CHAPTER

9

Stock Valuation

Key Concepts and Skills

- Understand how stock prices depend on future dividends and dividend growth
- Be able to compute stock prices using the dividend growth model
- Understand how growth opportunities affect stock values
- Understand valuation comparables
- Understand how stock markets work

Chapter Outline

Valuation Principle

- First Principle:
  - Intrinsic Value (or Fair Price) of a financial security = PV of expected future cash flows over its life discounted at the appropriate rate.
- To value a security, we need to:
  - Estimate future cash flows:
    - Size (how much) and
    - Timing (when)
  - Discount future cash flows at an appropriate rate:
    - The rate should be appropriate to the risk presented by the security.
    - Recall: The Opportunity Cost Principle in determining the appropriate discount rate in PV calculations (Chapter 4).

Intrinsic Value Analysis

- The use of the intrinsic value (fair price) as the benchmark in identifying mispriced stock.
- If market price < intrinsic value, i.e., NPV>0, the stock is underpriced ➔ BUY!
- If market price > intrinsic value, i.e., NPV<0, the stock is overpriced ➔ SELL!

9.1 The PV of Common Stocks

- The value of any asset is the present value of its expected future cash flows.
- Stock ownership produces cash flows from:
  - Dividends
  - Capital Gains
- Valuation of Different Types of Stocks
  - Zero Growth
  - Constant Growth
  - Differential Growth

Case 1: Zero Growth

- Assume that dividends will remain at the same level forever

$$\text{Div}_1 = \text{Div}_2 = \text{Div}_3 = \cdots$$

  - Since future cash flows are constant, the value of a zero growth stock is the present value of a perpetuity:

$$V_0 = \frac{\text{Div}_1}{(1+R)^1} + \frac{\text{Div}_2}{(1+R)^2} + \frac{\text{Div}_3}{(1+R)^3} + \cdots$$

$$V_0 = \frac{\text{Div}}{R}$$

Case 2: Constant Growth

Assume that dividends will grow at a constant rate, g, forever, *i.e.*,

$$\text{Div}_1 = \text{Div}_0(1+g)$$

$$\text{Div}_2 = \text{Div}_1(1+g) = \text{Div}_0(1+g)^2$$

$$\text{Div}_3 = \text{Div}_2(1+g) = \text{Div}_0(1+g)^3$$

Since future cash flows grow at a constant rate forever, the value of a constant growth stock is the present value of a growing perpetuity:

$$V_0 = \frac{\text{Div}_1}{R-g}$$

Constant Growth Example

- Suppose Big D, Inc., just paid a dividend of $.50. It is expected to increase its dividend by 2% per year. If the market requires a return of 15% on assets of this risk level, how much should the stock be selling for?
- $V_0 = .50(1+.02) / (.15 - .02) = \$3.92$

Case 3: Differential Growth

- Assume that dividends will grow at different rates in the foreseeable future and then will grow at a constant rate thereafter.
- To value a Differential Growth Stock, we need to follow this 3-step procedure:
  1. Estimate future dividends in the foreseeable future, i.e., during the FINITE abnormal growth stage, N.
  2. Estimate the future stock price when the stock becomes a Constant Growth Stock at the end of the abnormal growth stage, V_N.
  3. Compute the total present value of the estimated future dividends during the *finite* abnormal growth stage (step 1) and future stock price that captures the value of the infinite series of dividends during the *infinite* normal growth stage (step 2).

Case 3: Differential Growth

- Assume that dividends will grow at rate g_1 for N years and grow at rate g_2 thereafter.

$$\text{Div}_1 = \text{Div}_0(1+g_1)$$

$$\text{Div}_2 = \text{Div}_1(1+g_1) = \text{Div}_0(1+g_1)^2$$

$$\vdots$$

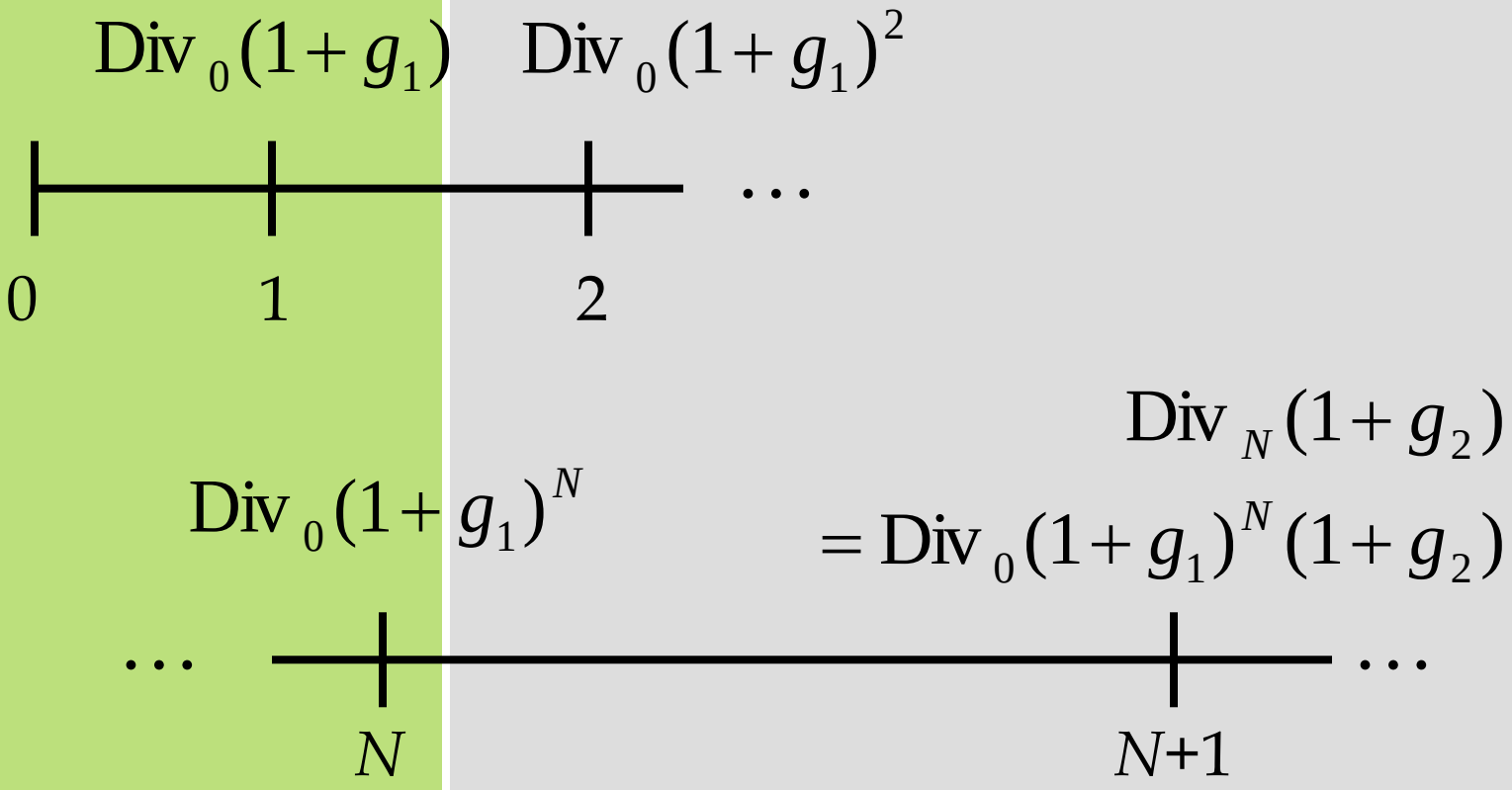
$$\text{Div}_N = \text{Div}_{N-1}(1+g_1) = \text{Div}_0(1+g_1)^N$$

$$\text{Div}_{N+1} = \text{Div}_N(1+g_2) = \text{Div}_0(1+g_1)^N(1+g_2)$$

$$\vdots$$

Case 3: Differential Growth

Dividends will grow at rate g_1 for N years and grow at rate g_2 thereafter



Case 3: Differential Growth

We can value this as the sum of:

- an N-year annuity growing at rate g_1

$$V_N = \frac{C}{R - g_1}\left[1 - \frac{(1+g_1)^N}{(1+R)^N}\right]$$

- plus the discounted value of a perpetuity growing at rate g_2 that starts in year N+1

$$\frac{\left(\frac{\text{Div}_{N+1}}{R - g_2}\right)}{(1+R)^N}$$

Case 3: Differential Growth

Consolidating gives:

$$V_0 = \frac{C}{R - g_1}\left[1 - \frac{(1+g_1)^N}{(1+R)^N}\right] + \frac{\left(\frac{\text{Div}_{N+1}}{R - g_2}\right)}{(1+R)^N}$$

Or, we can “cash flow” it out.

A Differential Growth Example

A common stock just paid a dividend of $2. The dividend is expected to grow at 8% for 3 years, then it will grow at 4% in perpetuity.

What is the stock worth? The discount rate is 12%.

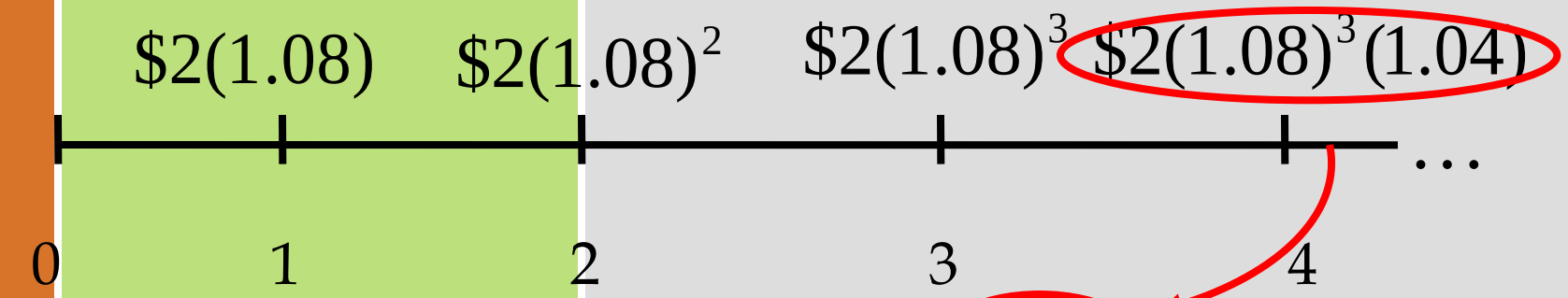
With the Formula

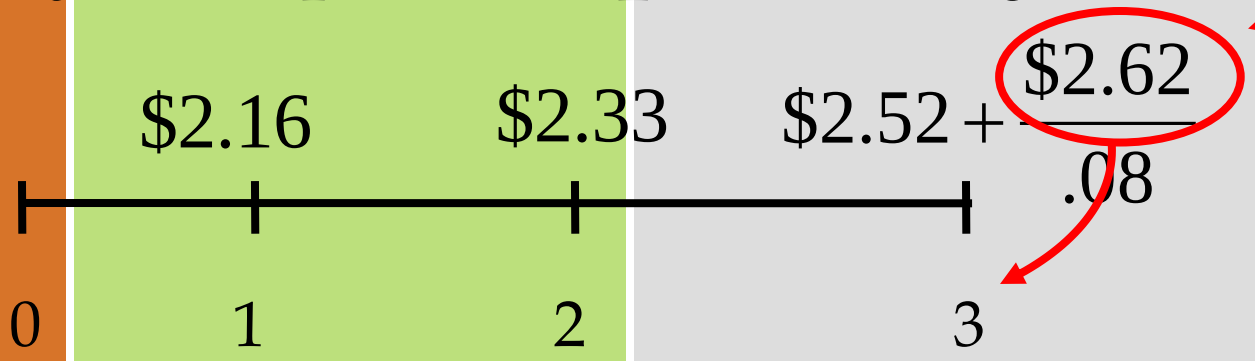
$$V_0 = \frac{\$2 \times (1.08)}{.12 - .08}\left[1 - \frac{(1.08)^3}{(1.12)^3}\right] + \frac{\left(\frac{\$2(1.08)^3(1.04)}{.12 - .04}\right)}{(1.12)^3}$$

$$V_0 = \$54 \times [1 - .8966] + \frac{(\$32.75)}{(1.12)^3}$$

$$V_0 = \$5.58 + \$23.31 \qquad V_0 = \$28.89$$

With Cash Flows





The constant growth phase beginning in year 4 can be valued as a growing perpetuity *at time 3*.

$$V_0 = \frac{\$2.16}{1.12} + \frac{\$2.33}{(1.12)^2} + \frac{\$2.52 + \$32.75}{(1.12)^3} = \$28.89$$

$$V_3 = \frac{\$2.62}{.08} = \$32.75$$

9.2 Estimates of Parameters

- The value of a firm depends upon its growth rate, *g*, and its discount rate, *R*.
  - Where does *g* come from?

    g = Retention ratio × Return on retained earnings

    i.e., g = b * ROE

Other factors being equal,

-- **The higher the growth rate, the higher the intrinsic value.**

-- **The higher the ROE, the higher the intrinsic value.**

-- **However, the impact of the retention ratio on the intrinsic value of a stock is NOT unidirectional! WHY???**

Retention Rate and Firm Value

- An increase in the retention rate (b) will:
  - Reduce the dividend paid to shareholders
  - Increase the firm's growth rate
- These have offsetting influences on stock price

- Which one dominates?
  - If ROE > *R*, then increased retention increases firm value since reinvested capital earns more than the cost of capital, and vice versa.
    - Recall: For independent projects, IRR > R ➔ NPV>0!

Where does *R* come from?

- The discount rate can be broken into two parts.
  - The dividend yield
  - The growth rate (in dividends)
- The discount rate can be estimated according to asset pricing models such as Capital Asset Pricing Model (CAPM); to be introduced later!
- In practice, there is a great deal of estimation error involved in estimating *R*.
- **Other factors being equal, the higher the discount rate, R, the lower the intrinsic value of the stock.**

Using the DGM to Find R

- NOTE - This approach holds only if the stock is fairly priced, and hence E(R)=R!
- Start with the DGM:

$$P_0 = \frac{D_0(1+g)}{R-g} = \frac{D_1}{R-g}$$

Rearrange and solve for R:

$$R = \frac{D_0(1+g)}{P_0} + g = \frac{D_1}{P_0} + g$$

Note: E(R) = dividend yield + capital gains yield!

9.3 Growth Opportunities

- Growth opportunities are opportunities to invest in positive NPV projects.
- The value of a firm can be conceptualized as the sum of the value of a firm that pays out 100% of its earnings as dividends, i.e., income component, and the net present value of the growth opportunities, i.e., growth component.

$$P = \frac{EPS}{R} + NPVGO$$

The Dividend Growth Model and the NPVGO Model

- We have two ways to value a stock:
  - The dividend discount model
  - The sum of its price as a “cash cow”, i.e., income component, plus the per share value of its growth opportunities, i.e., growth component!
    - **NOTE: Short-cut for calculating the Growth component, i.e., Price – Income component!**

The NPVGO Model: Example

Consider a firm that has EPS of $5 at the end of the first year, a dividend-payout ratio of 30%, a discount rate of 16%, and a return on retained earnings of 20%.

- The dividend at year one will be $5 × .30 = $1.50 per share.
- The retention ratio is .70 (= 1 -.30), implying a growth rate in dividends of 14% = .70 × 20%.

From the dividend growth model, the price of a share is:

$$P_0 = \frac{\text{Div}_1}{R - g} = \frac{\$1.50}{.16 - .14} = \$75$$

The NPVGO Model: Example

First, we must calculate the value of the firm as a cash cow, i.e., **Income component** -

$$\frac{EPS}{R} = \frac{\$5}{.16} = \$31.25$$

Second, we must calculate the value of the growth opportunities, i.e., growth component -

$$P_0 = \frac{\left[-3.50 + \frac{3.50 \times .20}{.16}\right]}{R - g} = \frac{\$.875}{.16 - .14} = \$43.75$$

Finally, $P_0 = 31.25 + 43.75 = \$75$

9.4 Comparables

- Comparables are used to value companies based primarily on multiples.
- Common multiples include:
  - Price-to-Earnings
  - Enterprise Value Ratios
- Many analysts frequently relate earnings per share to price.
- The price-earnings ratio is calculated as the current stock price divided by annual EPS.
  - *The Wall Street Journal* uses last 4 quarter's earnings

$$\text{P/E ratio} = \frac{\text{Price per share}}{EPS}$$

PE and NPVGO

- Recall,

$$P = \frac{EPS}{R} + NPVGO$$

- Dividing every term by EPS provides the following description of the PE ratio:

$$PE = \frac{1}{R} + \frac{NPVGO}{EPS}$$

- So, a firm's PE ratio is positively related to growth opportunities (NPVGO) and negatively related to risk (*R*)!

Enterprise Value Ratios

- The PE ratio focuses on equity, but what if we want the value of the firm?
- Use Enterprise Value:
  - EV = market value of equity + market value of debt - cash
- Like PE, we compare the value to a measure of earnings. From a firm level, this is EBITDA, or earnings before interest, taxes, depreciation, and amortization.
  - EBITDA represents a measure of total firm cash flow
- The Enterprise Value Ratio = EV / EBITDA

Other Comparables

- Many analysts frequently relate other variables to price, *e.g.*:
  - Price/Cash Flow Ratio
    - cash flow = net income + depreciation = cash flow from operations or operating cash flow
  - Price/Sales
    - current stock price divided by annual sales per share
  - Price/Book (a.k.a. Market to Book Ratio)
    - price divided by book value of equity, which is measured as assets – liabilities

9.6 The Stock Markets (**Self-Study**)

- Dealers vs. Brokers
- New York Stock Exchange (NYSE)
  - Largest stock market in the world
  - License Holders (formerly “Members”)
    - Entitled to buy or sell on the exchange floor
    - Commission brokers
    - Specialists
    - Floor brokers
    - Floor traders
  - Operations
  - Floor activity

NASDAQ

- Not a physical exchange – computer-based quotation system
- Multiple market makers
- Electronic Communications Networks
- Three levels of information
  - Level 1 – median quotes, registered representatives
  - Level 2 – view quotes, brokers & dealers
  - Level 3 – view and update quotes, dealers only
- Large portion of technology stocks

Stock Market Reporting

52 WEEKS HI	52 WEEKS LO	STOCK	SYM	DIV	YLD %	PE	VOL 100s	CLOSE	NET CHG
25.72	18.12	Gap Inc	GPS	0.18	0.8	18	39961	21.35	…

Gap has been as high as $25.72 in the last year.

Gap has been as low as $18.12 in the last year.

Gap pays a dividend of 18 cents/share.

Given the current price, the dividend yield is .8%.

Given the current price, the PE ratio is 18 times earnings.

3,996,100 shares traded hands in the last day's trading.

Gap ended trading at $21.35, which is unchanged from yesterday.

Quick Quiz

- What determines the price of a share of stock?
- What determines *g* and *R* in the DGM?
- Decompose a stock's price into income component (or cash cow; EPS/R) and growth component (NPVGO).
- Discuss the importance of the PE ratio.
- What are some of the major characteristics of NYSE and Nasdaq?