Chapter 9: Valuing Stocks

Fundamental question: How do we determine the value of a company's common stock?

9.1 The Dividend-Discount Model

Note: We don't really need any of the equations in this section. They are all just applications of equation (4.2).

However, equation (9.2) is useful since dividend yield and capital gain rate are a common way to break out sources of the return on stocks (or other assets).

A. A One-Year Investor

=> **price will equal the present value of the dividend and sales price one year from today**

$$P_0 = \frac{D_1+P_1}{1+r_E} \qquad (9.1)$$

where:

P_0 = current market price of stock
D_1 = dividend at the end of year 1
P_1 = market price of stock at end of year 1
r_E = equity cost of capital = expected return on other investments with risk equivalent to firm's shares

Notes:

1) **equality of price and value must hold for both buyer and seller to be willing to trade**
2) most stocks pay dividends quarterly

Ex. Assume that one year from today, you expect Cardgil Inc. to pay a dividend of $1.50 per share and have a price of $25 per share. You estimate that the equity cost of capital for Cardgil is 8%. What is the value of Cardgil shares today?

$$P_0 = 24.537 = \frac{\mathbf{1.50+25}}{\mathbf{1.08}}$$

B. Dividend Yields, Capital Gains, and Total Returns

=> return can be broken down into two components: **dividend yield and capital gain rate**

$$r_E = \frac{D_1+P_1}{P_0} - 1 = \frac{D_1}{P_0} + \frac{P_1-P_0}{P_0} \quad (9.2)$$

Dividend Yield = $\frac{D_1}{P_0}$

=> return from dividends

Capital Gain Rate = $\frac{P_1-P_0}{P_0}$

=> return from change in stock price

Ex. Assume Gilford stock currently trades for $15 per share. One year from today, you expect Gilford to pay a dividend of $0.75 and you expect Gilford's stock to equal $15.50. What dividend yield, capital gain rate, and total return do you expect on Gilford stock?

Dividend yield= .05 = $\frac{.75}{15}$

Capital gain rate= .03333 = $\frac{15.50-15}{15}$

Total return= .08333 = $\frac{.75}{15} + \frac{15.50-15}{15} = .05 + .0333$

Or,

Total return= .08333 = $\frac{.75+15.50}{15} - 1$

The Mechanics of a Short Sale

Key term: short interest = total number of shares sold short

Notes:

1) Look back at chapter 3 for more detail on short selling
2) Naked short sales (selling stock without first borrowing it) is prohibited by SEC
3) Brokers typically charges fee for lending stock

C. A Multiyear Investor

=> if an investor has a two-year investment horizon, the price will equal present value of dividends plus present value of sales price two years from today

$$P_0 = \frac{D_1}{1+r_E} + \frac{D_2+P_2}{(1+r_E)^2} \quad (9.3)$$

Ex. Assume that you expect Mogent Corp. to pay a dividend of $2 one year from today and $2.50 two years from today. In addition, you expect the price of Mogent to equal $50 two years from today. If Mogent's equity cost of capital equals 12.5%, what it the price today of Mogent stock?

$$P_0 = 43.26 = \frac{\mathbf{2}}{\mathbf{1.125}} + \frac{\mathbf{2.5+50}}{\mathbf{(1.125)^2}}$$

D. The Dividend-Discount Model Equation

=> model can be extended for any number of periods. Thus the price will equal **the present value of all future dividends plus the present value of the eventual sales price.**

$$P_0 = \frac{D_1}{1+r_E} + \frac{D_2}{(1+r_E)^2} + \cdots + \frac{D_N}{(1+r_E)^N} + \frac{P_N}{(1+r_E)^N} \quad (9.4)$$

$$P_0 = \sum_{n=1}^{\infty} \frac{D_n}{(1+r_E)^n} \quad (9.5)$$

Ex. Assume that Steady Inc. is expected to pay a dividend of $2 one year from today. After this, dividends are expected to grow by 4% per year. Assume you also believe you can sell Steady four years from today for $29.25. If Steady's equity cost of capital equals 12%, what is the value of Steady stock today?

Note: the dividends are a growing annuity

$$\Rightarrow P_0 = 25.00 = \frac{\mathbf{2}}{\mathbf{(.12-.04)}}\left(\mathbf{1} - \left(\frac{\mathbf{1.04}}{\mathbf{1.12}}\right)^{\mathbf{4}}\right) + \frac{\mathbf{29.25}}{\mathbf{(1.12)^4}} = \mathbf{6.41 + 18.59}$$

9.2 Applying the Dividend-Discount Model

Note: estimating future dividends (especially far into future) is difficult

A. Constant Dividend Growth

=> **assume dividends will grow at a constant rate forever**

$$P_0 = \frac{D_1}{r_E - g} \qquad (9.6)$$

Note: as text states, equation (9.6) is just an application of equation (4.11)

$$r_E = \frac{D_1}{P_0} + g \qquad (9.7)$$

=> return on equity = dividend yield + capital gains rate

Note: g = growth rate of dividends and capital gains rate

=> **in the constant dividend growth model, dividends and price grow at the same rate "g".**

Ex. Assume PerpGrow Inc. plans to pay a dividend of $2.25 one year from today and that it plans to increase annual dividends at a rate of 5% per year forever. Estimate PerpGrow's current stock price if its equity cost of capital equals 11%. Determine also PerpGrow's dividend yield and capital gains rate?

$$P_0 = 37.50 = \frac{\mathbf{2.25}}{\mathbf{.11 - .05}}$$

$$r_E = .11 = \frac{\mathbf{2.25}}{\mathbf{37.50}} + \mathbf{.05} = \mathbf{.06} + \mathbf{.05}$$

Dividend yield = 6% and capital gains rate = 5%

B. Dividends Versus Investment and Growth

Notes:

1) the tradeoff between dividends and investment only holds strictly if the firm has no access to external funding
2) **if a firm has access to external funding, it can grow and pay dividends if issues stocks or debt**
   => value of investment might be lower if raise external funds because of cost to raise external funds (discussed later).

1. A Simple Model of Growth

a. Several assumptions are important:
   1) firms do not issue or repurchase shares and do not borrow or pay back any debt
   2) without new investment, firms generate constant earnings forever
   3) cash flow equals earnings
      => if not, new investment might not equal earnings × the retention rate
      key: investment must be made with cash not retained earnings (an accounting number)
   4) new investment earns a fixed rate forever
   5) firms pay a dividend that equals a fixed percent of earnings

$$D_t = \frac{E_t}{SO_t} \times DPR_t \qquad (9.8)$$

where:

D_t = dividend per share at date t
E_t = earnings at date t
SO_t = stock outstanding at date t
DPR_t = dividend payout rate at date t

b. firm's new investment equals firm's earnings multiplied by the firm's retention rate (percent of earnings not paid out).

$$NI_t = E_t \times RR_t \qquad (9.10)$$

where:

NI_t = new investment at date t
E_t = earnings at date t
RR_t = retention rate at date t

$$\Rightarrow RR_t = 1 - DPR_t \qquad (9.a)$$

c. the more a firm pay out in dividends, the less it can invest in new projects

d. the change in a firm's earnings at date $t+1$ will equal the amount the firm invests at date t multiplied by the return on that new investment at date t

$$\Delta E_{t+1} = NI_t \times RONI_t \quad (9.9)$$

where:

ΔE_{t+1} = change in earnings at date t
$RONI_t$ = return on new investment at date t

e. the firm's earnings growth rate equals the retention rate multiplied by the return on new investment

key: substitute (9.10) into (9.9) and then plug (9.9) into:

$$EGR_{t+1} = \frac{\Delta E_{t+1}}{E_t} \quad (9.11a)$$

where:
EGR_t = earnings growth rate
Note: earnings cancels out

$$\Rightarrow EGR_{t+1} = RR_t \times RONI_t \quad (9.11b)$$

f. if the firm pays out a constant percent of earnings (constant payout rate), dividends must grow at the same rate as earnings

$$\Rightarrow g_{t+1} = RR_t \times RONI_t \quad (9.12)$$

Ex. Gradient expects earnings a year from today of $100 million. The firm plans to pay out 40% of its earnings and invest 60% of its earnings in new projects earning a 10% return forever. Gradient has 25 million shares outstanding. Calculate the rate at which Gradient's dividend are expected to grow and the value of its stock if Gradient's equity cost of capital equals 8%.

g = .06 = **.6 x .1**

$D_1 = \$1.60 = \frac{\mathbf{100}}{\mathbf{25}}(.\mathbf{4})$

$P_0 = \$80.00 = \frac{\mathbf{1.60}}{\mathbf{.08-.06}}$

Notes:

NI_1 = New investment = $60 = **100 x .6**
ΔE_2 = Change in earnings = 6 = **60 x .1**
EGR_2 = Earnings growth rate = .06 = **6/100**

2. Profitable Growth

Key issue: cutting dividends to increase investment increases a stock's value if the return on investment exceeds equity cost of capital (so that positive NPV).

C. Changing Growth Rates

Ex. Assume Big Corp expects earnings per share of $1.50 a year from today. Assume also that over the next five years, Big expects to pay out 10% of its earnings as dividends and to reinvest 90% of earnings in projects earning a rate of return of 30%. Six years from today, Big's return on new investments will fall to equal its cost of capital of 9% and Big will boost its payout to 75% of earnings forever. What is the value today of Big's stock?

D_1 = \$0.15 = **1.5(.1)**
$g_{2\text{ to }6}$ = .27 = **(.9)(.3)**
g_{7+} = .0225 = **(.25)(.09)**

Note: growth falls to 2.25% after the 6th dividend, so can use it to determine terminal value (TV) of the stock 5 years from today.

$E_6 = 4.95576 = \mathbf{1.5(1.27)^5}$
D_6 = 3.71682 = **.75(4.95576)**

$TV_5 = 55.06395 = \frac{\mathbf{3.71682}}{\mathbf{.09-.0225}}$

Note: can calculate and take present value of first five dividends individually

=> but easier to take present value as a growing annuity

$$P_0 = 36.74 = \frac{\mathbf{.15}}{\mathbf{(.09-.27)}}\left(\mathbf{1} - \left(\frac{\mathbf{1.27}}{\mathbf{1.09}}\right)^{\mathbf{5}}\right) + \frac{\mathbf{55.06395}}{\mathbf{(1.09)^5}}$$

D. Limitations of the Dividend-Discount Model

Key issue: **models extremely sensitive to assumptions and forecasts**

9.3 Total Payout and Free Cash Flow Valuation Models

A. Share Repurchases and the Total Payout Model

Key issue: firms increasingly distribute excess cash to shareholders with **share repurchases in addition to or instead of through dividends**

$$P_0 = \frac{PV(FTDR)}{SO} \qquad (9.16)$$

where:

FTDR = **future total dividends and repurchases**

Note: relevant growth is of total earnings rather than earnings per share

Ex. Assume that Federated expects earnings of $500 million a year from today. Federated expects to pay out 10% of its earnings as dividend and expects to pay out 30% of its earnings through repurchases of common stock. Federated expects its earnings to grow by 4% per year. What is the value of Federated stock if its equity cost of capital equals 15% and it has 100 million shares outstanding?

=> total payout a year from today = 200 = **(.1 + .3) x 500**

=> $PV(payouts) = 1818.18 = \frac{\mathbf{200}}{\mathbf{.15-.04}}$

=> $P_0 = \$18.18 = \frac{\mathbf{1818.18}}{\mathbf{100}}$

B. The Discounted Free Cash Flow Model

1. Valuing the Enterprise

Note: Many of the equations in this section are not new…they are just presented again and renumbered from previous chapters.

=> value of firm to all investors

$$EV = MVE + D - C \tag{9.17}$$

where:

EV = enterprise value
MVE = market value of equity
D = debt
C = cash

Note: (9.17) is the same as equation (2.4)

$$FCF = UNI + D - CE - \Delta NWC \tag{9.18}$$

where:

UNI = unlevered net income = $EBIT(1-\tau_c)$
D = depreciation
CE = capital expenditures
ΔNWC = change (or increase) in net working capital

Note: (9.18) is the same as (8.5a)

$$NI = CE - D \tag{9.19}$$

where:

NI = net investment
CE = capital expenditures
D = depreciation

$$FCF = EBIT(1-\tau_c) - NI - \Delta NWC \tag{9.20}$$

$$V_0 = PV(FCF) \tag{9.21}$$

Where FCF = free cash flow of the firm

$$P_0 = \frac{V_0 + C_0 - D_0}{SO_0} \tag{9.22}$$

2. Implementing the Model

Key issue: **discount firm's free cash flow of firm at firm's weighted average cost of capital**

$$V_0 = \frac{FCF_1}{1+r_{wacc}} + \frac{FCF_2}{(1+r_{wacc})^2} + \cdots + \frac{FCF_N+V_N}{(1+r_{wacc})^N} \quad (9.23)$$

$$V_N = \frac{FCF_{N+1}}{r_{wacc}-g_{FCF}} \quad (9.24)$$

where:

r_{wacc} = firm's weighted average cost of capital
=> **average cost of capital firm must pay to all investors not just stockholders**

g_{FCF} = expected long-run growth rate of firm's free cash flows…assumed equal to long-run growth of sales

Ex. Assume a firm had revenues of $100 million for the year ended today and that revenues are expected to grow at a rate of 20% per year through five years from today. Variable costs will equal 40% of sales and fixed costs will equal $30 million per year. Depreciation and capital spending will equal $14 million per year. Cash equals 5% of revenues in the current year and accounts receivable equal 25% of revenues in the current year. Inventory equals 40% of the following year's sales, and accounts payable equal 45% of inventory. The firm's tax rate equals 35%. The cost of capital for the firm equals 9%. Beyond year 5, free cash flows (and revenues) are expected to grow at a rate of 3% per year forever. The firm's outstanding debt equals $300 million and the firm has 25 million shares outstanding. What is the price per share for the firm's stock?

Year		1	2	3	4	5
Unlevered Net Income:						
Revenue	100.00	120.00	144.00	172.80	207.36	248.83
Expenses		78.00	87.60	99.12	112.94	129.53
Depreciation		14.00	14.00	14.00	14.00	14.00
Pretax Income		28.00	42.40	59.68	80.42	105.30
Taxes		9.80	14.84	20.89	28.15	36.85
Unlevered Net Income		18.20	27.56	38.79	52.27	68.44
Free Cash Flow:		1	2	3	4	5
Unlevered Net Income		18.20	27.56	38.79	52.27	68.44
Depreciation		14.00	14.00	14.00	14.00	14.00
Capital Expenditures		14.00	14.00	14.00	14.00	14.00
Change in Net Working Capital		11.28	13.54	16.24	19.49	14.08
Free Cash Flow		6.92	14.02	22.55	32.78	54.36
Net Working Capital	0	1	2	3	4	5
Cash	5.00	6.00	7.20	8.64	10.37	12.44
Accounts Receivable	25.00	30.00	36.00	43.20	51.84	62.21
Inventory	48.00	57.60	69.12	82.94	99.53	102.52
Accounts Payable	21.60	25.92	31.10	37.32	44.79	46.13
Net Working Capital	56.40	67.68	81.22	97.46	116.95	131.03

Note: The spreadsheet for this example is on my website.

$V_4 = 906 = \frac{\mathbf{54.36}}{(\mathbf{.09-.03})}$

$V_0 = 700.63 = \frac{\mathbf{6.92}}{\mathbf{1.09}} + \frac{\mathbf{14.02}}{(\mathbf{1.09})^2} + \frac{\mathbf{22.55}}{(\mathbf{1.09})^3} + \frac{\mathbf{32.78+906}}{(\mathbf{1.09})^4}$

$P_0 = 16.23 = \frac{\mathbf{700.63+5-300}}{\mathbf{25}}$

Note on Example 9.7 in the textbook

Note: Since free cash flow grows at a constant rate after year 2011, we can actually calculate the present value of the free cash flows by using the 2011 free cash flow to determine terminal value:

Terminal value = $\frac{37.6}{.11-.04} = 537.14286$

$V_0 = \frac{23.6}{1.11} + \frac{26.4}{(1.11)^2} + \frac{29.3}{(1.11)^3} + \frac{32.2}{(1.11)^4} + \frac{35.0+537.14286}{(1.11)^5} = 424.86$

=> same answer as text if don't round anything in text's example

3. Connection to Capital Budgeting

=> Enterprise value = **NPV of existing plus future projects.**

9.4 Valuation Based on Comparable Firms

Note: There is a nice summary of the Law of One Price at the beginning of this section in the textbook.

The value [of a firm or its stock] is the present value of its future cash flows, because the present value is the amount we would need to invest elsewhere in the market to replicate the cash flows with the same risk.

Key idea: method of comparables (or "comps"): Estimate value of firm based on value of other, comparable firms or assets that will generate similar cash flows in the future.

=> adjust for differences in scale by expressing value as the ratio of value to some measure of firm's scale.

A. Valuation Multiples

Valuation multiple: **ratio of a firm's value to some measure of the firm's scale**

1. The Price-Earnings Multiple

$$FPE = \frac{P_0}{EPS_1} = \frac{D_1/EPS_1}{r_E - g} \quad (9.25)$$

where:

D_1 = dividend at date 1

Notes:

1) firms should have same P/E ratio IF have same payout, earnings growth, and risk (same equity cost of capital).
2) footnote 8 is important. When valuing based on multiples, want to capture only ongoing earnings. So usually exclude extraordinary items when calculating P/E ratios.

Ex. Last year Morphia Corp. reported earnings of $1.00 per share. However, last year the firm had a non-recurring loss of $0.50 due to its writing down of the value of assets it acquired two years ago. The average P/E ratio for comparable firms equals 14, but range from 12 to 15. Calculate a reasonable price per share for Morphia?

Average = $21 = **14 x 1.50**
Range:

High = $22.50 = **15 x 1.50**
Low = $18 = **12 x 1.50**

2. Enterprise Value Multiples

$$\frac{V_0}{EBITDA_1} = \frac{FCF_1/EBITDA_1}{r_{wacc} - g_{FCF}} \quad (9.26)$$

Notes:

1) beneficial if firms have **different levels of leverage**
2) multiple higher for firms with high growth since higher g_{FCF}
3) multiple higher for firms withand low capital requirements since higher FCF
4) multiple is lower for higher-risk firms since higher r_{wacc}

Ex. Last year Velocity Inc.'s EBIT equaled $160 million. Velocity's depreciation expense equaled $30 million and its amortization expense equaled $10 million. It had $500 million of debt and $100 million of cash. The average enterprise value to EBITDA was 7, but ranged from 6 to 8.5. Calculate a reasonable price per share for Velocity if there are 50 million shares outstanding.

EBITDA = $200 = **160 + 30 + 10**

Enterprise Value:

Average = $1400 = **7 x 200**
High = $1700 = **8.5 x 200**
Low = $1200 = **6 x 200**

Price:

Note: EV = Equity + (Debt – Cash) => Equity = EV – (Debt – Cash)

Average: $20 = $\frac{(1400-(500-100))}{50}$
High: $26 = $\frac{(1700-(500-100))}{50}$
Low: $16 = $\frac{(1200-(500-100))}{50}$

3. Other Multiples

=> enterprise value to sales, market price to book value of equity

B. Limitations of Multiples

1. Differences can stem from differences in growth, profitability, risk, accounting conventions, management competence, manufacturing processes, patents, etc.

2. **Not clear how to adjust for these differences**

3. Doesn't help us determine whether the set of comparable firms is fairly valued

C. Comparison with Discounted Cash Flow Methods

Keys:

1) using market's valuation of firms with similar prospects
2) comparables are a **short-cut estimate of value**

D. Stock Valuation Techniques: The Final Word

Key idea: all of these techniques are only estimates => most practitioners use a combination of approaches

9.5 Information, Competition, and Stock Prices

Fundamental question: if market price differs from our estimated value, is it more likely that the market price wrong or that our estimate is wrong?

A. Information in stock prices

Key issues:

1) the NPV of buying and selling a stock cannot *both* be positive
2) stock prices aggregate the information and views of many different investors as the willingness of others to trade lead buyers and sellers to revise their own beliefs about values
3) **need a compelling reason to believe own analysis is better than the combined analysis of all other market participants**

B. Competition and Efficient Markets

Key idea: efficient markets: competition between investors eliminates all positive NPV trading (selling or buying).

=> **securities are fairly priced**

1. Public, Easily Interpretable Information

=> can include news, information on the internet, financial statements, corporate press releases, etc.

2. Private or Difficult-to-Interpret Information

Note: markets should be just inefficient enough that **it is worthwhile for the most skilled analysts to gather and interpret information about securities**

3. Tests of Market Efficiency

=> tests of market efficiency often categorized by the type of information that markets are efficient with respect to

1) Weak form: it should not be possible to consistently profit by trading on information in past prices
2) Semi-strong form: it should not be possible to consistently profit by trading on any public information (info released by firm, news organizations, or analysts)
3) Strong form: it should not be possible to consistently profit by trading on private information

4. Lessons for Investors and Corporate Managers

a. Consequences for investors

1) positive NPV opportunities in securities markets only exist if **unique expertise, better information, or lower trading costs**
2) uninformed investors can invest with confidence since **securities should be fairly priced almost all the time**

b. Implications for Corporate Managers

1) **should make decisions that increase the present value of free cash flows**
2) should not base decisions on the impact on accounting statements
3) firms should be able to issue securities at a fair price

5. The Efficient Markets Hypothesis Versus No Arbitrage

Key idea => NPV of investing is zero if markets efficient