P_1.
    - ✓ We will henceforth use the simpler notation P_1 instead of $E(P_1)$ to avoid clutter.
    - ✓ Keep in mind, though, that future prices and dividends are unknown, and we are dealing with expected values, not certain values.
- We've already established that

$$V_0 = \frac{D_1 + P_1}{1 + k} \qquad (13.1)$$

  - While this year's dividend is fairly predictable given a company's history, you might ask how we can estimate P_1, the year-end price.

◆ According to Equation 13.1, V_1 (the year-end value) will be

$$V_1 = \frac{D_2 + P_2}{1+k}$$

◆ If we assume the stock will be selling for its intrinsic value next year, then $V_1 = P_1$, and we can substitute this value for P_1 into Equation 13.1 to find

$$V_0 = \frac{D_1 + P_1}{1+k} = \frac{D_1}{1+k} + \frac{P_1}{1+k} = \frac{D_1}{1+k} + \frac{1}{1+k}V_1$$
$$= \frac{D_1}{1+k} + \frac{1}{1+k}\left(\frac{D_2 + P_2}{1+k}\right) = \frac{D_1}{1+k} + \frac{D_2 + P_2}{(1+k)^2}$$

✓ This equation may be interpreted as the present value of dividends plus sales price for a two-year holding period.

◆ Of course, now we need to come up with a forecast of P_2.

✓ Continuing in the same way, we can replace P_2 by $(D_3 + P_3)/(1 + k)$, which relates P_0 to the value of dividends plus the expected sales price for a three-year holding period.

- More generally, for a holding period of H years, we can write the stock value as the present value of dividends over the H years plus the ultimate sales price, P_H.

$$V_0 = \frac{D_1}{(1+k)} + \frac{D_2}{(1+k)^2} + \ldots + \frac{D_H + P_H}{(1+k)^H} \qquad (13.2)$$

  - Note the similarity between this formula and the bond valuation formula developed in Chapter 10.
    - ✓ Each relates price to the present value of a stream of payments (coupons in the case of bonds, dividends in the case of stocks) and a final payment (the face value of the bond or the sales price of the stock).
    - ✓ The key differences in the case of stocks are the uncertainty of dividends, the lack of a fixed maturity date, and the unknown sales price at the horizon date.
- Indeed, one can continue to substitute for price indefinitely to conclude

$$V_0 = \frac{D_1}{(1+k)} + \frac{D_2}{(1+k)^2} + \frac{D_3}{(1+k)^3} + \ldots \qquad (13.3)$$

- Equation 13.3 states the stock price should equal the present value of all expected future dividends into perpetuity.
- This formula is called the **dividend discount model (DDM)** of stock prices.

■ It is tempting, but incorrect, to conclude from Equation 13.3 that the DDM focuses exclusively on dividends and ignores capital gains as a motive for investing in stock.

- Indeed, we assume explicitly in Equation 13.1 that capital gains (as reflected in the expected sales price, P_1) are part of the stock's value.
- At the same time, the price at which you can sell a stock in the future depends on dividend forecasts at that time.

■ The reason only dividends appear in Equation 13.3 is not that investors ignore capital gains. It is instead that those capital gains will reflect dividend forecasts at the time the stock is sold.

- That is why in Equation 13.2 we can write the stock price as the present value of dividends plus sales price for *any* horizon date.
  - ✓ P_H is the present value at time H of all dividends expected to be paid after the horizon date. That value is then discounted back to today, time 0.

- The DDM asserts that stock prices are determined ultimately by the cash flows accruing (累積) to stockholders, and those are dividends.

The Constant-Growth DDM

- Equation 13.3 as it stands is still not very useful in valuing a stock because it requires dividend forecasts for every year into the indefinite future.
  - To make the DDM practical, we need to introduce some simplifying assumptions.
  - A useful and common first pass at the problem is to assume that dividends are trending upward at a stable growth rate that we will call g.
    - ✓ For example, if $g = .05$ and the most recently paid dividend was $D_0 = \$3.81$, expected future dividends are

$$D_1 = D_0(1+g) = \$3.81 \times 1.05 = \$4.00$$
$$D_2 = D_0(1+g)^2 = \$3.81 \times (1.05)^2 = \$4.20$$
$$D_3 = D_0(1+g)^3 = \$3.81 \times (1.05)^3 = \$4.41 \text{ etc.}$$

◆ Using these dividend forecasts in Equation 13.3, we solve for intrinsic value as

$$V_0 = \frac{D_0(1+g)}{(1+k)} + \frac{D_0(1+g)^2}{(1+k)^2} + \frac{D_0(1+g)^3}{(1+k)^3} + \ldots$$

This equation can be simplified to

$$V_0 = \frac{D_0(1+g)}{k-g} = \frac{D_1}{k-g} \qquad (13.4)$$

✓ Note in Equation 13.4 that we divide D_1 (not D_0) by $k - g$ to calculate intrinsic value.

◆ The proof of Equation 13.4:

$$V_0 = \frac{D_1}{1+k} + \frac{D_2}{(1+k)^2} + \frac{D_3}{(1+k)^3} + \ldots$$

$$= \frac{D_0(1+g)}{1+k} + \frac{D_0(1+g)^2}{(1+k)^2} + \frac{D_0(1+g)^3}{(1+k)^3} + \ldots$$

According to the formula for the infinite geometric series, we can rewrite the above equation as follows:

$$V_0 = \frac{D_0(1+g)}{1+k} / (1 - \frac{1+g}{1+k}) = \frac{D_0(1+g)}{1+k} / \frac{k-g}{1+k} = \frac{D_0(1+g)}{k-g} = \frac{D_1}{k-g}$$

- If the market capitalization rate for Steady State is 12%, we can use Equation 13.4 to show that the intrinsic value of a share of Steady State stock is

$$\frac{\$4.00}{.12 - .05} = \$57.14$$

- Equation 13.4 is called the **constant growth DDM** or the Gordon model, after Myron J. Gordon, who popularized the model.
- It should remind you of the formula for the present value of a perpetuity.
  - If dividends were expected not to grow, then the dividend stream would be a simple perpetuity, and the valuation formula for such a nongrowth stock would be $P_0 = D_1/k \equiv D/k$.

a bond or other security with no fixed maturity date.

- Equation 13.4 is a generalization of the perpetuity formula to cover the case of a *growing* perpetuity.
  - ✓ As g increases, the stock price also rises.

■ Example 13.1: *Preferred Stock and the DDM*

- Preferred stock that pays a fixed dividend can be valued using the constant-growth dividend discount model.
  - ✓ The constant growth rate of dividends is simply zero.
    - ➢ For example, to value a preferred stock paying a fixed dividend of $2 per share when the discount rate is 8%, we compute

$$V_0 = \frac{\$2}{.08 - 0} = \$25$$

■ Example 13.2: *The Constant-Growth DDM*

- High Flyer Industries has just paid its annual dividend of $3 per share. The dividend is expected to grow at a constant rate of 8% indefinitely. The beta of High Flyer stock is 1, the risk-free rate is 6%, and the market risk premium is 8%.

- ✓ What is the intrinsic value of the stock?
- ✓ What would be your estimate of intrinsic value if you believed that the stock was riskier, with a beta of 1.25?

◆ Because a $3 dividend has just been paid and the growth rate of dividends is 8%, the forecast for the year-end dividend is $3 × 1.08 = $3.24. The market capitalization rate (using the CAPM) is 6% + 1.0 × 8% = 14%.

- ✓ Therefore, the value of the stock is

$$V_0 = \frac{D_1}{k-g} = \frac{\$3.24}{.14-.08} = \$54$$

◆ If the stock is perceived to be riskier, its value must be lower.

- ✓ At the higher beta, the market capitalization rate is 6% + 1.25 × 8% = 16%, and the stock is worth only

$$\frac{\$3.24}{.16-.08} = \$40.50$$

- The constant-growth DDM is valid only when g is less than k.
  - If dividends were expected to grow forever at a rate faster than k, the value of the stock would be infinite.
    - ✓ If an analyst derives an estimate of g that is greater than k, that growth rate must be unsustainable in the long run.
    - ✓ The appropriate valuation model to use in this case is a multistage DDM such as those discussed below.
- The constant-growth DDM is so widely used by stock market analysts that it is worth exploring some of its implications and limitations.
  - The constant growth rate DDM implies that a stock's value will be greater:
    - ✓ 1. The larger its expected dividend per share.
    - ✓ 2. The lower the market capitalization rate, k.
    - ✓ 3. The higher the expected growth rate of dividends.

- Another implication of the constant-growth model is that the stock price is expected to grow at the same rate as dividends.
  - To see this, suppose Steady State stock is selling at its intrinsic value of $57.14, so that $V_0 = P_0$. Then

$$P_0 = \frac{D_1}{k - g}$$

  - Note that price is proportional to dividends.
  - Therefore, next year, when the dividends paid to Steady State stockholders are expected to be higher by $g = 5\%$, price also should increase by 5%.
  - To confirm this, we can write

$$D_2 = \$4 \times (1.05) = \$4.20$$

$$P_1 = D_2/(k - g) = \$4.20/(.12 - .05) = \$60.00$$

which is 5% higher than the current price of $57.14.

- To generalize

$$P_1 = \frac{D_2}{k-g} = \frac{D_1(1+g)}{k-g} = \frac{D_1}{k-g}(1+g) = P_0(1+g)$$

- Therefore, the DDM implies that, in the case of constant expected growth of dividends, the expected rate of price appreciation in any year will equal that constant growth rate, g.
- For a stock whose market price equals its intrinsic value ($V_0 = P_0$) the expected holding-period return will be

$$E(r) = \text{Dividend yield} + \text{Capital gains yield}$$
$$= \frac{D_1}{P_0} + \frac{P_1 - P_0}{P_0} = \frac{D_1}{P_0} + g \qquad (13.5)$$

- This formula offers a means to infer the market capitalization rate of a stock, for if the stock is selling at its intrinsic value, then $E(r) = k$, implying that $k = D_1/P_0 + g$.
  - ✓ By observing the dividend yield, D_1/P_0, and estimating the growth rate of dividends, we can compute k.
  - ✓ This equation is known also as the *discounted cash flow (DCF) formula.*
- This is an approach often used in rate hearings for regulated public utilities.
  - ✓ The regulatory agency responsible for approving utility pricing decisions is mandated to allow the firms to charge just enough to cover costs plus a "fair" profit, that is, one that allows a competitive return on the investment the firm has made in its productive capacity.
  - ✓ In turn, that return is taken to be the expected return investors require on the stock of the firm.
    - ➢ The $D_1/P_0 + g$ formula provides a means to infer that required return.

- Example 13.3: *The Constant-Growth Model*
  - Suppose that Steady State Electronics wins a major contract for its revolutionary computer chip. The very profitable contract will enable it to increase the growth rate of dividends from 5% to 6% without reducing the current dividend from the projected value (預計值) of $4 per share.
    - ✓ What will happen to the stock price?
    - ✓ What will happen to future expected rates of return on the stock?
  - The stock price ought to increase in response to the good news about the contract, and indeed it does.
    - ✓ The stock price jumps from its original value of $57.14 to a postannouncement price of

$$\frac{D_1}{k-g} = \frac{\$4.00}{.12-.06} = \$66.67$$

    - ✓ Investors who are holding the stock when the good news about the contract is announced will receive a substantial windfall. (意外的收穫。)

- On the other hand, at the new price the expected rate of return on the stock is 12%, just as it was before the new contract was announced.

$$E(r) = \frac{D_1}{P_0} + g = \frac{\$4.00}{\$66.67} + .06 = .12 \text{ or } 12\%$$

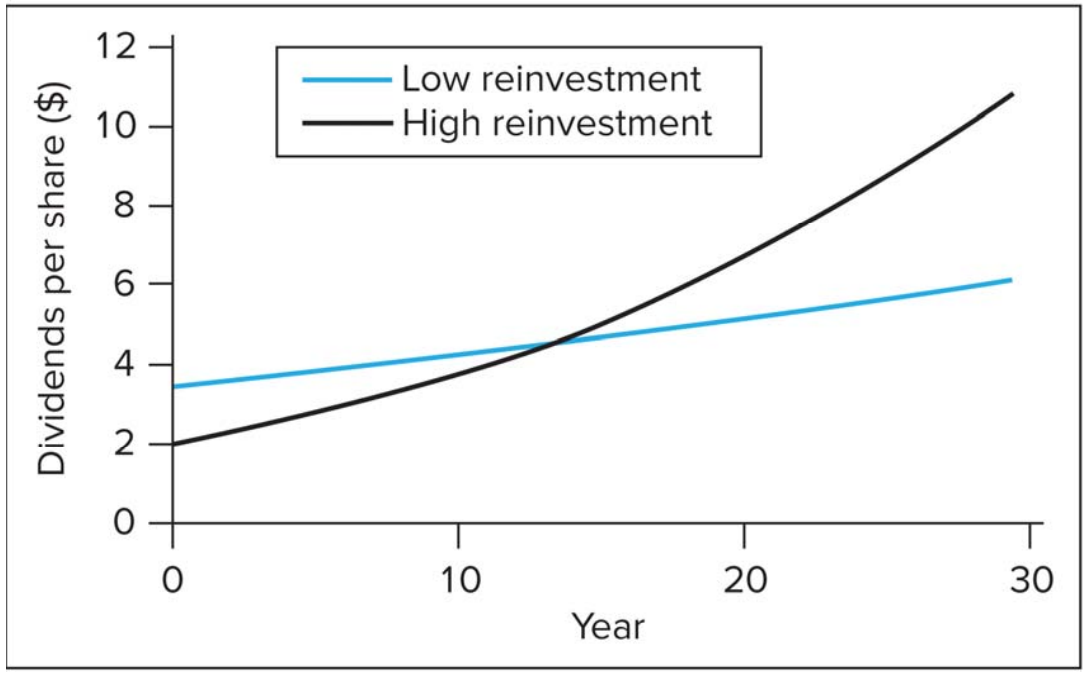
  - ✓ This result makes sense, of course.
    - ➢ Once the news about the contract is reflected in the stock price, the expected rate of return will be consistent with the risk of the stock.
    - ➢ Because the risk of the stock has not changed, neither should the expected rate of return.

Stock Prices and Investment Opportunities

- Consider two companies, Cash Cow, Inc., and Growth Prospects, each with expected earnings in the coming year of $5 per share.
  - Both companies could in principle pay out all of these earnings as dividends, maintaining a perpetual dividend flow of $5 per share.

- If the market capitalization rate were k = 12.5%, both companies would then be valued at D_1/k = \$5/.125 = \$40 per share.
  - ✓ Neither firm would grow in value, because with all earnings paid out as dividends, and no earnings reinvested in the firm, both companies' capital stock and earnings capacity would remain unchanged over time; earnings and dividends would not grow.
- Now suppose one of the firms, Growth Prospects, engages in projects that generate a return on investment of 15%, which is greater than the required rate of return, k = 12.5%.
  - ✓ It would be foolish for such a company to pay out all of its earnings as dividends.
    - ➢ If Growth Prospects retains or plows back some of its earnings into its highly profitable projects, it can earn a 15% rate of return for its shareholders, whereas if it pays out all earnings as dividends, it forgoes the projects, leaving shareholders to invest the dividends in other opportunities at a fair market rate of only 12.5%.

- Suppose, therefore, Growth Prospects chooses a lower **dividend payout ratio** (the fraction of earnings paid out as dividends), reducing payout from 100% to 40% and maintaining a **plowback ratio** (the fraction of earnings reinvested in the firm and not paid out as dividends) of 60%.
  - ✓ The plowback ratio also is referred to as the **earnings retention ratio.**
  - ✓ The dividend of the company, therefore, will be $2 (40% of $5 earnings) instead of $5.
- Will the share price fall?
  - ✓ No, it will rise!
    - ➢ Although dividends initially fall under the earnings reinvestment policy, subsequent growth in the assets of the firm because of reinvested profits will generate growth in future dividends, which will be reflected in today's share price.
  - ✓ Figure 13.1 illustrates the dividend streams generated by Growth Prospects under two dividend policies.



- A low reinvestment rate plan allows the firm to pay higher initial dividends but results in a lower dividend growth rate.
- Eventually, a high reinvestment rate plan will provide higher dividends.
- If the dividend growth generated by the reinvested earnings is high enough, the stock will be worth more under the high reinvestment strategy.

- How much growth will be generated?
  - ✓ Suppose Growth Prospects starts with plant and equipment of $100 million and is all-equity-financed.
    - ➢ With a return on investment or equity (ROE) of 15%, total earnings are ROE × $100 million = .15 × $100 million = $15 million.
    - ➢ There are 3 million shares of stock outstanding, so earnings per share are $5, as posited above.
  - ✓ If 60% of the $15 million in this year's earnings is reinvested, then the value of the firm's capital stock will increase by .60 × $15 million = 9 million, or by 9%.
    - ➢ The percentage increase in the capital stock is the rate at which income was generated (ROE) times the plowback ratio (the fraction of earnings reinvested in more capital), which we will denote as *b*.

- ✓ Now endowed with 9% more capital, the company earns 9% more income and pays out 9% higher dividends.
  - ➢ The growth rate of the dividends, therefore, is

$$g = \frac{\text{Reinvested earnings}}{\text{Book value}} = \frac{\text{Reinvested earnings}}{\text{Total earnings}} \times \frac{\text{Total earings}}{\text{Book value}}$$

$$= b \times \text{ROE} = .60 \times 15\% = 9\%$$

- ✓ If the stock price equals its intrinsic value, and this growth rate can be sustained (i.e., if the ROE and payout ratios are consistent with the long-run capabilities of the firm), then the stock should sell at

$$P_0 = \frac{D_1}{k - g} = \frac{\$2}{.125 - .09} = \$57.14$$

◆ When Growth Prospects pursued a no-growth policy and paid out all earnings as dividends, the stock price was only $40.

- ✓ Therefore, you can think of $40 as the value per share of the assets the company already has in place.

- When Growth Prospects decided to reduce current dividends and reinvest some of its earnings in new investments, its stock price increased.
  - ✓ The increase in the stock price reflects the fact that planned investments provide an expected rate of return greater than the required rate.
  - ✓ In other words, the investment opportunities have positive net present value.
    - ➢ The value of the firm rises by the NPV of these investment opportunities.
    - ➢ This net present value is also called the **present value of growth opportunities (PVGO).**
  - ✓ Therefore, we can think of the value of the firm as the sum of the value of assets already in place, or the no-growth value of the firm, plus the net present value of the future investments the firm will make, which is the PVGO.
  - ✓ For Growth Prospects, PVGO = $17.14 per share:

Price = No-growth value per share + PVGO

$$P_0 = \frac{E_1 (= D_1)}{k} + \text{PVGO} = \frac{D_1}{k} + \text{PVGO} \qquad (13.6)$$

$57.14 = $40 + $17.14

- We know that, in reality, dividend cuts almost always are accompanied by steep drops in stock prices. Does this contradict our analysis?
  - Not necessarily: Dividend cuts are usually taken as bad news about the future prospects of the firm, and it is the *new information* about the firm—not the reduced dividend yield per se—that is responsible for the stock price decline.
  - For example, when J.P. Morgan cut its quarterly dividend from 38 cents to 5 cents a share in 2009, its stock price actually increased by about 5%.
    - ✓ The company was able to convince investors that the cut would conserve cash and prepare the firm to weather a severe recession.
    - ✓ When investors were convinced that the dividend cut made sense, the stock price actually increased.
  - Similarly, when BP announced in the wake of the massive 2010 Gulf oil spill that it would suspend dividends for the rest of the year, its stock price did not budge.
    - ✓ The cut already had been widely anticipated, so it was not new information.
  - These examples show that stock price declines in response to dividend cuts are really a response to the information conveyed by the cut.

- It is important to recognize that growth per se is not what investors desire.
  - Growth enhances company value only if it is achieved by investment in projects with attractive profit opportunities (i.e., with ROE > k).
- To see why, let's now consider Growth Prospects' unfortunate sister company, Cash Cow.
  - Cash Cow's ROE is only 12.5%, just equal to the required rate of return, k.
    - ✓ Therefore, the NPV of its investment opportunities is zero.
  - We've seen that following a zero-growth strategy with $b = 0$ and $g = 0$, the value of Cash Cow will be $E_1/k = \$5/.125 = \$40$ per share.
  - Now suppose Cash Cow chooses a plowback ratio of $b = .60$, the same as Growth Prospects' plowback. Then g would be

    $g = \text{ROE} \times b = .125 \times .60 = .075$

    but the stock price is still \$40: $P_0 = \dfrac{D_1}{k - g} = \dfrac{\$2}{.125 - .075} = \$40$

    which is no different from the no-growth strategy.

- In the case of Cash Cow, the dividend reduction that frees funds for reinvestment in the firm generates only enough growth to maintain the stock price at the current level.
  - ✓ This is as it should be: If the firm's projects yield only what investors can earn on their own, then NPV is zero, and shareholders cannot be made better off by a high reinvestment rate policy.
  - ✓ This demonstrates that "growth" is not the same as growth opportunities.
    - ➢ To justify reinvestment, the firm must engage in projects with better prospective returns than those shareholders can find elsewhere.
  - ✓ Notice also that the PVGO of Cash Cow is zero: PVGO = $P_0 - E_1/k$ = \$40 – \$40 = 0.
    - ➢ With ROE = k, there is no advantage to plowing funds back into the firm; this shows up as PVGO of zero.
  - ✓ In fact, this is why firms with considerable cash flows, but limited investment prospects, are called "cash cows." The cash these firms generate is best taken out of or "milked from" the firm.

- Example 13.4: *Growth Opportunities*
  - Takeover Target is run by entrenched management that insists on reinvesting 60% of its earnings in projects that provide an ROE of 10%, despite the fact that the firm's capitalization rate is $k = 15\%$. The firm's year-end dividend will be \$2 per share, paid out of earnings of \$5 per share.
    - ✓ At what price will the stock sell?
    - ✓ What is the present value of growth opportunities?
    - ✓ Why would such a firm be a takeover target for another firm?
  - Given current management's investment policy, the dividend growth rate will be

    $g = \text{ROE} \times b = 10\% \times .6 = 6\%$

    and the stock price should be

    $$P_0 = \frac{\$2}{.15 - .06} = \$22.22$$

- The present value of growth opportunities is

  PVGO = Price per share – No-growth value per share

  = \$22.22 – E_1/k = \$22.22 – \$5/.15 = -\$11.11

  - ✓ PVGO is *negative*.
    - ➢ This is because the net present value of the firm's projects is negative: The rate of return on those assets is less than the opportunity cost of capital.
- Such a firm would be subject to takeover because another firm could buy the firm for the market price of \$22.22 per share and increase the value of the firm by changing its investment policy.
  - ✓ For example, if the new management simply paid out all earnings as dividends, the value of the firm would increase to its no-growth value, E_1/k = \$5/.15 = \$33.33.

Life Cycles and Multistage Growth Models

- As useful as the constant growth DDM formula is, you need to remember that it is based on a simplifying assumption, namely, that the dividend growth rate will be constant forever.
- In fact, firms typically pass through life cycles with very different dividend profiles in different phases.
  - In early years, there are ample opportunities for profitable reinvestment in the company.
    - ✓ Payout ratios are low, and growth is correspondingly rapid.
  - In later years, the firm matures, production capacity is sufficient to meet market demand, competitors enter the market, and attractive opportunities for reinvestment may become harder to find.
    - ✓ In this mature phase, the firm may choose to increase the dividend payout ratio, rather than retain earnings.
    - ✓ The dividend level increases, but thereafter it grows at a slower rate because the company has fewer growth opportunities.

- To value companies with temporarily high growth, analysts use a multistage version of the dividend discount model.
  - Dividends in the early high-growth period are forecast and their combined present value is calculated.
  - Then, once the firm is projected to settle down to a steady growth phase, the constant growth DDM is applied to value the remaining stream of dividends.
- We can illustrate this with a real-life example using a **two-stage DDM.**
  - Figure 13.2 is a *Value Line Investment Survey* report on General Electric. Some of GE's relevant information of the end of 2014 is highlighted.
    - ✓ GE's beta appears at the circled A, its recent stock price at the B, the per-share dividend payments at the C, the ROE (referred to as "return on shareholder equity") at the D, and the dividend payout ratio (referred to as "all dividends to net profits") at the E.
    - ✓ The rows ending at C, D, and E are historical time series.
    - ✓ The boldfaced italicized entries under 2015 are estimates for that year.

GENERAL ELECTRIC NYSE-GE

RECENT PRICE 24.81 | P/E RATIO 14.3 (Trailing: 15.8 Median: 15.0) | RELATIVE P/E RATIO 0.83 | DIV'D YLD 3.5% | VALUE LINE

TIMELINESS 3 Lowered 4/18/14
SAFETY 3 Lowered 3/13/09
TECHNICAL 3 Lowered 2/21/14
BETA 1.20 (1.00 = Market)

2017-19 PROJECTIONS

	Price	Gain	Ann'l Total Return
High	50	(+100%)	22%
Low	30	(+20%)	9%

Insider Decisions

	N	D	J	F	M	A	M	J	J
to Buy	1	0	3	0	1	0	0	0	1
Options	0	0	0	0	0	0	0	0	0
to Sell	2	0	0	0	0	0	0	0	0

Institutional Decisions

	4Q2013	1Q2014	2Q2014
to Buy	891	910	866
to Sell	814	832	818
Hld's(000)	5511	13085	13865

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	© VALUE LINE PUB. LLC	17-19
	10.24	11.33	13.07	12.69	13.21	13.33	14.44	14.28	15.90	17.30	17.32	14.70	14.15	13.93	14.16	14.52	*14.90*	*15.10*	Revenues per sh	*18.05*
	1.54	1.77	2.06	2.14	2.12	2.24	2.38	2.56	2.90	3.28	2.81	2.07	2.13	2.28	2.44	2.65	*2.65*	*2.85*	"Cash Flow" per sh	*3.80*
	.93	1.07	1.29	1.41	1.51	1.55	1.61	1.72	1.99	2.20	1.78	1.03	1.15	1.31	1.52	1.64	*1.70*	*1.85*	Earnings per sh [B]	*2.70*
	.42	.49	.57	.64	.73	.77	.82	.91	1.03	1.15	1.24	.61	.46	.61	.70	.79	*.88*	*1.00*	Div'ds Decl'd per sh [C]	*1.40*
	.21	.21	.26	.29	.24	.97	1.24	1.38	1.62	1.79	1.52	.81	.92	1.20	1.45	1.34	*1.35*	*1.40*	Cap'l Spending per sh	*1.60*
	3.96	4.32	5.08	5.52	6.39	7.87	10.47	10.43	10.93	11.57	9.93	11.00	11.20	11.01	11.82	12.98	*13.80*	*14.60*	Book Value per sh [D]	*17.10*
	9813.9	9854.5	9932.0	9925.9	9969.9	10063	10586	10484	10277	9987.6	10537	10663	10615	10573	10406	10061	*10000*	*10000*	Common Shs Outst'g [E]	*10000*
	30.3	35.9	40.1	30.8	20.7	18.1	20.5	20.5	17.3	17.2	15.7	13.0	14.4	13.9	13.3	14.7	*Bold figures are Value Line estimates*		Avg Ann'l P/E Ratio	*15.0*
	1.58	2.05	2.61	1.58	1.13	1.03	1.08	1.09	.93	.91	.94	.87	.92	.87	.85	.83			Relative P/E Ratio	*.94*
	1.5%	1.3%	1.1%	1.5%	2.3%	2.7%	2.5%	2.6%	3.0%	3.0%	4.4%	4.6%	2.8%	3.4%	3.5%	3.3%			Avg Ann'l Div'd Yield	*3.5%*
	152866	149702	163391	172738	182515	156783	150211	147300	147359	146045	*149200*	*151000*	Revenues ($mill)	*180300*
	26.8%	30.6%	32.5%	35.1%	31.1%	25.4%	26.8%	30.3%	27.7%	26.5%	*27.0%*	*28.0%*	Operating Margin [A]	*30.5%*
	8385.0	8538.0	9158.0	10278	11492	10636	10013	9185.0	9346.0	9762.0	*9600*	*10000*	Depreciation ($mill)	*11100*
	16819	18275	20666	22468	18089	11434	12623	14880	16065	16882	*17000*	*18500*	Net Profit ($mill)	*27000*
	17.9%	17.4%	16.1%	15.5%	5.5%	--	7.4%	27.4%	14.4%	8.5%	*15.0%*	*25.0%*	Income Tax Rate	*25.0%*
	11.0%	12.2%	12.6%	13.0%	9.9%	7.3%	8.4%	10.1%	10.9%	11.6%	*11.4%*	*12.3%*	Net Profit Margin	*15.0%*
	287826	184959	235281	244405	254715	316579	314972	272131	283910	245855	*275000*	*295000*	Working Cap'l ($mill)	*310000*
	212670	212281	260804	319015	330067	338215	360681	315832	312668	251789	*247000*	*240000*	Long-Term Debt ($mill)	*230000*
	110821	109354	112314	115559	104665	117291	118936	116438	123026	130566	*138000*	*146000*	Shr. Equity ($mill) [D]	*171000*
	6.3%	7.1%	6.7%	6.4%	5.6%	4.6%	3.9%	4.8%	4.8%	5.6%	*6.0%*	*6.5%*	Return on Total Cap'l	*8.0%*
	15.2%	16.7%	18.4%	19.4%	17.3%	9.7%	10.6%	12.8%	13.1%	12.9%	*12.5%*	*12.5%*	Return on Shr. Equity	*16.0%*
	7.7%	8.2%	9.1%	9.5%	5.4%	2.1%	6.6%	7.2%	7.2%	6.9%	*6.5%*	*6.5%*	Retained to Com Eq	*8.0%*
	49%	51%	50%	51%	69%	79%	38%	43%	45%	46%	*52%*	*54%*	All Div'ds to Net Prof	*52%*

% TOT. RETURN 9/14

	THIS STOCK	VL ARITH.* INDEX
1 yr.	10.9	9.5
3 yr.	84.7	84.2
5 yr.	81.5	104.4

CAPITAL STRUCTURE as of 6/30/14
Total Debt $320.6 bill. Due in 5 Yrs $160.0 bill.
LT Debt $247.1 bill. LT Interest $13.6 bill.
(64% of Cap'l)
Leases, Uncapitalized $854 mill.
Pension Assets-12/13 $59.4 bill. Obligation $71.6 bill.
Pfd. Stock None
Pfd. Div'd None
Common Stock 10,033,903,754 shares
MARKET CAP: $249 billion (Large Cap)

CURRENT POSITION ($MILL.)	2012	2013	6/30/14
Cash Assets	125866	132536	133324
Receivables	287489	272442	261724
Inventory (LIFO)	15374	17325	19706
Other	--	--	--
Current Assets	428729	422303	414754
Accts Payable	15675	16471	17561
Debt Due	101392	77890	73531
Other	27752	82087	27450
Current Liab.	144819	176448	118542

ANNUAL RATES of change (per sh)	Past 10 Yrs.	Past 5 Yrs.	Est'd '11-'13 to '17-'19
Revenues	1.0%	-3.5%	*4.0%*
"Cash Flow"	1.5%	-4.0%	*7.5%*
Earnings	--	-5.5%	*11.0%*
Dividends	--	-9.5%	*12.0%*
Book Value	6.0%	2.0%	*6.0%*

Calendar	QUARTERLY REVENUES ($ mill.) [F] Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2011	35938	36199	36043	39120	147300
2012	35182	36501	36349	39327	147359
2013	34815	35123	35725	40382	146045
2014	34178	36233	*37050*	*41739*	*149200*
2015	*34400*	*36900*	*37600*	*42100*	*151000*

Calendar	EARNINGS PER SHARE [B] Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2011	.31	.33	.30	.37	1.31
2012	.34	.38	.36	.44	1.52
2013	.39	.36	.36	.53	1.64
2014	.33	.39	*.42*	*.56*	*1.70*
2015	*.36*	*.43*	*.46*	*.60*	*1.85*

Calendar	QUARTERLY DIVIDENDS PAID [C] ■ Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2010	.10	.10	.10	.12	.42
2011	.14	.14	.15	.15	.58
2012	.17	.17	.17	.17	.68
2013	.19	.19	.19	.19	.76
2014	.22	.22	.22		

BUSINESS: General Electric Company is one of the largest & most diversified technology and financial services companies in the world. With products ranging from aircraft engines, power generation, oil and gas production equip., and household appliances to medical imaging, business and consumer financing, and industrial products, it serves customers in more than 100 countries. 2013 R&D outlays: $4.8 billion, 3.3% of revenues; 2013 international sales: $77.4 billion, 53.0% of total top line. Employs approximately 307,000. Officers & directors own less than 1% of common stock; BlackRock, 5.0% (3/14 Proxy). Chairman & CEO: Jeffrey Immelt. Incorporated: NY. Address: 3135 Easton Turnpike, Fairfield, CT 06828. Telephone: 203-373-2211. Internet: www.ge.com.

General Electric is out of favor in today's investment world. We do not mean that the stock is trading lower, it is not. But it is not trading much higher either. Bluntly put, it is not moving much at all. For years, GE was the cornerstone of many portfolios, and its solid financials and growth brought in an array of investors. Present day, however, the shares have traded between $24 and $27 a share for the entirety of 2014, a year that has seen the market head higher. The casual investor, in our view, does not appear interested in this story. The top holders of this equity are index-based funds (Dow 30) and exchange-traded funds, not the sexiest list. It is pretty clear why that is. With the Apples and Googles stealing all the headlines, industrial conglomerates in the midst of spinning off their finance arms are not everyone's cup of tea. The financial crisis scared away droves of investors, and GE needs to win them back.

Recent portfolio moves continue to point the company in the direction management wants to be heading. Getting back to its industrial roots is a slogan that has been thrown around for some time now, and the pace of this movement cannot move fast enough for many of those on board. The Synchrony IPO and the purchase of the power and grid business from Alstom were met with rousing approval. The in-house goal is to have 70% of earnings derived from industrial operations by the close of 2015. We are on board with this call, and particularly like the complementary technologies brought on board with the Alstom pact. Too, this agreement should lead to $1.2 billion in synergies five years out. This amount could translate into an extra dime on earnings each year upon completion.

Earnings growth likely will not bowl over anyone this year and the next. Oil and gas operations will lead the way. Our figures remain unchanged at $1.70 and $1.85 for 2014 and 2015.

At current price levels, we think the dividend is this neutrally ranked stock's best feature. Too, appreciation potential out to 2017-2019 is above average. Therefore, a wait-and-see approach should be rewarded by the time the full transformation is complete.

Erik M. Manning *October 17, 2014*

(A) Operating margin includes all expenses except interest, depreciation, and taxes.
(B) Diluted EPS. Excludes nonrecuring and/or discontinued items: '00, 24¢; '01, 4¢; '02, 10¢; '05, (18¢); '06, 1¢; '07, (3¢); '08, (6¢); '09, (2¢); '10, (9¢); '11, (7¢). Quarterly EPS may not sum due to rounding. Next earnings report due mid-January. (C) Divs. historically paid late January, April, July, and October. ■ DRIP available. (D) Includes intangibles. In '13: $92.0 billion, $9.14/share. (E) In millions, adjusted for split. (F) Revenues may not sum, as reported.

Company's Financial Strength	B++
Stock's Price Stability	75
Price Growth Persistence	15
Earnings Predictability	70

Source: From *Value Line Investment Survey*, October 17, 2014

- ✓ Similarly, the entries in the far right column (labeled 17-19) are forecasts for some time between 2017 and 2019, which we will take to be 2018.

◆ Value Line provides explicit dividend forecasts over the relative short term, with dividends rising from $1.00 in 2015 to $1.40 in 2018.

◆ We can obtain dividend inputs for this initial period by using the explicit forecasts for 2015-2018 and linear interpolation for the years between:

2015	$1.00
2016	$1.13
2017	$1.26
2018	$1.40

◆ Now let us assume the dividend growth rate will be steady beyond 2018. What is a reasonable guess for that steady-state growth rate? Value Line forecasts a dividend payout ratio of .52 and an ROE of 16%, implying long-term growth will be

$g = \text{ROE} \times b = 16\% \times (1 - .52) = 7.68\%$

- Our estimate of GE's intrinsic value using an investment horizon of 2018 is therefore obtained from Equation 13.2, which we restate here:

$$V_{2014} = \frac{D_{2015}}{(1+k)} + \frac{D_{2016}}{(1+k)^2} + \frac{D_{2017}}{(1+k)^3} + \frac{D_{2018} + P_{2018}}{(1+k)^4}$$
$$= \frac{\$1.00}{(1+k)} + \frac{\$1.13}{(1+k)^2} + \frac{\$1.26}{(1+k)^3} + \frac{\$1.40 + P_{2018}}{(1+k)^4}$$

- Here, P_{2018} represents the forecast price at which we can sell our shares of GE at the end of 2018, when dividends enter their constant-growth phase.
  - ✓ That price, according to the constant growth DDM, should be

$$P_{2018} = \frac{D_{2019}}{k-g} = \frac{D_{2018}(1+g)}{k-g} = \frac{\$1.40 \times 1.0768}{k-.0768}$$

The only variable remaining to be determined to calculate intrinsic value is the market capitalization rate, k.

◆ One way to obtain k is from the CAPM.

✓ Observe from the Value Line data that GE's beta is 1.20. The risk-free rate on long-term T-bonds in late 2014 was about 3%. Suppose that the market risk premium were forecast at 8%, roughly in line with its historical average.

➢ This would imply that the forecast for the market return was

Risk-free rate + Market risk premium = 3% + 8% = 11%

✓ Therefore, we can solve for the market capitalization rate as

$$k = r_f + \beta[E(r_M) - r_f] = 3\% + 1.20 \times (11\% - 3\%) = 12.6\%$$

◆ Our forecast for the stock price in 2018 is thus

$$P_{2018} = \frac{\$1.40 \times 1.0768}{.126 - .0768} = \$30.64$$

and today's estimate of intrinsic value is

$$V_{2014} = \frac{\$1.00}{1.126} + \frac{\$1.13}{(1.126)^2} + \frac{\$1.26}{(1.126)^3} + \frac{\$1.40 + \$30.64}{(1.126)^4} = \$22.59$$

- ✓ We know from the Value Line report that GE's actual price was $24.81 (at the circled B).
- ✓ Our intrinsic value analysis indicates GE was overpriced by about 10%.
- ✓ Should we reduce our holdings or even sell the stock short?

◆ Perhaps. But before betting the farm, stop to consider how much confidence you should place in this estimate.

- ✓ We've had to guess at dividends in the near future, the ultimate growth rate of those dividends, and the appropriate discount rate.
- ✓ Moreover, we've assumed GE will follow a relatively simple two-stage growth process.
  - ➢ In practice, the growth of dividends can follow more complicated patterns.
- ✓ Even small errors in these approximations could upset a conclusion.

◆ For example, we saw in Chapter 7 that betas are typically estimated with considerable imprecision.

- ✓ Suppose that GE's beta is actually 1.1 rather than 1.2. Then its risk premium will be smaller, and its market capitalization rate will be 11.8%

- ✓ At this lower capitalization rate, the intrinsic value of the firm based on the two-stage model increases to $27.02, which is *more* than its recent stock price.
  - ➢ Our conclusion regarding mispricing is reversed.

- The exercise highlights the importance of assessing the sensitivity of your analysis to changes in underlying assumptions.
  - ◆ Sensitivity analysis will highlight the inputs that need to be most carefully examined.
    - ✓ For example, we just found that even small changes in the estimated risk premium of the stock can result in big changes in intrinsic value.
    - ✓ Similarly, small changes in the assumed growth rate change intrinsic value substantially.
    - ✓ On the other hand, reasonable changes in the dividends forecast between 2015 and 2018 have a small impact on intrinsic value.

● Multistage Growth Models

- The two-stage growth model that we just considered for GE is a good start toward realism, but clearly we could do even better if our valuation model allowed for more flexible patterns of growth.

- Multistage growth models allow dividends per share to grow at several different rates as the firm matures.
  - Many analysts use three-stage growth models.
    - ✓ They may allow for year-by-year forecasts of dividends for the short term, a final period of sustainable growth, and a transition period in between, during which dividend growth rates taper off from the initial rate to the ultimate sustainable rate. 逐漸停止
    - ✓ These models are conceptually no harder to work with than a two-stage model, but they require many more calculations and can be tedious to do by hand.
    - ✓ It is easy, however, to build an Excel spreadsheet for such a model.
- Spreadsheet 13.1 is an example of such a model.
  - Column B contains the inputs we have used so for GE.
  - Column E contains dividend forecasts.
  - In cells E2 through E5 we present the Value Line estimates for the next four years.
    - ✓ Dividend growth in this period is about 11.87% annually.

	A	B	C	D	E	F	G	H	I
1	**Inputs**			Year	Dividend	Div growth	Term value	Investor CF	
2	beta	1.2		2015	1.00			1.00	
3	**mkt_prem**	0.08		2016	1.13			1.13	
4	**rf**	0.03		2017	1.27			1.27	
5	k_equity	0.1260		2018	1.40			1.40	
6	plowback	0.48		2019	1.57	0.1187		1.57	
7	roe	0.16		2020	1.75	0.1145		1.75	
8	term_gwth	0.077		2021	1.94	0.1103		1.94	
9				2022	2.14	0.1061		2.14	
10				2023	2.36	0.1019		2.36	
11				2024	2.59	0.0977		2.59	
12	Value Line			2025	2.84	0.0936		2.84	
13	forecasts of			2026	3.09	0.0894		3.09	
14	annual dividends			2027	3.35	0.0852		3.35	
15				2028	3.62	0.0810		3.62	
16				2029	3.90	0.0768		3.90	
17	Transitional	period		2030	4.20	0.0768	91.96	91.96	
18	with slowing	dividend							
19	growth							26.52	= PV of CF
20		Beginning of constant			E17*(1+F17)/(B5−F17)				
21		growth period						NPV(B5,H2:H17)	

- Rather than assume a sudden transition to constant dividend growth starting in 2018, we assume instead that the dividend growth rate in 2018 will be 11.87% and that it will decline linearly through 2029 (see column F), finally reaching the constant terminal growth rate of 7.68% in 2029.
- Each dividend in the transition period is the previous year's dividend times that year's growth rate.
- Terminal value once the firm enters a constant-growth stage (cell G17) is computed from the constant-growth DDM.
- Finally, investor cash flow in each period (column H) equals dividends in each year plus the terminal value in 2030.
  - ✓ The present value of these cash flows is computed in cell H19 as $26.52, about 17% more than the value we found in the two-stage model.
- We obtain a greater intrinsic value in this case because we assume that dividend growth, which at the current rate of 11.87% is quite rapid, only gradually declines to its steady-state value.

13.4 PRICE-EARNINGS RATIOS

The Price-Earnings Ratio and Growth Opportunities

- Much of the real-world discussion of stock market valuation concentrates on the firm's **price-earnings multiple,** the ratio of price per share to earnings per share, commonly called the P/E ratio.
  - In fact, one common approach to valuing a firm is to use an earnings multiplier.
    - ✓ The value of the stock is obtained by multiplying projected earnings per share by a forecast of the P/E ratio.
  - This procedure seems simple, but its apparent simplicity is deceptive.
    - ✓ First, forecasting earnings is challenging.
      - ➢ Earnings will depend on international, macroeconomic, and industry as well as firm-specific factors, many of which are highly unpredictable.
    - ✓ Second, forecasting the P/E multiple is even more difficult.
      - ➢ P/E ratios vary across industries and over time.
  - Nevertheless, our discussion of stock valuation provides some insight into the factors that ought to determine a firm's P/E ratio.

- Recall our discussion of growth opportunities, in which we compared two firms, Growth Prospects and Cash Cow, each of which had earnings per share of $5.
  - Growth Prospects reinvested 60% of its earnings in prospects with an ROE of 15%, while Cash Cow paid out all of its earnings as dividends.
  - Cash Cow had a price of $40, giving it a P/E multiple of $40/$5 = 8.0, while Growth Prospects sold for $57.14, giving it a multiple of $57.14/$5 = 11.4.
    - ✓ This observation suggests the P/E ratio might serve as a useful indicator of expectations of growth opportunities.
  - We can see this explicitly by rearranging Equation 13.6 to

$$P_0 = \frac{E_1}{k} + \text{PVGO} \tag{13.6}$$

$$\Rightarrow \quad \frac{P_0}{E_1} = \frac{1}{k} + \frac{\text{PVGO}}{E_1}$$

$$\Rightarrow \quad \frac{P_0}{E_1} = \frac{1}{k}\left[1 + \frac{\text{PVGO}}{E_1 / k}\right] \tag{13.7}$$

- When PVGO = 0, Equation 13.7 shows that $P_0 = E_1/k$.
  - ✓ The stock is valued like a nongrowing perpetuity of EPS_1.
  - ✓ The P/E ratio is just $1/k$.
- However, as PVGO becomes an increasingly dominant contributor to price, the P/E ratio can rise dramatically.
- The ratio of PVGO to E/k has a straightforward interpretation.
  - ✓ It is the ratio of the component of firm value reflecting growth opportunities to the component of value reflecting assets already in place (i.e., the no-growth value of the firm, E/k).
  - ✓ When future growth opportunities dominate the estimate of total value, the firm will command a high price relative to current earnings.
  - ✓ Thus, a high P/E multiple appears to indicate that a firm is endowed with ample growth opportunities.

- Example 13.5: *P/E Ratios and Growth Opportunities*
  - Return again to Takeover Target, the firm we first encountered in Example 13.4.
    - ✓ Earnings are $5 per share, and the capitalization rate is 15%, implying that the no-growth value of the firm is E_1/k = $5/.15 = $33.33.
    - ✓ The stock price actually is $22.22, implying that the present value of growth opportunities equals -$11.11.
    - ✓ This implies that the P/E ratio should be

$$\frac{P_0}{E_1} = \frac{1}{k}\left[1 + \frac{\text{PVGO}}{E/k}\right] = \frac{1}{.15}\left[1 + \frac{-\$11.11}{\$33.3}\right] = 4.44$$

    - ✓ In fact the stock price is $22.22 and earnings are $5 per shore, so the P/E ratio is $22.22/$5 = 4.44.

- Let's see if P/E multiples do vary with growth prospects.
  - Between 1996 and 2013, for example, FedEx's P/E ratio averaged about 17.5 while Consolidated Edison's average P/E was only 13.8.
    - ✓ These numbers do not necessarily imply that FedEx was overpriced compared to Con Ed.
      - ➢ If investors believed FedEx would grow faster, its higher price per dollar would be justified.
      - ➢ That is, investors might well pay a higher price per dollar of *current earnings* if they expect that earnings stream to grow more rapidly.
    - ✓ In fact FedEx's growth rate has been consistent with its higher P/E multiple.
      - ➢ In this period, its earnings per share grew by a factor of 3.64, while Con Ed's earnings grew by only 34%.

- We conclude that the P/E ratio reflects the market's optimism concerning a firm's growth prospects.
  - Analysts must decide whether they are more or less optimistic than the belief implied by the market multiple.
    - ✓ If they are more optimistic, they will recommend buying the stock.
- There is a way to make these insights more precise. Look again at the constant growth DDM formula, $P_0 = D_1/(k - g)$.
  - Now recall that dividends equal the earnings that are *not* reinvested in the firm: $D_1 = E_1(1 - b)$. Recall also that $g = \text{ROE} \times b$.
  - Hence, substituting for D_1 and g, we find that

$$P_0 = \frac{D_1}{k - g} = \frac{E_1(1-b)}{k - (\text{ROE} \times b)}$$

implying that the P/E ratio for a firm growing at a long-run sustainable pace is

$$\frac{P_0}{E_1} = \frac{(1-b)}{k - (\text{ROE} \times b)} \qquad (13.8)$$

- It is easy to verify that the P/E ratio increases with ROE.
  - This makes sense, because high ROE projects give the firm good opportunities for growth.
    - ✓ See the following proof:

      Take a partial derivative of Equation 13.8 with respect to ROE:

$$\frac{\partial(P_0/E_1)}{\partial \text{ROE}} = \frac{b(1-b)}{[k-(\text{ROE}\times b)]^2} > 0$$

$$\text{ROE}\uparrow \Rightarrow \frac{P_0}{E_1}\uparrow$$

- We also can verify that the P/E ratio increases for higher plowback, *b*, as long as ROE exceeds *k*. This too makes sense.
  - When a firm has good investment opportunities, the market will reward it with a higher P/E multiple if it exploits those opportunities more aggressively by plowing back more earnings into those opportunities.

✓ See the following proof:

Take a partial derivative of Equation 13.8 with respect to b:

$$\frac{\partial(P_0/E_1)}{\partial b} = \frac{\text{ROE} - k}{[k - (\text{ROE} \times b)]^2}$$

- If ROE $> k$, $\frac{\partial(P_0/E_1)}{\partial b} > 0$, $b\uparrow \Rightarrow \frac{P_0}{E_1}\uparrow$.
- If ROE $< k$, $\frac{\partial(P_0/E_1)}{\partial b} < 0$, $b\uparrow \Rightarrow \frac{P_0}{E_1}\downarrow$.
- If ROE $= k$, $\frac{\partial(P_0/E_1)}{\partial b} = 0$, $\frac{P_0}{E_1}$ is not affected by b.

- Remember, however, that growth is not desirable for its own sake.
  - Examine Table 13.3, where we use Equation 13.8 to compute both growth rates and P/E ratios for different combinations of ROE and *b*.

TABLE 13.3 Effect of ROE and plowback on growth and the P/E ratio

	Plowback Ratio (*b*)			
	0	**0.25**	**0.50**	**0.75**
	A. Growth rate, *g*			
ROE				
10%	0%	2.5%	5.0%	7.5%
12	0	3.0	6.0	9.0
14	0	3.5	7.0	10.5
	B. P/E ratio			
ROE				
10%	8.33	7.89	7.14	5.56
12	8.33	8.33	8.33	8.33
14	8.33	8.82	10.00	16.67

Note: Assumption: $k = 12\%$ per year.

- ✓ While growth always increases with the plowback ratio (move across the rows in Panel A of Table 13.3), the P/E ratio does not (move across the rows in Panel B).
  - ➢ In the top row of Table 13.3, Panel B, the P/E falls as the plowback rate increases.
  - ➢ In the middle row, it is unaffected by plowback.
  - ➢ In the third row, it increases.

■ This pattern has a simple interpretation.

◆ When the expected ROE is less than the required return, *k*, investors prefer that the firm pay out earnings as dividends rather than reinvest earnings in the firm at an inadequate rate of return.

✓ That is, for ROE lower than *k*, the value of the firm falls as plowback increases.

◆ Conversely, when ROE exceeds *k*, the firm offers superior investment opportunities, so the value of the firm is enhanced as those opportunities are more fully exploited by increasing the plowback ratio.

- Finally, where ROE just equals *k*, the firm offers "break-even" investment opportunities with a fair rate of return.
  - ✓ In this case, investors are indifferent between reinvestment of earnings in the firm or elsewhere at the market capitalization rate, because the rate of return in either case is 12%.
  - ✓ Therefore, the stock price is unaffected by the plowback ratio.

- We conclude that the higher the plowback ratio, the higher the growth rate, but a higher plowback ratio does not necessarily mean a higher P/E ratio.
  - A higher plowback ratio increases P/E only if investments undertaken by the firm offer an expected rate of return higher than the market capitalization rate.
  - Otherwise, increasing plowback hurts investors because more money is sunk into prospects with inadequate rates of return.

- Notwithstanding these fine points, P/E ratios commonly are taken as proxies for the expected growth in dividends or earnings.
  - In fact, a common Wall Street rule of thumb is that the growth rate ought to be roughly equal to the P/E ratio.
    - ✓ In other words, the ratio of P/E to g, often called the **PEG ratio,** should be about 1.0.
  - Peter Lynch, the famous portfolio manager, puts it this way in his book *One Up on Wall Street*:
    - ✓ The P/E ratio of any company that's fairly priced will equal its growth rate. I'm talking here about growth rate of earnings….
    - ✓ If the P/E ratio of Coca-Cola is 15, you'd expect the company to be growing at about 15% per year, etc.
    - ✓ But if the P/E ratio is less than the growth rate, you may have found yourself a bargain.
  - Let's try his rule of thumb.

- Example 13.6: *P/E Ratio versus Growth Rate*
  - Assume:

    $r_f = 8\%$ (about the value when Peter Lynch was writing)

    $r_M - r_f = 8\%$ (about the historical average market risk premium)

    $b = .4$ (a typical value for the plowback ratio in the U.S.)

    ✓ Therefore, $r_M = r_f$ + Market risk premium = 8% + 8% = 16%, and $k = 16\%$ for an average ($\beta = 1$) company.
  - If we also accept as reasonable that ROE = 16% (the same value as the expected return on the stock) we conclude that

    $g = \text{ROE} \times b = 16\% \times .4 = 6.4\%$

    and from Equation 13.8

$$\frac{P}{E} = \frac{(1-b)}{k-(\text{ROE}\times b)} = \frac{1-.4}{.16-.064} = 6.26$$

    ✓ Thus the P/E ratio and g are about equal using these assumptions, consistent with the rule of thumb.

- However, this rule of thumb, like almost all others, will not work in all circumstances.
  - ✓ For example, the yield on long-term Treasury bonds today is more like 3%, so a comparable forecast of r_M today would be:

    r_f + Market risk premium = 3% + 8% = 11%

  - ✓ If we continue to focus on a firm with β = 1, and ROE still is about the same as k, then

    $g = 11\% \times .4 = 4.4\%$

    while

    $$\frac{P}{E} = \frac{(1-b)}{k-(\text{ROE}\times b)} = \frac{1-.4}{.11-.044} = 9.1$$

    The P/E ratio and g now diverge, and the PEG ratio is now 9.1/4.4 = 2.1
  - ✓ Nevertheless, lower-than-average PEG ratios are still widely seen as signaling potential underpricing.

P/E Ratios and Stock Risk

- One important implication of any stock valuation model is that (holding all else equal) riskier stocks will have lower P/E multiples.
  - We can see this quite easily in the context of the constant-growth model by examining the formula for the P/E ratio (Equation 13.8):

$$\frac{P}{E} = \frac{1-b}{k-(\text{ROE}\times b)} = \frac{1-b}{k-g}$$

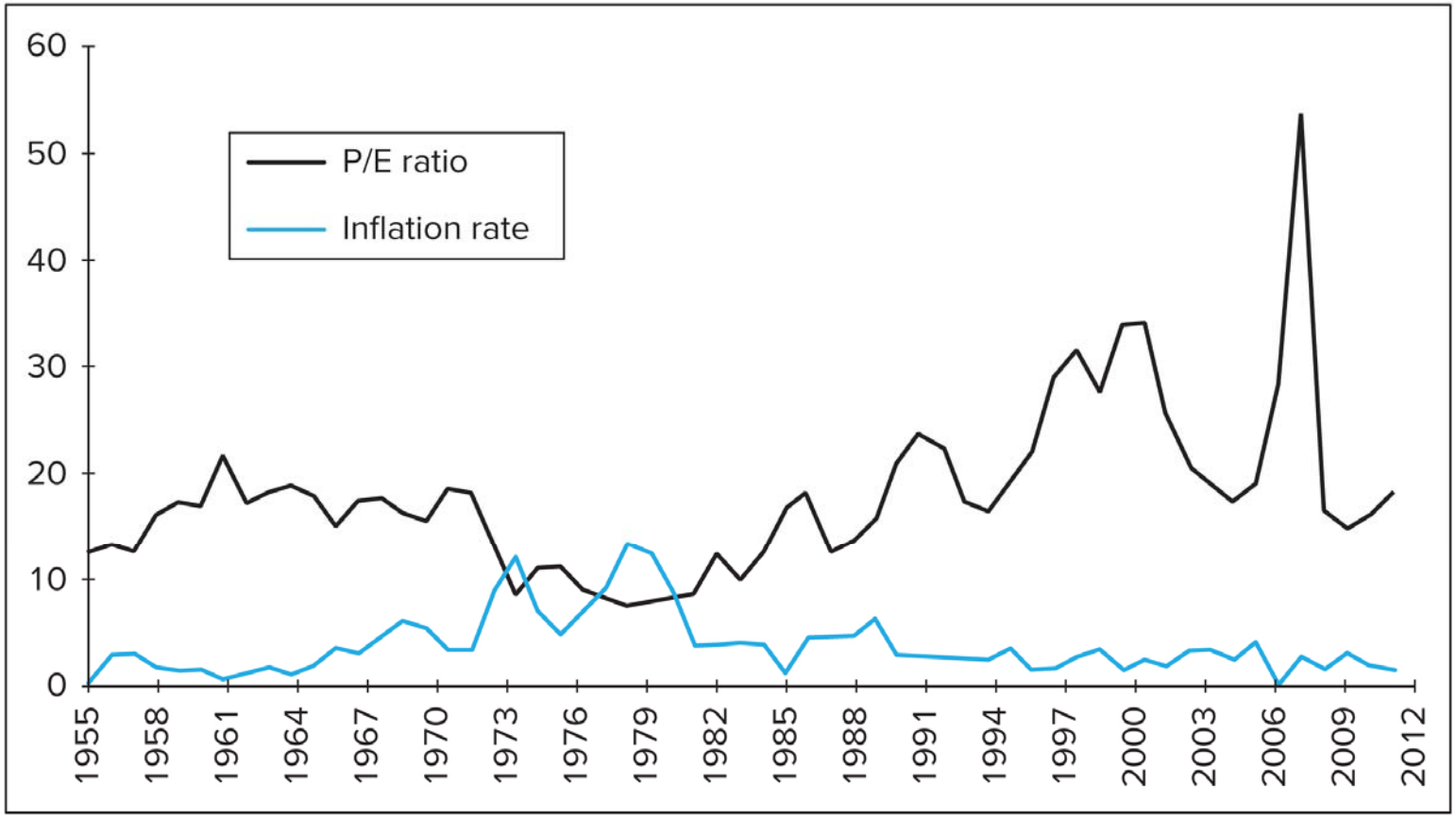
    - ✓ Riskier firms will have higher required rates of return (i.e., higher values of k). Therefore, their P/E multiples will be lower.
  - This is true even outside the context of the constant growth model.
    - ✓ For *any* expected earnings and dividend stream, the present value of those cash flows will be lower when the stream is perceived to be riskier.
      - ➢ Hence the stock price and the ratio of price to earnings will be lower.

- Of course, many small, risky, start-up companies have very high P/E multiples.
  - This does not contradict our claim that P/E multiples should fall with risk: Instead, it is evidence of the market's expectations of high growth rates for those companies.
    - ✓ This is why we said that high-risk firms will have lower P/E ratios *holding all else equal*.
  - Given a growth projection, the P/E multiple will be lower when risk is perceived to be higher.

Pitfalls in P/E Analysis

- No description of P/E analysis is complete without mentioning some of its pitfalls.
  - First, consider that the denominator in the P/E ratio is accounting earnings, which are influenced by somewhat arbitrary accounting rules such as the use of historical cost in depreciation and inventory valuation.
    - ✓ In times of high inflation, historic cost depreciation and inventory costs will tend to underrepresent true economic values because the replacement cost of both goods and capital equipment will rise with the general level of prices.

- ✓ As Figure 13.3 demonstrates, P/E ratios generally have been inversely related to the inflation rate.
  - ➢ In part, this reflects the market's assessment that earnings in high earnings periods are of "lower quality," artificially distorted by inflation, and warranting lower P/E ratios.



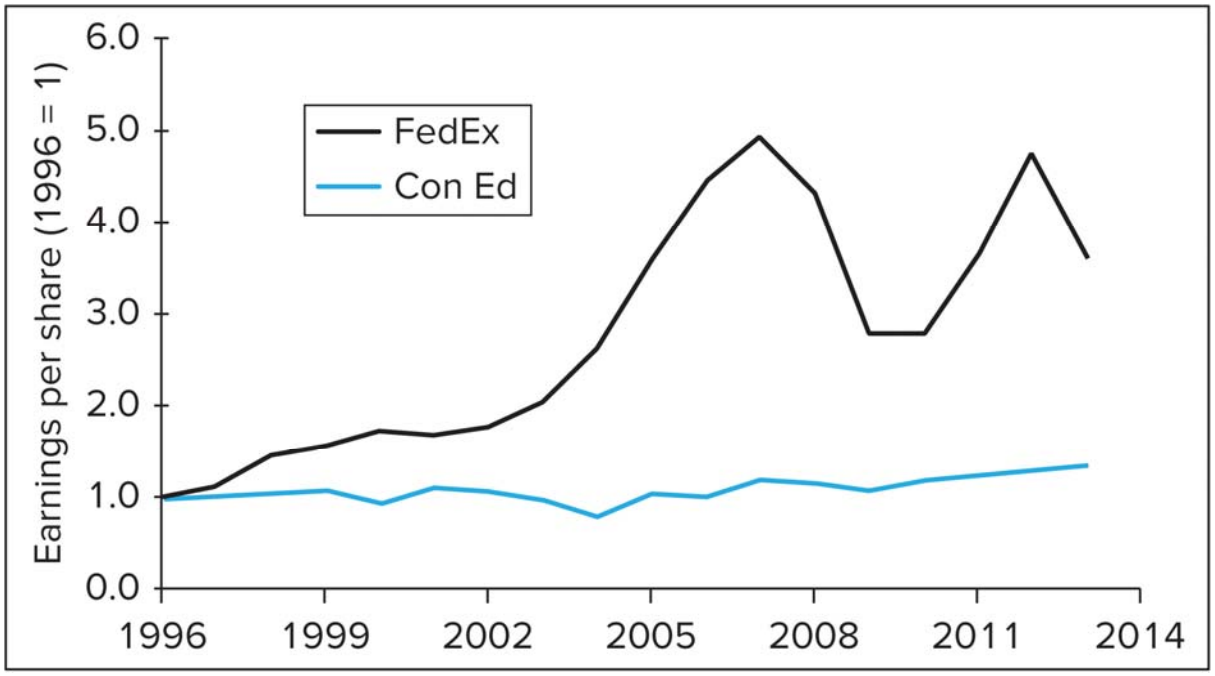
- **Earnings management** is the practice of using flexibility in accounting rules to manipulate the apparent profitability of the firm.
  - A version of earnings management that became common in recent years was the reporting of "pro forma earnings" measures.
    - ✓ These measures are sometimes called *operating earnings*, a term with no precise generally accepted definition.
  - Pro forma earnings are calculated ignoring certain expenses, for example, restructuring charges, stock-option expenses, or write-downs of assets from continuing operations.
    - ✓ Firms argue that ignoring these expenses gives a clearer picture of the underlying profitability of the firm.
  - But when there is too much leeway for choosing what to exclude it becomes hard for investors or analysts to interpret the numbers or to compare them across firms.
    - ✓ The lack of standards gives firms considerable leeway to manage earnings.

leeway: the amount of freedom to move or act that is available.

- Even GAAP allows firms considerable discretion to manage earnings.
  - For example, in the late 1990s, Kellogg took restructuring charges, which are supposed to be one-time events, nine quarters in a row.
    - ✓ Were these really one-time events, or were they more appropriately treated as ordinary expenses?
  - Given the available leeway in reporting earnings, the justified P/E multiple becomes difficult to gauge. 測量
- Another confounding factor in the use of P/E ratios is related to the business cycle. 混雜
  - We were careful in deriving the DDM to define earnings as being net of *economic* depreciation, that is, the maximum flow of income that the firm could pay out without depleting its productive capacity.
  - Yet reported earnings, as we note above, are computed in accordance with generally accepted accounting principles and need not correspond to economic earnings.
  - Beyond this, however, notions of a normal or justified P/E ratio, as in Equation 13.7 or 13.8, assume implicitly that earnings rise at a constant rate, or, put another way, on a smooth trend line.

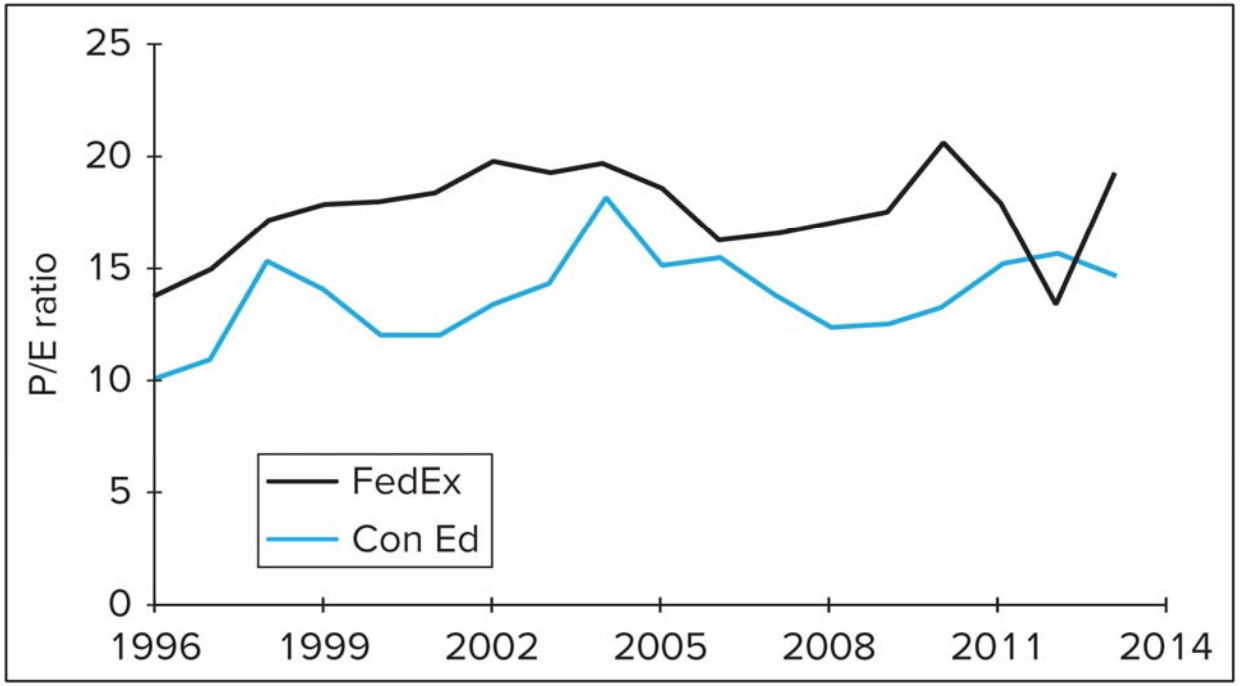
- In contrast, reported earnings can fluctuate dramatically around a trend line over the course of the business cycle.

- Another way to make this point is to note that the "normal" P/E ratio predicted by Equation 13.8 is the ratio of today's price to the trend value of future earnings, E_1.
  - The P/E ratio reported in the financial pages of the newspaper, by contrast, is the ratio of price to the most recent *past* accounting earnings.
  - Current accounting earnings can differ considerably from future economic earnings.
  - Because ownership of stock conveys the right to future as well as current earnings, the ratio of price to most recent earnings can vary substantially over the business cycle, as accounting earnings and the trend value of economic earnings diverge by greater and lesser amounts.
- As an example, Figure 13.4 graphs the earnings per share of FedEx and Consolidated Edison since 1996.
  - Note that FedEx's EPS fluctuates around its trend line more than Con Ed's.



- Because the market values the entire stream of future dividends generated by the company, when earnings are temporarily depressed, the P/E ratio should tend to be high—that is, the denominator of the ratio responds more sensitively to the business cycle than the numerator.
  - ✓ This pattern is borne well.

■ Figure 13.5 graphs the P/E ratios of the two firms.



◆ FedEx has greater earnings volatility and more variability in its P/E ratio.

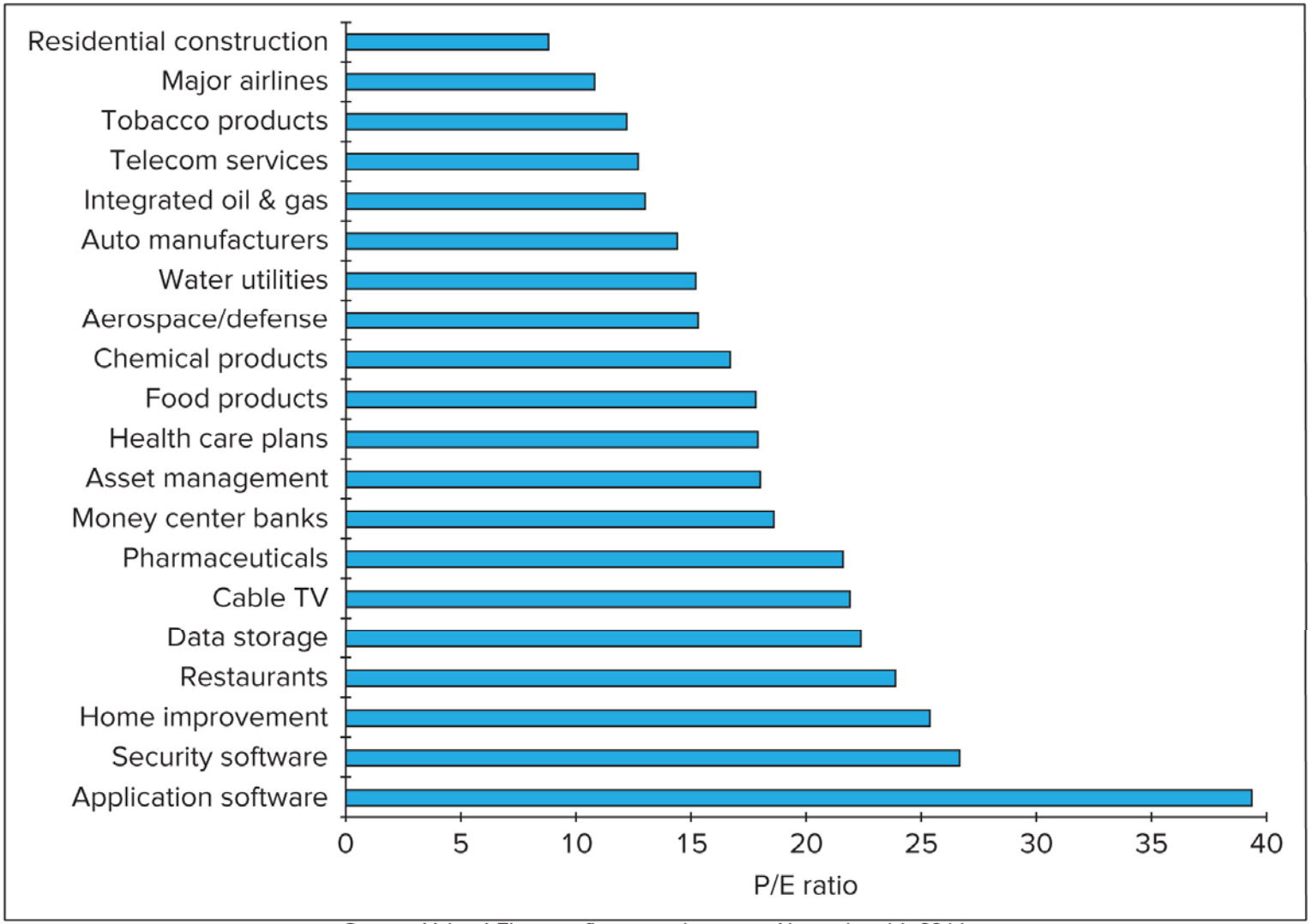
✓ Its clearly higher average growth rate shows up in its generally higher P/E ratio.

- The only year in which Con Ed's P/E ratio exceeded FedEx's was 2012, a year when Con FedEx's earnings rose at a far faster rate than its underlying trend.
  - ✓ The market seems to have recognized that this earnings performance was not likely to be sustainable, and FedEx's price did not respond dramatically to this fluctuation in earnings.
  - ✓ Consequently, its P/E ratio declined.

- This example shows why analysts must be careful in using P/E ratios.
  - There is no way to say a P/E ratio is overly high or low without referring to the company's long-run growth prospects, as well as to current earnings per share relative to the long-run trend line.

- Nevertheless, Figures 13.4 and 13.5 demonstrate a clear relationship between P/E ratios and growth.
  - Despite short-run fluctuations, FedEx's EPS clearly trended upward over the period. Its compound rate of growth in the 1996-2013 period was 7.9%.
  - Con Edison's earnings grew far less rapidly, with a compound growth rate of 1.7%.
  - FedEx's growth prospects are reflected in its consistently higher P/E multiple.

- This analysis suggests that P/E ratios should vary across industries and, in fact, they do.
  - Figure 13.6 shows P/E ratios for a sample of industries.



Source: Yahoo! Finance, finance.yahoo.com, November 14, 2014

- ✓ Notice that the industries with the two highest multiples—security and application software—have attractive investment opportunities, whereas the industries with the lowest multiples—residential construction, airlines, or tobacco products—are in more mature or less profitable industries with limited growth opportunities.

  - ◆ The relationship between P/E and growth is not perfect, which is not surprising in light of the pitfalls discussed in this section, but as a general rule, the P/E multiple does appear to track growth opportunities.

● Combining P/E Analysis and the DDM

- ■ Some analysts use P/E ratios in conjunction with earnings forecasts to estimate the price of stock at an investor's horizon date.

  - ◆ The GE analysis in Figure 13.2 shows that Value Line forecasted a P/E ratio for 2018 of 15. EPS for 2018 were forecast at \$2.70, implying a price in 2018 of $15 \times \$2.70 = \$40.50$.

- ✓ Given an estimate of $40.50 for the 2018 sales price, we would compute GE's intrinsic value as

$$V_{2014} = \frac{\$1.00}{(1.126)} + \frac{\$1.13}{(1.126)^2} + \frac{\$1.26}{(1.126)^3} + \frac{\$1.40 + \$40.50}{(1.126)^4} = \$28.73$$

● Other Comparative Valuation Ratios

- ■ The price-earnings ratio is an example of a comparative valuation ratio. Such ratios are used to assess the valuation of one firm versus another based on a fundamental indicator such as earnings.
  - ◆ For example, an analyst might compare the P/E ratios of two firms in the same industry to test whether the market is valuing one firm "more aggressively" than the other.
  - ◆ Other such comparative ratios are commonly used.

PRICE-TO-BOOK RATIO

- This is the ratio of price per share divided by book value per share.
  - As we noted earlier in this chapter, some analysts view book value as a useful measure of value and therefore treat the ratio of price-to-book value as an indicator of how aggressively the market values the firm.

PRICE-TO-CASH-FLOW RATIO

- Earnings as reported on the income statement can be affected by the company's choice of accounting practices and thus are commonly viewed as subject to some imprecision and even manipulation.
  - In contrast, cash flow—which tracks cash actually flowing into or out of the firm—is less affected by accounting decisions.
    - ✓ As a result, some analysts prefer to use the ratio of price to cash flow per share rather than price to earnings per share.
    - ✓ Some analysts use operating cash flow when calculating this ratio; others prefer free cash flow, that is, operating cash flow net of new investment.

PRICE-TO-SALES RATIO

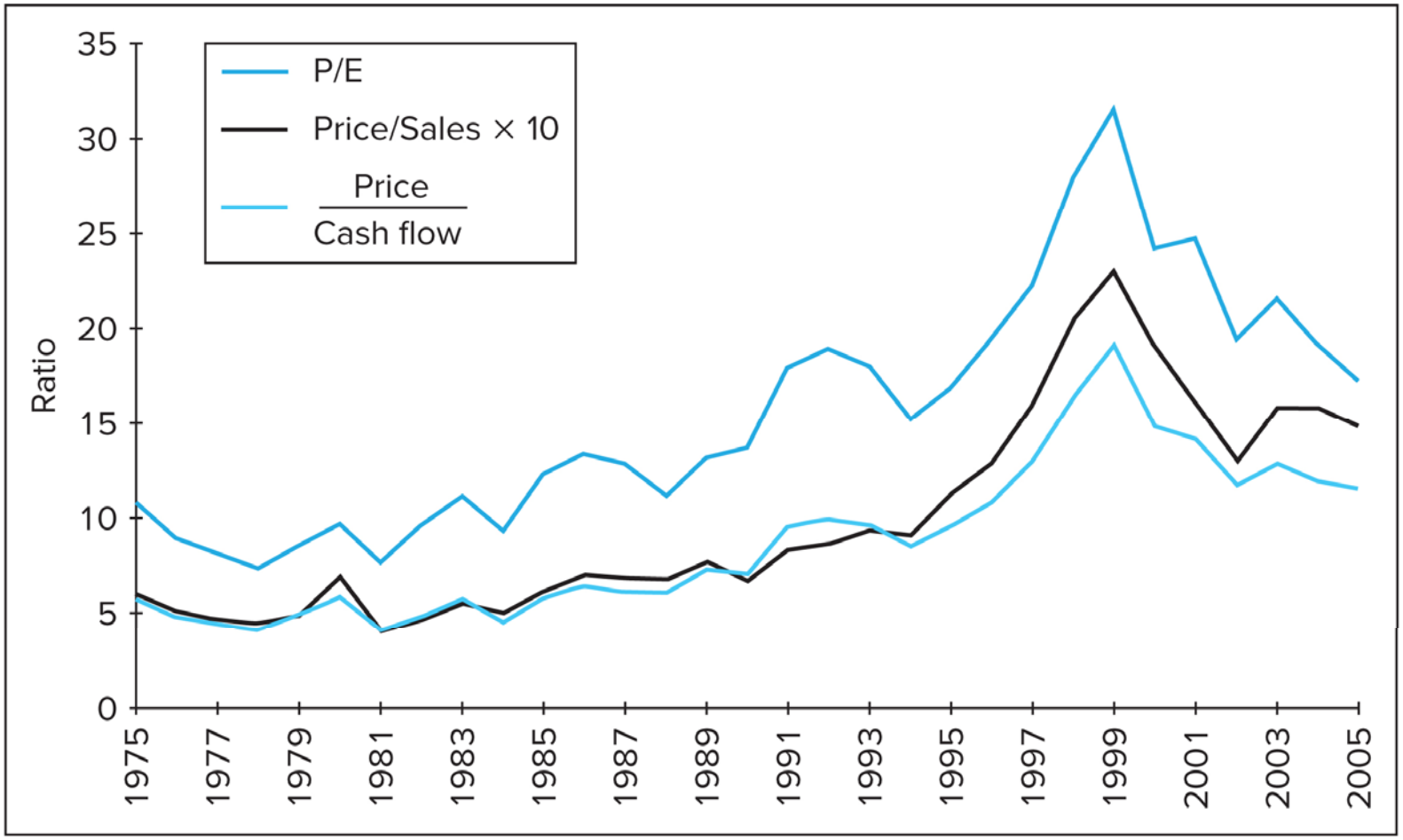
- Many start-up firms have no earnings.
  - ◆ As a result, the P/E ratio for these firms is meaningless.
- The price-to-sales ratio (the ratio of stock price to the annual sales per share) is sometimes taken as a valuation benchmark for these firms.
  - ◆ Of course, price-to-sales ratios can vary markedly across industries because profit margins vary widely.

the amount by which revenue from sales exceeds costs in a business.

BE CREATIVE

- Sometimes a standard valuation ratio will simply not be available, and you will have to devise your own.
- In the l990s, some analysts valued retail Internet firms based on the number of hits their websites received.
  - ◆ In retrospect, they valued these firms using too generous "price-to-hits" ratios.
- Nevertheless, in a new investment environment, these analysts used the information available to them to devise the best valuation tools they could.

- Figure 13.7 presents the behavior of these valuation measures for the S&P 500.



  - While the levels of these ratios differ considerably, for the most part they track each other fairly closely, with upturns and downturns at the same times.

13.5 FREE CASH FLOW VALUATION APPROACHES

- An alternative approach to the dividend discount model values the firm using free cash flow, that is, cash flow available to the firm or the equity holders net of capital expenditures. 扣除資本支出
  - This approach is particularly useful for firms that pay no dividends, for which the dividend discount model would be difficult to implement.
  - But free cash flow models are valid for any firm, and can provide useful insights about firm value beyond the DDM.
- One approach is to discount the *free cash flow* for the *firm* (FCFF) at the weighted-average cost of capital to obtain the value of the firm and then subtract the then-existing value of debt to find the value of equity.
- Another is to focus from the start on the free cash flow to *equity holders* (FCFE), discounting those directly at the cost of equity to obtain the market value of equity.

- The free cash flow to the firm is the after-tax cash flow generated by the firm's operations, net of investments in capital and net working capital. It includes cash flows available to both debt and equity holders. It equals:

  $$\text{FCFF} = \text{EBIT} \times (1 - t_c) + \text{Depreciation} - \text{Capital expenditures} - \text{Increase in NWC} \quad (13.9)$$

  where

  EBIT = Earnings before interest and taxes

  t_c = The corporate tax rate

  NWC = Net working capital (i.e., current assets less current liabilities)

- Alternatively, we can focus on cash flow available to equity holders.
  - This will differ from free cash flow to the firm by after-tax interest expenditures, as well as by cash flow associated with net issuance or repurchase of debt (i.e., principal repayments minus proceeds from issuance of new debt).

  $$\text{FCFE} = \text{FCFF} - \text{Interest expense} \times (1 - t_c) + \text{Increases in net debt} \quad (13.10)$$

- A free cash flow to the firm valuation model discounts year-by-year cash flows plus some estimate of terminal value, P_T.
  - In Equation 13.11, we use the constant-growth model to estimate terminal value. The appropriate discount rate is the weighted-average cost of capital.

$$\text{Firm value} = \sum_{t=1}^{T} \frac{\text{FCFF}_t}{(1+\text{WACC})^t} + \frac{P_T}{(1+\text{WACC})^T} \qquad (13.11)$$

where

$$P_T = \frac{\text{FCFF}_{T+1}}{\text{WACC} - g}$$

  - To find equity value, we subtract the existing market value of debt from the derived value of the firm.

- Alternatively, we can discount free cash flows to *equity* (FCFE) at the cost of *equity*, k_E.

$$\text{Intrinsic value of equity} = \sum_{t=1}^{T} \frac{\text{FCFE}_t}{(1+k_E)^t} + \frac{P_T}{(1+k_E)^T} \qquad (13.12)$$

where

$$P_T = \frac{\text{FCFE}_{T+1}}{k_E - g}$$

- As in the dividend discount model, free cash flow models use a terminal value to avoid adding the present values of an infinite sum of cash flows.
  - That terminal value may simply be the present value of a constant-growth perpetuity (as in the formulas above), or it may be based on a multiple of EBIT, book value, earnings, or free cash flow.
  - As a general rule, estimates of intrinsic value depend critically on terminal value.

Comparing the Valuation Models

- In principle, the free cash flow approach is fully consistent with the dividend discount model and should provide the same estimate of intrinsic value if one can extrapolate to a period in which the firm begins to pay dividends growing at a constant rate.
  - This was demonstrated in two famous papers by Modigliani and Miller (1958, 1961).
  - However, in practice, you will find that values from these models may differ, sometimes substantially.
    - ✓ This is due to the fact that in practice, analysts are always forced to make simplifying assumptions.
      - For example, how long will it take the firm to enter a constant-growth stage? How should depreciation best be treated? What is the best estimate of ROE?
      - Answers to questions like these can have a big impact on value, and it is not always easy to maintain consistent assumptions across the models.

- We have now valued GE using several approaches, with estimates of intrinsic value as follows:

Model	Intrinsic Value
Two-stage dividend discount model	$22.59
DDM with earnings multiple terminal value	$28.73
Three-stage DDM	$26.52
Free cash flow to the firm	$25.18
Free cash flow to equity	$26.73
Market price in 2014	$24.81

  - What should we make of these differences?
    - ✓ The two-stage dividend discount model is the most conservative of the estimates, probably because it assumes that Honda's dividend growth rate will fall to its terminal value after only three years.

- ✓ In contrast, the three-stage DDM allows growth to taper off over a longer period.
  - ➢ The estimate of intrinsic value from this model is much closer to those from both free cash flow models.
- ✓ The DDM with a terminal value provided by the earnings multiple results in the highest estimate of intrinsic value.
- ✓ With the exception of the two-stage DDM, all of these models produce intrinsic values greater than GE's market price.
  - ➢ Perhaps the assumed terminal growth rate used in our valuation exercise is unrealistically high, or perhaps the stock is indeed underpriced compared to intrinsic value.

■ On balance, however, this valuation exercise suggests that finding bargains is not as easy as it seems.

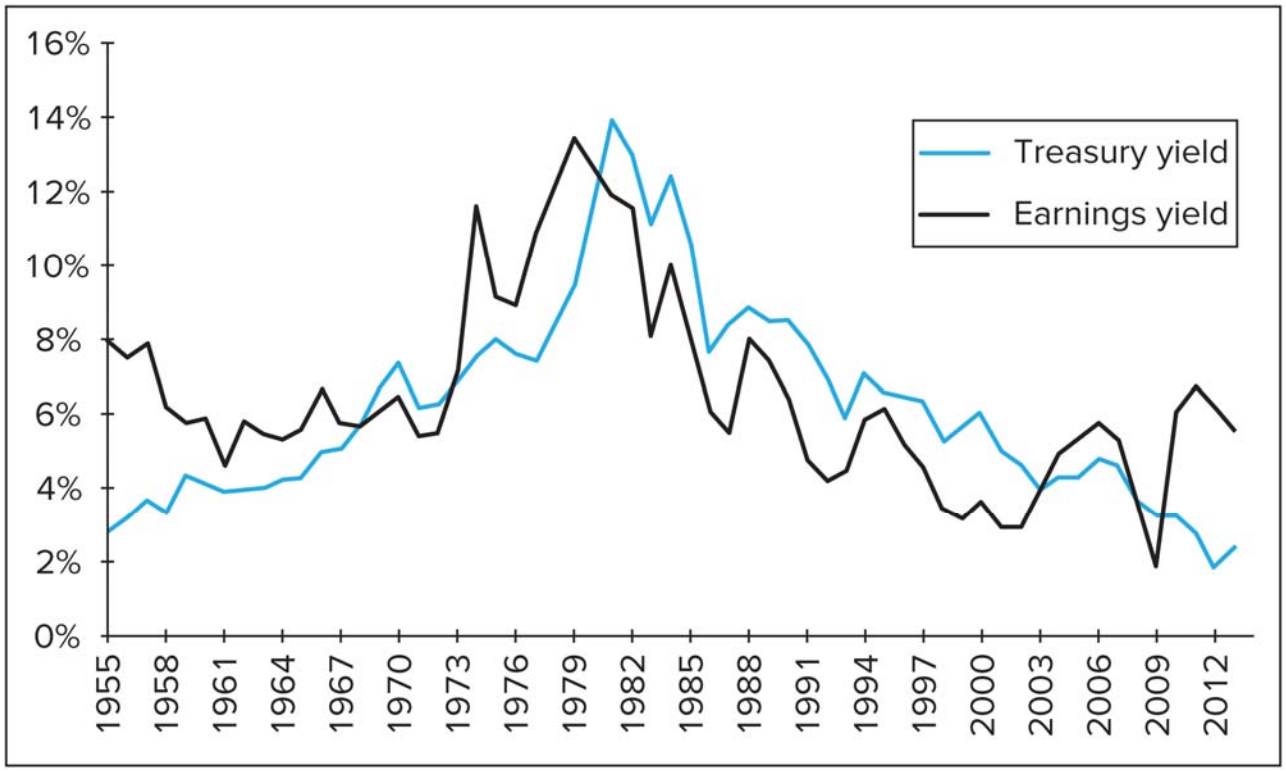
- ◆ While these models are easy to apply, establishing proper inputs is more of a challenge. This should not be surprising.
- ◆ In even a moderately efficient market, finding profit opportunities will be more involved than analyzing Value Line data for a few hours.

◆ The models are extremely useful to analysts, however.

- ✓ They provide ballpark estimates of intrinsic value.
- ✓ More than that, they force rigorous thought about underlying assumptions and highlight the variables with the greatest impact on value and the greatest payoff to further analysis.

13.6 THE AGGREGATE STOCK MARKET

- The most popular approach to valuing the overall stock market is the earnings multiplier approach applied at the aggregate level.
  - The first step is to forecast corporate profits for the coming period.
  - Then we derive an estimate of the earnings multiplier, the aggregate P/E ratio, based on a forecast of long-term interest rates.
  - The product of the two forecasts is the estimate of the end-of-period level of the market.
- The forecast of the P/E ratio of the market is sometimes derived from a graph similar to that in Figure 13.8, which plots the *earnings yield* (earnings per share divided by price per share, the reciprocal of the P/E ratio) of the S&P 500 and the yield to maturity on 10-year Treasury bonds.



- The two series clearly move in tandem over time and suggest that one might use this relationship and the current yield on 10-year Treasury bonds to forecast the earnings yield on the S&P 500.
- Given that earnings yield, a forecast of earnings could be used to predict the level of the S&P in some future period.
  - ✓ Let's consider a simple example of this procedure.

- Example 13.7: *Forecasting the Aggregate Stock Market*
  - In late 2014, the S&P 500 was at 2,040. The forecast for 12-month forward earnings per share for the S&P 500 portfolio was about $134. The 10-year Treasury-bond yield at this time was about 2.3%, but the yield curve was relatively steep, so a plausible forecast for its value next year would be higher, perhaps 2.8%.
  - As a first approach, we might posit that the spread between the earnings yield and the Treasury yield, which was around 3.2% in 2014, will remain at that level by the end of the year.
    - ✓ Given the assumed Treasury yield, this would imply an earnings yield for the S&P of 6% and a P/E ratio of 1/.06 = 16.67.
    - ✓ Our forecast for the level of the S&P Index would then be 16.67 × 134 = 2,233, which would imply a one-year capital gain on the index of 193/2,040 = 9.5%.
  - Of course, there is uncertainty regarding all three inputs into this analysis: the actual earnings on the S&P 500 stocks, the level of Treasury yields at year-end, and the spread between the Treasury yield and the earnings yield.

◆ One would wish to perform sensitivity or scenario analysis to examine the impact of changes in all of these variables.

✓ To illustrate, consider Table 13.4, which shows a simple scenario analysis treating possible effects of variation in the Treasury-bond yield.

TABLE 13.4 S&P 500 index forecasts under various scenarios

	Pessimistic Scenario	Most Likely Scenario	Optimistic Scenario
Treasury bond yield	3.3%	2.8%	2.3%
Earnings yield	6.5%	6.0%	5.5%
Resulting P/E ratio	15.4	16.7	18.2
EPS forecast	134	134	134
Forecast for S&P 500	2,062	2,233	2,436

Note: The forecast for the earnings yield on the S&P 500 equals the Treasury-bond yield plus 3.2%. The P/E ratio is the reciprocal of the forecast earnings yield.

➢ The scenario analysis shows that the forecast level of the stock market varies inversely and with dramatic sensitivity to interest rate changes.

- Some analysts use an aggregate version of the dividend discount model rather than an earnings multiplier approach.
  - All of these models, however, rely heavily on forecasts of such macroeconomic variables as GDP, interest rates, and the rate of inflation, which are difficult predict accurately.
- Because stock prices reflect expectations of future dividends, which are tied to the economic fortunes of firms, it is not surprising that the performance of a broad-based stock index like the S&P 500 is taken as a leading economic indicator, that is, a predictor of the performance of the aggregate economy.
  - Stock prices are viewed as embodying consensus forecasts of economic activity and are assumed to move up or down in anticipation of movements in the economy.
  - The government's index of leading economic indicators, which is taken to predict the progress of the business cycle, is made up in part of recent stock market performance.