Equity Valuation Model

Source: Bodie, Kane and Marcus, Investments, 12 ed., McGraw-Hill, 2021

Overview

- *Fundamental analysts* use information concerning the current and prospective profitability of a company to assess its fair market value
- Alternative measures of a company's value
- Dividend discount models
- P/E ratios
- Free cash flow models

Valuation by Comparables

- 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
- Valuation ratios are commonly used to assess the valuation of one firm compared to others in the same industry

Limitations of Book Value

- Shareholders are sometimes called “residual claimants”
- Book values are based on historical cost, while market values measure the *current* values of assets and liabilities
- Market values generally will not match historical values

Liquidation Value and Tobin's Q

- Net amount that could be realized by selling the assets of a firm after paying the debt is **liquidation value**
  - Good representation of a "floor" for the stock's price
- **Replacement cost** is the cost to replace a firm's assets
  - **Tobin's q** is the ratio of market value of the firm to replacement cost
  - Trends towards 1

Financial Highlights of Microsoft

Table 18.1 Financial highlights for Microsoft Corporation and the software applications industry

Price per share	$111.98	
Common shares outstanding (billion)	7.67	
Market capitalization ($ billion)	$ 858.6	
Latest 12 months		
Sales ($ billion)	$118.48	
EBITDA ($ billion)	$ 49.58	
Net income ($ billion)	$ 33.54	
Earnings per share	$ 4.31	
Valuation	**Microsoft**	**Industry Average**
Price/Earnings	22.43	39.94
Price/Book	9.33	8.03
Price/Sales	7.25	6.42
PEG	1.76	1.99
Profitability		
ROE (%)	39.35	13.47
ROA (%)	9.44	
Operating profit margin (%)	32.83	21.35
Net profit margin (%)	28.31	10.45

Source: Microsoft data from **finance.yahoo.com,** February 28, 2019; industry data courtesy of Professor Aswath Damadaran, **http://pages.stern.nyu.edu/~adamodar/.**

Intrinsic Value vs. Market Price

- The return on a stock is composed of cash dividends and capital gains or losses

$$\text{Expected HPR} = E(r) = \frac{E(D_1) + [E(P_1) - P_0]}{P_0}$$

- The *expected* HPR may be more or less than the required rate of return
  - Variation based on the stock's risk

Required Return

- CAPM gives the required return, *k*:

$$k = r_f + \beta[E(r_M) - r_f]$$

- If the stock is priced correctly, expected return will equal required return
- *k* is the required rate of return

Intrinsic Value and Market Price

- The **intrinsic value** (V_0) is the "true" value, according to a model
  - If intrinsic value > market value, the stock is considered undervalued and a good investment
- Trading signal
  - IV > MV → Buy
  - IV < MV → Sell
  - IV = MV → Hold

Dividend Discount Models (DDM)

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

- V_0 = current value
- D_t = dividend at time t
- k = required rate of return
- DDM says V_0 = the present value of all expected future dividends into perpetuity

Constant Growth DDM 1

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

- V_0 = current value
- D_t = dividend at time t
- k = appropriate risk-adjusted interest rate
- g = dividend growth rate

Constant Growth DDM 2

- A stock just paid an annual dividend of $3/share
- Dividend is expected to grow at 8% indefinitely
- Market capitalization rate is 14%

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

DDM Implications

- 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
- The stock price is expected to grow at the same rate as dividends

Discounted Cash Flow (DCF) Formula

$$E(r) = \text{Dividend yield} + \text{Capital gains yield}$$

$$= \frac{D_1}{P_0} + \frac{P_1 - P_0}{P_0} = \frac{D_1}{P_0} + g$$

- DCF formula often used in rate hearings for regulated public utilities
- Focus on “fair” profit

Dividend Growth for Two Earnings Reinvestment Policies

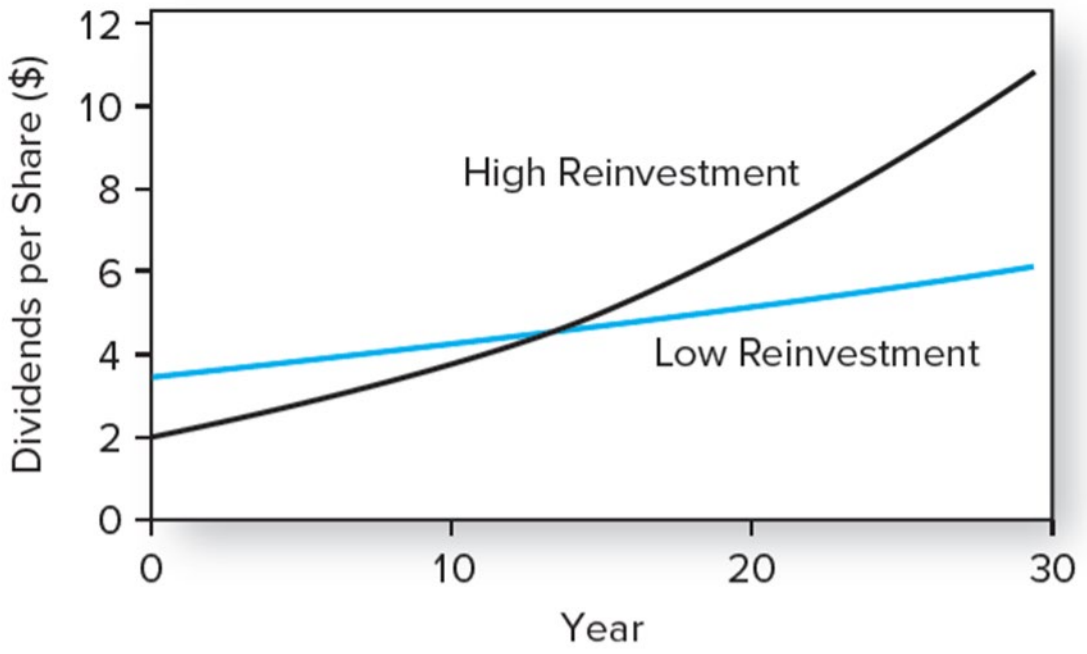


Figure 18.1 Dividend growth for two earnings reinvestment policies

Present Value of Growth Opportunities

- **Present value of growth opportunities (PVGO)** is the net present value of a firm's future investments
- The value of the firm is the sum of the following:
  - Value of assets already in place (no-growth value)
  - Net present value of the future investments the firm will make, or PVGO

$$P_0 = \frac{E_1}{k} + PVGO$$

Life Cycles and Multistage Growth Models

- Firms typically pass through life cycles with different dividend profiles.

- **Early Years**

- Ample opportunities for profitable reinvestment in the company
- Payout ratios are low
- Growth is correspondingly rapid

- **Later Years**

- Attractive opportunities for reinvestment may become harder to find
- Production capacity is enough to meet market demand
- Competitors enter the market
- Firms may choose to pay out a higher fraction of earnings as dividends

Financial Ratios in Two Industries

- **Table 18.2** Financial ratios in two industries

	Ticker	Return on Capital (%)	Payout Ratio (%)	Growth Rate 2017 to 2020
Computer software				
Adobe Systems	ADBE	18.0%	0.0%	20.7%
Citrix	CTXS	30.0	26.0	7.7
Cognizant	CTSH	11.1	4.0	7.1
Intuit	INTU	30.0	28.0	11.2
Microsoft	MSFT	24.0	46.0	13.5
Oracle	ORCL	17.0	23.0	9.8
Red Hat	RHT	17.0	0.0	14.7
Symantec	SYMC	14.5	19.0	7.7
SAP	SAP	12.5	41.0	7.3
Median		17.0%	23.0%	9.8%
Electric utilities (East Coast)				
Dominion Resources	D	6.5%	84.0%	5.3%
Consolidated Edison	ED	5.5	68.0	4.0
Duke Energy	DUK	5.0	77.0	3.7
Eversource	ES	5.5	63.0	5.2
FirstEnergy	FE	7.5	55.0	9.0
Nextera Energy	NEE	8.0	61.0	6.9
Public Service Enterprise	PEG	7.0	56.0	6.9
Southern Company	SO	6.5	73.0	5.6
Exelon	EXC	6.0	44.0	4.9
Median		6.5%	63.0%	5.3%

- Source: *Value Line Investment Survey,* February 2019. Reprinted with permission of Value Line Investment Survey.

Price-Earnings Ratio and Growth Opportunities [1]

- The ratio of PVGO to *E*/*k* is equivalent to the component of firm value due to growth opportunities to the value reflecting assets already in place

$$\frac{P_0}{E_1} = \frac{1}{k}\left(\frac{1+\text{PVGO}}{E/k}\right)$$

Price-Earnings Ratio and Growth Opportunities 2

- When PVGO = 0, $P_0 = E_1/k$
  - The stock is valued like a nongrowing perpetuity
- As PVGO becomes an increasingly dominant contributor to price, the P/E ratio can rise dramatically
- P/E ratio reflects the market's optimism concerning a firm's growth prospects

Price-Earnings Ratio and Growth Opportunities

- P/E increases:
  - As ROE increases
  - As plowback, *b*, increases, if ROE > k
  - As plowback decreases, if ROE < k
  - As k decreases

$$\frac{P_0}{E_1} = \frac{1-b}{k - ROE \times b}$$

Effect of ROE and Plowback on Growth and the P/E Ratio

Table 18.3 Effect of ROE and plowback on growth and the P/E ratio

	Plowback Ratio (*b*)			
	0	**0.25**	**0.50**	**0.75**
ROE		**A. Growth Rate (*g*)**		
10%	0	2.5%	5.0%	7.5%
12	0	3.0	6.0	9.0
14	0	3.5	7.0	10.5
ROE		**B. P/E Ratio**		
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

Assumption: k = 12% per year.

P/E and Growth Rate

- Wall Street rule of thumb suggests the growth rate ought to be roughly equal to the P/E ratio
- “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.”
  - Peter Lynch in *One Up on Wall Street*

P/E Ratios and Stock Risk

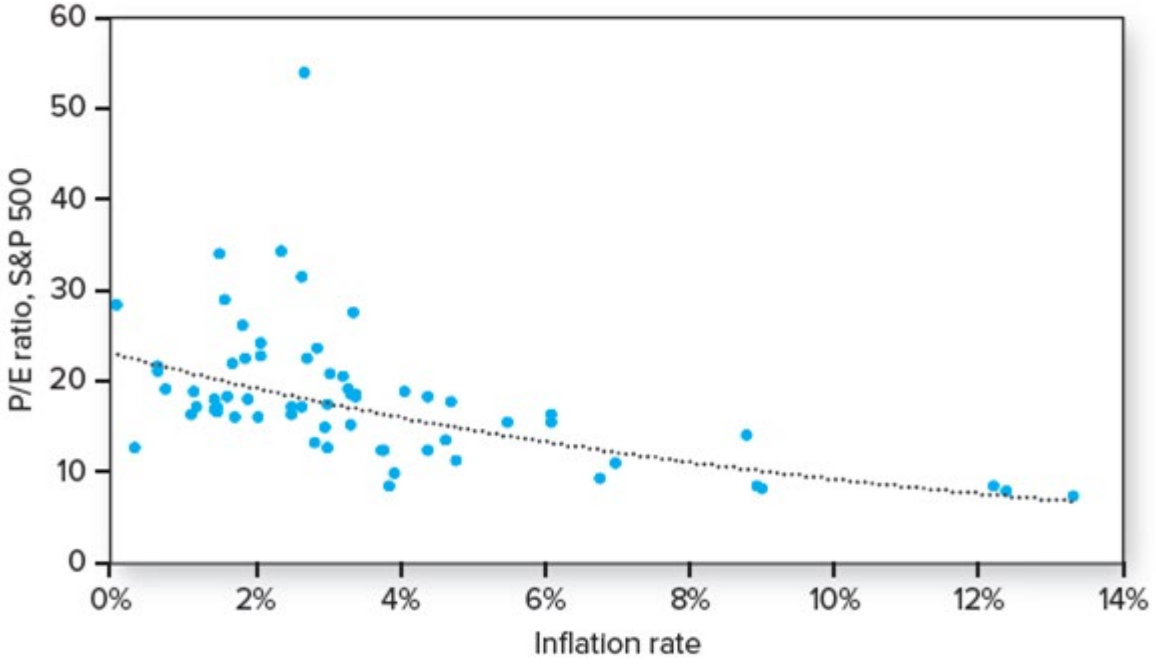
- Holding all else equal, riskier stocks will have lower P/E multiples
- Riskier firms will have higher required rates of return, that is, higher values of k, which means the P/E multiple will be lower

$$\frac{P}{E} = \frac{1-b}{k-g}$$

Pitfalls in P/E Analysis

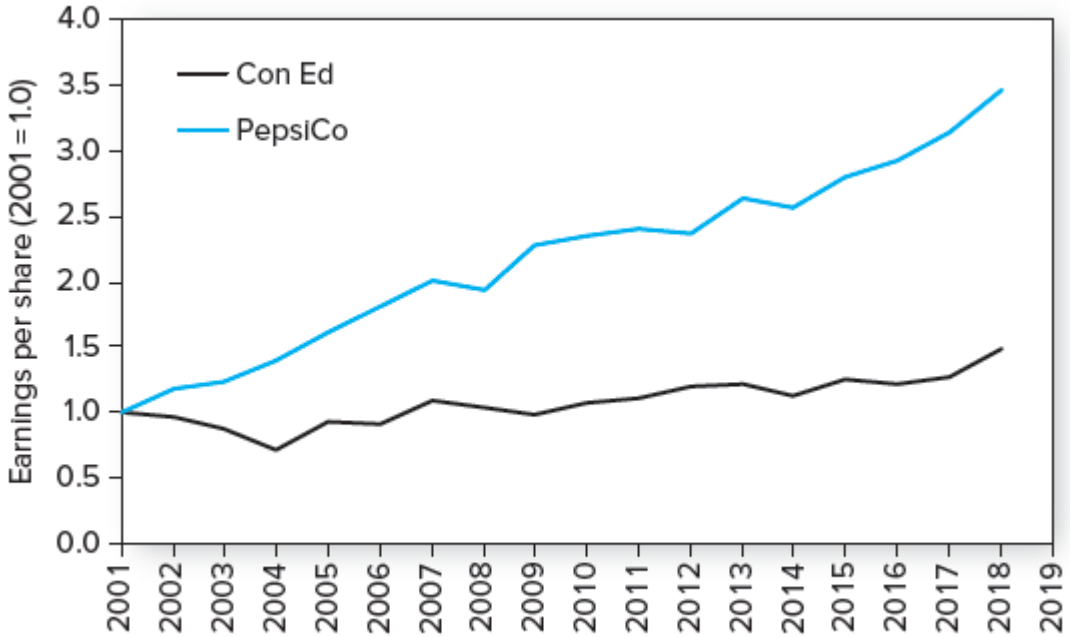
- Denominator in the P/E ratio is accounting earnings, which are influenced somewhat by arbitrary accounting rules
  - **Earnings management**
  - Choices on GAAP
- Inflation
- Reported earnings fluctuate around the business cycle

P/E Ratios of the S&P 500 Index and Inflation



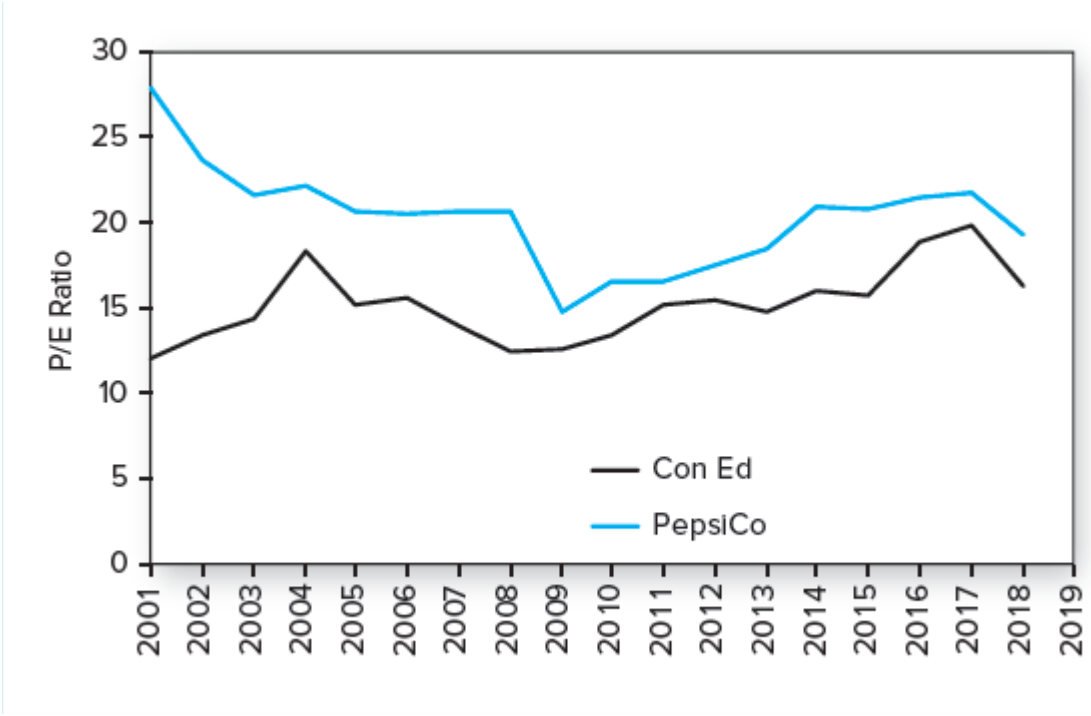
- **Figure 18.3** P/E ratio of the S&P 500 versus inflation rate, 1955 to 2018.

Earnings Growth for Two Companies



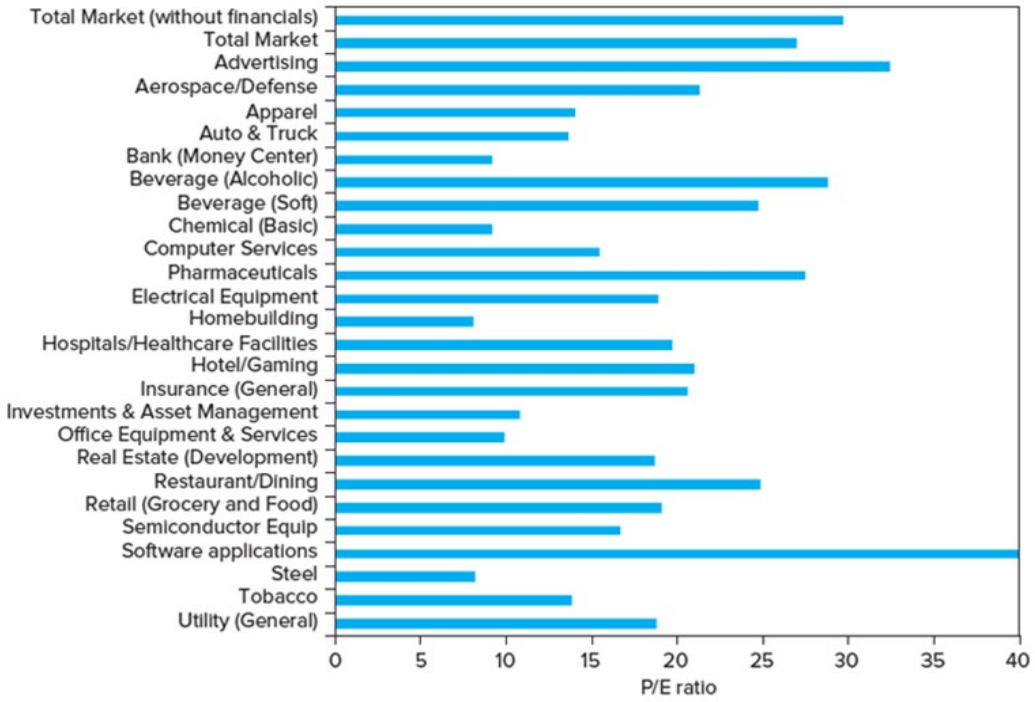
- **Figure 18.4** Earnings growth for two companies

Price-Earnings Ratios



- **Figure 18.5** Price–earnings ratios

P/E Ratios for Different Industries



- **Figure 18.6** P/E ratios for different industries

- Source: Website of Prof. Aswath Damodaran, **pages.stern.nyu.edu/~adamodar/,** February 27, 2019.

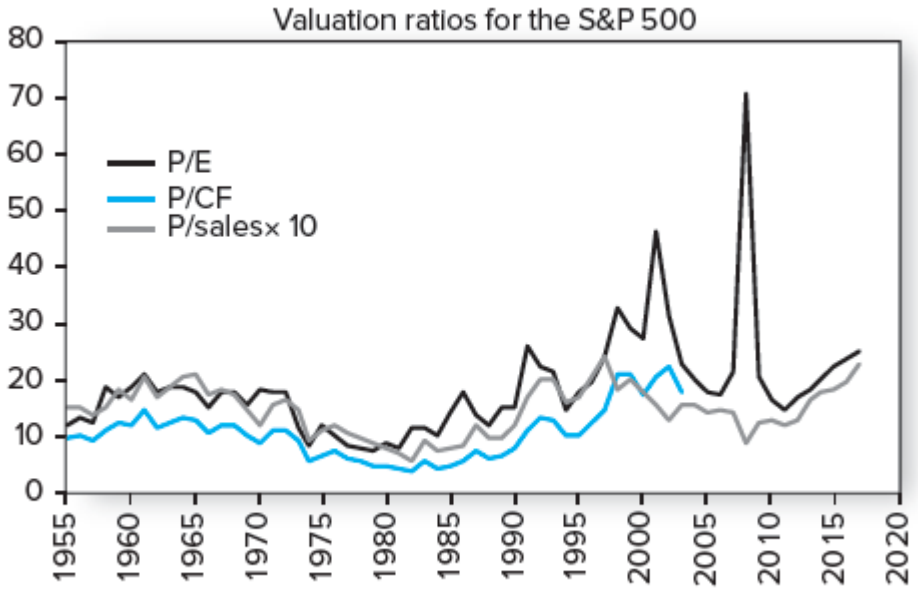
CAPE models

- Cyclically adjusted P/E ratio
  - Shiller suggests a “cyclically adjusted” P/E ratio (CAPE) to avoid the problems associated with using P/E ratios over different phases of the business cycle
  - Idea is to divide the stock price by an estimate of sustainable long-term earnings rather than current earnings
  - Proposed using average inflation-adjusted earnings over an extended period, such as 10 years

Other Comparative Valuation Ratios

- Price-to-book ratio
  - Ratio of price per share divided by book value per share
- Price-to-cash-flow ratio
  - Cash flow is less affected by accounting decisions than are earnings
  - Ratio of price to cash flow per share
- Price-to-sales ratio
  - Useful for start-up firms that do not have earnings
  - Ratio of stock price to the annual sales per share

Market Valuation Statistics



- **Figure 18.8** Valuation ratios for the S&P 500

Free Cash Flow for the Firm (FCFF) [1]

1. Discount the FCFF at the weighted-average cost of capital to find the value of entire firm
   - Free cash flow to the firm, FCFF, is the after-tax cash flow generated by the firm's operations, net of investments in fixed as well as working capital
2. Subtracting the value of debt results in the value of equity

$$FCFF = EBIT \times (1-t) + Depreciation - Cap.Exp. - \Delta NWC$$

Free Cash Flow for the Firm (FCFF) 2

- Value of the Firm

$$Firm\,Value = \sum_{t=1}^{T} \frac{FCFF_t}{(1+WACC)^t} + \frac{V_t}{(1+WACC)^T}$$

- Where

$$V_t = \frac{FCFF_{T+1}}{WACC - g}$$

Free Cash Flow to Equityholders (FCFE) 1

- Alternative approach is to focus on FCFE, discounting those directly at the cost of equity to obtain the market value of equity
- Free cash flow to equityholders, FCFE
  - Differs from FCFF by after-tax expenditures, as well as by cash flow associated with net issuance or repurchase of debt

$$FCFE = FCFF - Interest \times (1 - t) + \Delta Debt$$

Free Cash Flow to Equityholders (FCFE) 2

- Intrinsic value of equity

$$Intrinsic\,Value\,of\;Equity = \sum_{t=1}^{T} \frac{FCFE_t}{(1+k_E)^t} + \frac{E_T}{(1+k_E)^T}$$

- Where

$$E_T = \frac{FCFE_{T+1}}{k_E - g}$$

Comparing the Valuation Models

- In practice
  - Values from the FCF and DDM models may differ
  - Analysts are always forced to make simplifying assumptions
- Problems with DCF Models
  - Calculations are sensitive to small changes in inputs
  - Growth opportunities and growth rates are hard to pin down

The Aggregate Stock Market

- Most popular approach to valuing the overall stock market is the earnings multiplier approach applied at the aggregate level
- Some analysts use aggregate version of DDM rather than an earnings multiplier approach
- S&P 500 taken as leading economic indicator

Earnings Yield, S&P 500 vs. 10-Year Treasury Bond

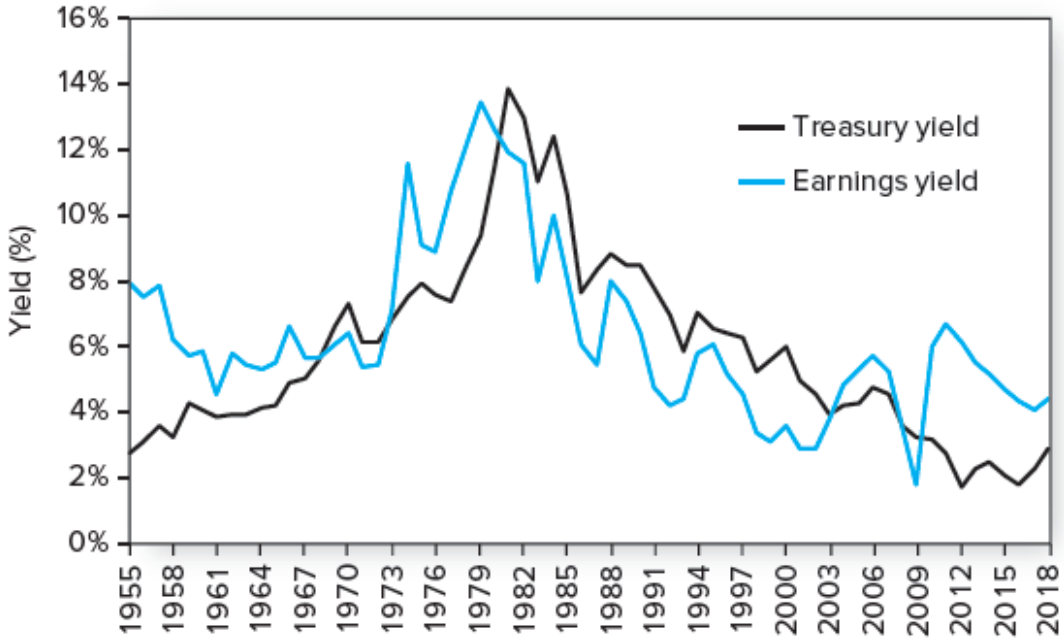


Figure 18.9 Earnings yield of S&P 500 versus 10-year Treasury-bond yield

S&P 500 Index Forecasts Under Various Scenarios

Table 18.4 S&P 500 index forecasts under various interest-rate scenarios

	Pessimistic Scenario	Most Likely Scenario	Optimistic Scenario
Treasury bond yield	3.40%	2.90%	2.40%
Earnings yield	5.70%	5.20%	4.70%
Resulting P/E ratio	17.54	19.23	21.28
EPS forecast	$154.67	$154.67	$154.67
Forecast for S&P 500	2,714	2,974	3,291

Forecast for the earnings yield on the S&P 500 equals Treasury bond yield plus 2.3%. The P/E ratio is the reciprocal of the forecast earnings yield.