

Chapter Eighteen

Equity Valuation Models

Valuation: Fundamental Analysis

- Fundamental analysis models a company's value by assessing its current and future profitability.
- The purpose of fundamental analysis is to identify mispriced stocks relative to some measure of “true” value derived from financial data. [See the type of traders slide.](#)

Valuation Methods

➤ Valuation by comparables

- Price/Earning Ratios
- Balance Sheet Models
 - ✓ Book Value

<https://finance.yahoo.com/quote/CSCO/financials/>

http://csimarket.com/Industry/Industry_Valuation.php?s=1100

➤ Expected Returns vs. Required Return

- CAPM

➤ Intrinsic Value vs. Market price

Book Value, Liquidation Value, and Tobin's q

- Book values are based on historical cost, not actual market values.
- It is possible, but uncommon, for market value to be less than book value.
- “Floor” or minimum value is the liquidation value per share.
- Tobin's q is the ratio of market price to replacement cost.

Holding Period Return

- The return on a stock is composed of 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, based on the stock's risk.

Required Return

- CAPM gives the required return, k :

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

- If the stock is priced correctly, k should equal the expected HPR.
- k is the market capitalization rate.

Expected HPR vs. Required Return

- k is the required return given stock's risk (beta)
- $E(r)$ is the return you'll get if you buy the stock at its market price (i.e., consensus value of all market participants)

Trading Signal:

$E(r) > k$ Buy

$E(r) < k$ Sell or Short Sell

$E(r) = k$ Hold or Fairly Priced

Example

Suppose

$$E(D_1) = \$2, E(P_1) = \$42, P_0 = \$38$$

$$r_f = 3\%, E(r_m) = 8\%, \text{beta} = 1.5$$

Expected HPR = $E(r)$

$$= [2 + (42 - 38)]/38 = 15.79\%$$

$$k = 3 + (8 - 3)1.5 = 10.5\%$$

Because $E(r) > k$, BUY!

How much would you pay for the stock?

Intrinsic Value and Market Price

- The intrinsic value (IV) is the “true” value, according to a model.
- The market value ($MV = P_0$) is the consensus value of all market participants

Trading Signal:

$IV > MV$ Buy

$IV < MV$ Sell or Short Sell

$IV = MV$ Hold or Fairly Priced

Example

Suppose

$$E(D_1) = \$2, E(P_1) = \$42, P_0 = \$38$$

$$r_f = 3\%, E(r_m) = 8\%, \text{beta} = 1.5$$

$$k = 3 + (8 - 3)1.5 = 10.5\%$$

$$IV = [E(D_1) + E(P_1)] / (1 + k)$$

$$= (2 + 42) / (1 + 0.105) = 44 / 1.105 = \$39.82$$

Because $IV > MV(P_0)$, BUY!

Dividend Discount Models (DDM)

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

- V_0 = Intrinsic value; D_t = dividend at time t ; k = required rate of return
- The DDM says the stock price should equal the present value of all expected future dividends into perpetuity.

Constant Growth DDM

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

V_0 = intrinsic value (IV) estimate
 k = risk-adjusted required return
(from CAPM)
 g = dividend growth rate

Example 18.1 Preferred Stock and the DDM

- No growth case
- Value a preferred stock paying a fixed dividend of \$2 per share when the discount rate is 8%:

$$V_0 = \frac{\$2}{0.08 - 0} = \$25$$

Example 18.2 Constant Growth DDM

- A stock just paid an annual dividend of \$3/share. The dividend is expected to grow at 8% indefinitely, and the market capitalization rate (from CAPM) is 14%.

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

Same decision whether we use returns or values!

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

where k is the required return.

You may use CAPM to determine k , i.e., $k = r_f + \beta[E(r_M) - r_f]$

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

Expected return: $E(r) = D_1/P_0 + g$

If $V_0 > P_0$, then $E(r) > k \rightarrow$ Buy

If $V_0 < P_0$, then $E(r) < k \rightarrow$ Sell

- If $P_0 = 45$, $E(r) = D_1/P_0 + g = 3.24/45 + 0.08 = 0.152$
- If $k = 14\%$, $V_0 = 3.24 / (0.14 - 0.08) = \54

Hence, $V_0 > P_0$ and $E(r) > k$

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.

Estimating Dividend Growth Rates

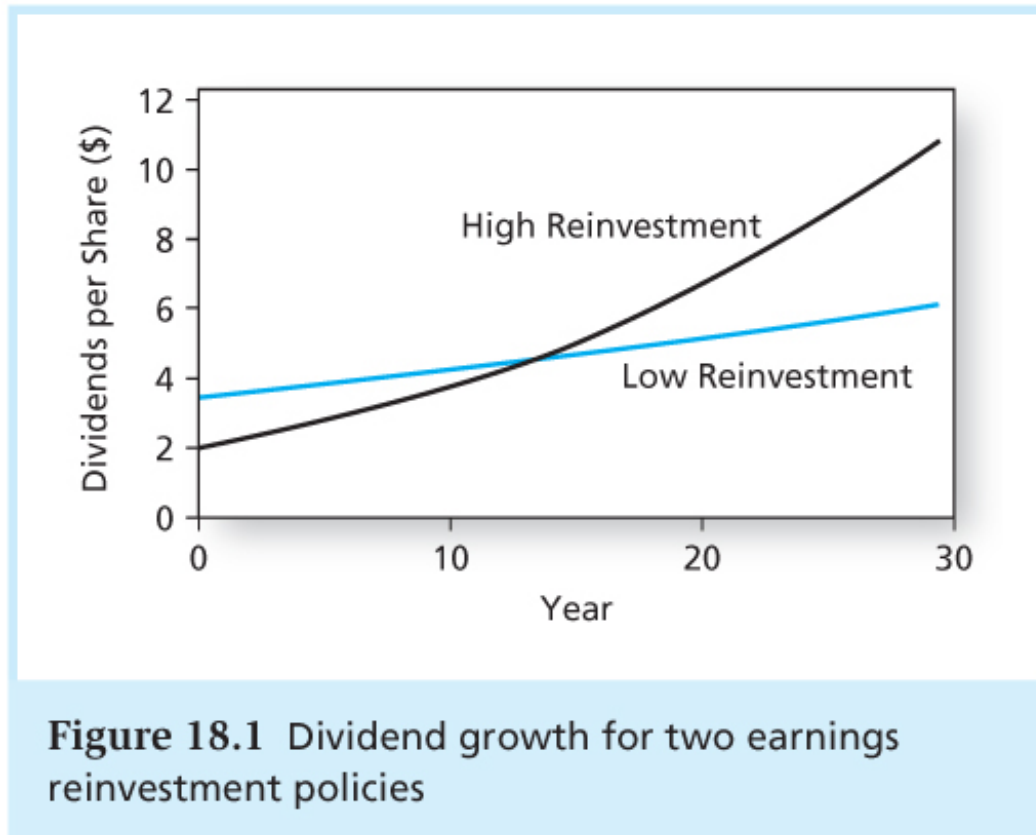
$$g = ROE \times b$$

g = growth rate in dividends

ROE = Return on Equity for the firm

b = plowback or retention percentage rate
(1- dividend payout percentage rate)

Figure 18.1 Dividend Growth for Two Earnings Reinvestment Policies



Present Value of Growth Opportunities

- The value of the firm equals the value of the assets already in place, the **no-growth value of the firm**,
- **Plus** the NPV of its future investments,
- Which is called the **present value of growth opportunities** or **PVGO**.

Present Value of Growth Opportunities

- Price = No-growth value per share + PVGO

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

Table 18.2 Financial Ratios in Two Industries

	Ticker	Return on Capital (%)	Payout Ratio (%)	Growth Rate 2022 to 2025 (%)
Computer Software				
Adobe Systems	ADBE	21.0	0.0	15.0
Citrix	CTXS	22.0	22.0	12.3
Cognizant	CTSH	17.0	25.0	9.7
Intuit	INTU	19.5	25.0	14.5
Microsoft	MSFT	32.5	28.0	11.4
Oracle	ORCL	20.5	25.0	12.2
Norton LifeLock	NLOK	24.5	37.0	7.9
SAP	SAP	<u>17.0</u>	<u>32.0</u>	<u>11.5</u>
<i>Median</i>		20.8	25.0	11.9
Electric Utilities (East Coast)				
Dominion Resources	D	6.0	68.0	5.0
Consolidated Edison	ED	5.0	64.0	4.5
Duke Energy	DUK	5.5	66.0	6.0
Eversource	ES	5.5	63.0	5.8
First Energy	FE	7.0	57.0	6.4
Nextera Energy	NEE	6.5	70.0	9.7
Public Service Enterprise	PEG	6.0	57.0	9.7
Southern Company	SO	6.5	70.0	5.2
Exelon	EXC	<u>5.5</u>	<u>53.0</u>	<u>6.7</u>
<i>Median</i>		6.0	64.0	6.0

Source: Value Line Investment Sun/ey, 2021. Reprinted with permission of Value Line Investment Survey. © 2021 Value Line Publishing, Inc. All rights reserved.

Example 18.4 Growth Opportunities

- Firm reinvests 60% of its earnings in projects with ROE of 10%, capitalization rate is 15%. Expected year-end dividend is \$2/share, paid out of earnings of \$5/share.
- $g = \text{ROE} \times b = 10\% \times .6 = 6\%$

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

Example 18.4 Growth Opportunities

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

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

$$PVGO = \$22.22 - \frac{\$5}{.15} = -\$11.11$$

Life Cycles and Multistage Growth Models

- Expected dividends for Honda:
2013 \$.78 2015 \$.92
2014 \$.85 2016 \$1.00
- Since the dividend payout ratio is 25% and ROE is 10%, the “steady-state” growth rate is 7.5%.

Honda Example

- Honda's beta is 0.95 and the risk-free rate is 2%. If the market risk premium is 8%, then k is:
- $k = 2\% + 0.95(8\%) = 9.6\%$
- Therefore:

$$P_{2016} = \frac{D_{2017}}{k - g} = \frac{D_{2016}(1 + g)}{k - g} = \frac{\$1(1.075)}{0.096 - 0.075} = \$51.19$$

Honda Example

- Finally,

$$V_{2012} = \frac{\$0.78}{1.096} + \frac{\$0.85}{1.096^2} + \frac{\$0.92}{1.096^3} + \frac{\$1 + \$51.19}{1.096^4}$$
$$= 38.23$$

- In 2012, one share of Honda Motor Company Stock was worth \$38.23.

Two Approaches to Valuation

- Investment opportunities model
- Dividend discount model

P/E Ratio and PVGO: Investment Opportunities Model

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

$$\begin{aligned} P_0/E_1 &= (1/k) + (PVGO/E_1) \\ &= 1/k [1 + PVGO/(E_1/k)] \end{aligned}$$

$PVGO/(E_1/k)$ is the ratio of firm value due to growth opportunities to **value due to assets already in place** (VAIP) (i.e., E_1/k).

P/E Ratio and Growth Opportunities

- When $PVGO=0$, $P_0=E_1/k$. The stock is valued like a nongrowing perpetuity.
- P/E rises dramatically with PVGO.
- High P/E indicates that the firm has ample growth opportunities.

P/E ratio vs. MV/BV ratio

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

$$P_0/E_1 = (1/k) + (PVGO/E_1)$$

$$= 1/k [1 + PVGO/(E_1/k)]$$

$$= 1/k [1 + PVGO/VAIP]$$

$$= 1/k [(VAIP + PVGO)/VAIP]$$

$$= 1/k [MV/BV] \text{ because } VAIP \approx BV$$

Hence, $P_0/E_1 = 1/k [MV/BV]$. Firms with higher MV/BV ratios have higher P/E ratios.

P/E Ratio: Dividend Discount Model

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

In equilibrium, $V_0 = P_0$.

$$P_0 = D_1/(k-g) = (1-b)E_1/(k-g)$$

$$P_0/E_1 = (1-b)/(k-g) = (1-b)/(k - ROE \times b)$$

Determinants of P/E Ratios

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

- P/E ratio increases with ROE. Hence, **profitable firms have high P/E ratios.**
- P/E ratio decreases with k. Because k increases with risk, P/E ratio decreases with risk, i.e., **riskier firms have lower P/E ratios.**

Relation between P/E Ratio and Retention Rate (b)

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

If we differentiate P/E with respect to b, we obtain:

$$d(P/E)/db = (ROE - k) / (k - ROE \times b)^2$$

Hence, $d(P/E)/db > 0$ if $ROE > k$ (a)

$d(P/E)/db < 0$ if $ROE < k$ (b)

(a) indicates that P/E ratio increases with the retention rate for firms with positive NPV projects (i.e., profitable firms, i.e., $ROE > k$).

(b) indicates that P/E ratio decreases with the retention rate for firms with negative NPV projects (i.e., non-profitable firms, i.e., $ROE < k$).

Table 18.3 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 Rate (<i>b</i>)			
	0	.25	.50	.75
ROE	A. Growth rate, <i>g</i>			
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			
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: The growth rate is 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.”

Quote from Peter Lynch in *One Up on Wall Street*.

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
- Negative earnings
- Inflation
- Reported earnings fluctuate around the business cycle

Figure 18.3 P/E Ratios of the S&P 500 Index and Inflation

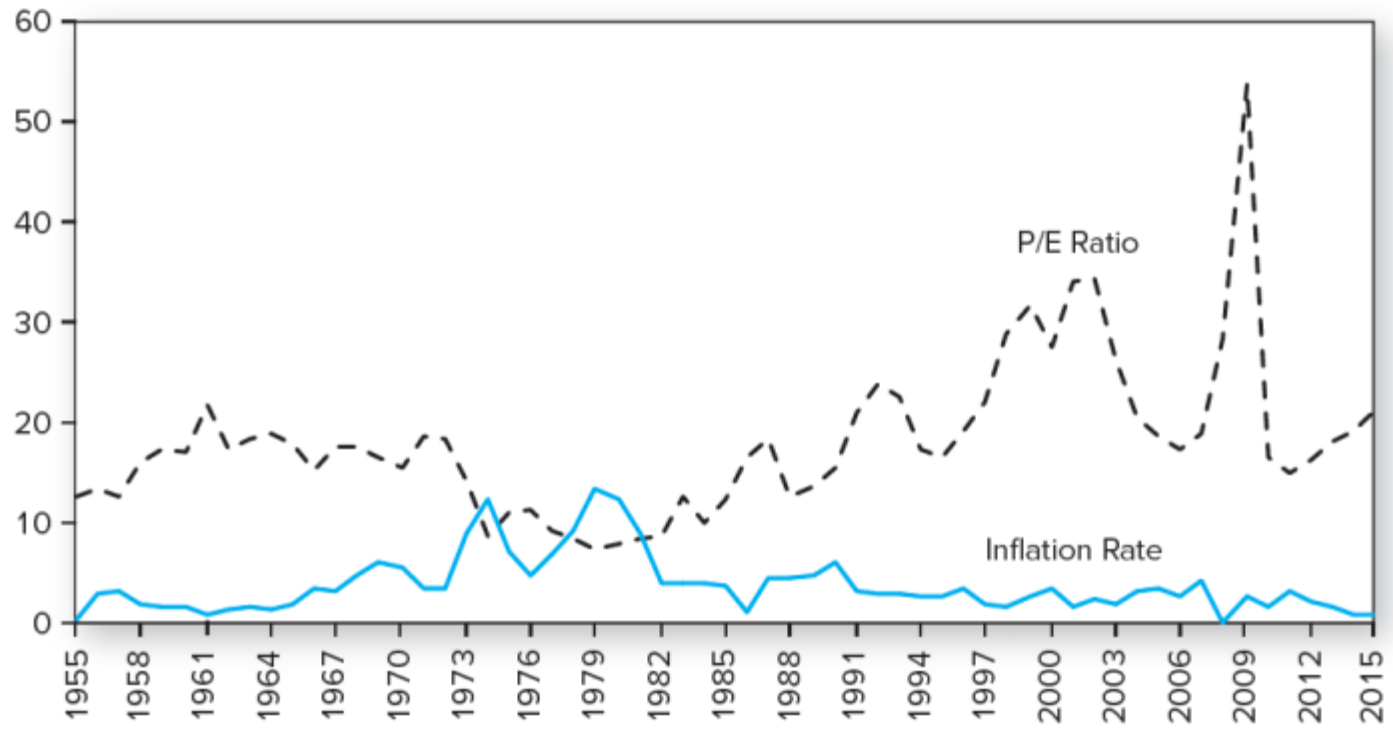
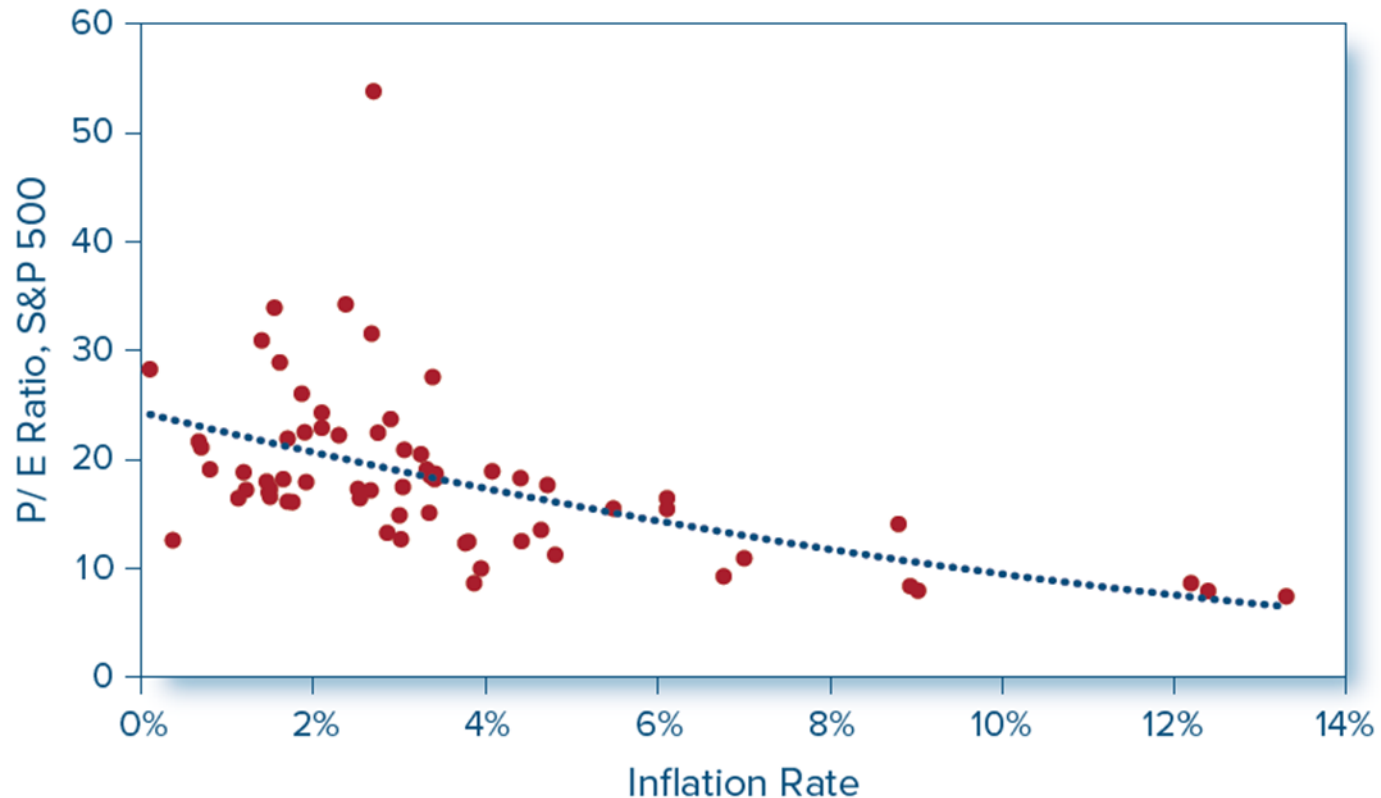


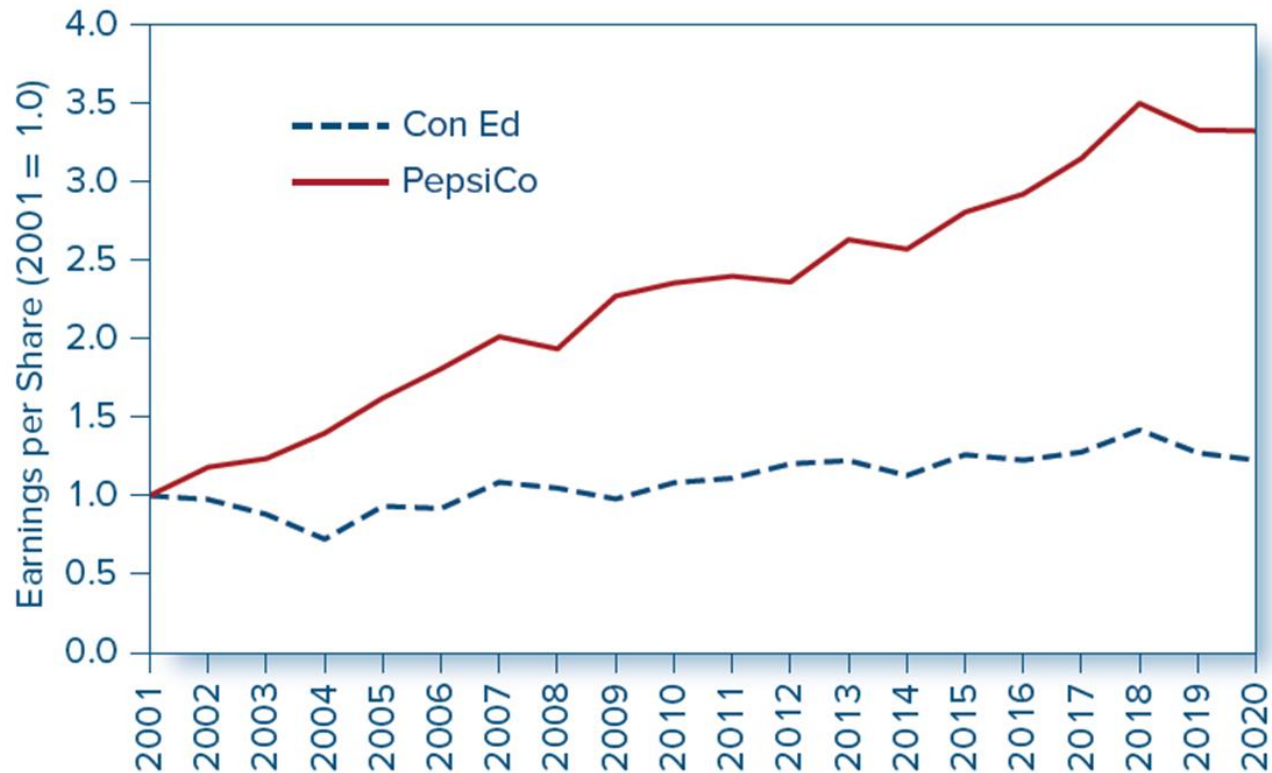
Figure 18.3 P/E ratios of the S&P 500 Index and inflation

Figure 18.3 *P/E* Ratios of the S&P 500 Index and Inflation, 1955 to 2020



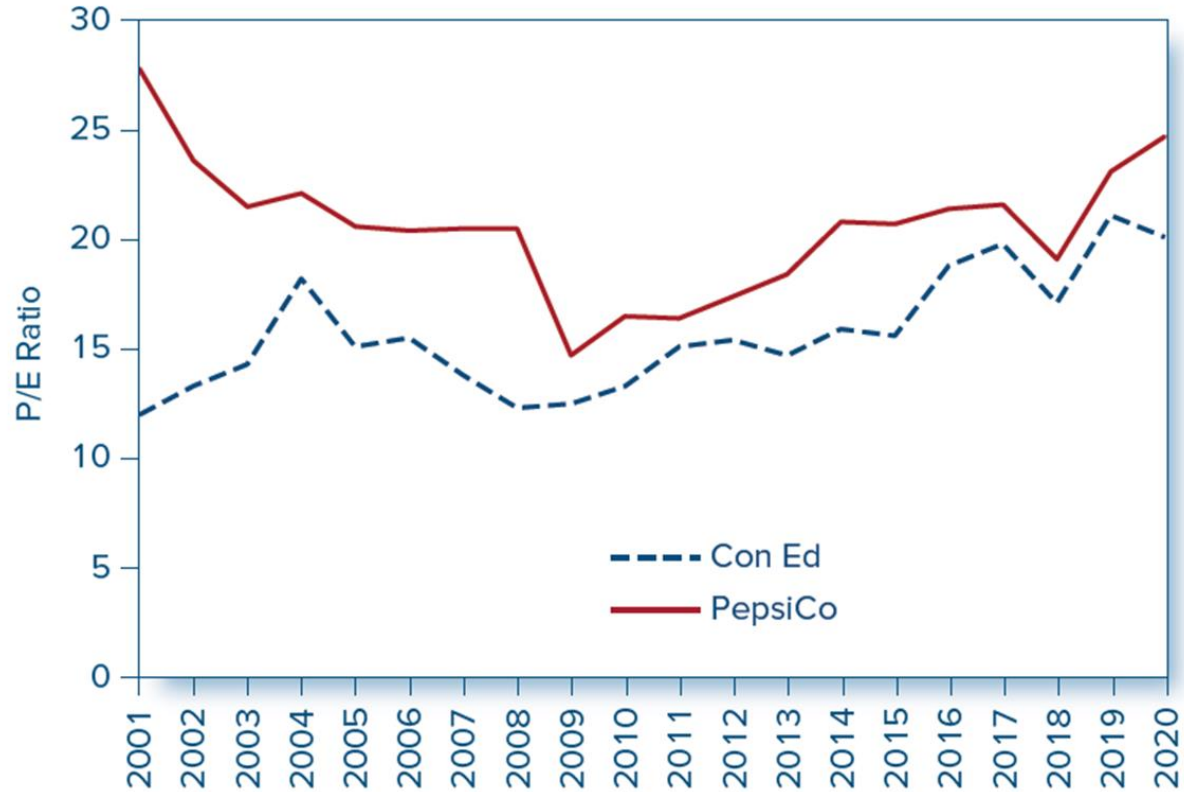
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Figure 18.4 Earnings Growth for Two Companies



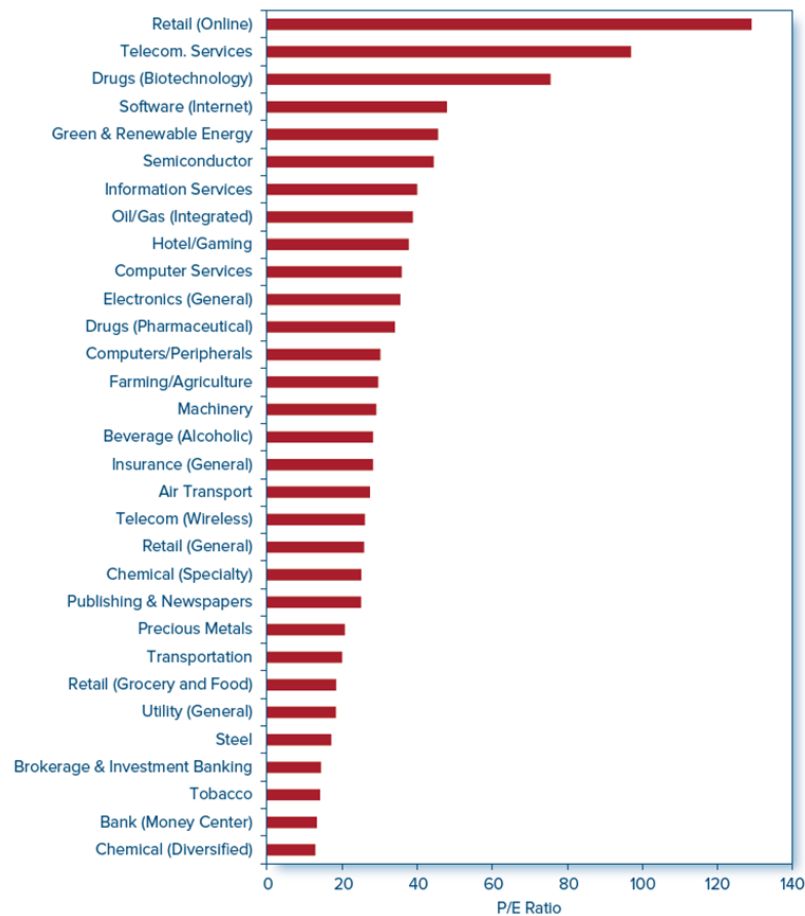
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Figure 18.5 Price–Earnings Ratios



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Figure 18.6 *P/E* Ratios for Different Industries

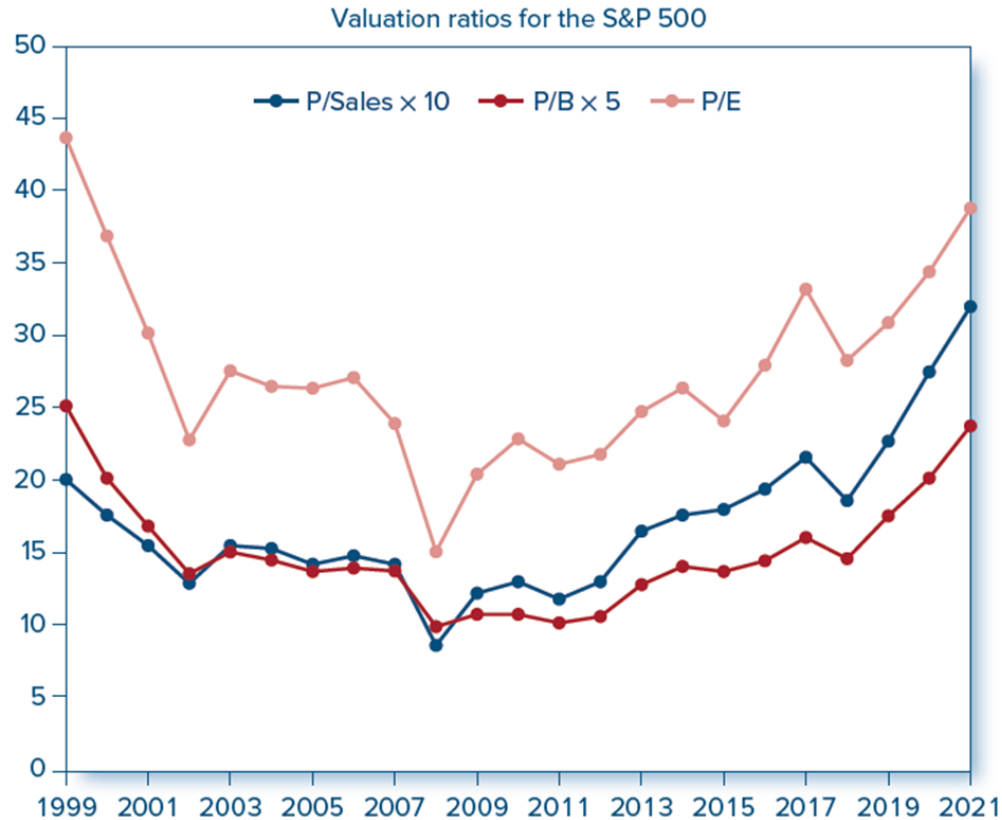


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Other Comparative Valuation Ratios

- 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

Figure 18.8 Valuation Ratios for the S&P 500



Source: Shiller, R. J. (2015). *Irrational Exuberance*, 3rd edition. Princeton University Press. updated data downloaded from www.murtpl.com.

[Access the text alternative for slide images.](#)

Free Cash Flow Approach

- Value the firm by discounting free cash flow at WACC.
- Free cash flow to the firm, FCFF, equals:
 - After tax EBIT
 - Plus depreciation
 - Minus capital expenditures
 - Minus increase in net working capital

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

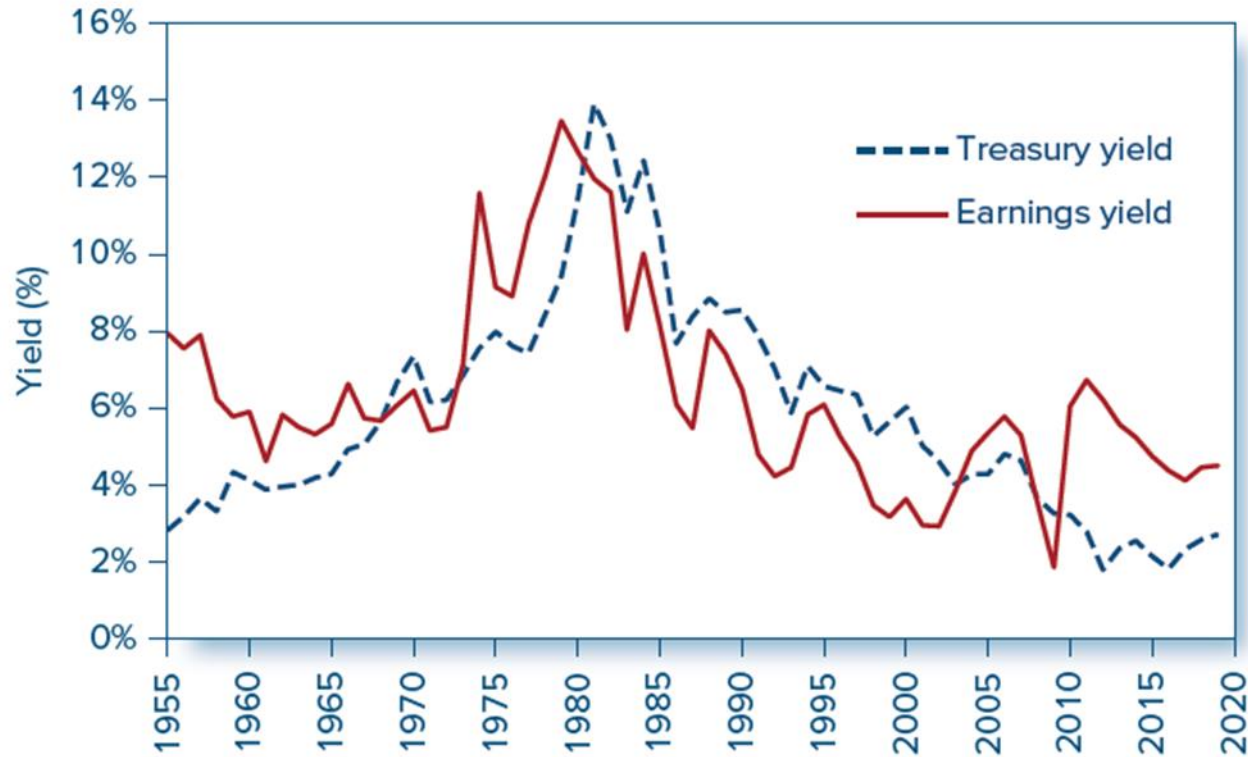
Comparing the Valuation Models: Toyota

Model	Intrinsic Value
Two-stage dividend discount model	\$140.41
DDM with earnings multiple terminal value	158.38
Three-stage DDM	157.00
Free cash flow to the firm	137.87
Free cash flow to equity	128.56
Market price (from Value Line)	152.23

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

Figure 18.9 Earnings Yield, S&P 500 Versus 10-Year Treasury Bond



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Table 18.4 S&P 500 Index Forecasts Under Various Scenarios

	Pessimistic Scenario	Most Likely Scenario	Optimistic Scenario
Treasury bond yield	2.25%	1.75%	1.25%
Earnings yield	4.25%	3.75%	3.25%
Resulting <i>P/E</i> ratio	23.53	26.67	30.77
EPS forecast	\$196.36	\$196.36	\$196.36
Forecast for S&P 500	4,620	5,236	6,042

Forecast for the earnings yield on the S&P 500 equals Treasury bond yield plus 2.0%. The *P/E* ratio is the reciprocal of the forecast earnings yield.

Figure 11.3 Prices Fluctuate Around Intrinsic Value

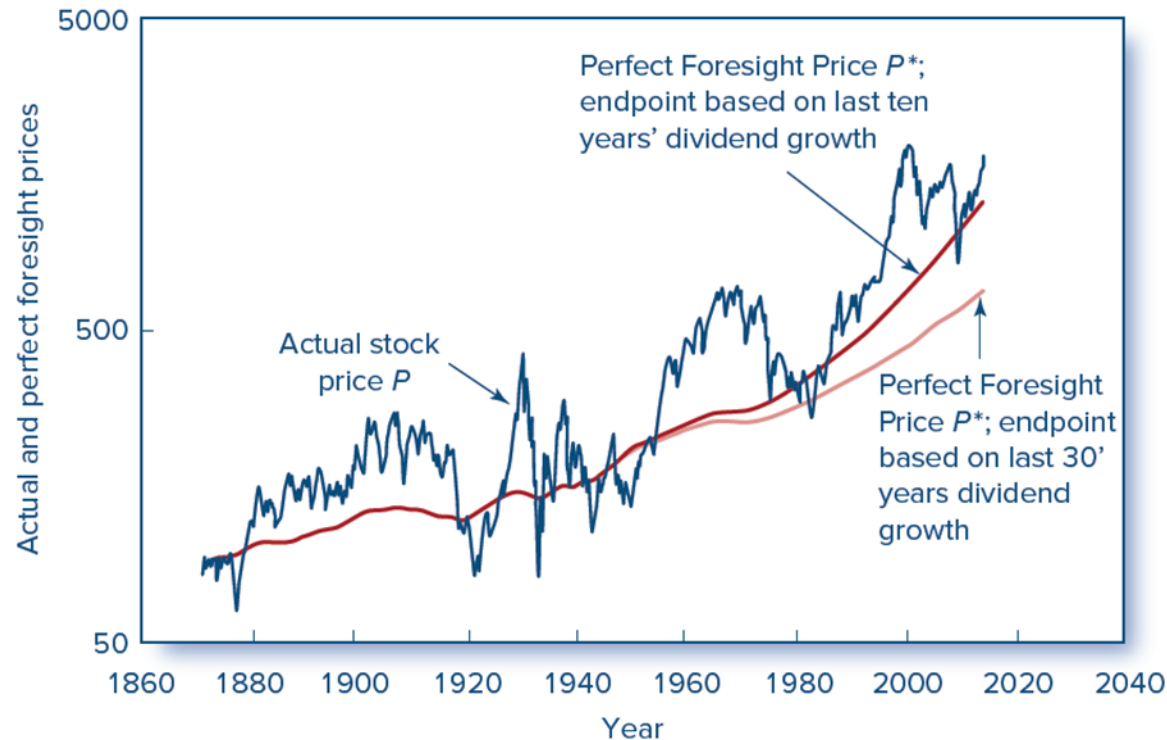


Figure 11.3 Real (inflation-adjusted) value of S&P50 and two estimates of intrinsic value obtained by discounting future dividends plus terminal value in 2013 based on a constant-growth dividend discount model. Discount rate equals 7.6%, the historical average real market return since 1871.

Source: Shiller, R. J. Speculative asset prices, revision of 2013 Nobel Prize Lecture, available at www.nobelprize.org/uploads/2018/06/shiller-lecture.pdf.

[Access the text alternative for slide images.](#)

Robert Shiller's Model

$$\begin{aligned} P &= \sum E(D_t)/(1+k)^t \\ &= E[\sum D_t/(1+k)^t] \\ &= E[P^*] \end{aligned}$$

where $P^* = \sum D_t/(1+k)^t$

Variance (P) < Variance (P^*): Theory

Variance (P) > Variance (P^*): Data