

### Corpfm module 3: Stock valuation intuition and practice problems

(The attached PDF file has better formatting.)

#### Brealey and Myers Chapter 4 stocks

##### \*\* Exercise 1.2: stock price

A stock's price depends on several variables:

- A.  $\beta$  = the CAPM beta for the stock
- B.  $r_f$  = risk-free rate
- C.  $mrp$  = market risk premium
- D.  $eps$  = earnings per share
- E.  $g$  = growth rate of earnings and dividends
- F. ROE = return on book equity
- G.  $b$  = payout ratio

How do each of these affect the stock price? For example, if  $\beta$  increases and all other parameters remain the same, does the stock price increase or decrease?

*Part A:* If  $\beta$  increases, the stock's market capitalization rate increases. If the expected dividends remain the same, the stock price decreases.

*Part B:* A higher risk-free rate means a higher market capitalization rate, which decreases the stock price. In practice, a higher risk-free rate generally is associated with higher dividend growth rates, so the stock price does not change.

*Part C:* A higher market risk premium means investors are less sanguine about market returns and are less likely to invest in common stocks. They may move to bonds, real estate, and other investments. Demand for stocks decreases, and stock prices decrease. For the dividend growth model, the higher market risk premium means a higher market capitalization rate and lower stock prices.

*Part D:* If earnings per share increase, each share is more valuable, so the stock price increases. For the dividend growth model, if the payout ratio does not change and earnings per share increase, then dividends increase and the stock price increases.

*Part E:* If the dividend growth rate increases, the stock price increases. If the dividend growth rate is zero, all earnings are paid out as dividends and the stock has no present value of growth opportunities. If the payout ratio remains the same and the dividend growth rate increases, the stock has higher present value of growth opportunities and the stock price increases.

*Part F:* If the return on book equity increases, the NPV of the firm's project increases, and the stock price increases. For the dividend growth model, the return on book equity times the plow-back ratio ( $= 1 - \text{payout ratio}$ ) is the dividend growth rate.

*Part G:* If the return on book equity is more than the market capitalization rate, the firm should reinvest its earnings, not pay them out as dividends. A higher payout ratio reduces the stock price.

If the return on book equity is less than the market capitalization rate, the firm should put out its earnings to shareholders, not reinvest them. A higher payout ratio increases the stock price.

**\*\* Exercise 1.3: Stock price**

Firms ABC and XYZ have the same assets and projects, the same number of share outstanding, and the same return on book equity.

ABC has a higher payout ratio (dividends divided by earnings).

- A. Which firm has the higher market capitalization rate?
- B. Which firm has the higher growth rate of earnings per share?
- C. Which firm has the higher stock price?

*Part A:* If the firms have the same assets and projects, they have the same systematic risk and the same market capitalization rate.

*Part B:* The earnings growth rate is the return on book equity  $\times$  the plowback ratio ( $= 1 - \text{the payout ratio}$ ). If the payout ratio is constant, the dividend growth rate equals the earnings growth rate. XYZ has the lower payout ratio so it has the higher earnings growth rate.

*Part C:* If the return on book equity is more than the market capitalization rate, the firm with the higher plowback ratio (firm XYZ) has the higher stock price, since it is better to reinvest the earnings in the firm's projects than to pay them as dividends.

If the return on book equity is less than the market capitalization rate, the firm with the higher payout ratio (firm ABC) has the higher stock price, since it is better to pay the earnings as dividends to shareholders than to reinvest them in the firm's projects, which has negative net present values.

**\*\* Exercise 1.4: Dividend growth model**

The risk-free rate is 5%, the market risk premium is 8%, and a firm's CAPM  $\beta$  is 0.875.

In 20X1, the firm's after-tax earnings per share are \$10.00, and its payout ratio is 60% each year.

Earnings are expected to grow indefinitely at a constant rate.

The firm's ROE = ratio of earnings to book value of equity = 15%.

- A. What is the firm's market capitalization rate?
- B. What is the firm's growth rate of earnings per share?
- C. What is the firm's growth rate of dividends per share?
- D. What is the firm's dividend in 20X1?
- E. What is the firm's expected dividend in 20X2?
- F. What is the firm's stock price in 20X1?
- G. If the firm paid out all earnings as dividends starting in 20X1 (instead of paying out only 60%), what would its stock price be in 20X1 right after its dividend payment?
- H. What is the firm's present value of growth opportunities?
- I. If the firm paid out all earnings as dividends starting in 20X2 (instead of paying out only 60%), what would its stock price be in 20X1 right after its dividend payment?
- J. What is the firm's present value of growth opportunities?

*Part A:* the firm's market capitalization rate (from the CAPM equation) =  $5\% + 0.875 \times 8\% = 12\%$ .

*Part B:* The firm's growth rate of earnings per share =  $\text{ROE} \times (1 - 60\%) = 6\%$ .

*Part C:* The payout rate is constant, so the growth rate of dividends per share is also 6%.

*Part D:* The dividend in 20X1 is  $\$10 \times 60\% = \$6$ .

*Part E:* The dividend in 20X2 is  $\$6 \times 1.06 = \$6.36$ .

*Part F:* The stock price in 20X1 is  $\$6.36 / (12\% - 6\%) = \$106.00$ .

*Part G:* If the firm pays all earnings as dividends beginning in 20X1, its dividends are \$10 a year. Its stock price right after the 20X1 dividend payment is  $\$10 / 12\% = \$83.33$  and its dividend growth rate is zero.

*Part H:* The present value of growth opportunities is the difference between the stock price if the firm grows at the current rate and the stock price if the firm does not grow. If the firm stops retaining earnings in 20X1:  $\$106.00 - \$83.33 = \$22.67$ .

*Part I:* Earnings per share next year are \$10.60 if the firm pays only a \$6 dividend in 20X1. If these earnings are all paid as dividends, its stock price should be  $\$10.60 / 12\% = \$88.33$ .

The stock price depends on when the firm stops retaining any earnings. The first solution assumes the firm stops retaining earnings in 20X1. The second solution assumes the firm stops retaining earnings in 20X2.

*Part J:* The present value of growth opportunities is the difference between the stock price if the firm grows at the current rate and the stock price if the firm does not grow. If the firm stops retaining earnings in 20X2:  $\$106.00 - \$88.33 = \$17.67$ .

*Question:* Which interpretation do Brealey and Myers use?

*Answer:* Brealey and Myers assume the 20X1 dividend payment is past history. The firm has a 60% payout ratio, so it paid out only \$6 in dividends, not \$10. If the firm *now* decides to stop retaining any earnings, its expected dividend is \$10.60 each year.

*Question:* Chapter 4 of the Brealey and Myers textbook says that the stock price depends on the payout ratio. If  $ROE >$  the firm's market capitalization rate, a higher payout rate depresses the stock price. In Chapter 16, the textbook says that dividend policy is irrelevant to the firm's stock price. Which is correct?

*Answer:* Chapter 16 says that dividend policy is irrelevant to the firm's stock price in perfect capital markets. In perfect capital markets, all firms are the same, and all investors have perfect information. If all firms have high ROE's, the market capitalization rate is equally high. An attribute of perfect capital markets is that  $ROE =$  the firm's market capitalization rate. In this special case, the payout ratio does not affect the stock price.