Introduction to Stock Valuation

(Text reference: Chapter 5 (Sections 5.4-5.9))

Topics

- background
- dividend discount models
- parameter estimation
- growth opportunities
- price-earnings ratios
- some final points

Background

- recall that a corporation is owned by its shareholders and that the shareholders' equity is the portion of total assets that belong to the shareholders

- the value of shareholders' equity as recorded on the balance sheet is the *book value* of equity; dividing the book value of equity by the number of outstanding shares gives the book value per share

- the *market value* of each share is the price required to purchase a share in the firm from a trade on a stock exchange; multiplying the share price by the number of outstanding shares gives the market value of equity

- these two equity values (book vs. market) are seldom equal—for most healthy firms, market value exceeds book value

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- why does market value $\neq$ book value?

  - share price is based on the returns or cash flows that the investor expects to receive from owning the share (depends on the ability of the company to earn a profit)

  - book value depends on the historical costs of the firm's assets (this may tell us the replacement value of the firm's assets, but it does not necessarily reflect the ability of the firm to turn the assets into profits)

- more precisely, market value is determined by the ability of the firm to earn a return on its investments above the opportunity cost of capital

- compared to bonds, stocks are more difficult to value because:

  - cash flows are not pre-specified

  - no maturity date

  - can't easily determine or observe required market return

Dividend Discount Models

- as with any asset, the (market) value of a share of common stock is determined by the PV of its expected future cash flows

- shareholders receive cash in the form of dividends (assume annually for simplicity) or capital gains/losses, or both

- notation:
  - P_0 market price of a share today
  - P_t market price of a share after the end of year t
  - Div_t dividend per share paid at the end of year t
  - r discount rate

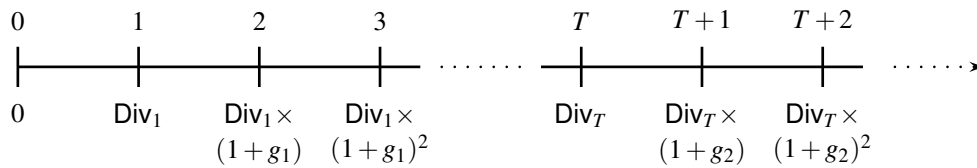- suppose an investor buys the stock and holds it for one year:

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- what about P_1?

- extend until time T:

- basic dividend discount (a.k.a. Gordon) model:

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- the dividend discount model simply says that today's stock price is the PV of all expected future dividends
  - takes into account both dividends and capital gains
  - long-term model holds even when investors have short horizons
- special cases:
  1. Zero growth: dividends remain at the same level forever

  2. Constant growth: dividends grow at the same rate g forever

  3. Differential growth: dividends grow at different rates over time (see examples below)

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- the basic idea for differential growth is something like this:

0	1	2	3	T	$T+1$	$T+2$

0 Div_1 $\text{Div}_1\times$ $\text{Div}_1\times$ Div_T $\text{Div}_T\times$ $\text{Div}_T\times$

$(1+g_1)$ $(1+g_1)^2$ $(1+g_2)$ $(1+g_2)^2$

- in this case, we have high growth (at the rate g_1) for T periods and then low growth (at the rate g_2) forever after

$$P_0 = \sum_{t=1}^{T} \frac{\text{Div}_t}{(1+r)^t} + \frac{P_T}{(1+r)^T}$$

$$= \sum_{t=1}^{T} \frac{\text{Div}_1 \times (1+g_1)^{t-1}}{(1+r)^t} + \frac{\text{Div}_{T+1}}{r-g_2} \times (1+r)^{-T}$$

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- example: a firm's dividends are expected to grow at 25% per year for three years after which growth will slow to 8% per year forever. The firm just paid a dividend of $0.60 per share and $r = 15\%$. What is P_0?

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- example: four years ago a firm paid a dividend of $0.32 per share. Today it paid a dividend of $0.62 per share. Dividends will continue to grow at this same rate for the next four years, after which the growth rate will be 5% per year forever. Suppose the opportunity cost of capital is 10%. If someone offers to sell you this stock for $22, should you buy it?

Parameter Estimation

- growth rate g:
  - net investment is total investment less depreciation
  - if net investment equals zero, the firm is maintaining its productive capacity but not expanding
  - net investment is positive only if some earnings are retained
  - since

    earnings next year $=$ earnings this year
    $+$ retained earnings this year $\times$ return on retained earnings,

  we have

  $$g = \text{retention ratio} \times \text{return on retained earnings}$$
  $$= \text{retention ratio} \times \text{ROE}$$

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- discount rate r:
  - we will consider only one simple way here (see Chapters 10-11 for more sophisticated alternatives)
  - in the case of the constant growth model:

$$P_0 = \frac{\text{Div}_1}{r - g} \Rightarrow r = \frac{\text{Div}_1}{P_0} + g$$

  - the estimated value of r will be very sensitive to the estimated value for g (and thus to assumptions made when estimating g)
  - some analysts argue that the errors are so large when calculating r for a single firm that one should do it for each firm in an industry and use the average estimate of r

Growth Opportunities

- the models above use projected future dividends to determine common stock value
- while in general the payment of dividends reflects that a firm is profitable, there is often little relationship between profitability and size of dividend
- dividends often do not provide sufficient information regarding future profitability $\Rightarrow$ the key to firm valuation is the rate of return that the firm earns relative to the cost of capital
- if a firm pays out all earnings as dividends, it will have no growth:

$$P_0 = \frac{\text{Div}_1}{r} = \frac{\text{EPS}_1}{r}$$

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- however, firms typically do have growth opportunities. If so, the stock will have additional value equal to the net present value (per share) of growth opportunities (NPVGO):

$$\Rightarrow P_0 = \frac{\text{EPS}}{r} + \text{NPVGO}$$

- note that the stock price will be lower than the zero growth case if NPVGO < 0, even if earnings and dividends are growing (see text example pp. 131-132)

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- example: a firm has $\text{EPS}_1 = \$4.50$ and a retention ratio of 30%. Its return on retained earnings is 25%. If $r = 15\%$, what is P_0? What portion of this is due to NPVGO?

Price-Earnings Ratios

- the decomposition of $P_0 = \frac{\text{EPS}}{r} + \text{NPVGO}$ implies that

$$\frac{P_0}{\text{EPS}} = \frac{1}{r} + \frac{\text{NPVGO}}{\text{EPS}}$$

- P-E ratio depends on:
  - discount rate r
  - NPVGO
  - choice of accounting method
  - "trailing" or "forward" EPS

- a recently popular variation: PEG (P-E divided by growth rate) (see text discussion pp. 137-138)

Some Final Points

- stock value can be estimated from either a discounted dividend approach or a growth opportunities approach

- why not discount earnings?
  - investors receive dividends, not earnings
  - the discounted value of earnings would be too high

- how do we value a firm which never pays any dividends?
  - many firms (especially high growth firms) do not pay a dividend
  - hard to apply dividend discount models
  - must assume something about cash flows ultimately received by investors (e.g. future dividends or share price)