CHAPTER 7

Valuation of Stocks and Corporations

Need to Absorb - The attributes of common stocks including the rights of shareholders, how to use the Constant Growth Model, how to value non-constant growth stocks, and the attributes and valuation of preferred stock. On exams, this chapter almost always calculations to include a CAPM problem, a constant growth stock valuation problem, a non-constant growth valuation problem.

Do not need to Absorb - Types of common stock in (7.2) and stock market reporting (7.3), I am unlikely to ask on exams about stock valuation using multiples or Free Cash Flow Valuation (these are fair game for quizzes).

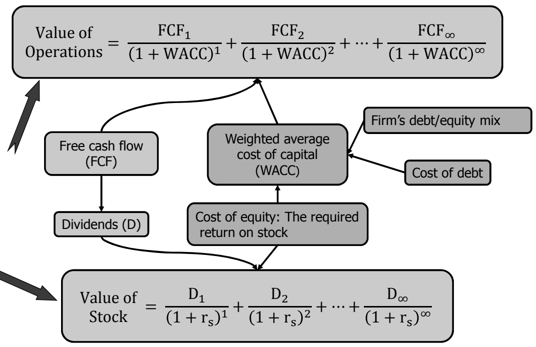
Need to Read - Read the Chapter.

Need to Do - Make 100 on the Quiz. You should be able to answer almost all of the end of chapter questions and problems. Most of the end of chapter problems have been used on past quizzes and exams. Problems 7, 17, and 18 would not be on an Exam.

Topics in Chapter

- Features of common stock
- Valuing common stock
  - Dividend growth model
  - Free cash flow valuation model
  - Market multiples
- Preferred stock

Corporate Valuation and Stock Valuation



Stock value = PV of dividends discounted at required return

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

Conceptually correct, but how do you find the present value of an infinite stream?

Different Approaches for Valuing Common Stock

- Dividend growth model
  - Constant growth stocks
  - Nonconstant growth stocks
- Free cash flow model
- Using the multiples of comparable firms

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Common Stock: Owners, Directors, and Managers

- Represents ownership.
- Ownership implies control.
- Stockholders elect directors.
- Directors hire management.
- Since managers are "agents" of shareholders, their goal should be: Maximize stock price.

Classified Stock

- Classified stock has special provisions.
- Could classify existing stock as founders' shares, with voting rights but dividend restrictions.
- New shares might be called "Class A" shares, with voting restrictions but full dividend rights.

Tracking Stock

- The dividends of tracking stock are tied to a particular division, rather than the company as a whole.
  - Investors can separately value the divisions.
  - Its easier to compensate division managers with the tracking stock.
- But tracking stock usually has no voting rights, and the financial disclosure for the division is not as regulated as for the company.

Different Approaches for Valuing Common Stock

- Dividend growth model
  - Constant growth stocks
  - Nonconstant growth stocks
- Free cash flow model
- Using the multiples of comparable firms

Stock value = PV of dividends discounted at required return

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

Conceptually correct, but how do you find the present value of an infinite stream?

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

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

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

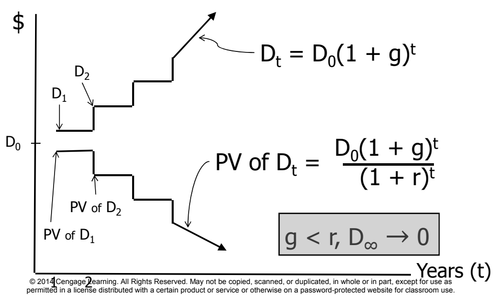
$$D_t = D_0(1 + g)^t$$

What is the present value of a constant growth D_t when discounted at the stock's required return, r_s? See next slide.

Present Value of a Constant Growth Dividend

- $PV = \frac{D_t}{(1+r_s)^t} = \frac{D_0(1+g)^t}{(1+r_s)^t} = D_0\left[\frac{1+g}{1+r_s}\right]^t$
- What happens to $\left[\frac{1+g}{1+r_s}\right]^t$ as t gets bigger?
- If $g<r_s$: Then $\left[\frac{1+g}{1+r_s}\right]^t < 1$.
- So D_t approaches zero as t gets large.

Constant Dividend Growth: PV of D_t if $g<r_s$



Constant Dividend Growth: Cumulative Sum of PV of D_t if $g<r_s$

$$\hat{P}_0 = \sum_{t=1}^{\infty} D_0\left[\frac{1+g}{1+r_s}\right]^t$$

What happens to $\hat{P}_0$ as t gets bigger? Consider this:

t	1	2	3	4	5
$(1/2)^t$	1/2	1/4	1/8	1/16	1/32
$\Sigma(1/2)^t$	1/2	3/4	7/8	15/16	Boring

This sum converges to 1. Similarly, $\hat{P}_0$ converges. See next slide.

What happens if $g > r_s$?

$$\hat{P}_0 = \frac{D_0(1+g)^1}{(1+r_s)^1} + \frac{D_0(1+g)^2}{(1+r_s)^2} + \ldots + \frac{D_0(1+r_s)^\infty}{(1+r_s)^\infty}$$

If $g > r_s$, then $\frac{(1+g)^t}{(1+r_s)^t} > 1$, and $\hat{P}_0 = \infty$

So g must be less than r_s for the constant growth model to be applicable!!

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Constant Dividend Growth Model ($g<r_s$)

- If g is constant and less than r_s, then $D_0\left[\frac{1+g}{1+r_s}\right]^t$ converges to:

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

Required rate of return: beta = 1.2, r_{RF} = 7%, and RP_M = 5%.

Use the SML to calculate r_s:

$$\begin{aligned} r_s &= r_{RF} + (RP_M)b_{Firm} \\ &= 7\% + (5\%)(1.2) \\ &= 13\%. \end{aligned}$$

Estimated Intrinsic Stock Value: D_0 = \$2.00, r_s = 13%, g = 6%

$D_1 = D_0(1+g)$

$D_1 = \$2.00(1.06) = \$2.12$

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

$\hat{P}_0 = \frac{\$2.12}{0.13-0.06}$ = **\$30.29**

Expected Stock Price in 1 Year

- In general: $\hat{P}_t = \frac{D_{t+1}}{r_s - g}$
- $D_1 = D_0(1+g)$
- $D_1 = \$2.12(1.06) = \$2.2472$
- $\hat{P}_0 = \frac{D_1}{r_s - g}$
- $\hat{P}_0 = \frac{\$2.2472}{0.13-0.06}$ = **\$32.10**

Expected Dividend Yield and Capital Gains Yield (Year 1)

$$\text{Dividend yield} = \frac{D_1}{P_0} = \frac{\$2.12}{\$30.29} = 7.0\%.$$

$$\text{CG Yield} = \frac{\hat{P}_1 - P_0}{P_0} = \frac{\$32.10 - \$30.29}{\$30.29}$$

$$= 6.0\%.$$

Total Year 1 Return

- Total return = Dividend yield + Capital gains yield.
- Total return = 7% + 6% = 13%.
- Total return = 13% = r_s.
- For constant growth stock:
  - Capital gains yield = 6% = g.

Is the stock price based on short-term growth?

The current stock price is $46.66.
The PV of dividends beyond Year 3 is:

$\hat{P}_3 / (1+r_s)^3$ = $39.22 (see slide 22)

The percentage of stock price due to "long-term" dividends is:

$$\frac{\$39.22}{\$46.66} = 84.1\%.$$

Suppose the stock price is \$32.09. Is this price based on short-term or long-term cash flows?

Year (t)	0	1	2	3
$D_t = D_0(1+g)^t$		\$2.1200	\$2.2472	\$2.3820
$PV(D_t) = D_t/(1+r_s)^t$		\$1.8761	\$1.7599	\$1.6509
Sum of PV(Divs.)	\$5.29			
P_0	\$30.29			
% of P_0 due to 3 PV(Divs.)	17%			
% of P_0 due to long-term divs.	83%			

Intrinsic Stock Value vs. Quarterly Earnings

- If most of a stock's value is due to long-term cash flows, why do so many managers focus on quarterly earnings?
  - Changes in quarterly earnings can signal changes future in cash flows. This would affect the current stock price.
  - Managers often have bonuses tied to quarterly earnings, so they have incentive to manage earnings.

Why are stock prices volatile?

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

- r_s could change: $r_s = r_{RF} + (RP_M)b_i$
  - Interest rates (r_{RF}) could change
  - Risk aversion (RP_M) could change
  - Company risk (b_i) could change
- g could change.

Estimated Stock Price: Changes in r_s and g

Growth Rate: 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 cause large changes in the estimated price.

Are volatile stock prices consistent with rational pricing?

- Small changes in expected g and r_s cause large changes in stock prices.
- As new information arrives, investors continually update their estimates of g and r_s.
- If stock prices aren't volatile, then this means there isn't a good flow of information.

Rearrange model to rate of return form:

$$\hat{P}_0 = \frac{D_1}{r_s - g} \quad \text{to} \quad \hat{r}_s = \frac{D_1}{P_0} + g.$$

$$\text{Then, } \hat{r}_s = \$2.12/\$30.29 + 0.06 = 0.07 + 0.06 = 13\%.$$

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Nonconstant Growth Stock

- Nonconstant growth of 30% for Year 0 to Year 1, 25% for Year 1 to Year 2, 15% for Year 2 to Year 3, and then long-run constant g = 6%.
- Can no longer use constant growth model.
- However, growth becomes constant after 3 years.

Steps to Estimate Current Stock Value

- Forecast dividends for nonconstant period, which ends at horizon date after which growth is constant at g_L, plus one constant growth dividend.
- Find horizon value, which is PV of dividends beyond horizon date discounted back to horizon date (Assume you sell stock as soon as growth is constant)
  - Horizon value = $\widehat{P}_t = \frac{D_t(1+g_L)}{r_s - g_L} = \frac{D_{t+1}}{r_s - g_L}$
- Compute the NPV of non-constant dividends and horizon value.

(Continued)

Steps to Estimate Current Stock Price (Continued)

- Find PV of each dividend in the forecast period.
- Find PV of horizon value.
- Sum PV of dividends and PV of horizon value.
- Result is estimated current stock value.

Example of Estimating Current Stock Value (D_0 = \$2.00, r_s = 13%)

		$g_{0,1}$ = 30%	$g_{1,2}$ = 25%	$g_{2,3}$ = 15%	g_L = 6%
Year	0	1	2	3	4
Dividends		$D_0(1+g_{0,1})$ ↓ \$2.600	$D_1(1+g_{1,2})$ ↓ \$3.250	$D_2(1+g_{2,3})$ ↓ \$3.7375	
		↓			$\frac{D_4}{r_s - g_L}$ ↓
PVs of divs.	\$2.301	← \$2.600/$(1+r_s)^1$			$\frac{D_3(1+g_L)}{r_s - g_L}$
	\$2.545	← \$3.250/$(1+r_s)^2$			
	\$2.590	← \$3.7375/$(1+r_s)^3$			↓
PV of $\hat{P}_3$	<u>\$39.224</u>	\$56.596/$(1+r_s)^3$	←	$\hat{P}_3$ = \$56.596 ⟵	$\frac{\$3.9618}{0.07}$

$\hat{P}_0 = \$46.661$

Expected Dividend Yield and Capital Gains Yield (t = 0)

At t = 0:

$$\text{Dividend yield} = \frac{D_1}{P_0} = \frac{\$2.60}{\$46.66} = 5.6\%$$

CG Yield = 13.0% – 5.6% = 7.4%.

(More…)

Expected Dividend Yield and Capital Gains Yield (after t = 3)

- During nonconstant growth, dividend yield and capital gains yield are not constant.
- If current growth is greater than g, current capital gains yield is greater than g.
- After t = 3, g = constant = 6%, so the capital gains yield = 6%.
- Because r_s = 13%, after t = 3 dividend yield = 13% – 6% = 7%.

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The Free Cash Flow Valuation Model: FCF and WACC

- Free cash flow (FCF) is:
  - The cash flow available for distribution to *all* of a company's investors.
  - Generated by a company's operations.
- The weighted average cost of capital (WACC) is:
  - The overall rate of return required by *all* of the company's investors.

Value of Operations (V_{op})

- The PV of expected future FCF, discounted at the WACC, is the value of a company's operations (V_{op}):

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

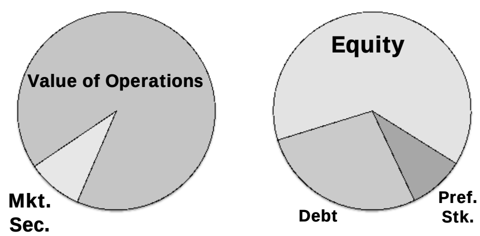
Sources of Value

- Value of operations
- Nonoperating assets
  - Marketable securities
  - Ownership of non-controlling interest in another company
  - Value of nonoperating assets usually is very close to figure that is reported on balance sheets.

Claims on Corporate Value

- Debtholders have first claim.
- Preferred stockholders have the next claim.
- Any remaining value belongs to stockholders.

Total Corporate Value: Sources and Claims



Data for FCF Valuation

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

Constant Growth Formula for Value of Operations

- If FCF 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

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

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

Total Value of Company (V_{Total})

$V_{operations}$	$420.00
+ ST Inv.	100.00
V_{Total}	$520.00

Estimated Intrinsic Value of Equity (V_{Equity})

$V_{operations}$	$420.00
+ ST Inv.	100.00
V_{Total}	$520.00
−Debt	200.00
− Preferred Stk.	50.00
V_{Equity}	$270.00

Estimated Intrinsic Stock Price per Share, $\hat{P}_0$

$V_{operations}$	\$420.00
+ ST Inv.	100.00
V_{Total}	\$520.00
−Debt	200.00
− Preferred Stk.	50.00
V_{Equity}	\$270.00
÷ n	10
$\hat{P}_0$	\$27.00

Expansion Plan: Nonconstant Growth

- Finance expansion financed by owners.
- Projected free cash flows (FCF):
  - Year 1 FCF = −\$10 million.
  - Year 2 FCF = \$20 million.
  - Year 3 FCF = \$35 million
  - FCF grows at constant rate of 5% after year 3.
- No change in WACC, marketable securities, debt, preferred stock, or number of shares of stock.

Horizon Value

- Free cash flows are forecast for three years in this example, so the forecast horizon is three years.
- Growth in free cash flows is not constant during the forecast, so we can't use the constant growth formula to find the value of operations at time 0.

Horizon Value (Cont.)

- Growth is constant after the horizon (3 years), so we can modify the constant growth formula to find the value of all free cash flows beyond the horizon, discounted back to the horizon.

Horizon Value Formula

$$HV = V_{op\ at\ time\ t} = \frac{FCF_t(1+g)}{(WACC - g)}$$

- Horizon value is also called terminal value, or continuing value.

Estimating Current Value of Operations (Nonconstant g in FCF until after Year 3; g_L = 5%; WACC = 11%)

					g_L = 5%
Year	0	1	2	3	4
FCF		−$10	$20	$35	
		↓			$\frac{FCF_4}{WACC - g_L}$
PVs of FCF	−$9.009	← −$10/(1+WACC)^1			↓
	$16.232	← $25/(1+WACC)^2			$\frac{FCF_3(1+g_L)}{WACC - g_L}$
	$25.592	← $35/(1+WACC)^3			↓
PV of $V_{op,3}$	$447.855	$612.5/(1+WACC)^3	←	$V_{op,3}$= $612.5	← $\frac{\$36.75}{0.06}$

V_{op} = $480.67

Estimated Intrinsic Stock Price per Share, $\hat{P}_0$

$V_{operations}$	\$480.67
+ ST Inv.	100.00
V_{Total}	\$580.67
−Debt	200.00
− Preferred Stk.	50.00
V_{Equity}	\$330.67
÷ n	10
$\hat{P}_0$	\$33.07

Comparing the FCF Model and Dividend Growth Model

- Can apply FCF model in more situations:
  - Privately held companies
  - Divisions of companies
  - Companies that pay zero (or very low) dividends
- FCF model requires forecasted financial statements to estimate FCF

Using Stock Price Multiples to Estimate Stock Price

- Analysts often use the P/E multiple (the price per share divided by the earnings per share).
- Example:
  - Estimate the average P/E ratio of comparable firms. This is the P/E multiple.
  - Multiply this average P/E ratio by the expected earnings of the company to estimate its stock price.

Using Entity Multiples

- The entity value (V) is:
  - the market value of equity (# shares of stock multiplied by the price per share)
  - plus the value of debt.
- Pick a measure, such as EBITDA, Sales, Customers, Eyeballs, etc.
- Calculate the average entity ratio for a sample of comparable firms. For example,
  - V/EBITDA
  - V/Customers

Using Entity Multiples (Continued)

- Find the entity value of the firm in question. For example,
  - Multiply the firm's sales by the V/Sales multiple.
  - Multiply the firm's # of customers by the V/Customers ratio
- The result is the firm's total value.
- Subtract the firm's debt to get the total value of its equity.
- Divide by the number of shares to calculate the price per share.

Problems with Market Multiple Methods

- It is often 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.
- Similar to bonds in that preferred stockholders receive a fixed dividend which must be paid before dividends can be paid on common stock.
- However, unlike bonds, preferred stock dividends can be omitted without fear of pushing the firm into bankruptcy.

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

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

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