Valuation of Stocks and Corporations

1. Intrinsic Value vs. Market Price
2. Discounted Dividend Model (DDM)
3. Non-Constant Growth
4. Corporate Valuation (FCFF) Model
5. Pricing Multiples Valuation
6. Preferred Stock

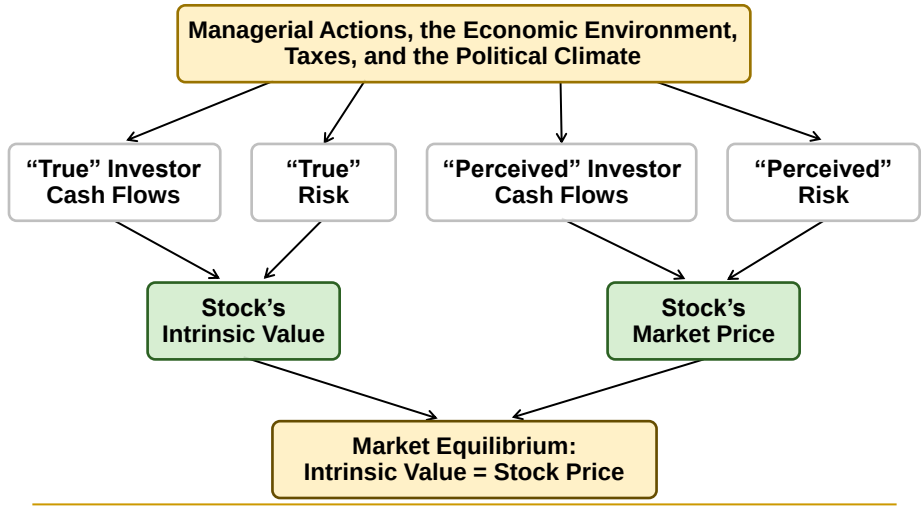
1

Stock Valuation

Review of concept of intrinsic value

2

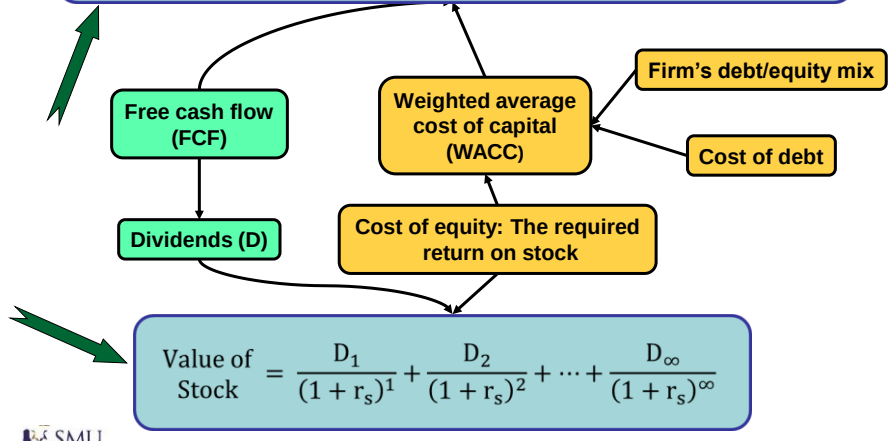
Determinants of Intrinsic Value and Stock Prices



3

Corporate Valuation and Stock Valuation

$$\text{Value of Operations} = \frac{FCF_1}{(1+WACC)^1} + \frac{FCF_2}{(1+WACC)^2} + \cdots + \frac{FCF_\infty}{(1+WACC)^\infty}$$



$$\text{Value of Stock} = \frac{D_1}{(1+r_s)^1} + \frac{D_2}{(1+r_s)^2} + \cdots + \frac{D_\infty}{(1+r_s)^\infty}$$

4

Intrinsic Value and Stock Price

- Outside investors, corporate insiders, and analysts use a variety of approaches to estimate a stock's intrinsic value (P_0).
- In equilibrium, stock price equals intrinsic value.
  - Outsiders estimate intrinsic value to help determine which stocks are attractive to buy and/or sell.
  - Stocks with a price below (above) its intrinsic value are *undervalued* (*overvalued*).

5

Estimating Intrinsic Value of Common Stock

1. Discounted dividend model (DDM)
2. Corporate valuation model (also known as DCF or FCFF models)
3. Pricing multiples of comparable firms

6

1. Discounted Dividend Model (DDM)

- Also known as the Discounted Cash Flow or Dividend Growth valuation models.
- Value of a stock (P_0) is the present value of the future dividends expected to be generated by the stock.

$$\hat{P}_0 = \frac{D_1}{(1+r_s)^1} + \frac{D_2}{(1+r_s)^2} + \frac{D_3}{(1+r_s)^3} + \ldots + \frac{D_\infty}{(1+r_s)^\infty}$$

Where D = expected dividends per share per year

r_s = required return on the stock

Constant Growth Stock

- Stock dividends are expected to grow forever at a constant rate, g.

$D_1 = D_0(1+g)^1$

$D_2 = D_1(1+g)^1 = D_0(1+g)^2$

$D_3 = D_2(1+g)^1 = D_0(1+g)^3$

$D_t = D_0(1+g)^t$

Substituting,

$$\widehat{P_0} = \frac{D_0(1+g)^1}{(1+r_s)^1} + \frac{D_0(1+g)^2}{(1+r_s)^2} + \frac{D_0(1+g)^3}{(1+r_s)^3} + \cdots + \frac{D_0(1+g)^t}{(1+r_s)^t}$$

Constant Growth Stock

- Using *geometric progression* and rearranging, if *g* is constant, intrinsic value converges to:

$$\hat{P}_0 = \frac{D_0(1+g)}{r_s - g} = \frac{D_1}{r_s - g}$$

- Also known as *Gordon's Constant Growth Model*.
- Note: *g* is the long-term sustainable growth rate; also known as the terminal growth rate.

What happens if $g > r_s$?

- If $g > r_s$, the constant growth formula leads to a negative stock price, which does not make sense.
- The constant growth model can only be used if:
  - $r_s > g$
  - g is expected to be constant forever

Use Capital Asset Pricing Model (CAPM) to Calculate Required Rate of Return (r_s)

CAPM: $r_s = r_F + (r_M - r_F)\beta$

Where r_F = risk free rate; r_M = required return on the market; beta is systematic risk of the stock compared to the market.

- If r_F = 7%, r_M = 12%, and β = 1.2, what is the required rate of return on the firm's stock?

$$\begin{aligned} r_s &= r_F + (r_M - r_F)\beta \\ &= 7\% + (12\% - 7\%)1.2 \\ &= 13\% \end{aligned}$$

Intrinsic Value of Stock

- If D_0 = \$2 and g is a constant 6%, find the intrinsic value of the stock if the required rate of return is 13%.
- This implies $D_1 = D_0(1+g) = 2(1.06) = 2.12$
- Using the constant growth model:

$$\hat{P}_0 = \frac{D_1}{r_s - g} = \frac{\$2.12}{0.13 - 0.06}$$

$$= \frac{\$2.12}{0.07} = \$30.29$$

- Watch conceptual video on DDM

Practice Problem Using DDM

Thomas Brothers just paid a dividend of $3.80 per share. The dividend is expected to grow at a constant rate of 8% a year. The required rate of return on the stock, r_s, is 14%. What is the stock's current value per share? Round your answer to two decimal places.

Answer: _____

13

What is the stock's expected value, one year from today?

- D_1 would have been paid out already. So, expected P_1 is the present value (as of Year 1) of D_2, D_3, D_4, etc. Note: $D_2 = D_1(1 + g) = 2.12(1.06) = 2.247$.

$$\hat{P}_1 = \frac{D_2}{r_s - g} = \frac{\$2.247}{0.13 - 0.06} = \$32.10$$

- Could also find expected P_1 as:

$$\hat{P}_1 = P_0(1.06) = \$32.10$$

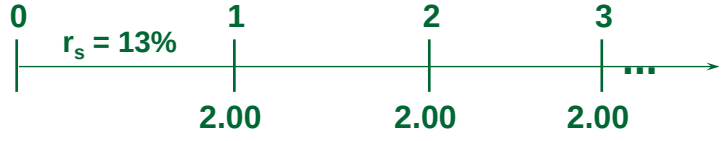
15

Expected Dividend Yield, Capital Gains Yield, and Total Return for First Year

- Dividend yield
  = D_1/P_0 = \$2.12/\$30.29 = 7.0%
- Capital gains yield
  = $(P_1 – P_0)/P_0$
  = (\$32.10 – \$30.29)/\$30.29 = 6.0%
- Total return (r_s)
  = Dividend yield + Capital gains yield
  = 7.0% + 6.0% = 13.0%
- Watch conceptual video

Expected price today if g = 0

- The dividend stream would be a perpetuity.



$$\hat{P}_0 = \frac{PMT}{r} = \frac{\$2.00}{0.13} = \$15.38$$

Past-year Exam Question: Constant Growth Model

The North Shore Company is expected to pay a dividend of $3.00 at the end of the year (that is, D_1 = $3.00). The dividend is expected to grow at a constant rate of 6 percent a year. The stock currently trades at a price of $50 a share. Assume that the stock is in equilibrium, that is, the stock's price equals its intrinsic value. Which of the following statements is most correct?

A. The required return on the stock is 12 percent.

B. The stock's expected price 10 years from now is $89.54.

C. The stock's dividend yield is 6 percent.

D. Statements A and C are correct.

E. All of the statements above are correct.

Stock Prices Are Very Volatile

$$\hat{P}_0 = \frac{D_1}{r_s - g}$$

- Highly sensitive to changes in r_s or g or both
- r_s could change: $r_s = r_F + (RP_M)\beta_i$
  - Interest rates (r_F) could change
  - Risk aversion (RP_M) could change
  - Company risk (β_i) could change
- g could change

Estimated Stock Price: Changes in r_s and g

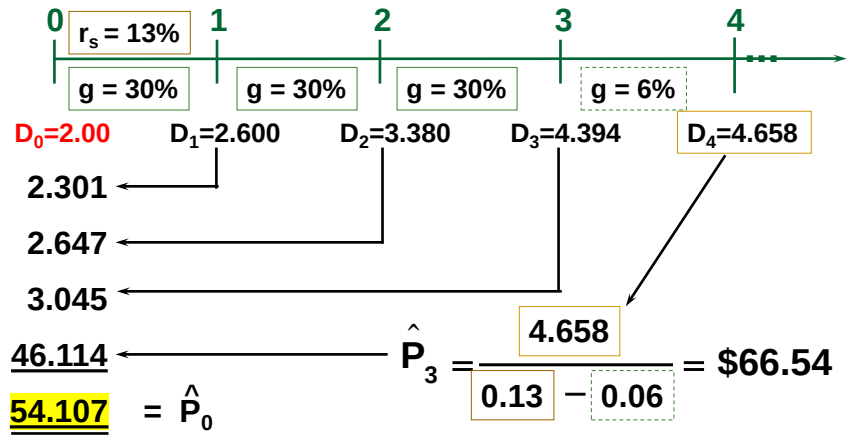
g	Required Return: r_s				
	11.0%	12.0%	13.0%	14.0%	15.0%
5%	$35.00	$30.00	$26.25	$23.33	$21.00
6%	$42.40	$35.33	**$30.29**	$26.50	$23.56
7%	$53.50	$42.80	$35.67	$30.57	$26.75

- Small changes in g or r_s can cause large changes in the estimated price.

Non-constant Growth

- What if g = 30% for 3 years before achieving long-run growth of 6%?
  - Can no longer use just the constant growth model to find stock value.
  - However, the growth does become constant after 3 years.

Valuing Common Stock with Supernormal Growth (Non-Constant)



Example of Non-Constant Growth Stock Valuation Model (Cont'd)

$$P_0 = \frac{D_1}{(1+r_s)^1} + \frac{D_2}{(1+r_s)^2} + \frac{D_3 + P_3}{(1+r_s)^3}$$

$$P_0 = \frac{2.60}{(1+0.13)^1} + \frac{3.38}{(1+0.13)^2} + \frac{4.394+66.54}{(1+0.13)^3}$$
$$= \$54.107$$

where

$$P_3 = \frac{D_4}{r_s - g} = \frac{4.394(1+0.06)}{0.13 - 0.06} = \frac{4.658}{0.07} = 66.54$$

Stock Valuation Exercise

Microtech Corp is expanding rapidly, and it currently needs to retain all of its earnings, hence it does not pay any dividends. However, investors expect Microtech to begin paying dividends, with the first dividend of $1.00 coming 3 years from today. The dividend should grow rapidly – at a rate of 50% per year – during Years 4 and 5. After Year 5, the company should grow at a constant rate of 8% per year. If the required return on the stock is 15%, what is the value of the stock today?

<Group Discussion>

2. Corporate Valuation Model

- Also known as FCFF Valuation Model, which is useful for valuing an entire firm or company.
- Recall that Free Cash Flow (FCF) is:
  - The cash flow available for distribution to *all* of a company's investors.
  - Generated by a company's operations.
  - FCF is the firm's after-tax operating income less the net capital investment.

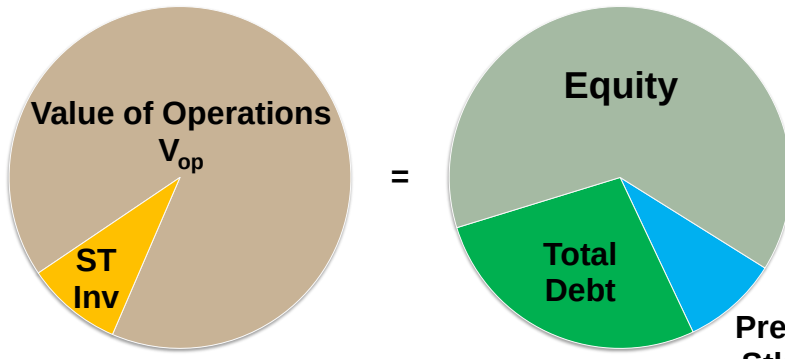
FCF = NOPAT – Net investment in operating capital

FCF = [EBIT(1 – T) + Depreciation] – [CapEx + ΔNOWC]

Steps to Valuation of a Company

1. Determine the stream of future FCFs that the firm is expected to generate;
2. Establish the capital structure of firm using market values;
3. Estimate cost of debt based on YTM of an existing bond of the company;
4. Estimate company's cost of equity using CAPM;
5. Compute WACC;
6. Discount FCFs using WACC to obtain value of firm's operations V_{op};
7. Add ST investments.

Total Corporate (Firm) Value: Sources and Claims



Firm Value = V_{op} + ST Inv

Value of Firm's Operations (V_{op})

- The PV of expected future FCF, discounted at the WACC, is the value of a company's operations (V_{op}):
- The WACC is the overall rate of return required by *all* of the company's investors.

$$V_{op} = \sum_{t=1}^{\infty} \frac{FCF_t}{(1 + WACC)^t}$$

$$V_{op} = \frac{FCF_1}{(1 + WACC)^1} + \frac{FCF_2}{(1 + WACC)^2} + \frac{FCF_3 + HV_3}{(1 + WACC)^3}$$

Intrinsic Value of Company (Firm)

Intrinsic Value of Firm = V_{op} + ST Investments

<u>Who has a claim on the firm's total value?</u>

- Debtholders have first claim.
- Preferred stockholders have the next claim.
- Any remaining value belongs to stockholders, who are the residual claimnants.

Steps to Finding Intrinsic Value of Stock from Intrinsic Value of Company

- Estimate the intrinsic value (IV) of the company from the PV of the firm's future FCFs.
- Add to this any marketable securities (ST investments, if any) (found within current assets)
- Subtract value of firm's total debt (ST & LT) and preferred stock to get intrinsic value of total equity.
- Divide intrinsic value of equity by the number of shares outstanding to get intrinsic value per share.

Example 1: Corporate Valuation with Constant Growth in FCFs

- FCF_0 = $24 million
- WACC = 11%
- FCF is expected to grow at a constant rate of g = 5%
- ST investments= $100 million
- Debt = $200 million
- Preferred stock = $50 million
- Number of shares = n = 10 million

Constant Growth Formula for Value of Operations

- If FCFs are expected to grow at a constant rate of g:

$$V_{op} = \frac{FCF_1}{(WACC - g)}$$

$$= \frac{FCF_0(1+g)}{(WACC - g)}$$

Find Value of Operations V_{op}

$$V_{op} = \frac{FCF_0\,(1 + g)}{(WACC - g)}$$

$$V_{op} = \frac{24(1 + 0.05)}{(0.11 - 0.05)} = 420$$

Intrinsic Value of Firm = V_{op} + ST Investments

= 420 + 100

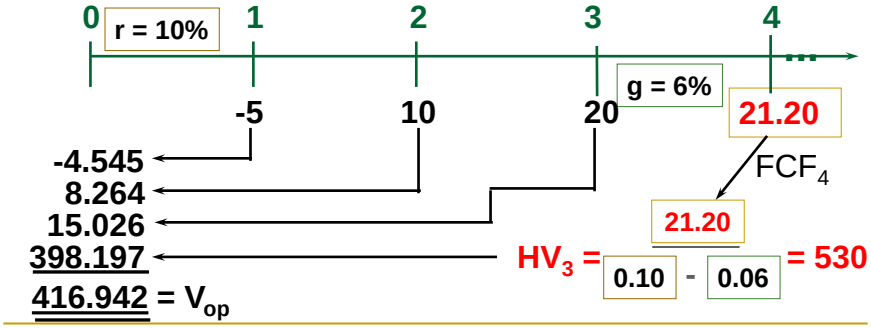
= $520 million

Estimated Intrinsic Value of Stock Price Per Share, $\hat{P}_0$

$V_{operations}$	\$420.00
+ ST Inv.	100.00
Intrinsic Firm Value	\$520.00
– Total Debt	200.00
– Preferred Stk.	50.00
V_{Equity}	\$270.00
÷ n	10
Intrinsic Value of Stock ($\hat{P}_0$)	\$27.00

Example 2: Corporate Valuation with Non-Constant Growth in FCFs

A firm expects free cash flows of FCF_1 = -\$5 mil, FCF_2 = \$10 mil and FCF_3 = \$20 mil. Thereafter, the long-run growth rate is 6%. It has \$50 mil of ST investments and WACC is 10%. What is the intrinsic value of the company?



Example of FCF Valuation Model (Cont'd)

$$V_{op} = \frac{FCF_1}{(1 + WACC)^1} + \frac{FCF_2}{(1 + WACC)^2} + \frac{FCF_3 + HV_3}{(1 + WACC)^3}$$

$$V_{op} = \frac{-5}{(1+0.1)^1} + \frac{10}{(1+0.1)^2} + \frac{20 + 530}{(1+0.1)^3} = \$416.94$$

Where $HV_3 = \frac{FCF_4}{WACC - g} = \frac{20(1 + 0.06)}{0.10 - 0.06} = \frac{21.20}{0.04} = 530$

Intrinsic value of company = V_{op} + ST Investments
= 416.94 + 50 = $466.94m

36

Example 2 (cont'd)

- If the firm has $100 mil of total debt and $40 mil of preferred stock, what is its intrinsic value per share if it has 10 mil shares of stock outstanding?
- Equity Value = Firm Val – Debt Val – Pref Val
  = 466.94 – $100 – $40
  = $326.94 million
- Intrinsic value of stock price per share
  = Equity Val / # of shares
  = $326.94/10 = $32.69

37

Non-Constant Growth FCF Valuation

Barrett Industries invests a large sum of money in R&D; as a result, it retains and reinvests all its earnings. In other words, Barrett does not pay any dividends, and it has no plans to pay dividends in the near future. A major pension fund is interested in purchasing Barrett's stock. The pension fund manager has estimated Barrett's free cash flows for the next 4 years as follows: $3 million, $5 million, $12 million, and $13 million. After the fourth year, free cash flow is projected to grow at a constant 4%. Barrett's WACC is 13%, the market value of its debt and preferred stock totals $50 million, and it has 18 million shares of common stock outstanding. The firm has no short-term investments.

a. What is the present value of the FCFs projected for the next 4 years?
b. What is the firm's horizon value in Year 4?
c. What is the intrinsic value of the company today?
d. What is your estimate of Barrett's price per share?

<Group Discussion>

Self-Test Question:
FCF Valuation Model

The current value of Matakana Brewery's free cash flows is estimated to be $840 million, based on the Corporate Valuation Model. Its balance sheet shows $70 million in accounts receivable, $50 million in inventory, $20 million in accounts payable, $110 million in notes payable, $90 million in long-term debt, $30 million in preferred stock, $140 million in retained earnings, and $280 million in total common equity. If the company has 25 million shares of stock outstanding, what is your best estimate of the stock's price per share?

Issues Regarding the FCF Valuation Model

- Can be used to value any firm.
- Useful for stock valuation when firm does not pay dividends or are hard to forecast.
- Similar to dividend growth model in the sense that it assumes free cash flow will grow at a constant rate at some point.
- Horizon value (HV_N) represents value of firm at the point that growth becomes constant.
- Requires forecasted financial statements to estimate FCF.

3. Pricing Multiples Relative Valuation

- Analysts sometimes use various multiples to value stocks.
  - P/E (Price to Earnings)
  - P/B (Price to Book value)
  - P/EBIT (Price to EBIT)
  - P/EBITDA (Price to EBITDA)
- Example: Based on comparable firms, estimate the appropriate P/E. Multiply this by expected earnings to back out an estimate of the stock price.

Problems with Market Multiple Methods

- It may be hard to find comparable firms.
- The average ratio for the sample of comparable firms often has a wide range.
  - For example, the average P/E ratio might be 20, but the range could be from 10 to 50.
  - How do you know whether your firm should be compared to the low, average, or high performers?

Preferred Stock

- Hybrid security.
- Like bonds, preferred stockholders receive a fixed dividend that must be paid before dividends are paid to common stockholders.
- However, companies can omit preferred dividend payments without fear of pushing the firm into bankruptcy.

Value of Preferred Stock (Dividend = $2.10; r_{ps} = 7%)

$$\hat{V}_{ps} = \frac{\text{Dividend}}{r_{ps}} = \frac{\$2.10}{7\%} = \$30$$

46

Practice Problem: Under/Over-Valuation

Your sister-in-law, a stockbroker at Invest Inc., is trying to sell you a stock with a current market price of $25. The stock's last dividend (D_0) was $2.00, and earnings and dividends are expected to increase at a constant growth rate of 10%. Your required return on this stock is 20%. From a strict valuation standpoint, you should:

A. Buy the stock; it is undervalued by $2.00.

B. Not buy the stock; it is overvalued by $3.00.

C. Buy the stock; it is undervalued by $3.00.

D. Buy the stock; it is fairly valued.

E. Not buy the stock; it is overvalued by $2.00.

47

Summary

Questions and Answers