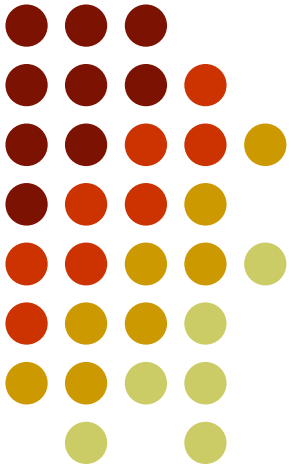
Stock Valuation

Chapter 7



Outline

- How common stocks are traded
- Valuation of common stock
- Stock price and earnings per share
- Alternative valuation techniques: multiplier models
- References: BF Chap 11; PF Chap 10

How Common Stocks Are Traded

- Primary Market
  - New securities
- Secondary Market
  - Previously-issued securities
- Common Stock
  - Ownership shares in publicly-held corporation

Valuation of Common Stock

- Book value
  - Net worth of firm according to balance sheet
- Dividend
  - Periodic cash distribution from firm to the shareholders
- P/E ratio
  - Price per share divided by earnings per share

Common Stock Valuation

- Discounted cash flow (DCF) formula
  - Value of a stock = present value of future cash flows

$$\text{PV(stock)} = \text{PV(expected future dividends)}$$

Common Stock Valuation

- Expected return
  - Percentage yield forecast from specific investment over time period
  - Sometimes called market capitalization rate, or cost of equity capital

$$\text{Expected return} = r = \frac{Div_1 + P_1 - P_0}{P_0}$$

Common Stock Valuation

- Example
  - Fledgling Electronics sells for $100 per share today; they are expected to sell for $110 in one year. What is expected return if dividend in one year is forecasted to be $5.00?

$$\text{Expected return} = \frac{5 + 110 - 100}{100} = .15$$

Common Stock Valuation

- Price of share of stock is present value of future cash flows
- For a stock, future cash flows are dividends and ultimate sales price

$$\text{Price} = P_0 = \frac{Div_1 + P_1}{1 + r}$$

Common Stock Valuation

- Example
  - Fledgling Electronics price

$$\text{Price} = P_0 = \frac{5 + 110}{1.15} = 100$$

Common Stock Valuation

- Dividend Discount Model
  - Computation of today's stock price: share value equals present value of all expected future dividends
    - H: Time horizon for investment

$$P_0 = \frac{Div_1}{(1+r)^1} + \frac{Div_2}{(1+r)^2} + \ldots + \frac{Div_H + P_H}{(1+r)^H}$$

$$P_0 = \sum_{t=1}^{H} \frac{Div_t}{(1+r)^t} + \frac{P_H}{(1+r)^H}$$

Dividend Discount Model

- Example
  - Fledgling Electronics forecasted to pay $5.00 dividend at end of year 1 and $5.50 dividend at end of year 2. End-of-second-year stock will be sold for $121. Discount rate is 15%. What is the price of stock?

$$PV = \frac{5.00}{(1+.15)^1} + \frac{5.50+121}{(1+.15)^2}$$

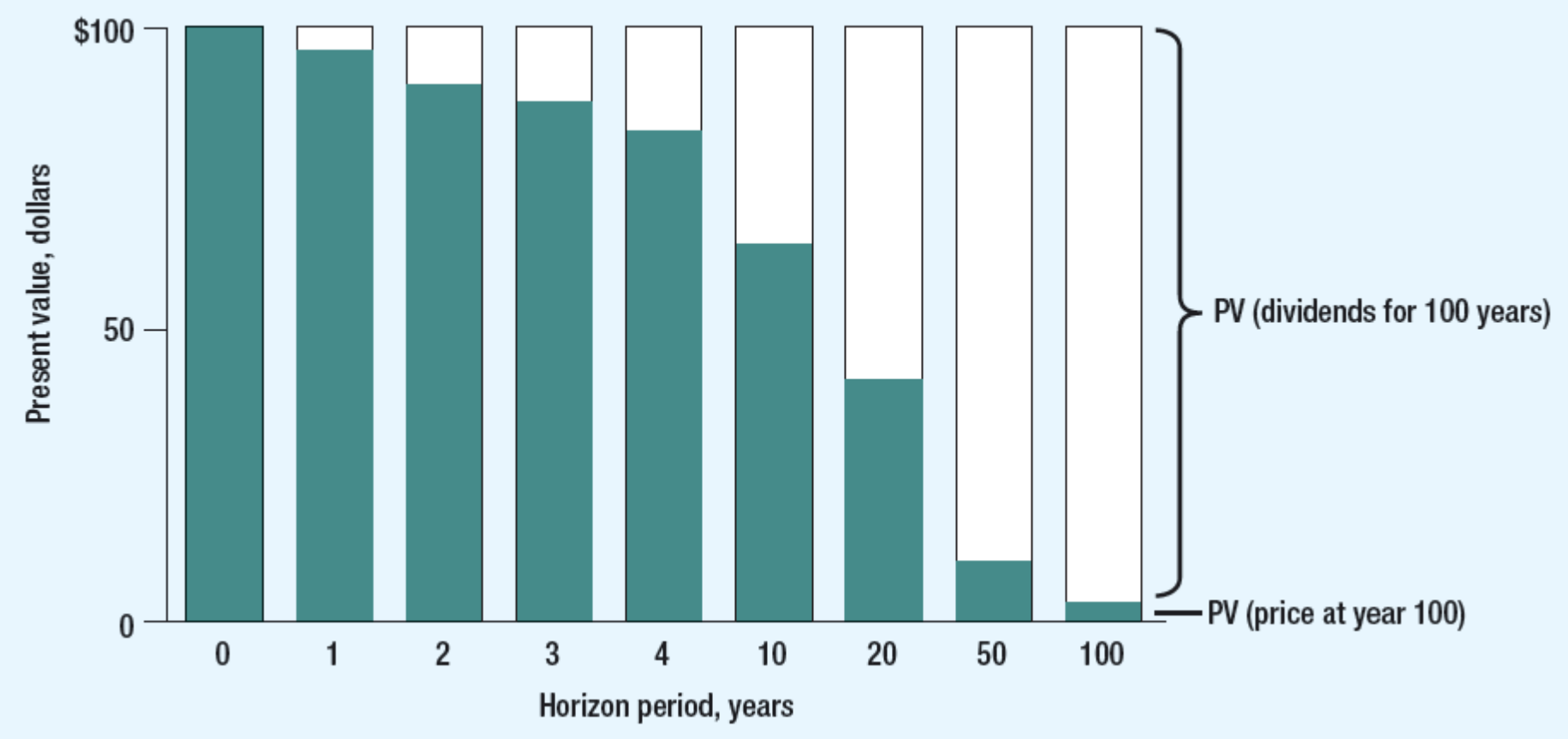
$$PV = \$100.00$$

Dividend Discount Model

- Assumptions:
  - Dividends increase at 10% per year, compounded.
  - Expected price increases at the same rate each year.
  - Capitalization rate is 15%.

	Expected Future Values		Present Values		
Horizon Period (H)	Dividend (DIV_t)	Price (P_t)	Cumulative Dividends	Future Price	Total
0	—	100	—	—	100
1	5.00	110	4.35	95.65	100
2	5.50	121	8.51	91.49	100
3	6.05	133.10	12.48	87.52	100
4	6.66	146.41	16.29	83.71	100
10	11.79	259.37	35.89	64.11	100
20	30.58	672.75	58.89	41.11	100
50	533.59	11,739.09	89.17	10.83	100
100	62,639.15	1,378,061.23	98.83	1.17	100

Dividend Discount Model



Dividend Discount Model

- We can forget about the terminal price entirely and express today's price as the present value of a perpetual stream of cash dividends.

$$P_0 = \sum_{t=1}^{\infty} \frac{Div_t}{(1+r)^t}$$

Common Stock Valuation

- Constant growth
  - Growth that is expected to continue into the foreseeable future at about the same rate as that of the economy as a whole
  - g = constant

Common Stock Valuation

- Constant growth model

$$P_0 = \frac{Div_0(1+g)}{1+r} + \frac{Div_0(1+g)^2}{(1+r)^2} + \cdots + \frac{Div_0(1+g)^\infty}{(1+r)^\infty}$$

$$= \frac{Div_0(1+g)}{r-g} = \frac{Div_1}{r-g}$$

Constant Growth Model

- Cost of equity capital
  - Dividend yield (DIV_1/P_0) plus expected dividend growth

$$\text{Price} = P_0 = \frac{Div_1}{r - g}$$

$$r = \frac{Div_1}{P_0} + g$$

Constant Growth Model

- Cost of equity capital: Example 1
  - Northwest Natural Gas shares sold for $47.30 at start of 2012. Dividend payments for 2013 were $1.86 a share with no growth. What is the cost of equity capital?

$$r = \frac{1.86}{47.30} = .039$$

Constant Growth Model

- Cost of equity capital: Example 2
  - Northwest Natural Gas shares sold for $47.30 at start of 2012. Dividend payments for 2013 were $1.86 a share with 6.1% growth. What is the cost of equity capital?

$$r = \frac{1.86}{47.30} + .061 = .10$$

Constant Growth Model

- Return measurements

$$\text{Dividend yield} = \frac{\text{DIV}_1}{P_0}$$

$$\text{Restated} \quad P_0 = \frac{\text{DIV}_1}{r - g}$$

$$r = \frac{\text{DIV}_1}{P_0} + g$$

$$\text{Return on equity} = \text{ROE}$$

$$\text{ROE} = \frac{\text{EPS}}{\text{book equity per share}}$$

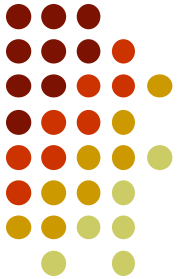
Common Stock Valuation

- DCF models with two stages of growth

$$\text{PV} = \frac{Div_1}{(1+r)^1} + \frac{Div_2}{(1+r)^2} + \ldots + \frac{Div_H}{(1+r)^H} + \frac{P_H}{(1+r)^H}$$

$$P_H = \frac{Div_{H+1}}{r-g}$$

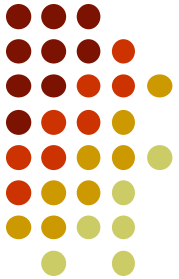
DCF Models with Two Stages of Growth



- Example
  - Phoenix pays dividends in three consecutive years of 0, .31, and .65. Year-4 dividend is estimated at .67 with perpetuity growth at 4%. With 10% discount rate, what is stock price?

$$PV = \frac{0}{(1+.1)^1} + \frac{.31}{(1+.1)^2} + \frac{.65}{(1+.1)^3} + \left[\frac{1}{(1+.1)^3} \times \frac{.67}{(.10-.04)}\right]$$
$$= 9.13$$

Common Stock Valuation

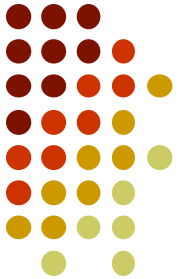


- Risk-adjusted required return
  - Adjustment depends on
    - The risk-free rate (r_f)
    - The return on the market (r_m)
    - The stock's beta
  - $r = r_f + (r_m - r_f)$ beta

Stock Price and Earnings Per Share

- If firm pays lower dividend and reinvests funds, stock price may increase due to higher future dividends
  - Payout ratio
    - Fraction of earnings paid out as dividends
  - Plowback ratio
    - Fraction of earnings retained by firm
  - Plowback ratio = 1 – Payout ratio

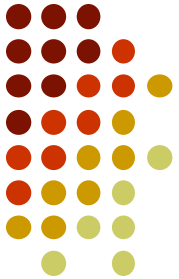
Stock Price and Earnings Per Share



- Dividend growth rate
  - Derived by applying return on equity to percentage of earnings reinvested in operations
    - *g* = return on equity × plowback ratio
    - plowback ratio = 1 – payout ratio

$$= 1 - \frac{\text{DIV}}{\text{EPS}}$$

Stock Price and Earnings Per Share



- Example
  - Company plans $8.33 dividend next year (100% of earnings). Investors will get 15% expected return. Instead, company plows back 40% of earnings at firm's current return on equity of 25%. What is the stock value before and after plowback decision?

No Growth

$$P_0 = \frac{8.33}{.15} = \$55.56$$

With Growth

$$g = .25 \times .40 = .10$$

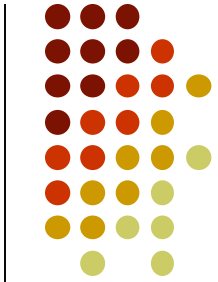
$$P_0 = \frac{5.00}{.15 - .10} = \$100.00$$

Stock Price and Earnings Per Share

- Example, continued
  - Stock price remains at $55.56 with no earnings plowed back
  - With plowback, price is $100.00
  - Difference is called present value of growth opportunities (PVGO)

$$PVGO = 100.00 - 55.56 = \$44.44$$

Stock Price and Earnings Per Share



- Present value of growth opportunities (PVGO)
  - Net present value of firm's future investments

$$PV_0 = \frac{EPS_1}{r} + PVGO$$

Valuing a Business

- Valuing a Business or Project
  - Usually computed as discounted value of free cash flow (FCF) to valuation horizon (H), plus the forecasted value at the horizon, also discounted back to present value.
  - Valuation horizon sometimes called terminal value

$$PV = \frac{FCF_1}{(1+r)^1} + \frac{FCF_2}{(1+r)^2} + \ldots + \frac{FCF_H}{(1+r)^H} + \frac{PV_H}{(1+r)^H}$$

PV (free cash flows) PV (horizon value)

Valuing a Business

- Example
  - Given cash flows for Concatenator Manufacturing Division, calculate PV of near-term cash flows, PV (horizon value), and total value of firm; r = 10%.

	1	2	3	4	5	6	7	8	9	10
Asset value	10.00	11.20	12.54	14.05	15.31	16.69	18.19	19.29	20.44	21.67
Earnings	1.20	1.34	1.51	1.69	1.84	2.00	2.18	2.31	2.45	2.60
Net investment	1.20	1.34	1.51	1.26	1.38	1.50	1.09	1.16	1.23	1.30
Free cash flow (FCF)	0.00	0.00	0.00	0.42	0.46	0.50	1.09	1.16	1.23	1.30
Return on equity (ROE)	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Asset growth rate	0.12	0.12	0.12	0.09	0.09	0.09	0.06	0.06	0.06	0.06
Earnings growth rate	0.12	0.12	0.12	0.09	0.09	0.09	0.06	0.06	0.06	0.06

Valuing a Business

- Example, continued

$$\text{PV(horizon value)} = \frac{1}{(1.1)^6}\left(\frac{1.09}{.10-.06}\right) = 15.4$$

$$\text{PV(FCF)} = \frac{0.42}{(1.1)^4} + \frac{0.46}{(1.1)^5} + \frac{0.50}{(1.1)^6} = 0.9$$

$$\begin{aligned}\text{PV(business)} &= \text{PV(FCF)} + \text{PV(horizon value)} \\ &= 0.9 + 15.4 \\ &= \$16.3\end{aligned}$$

Alternative Valuation Techniques: Multiplier Models

- P/E ratios
- Value = Earnings × P/E ratio
- Example:
  - If earnings = $2.45 and appropriate P/E = 13
  - Value = $2.45 × 13 = $31.85

Weaknesses in P/E Ratios

- Which earnings to use
  - Historical earnings
  - Forecasted earnings
- Determination of the appropriate multiplier

Alternative Multiplier Models

- Price-to-sales ratio
- Price-to-book ratio

Summary

- Common stock valuation
  - Dividend discount model

$$P_0 = \sum_{t=1}^{H} \frac{Div_t}{(1+r)^t} + \frac{P_H}{(1+r)^H}$$

$$P_0 = \sum_{t=1}^{\infty} \frac{Div_t}{(1+r)^t}$$

  - Constant growth model

$$\text{Price} = P_0 = \frac{Div_1}{r-g}$$

Summary

- Common stock valuation
  - DCF models with two stages of growth

$$\text{PV} = \frac{Div_1}{(1+r)^1} + \frac{Div_2}{(1+r)^2} + \ldots + \frac{Div_H}{(1+r)^H} + \frac{P_H}{(1+r)^H}$$

$$P_H = \frac{Div_{H+1}}{r-g}$$

Summary

- Stock price and earnings per share
  - Payout ratio and plowback ratio
  - Plowback ratio = 1 – Payout ratio = $1 - \frac{\text{DIV}}{\text{EPS}}$
  - Dividend growth rate g = ROE × plowback ratio
  - Earnings and growth opportunities

$$PV_0 = \frac{EPS_1}{r} + PVGO$$

Summary

- Alternative valuation techniques: multiplier models
  - Price-to-earnings ratio
  - Price-to-sales ratio
  - Price-to-book ratio