Gordon Growth Model (Continued)

Determining Dividend Growth Rates

How does the cash make its way from earnings into dividends?

Terminology

- **Book equity per share (BE):** replacement cost (per share) of productive capacity.
- **Return on equity (ROE):** cash flow generated by capital, net of maintaining productive capacity, as a percentage of BE.
- **Earnings per share (EPS):** cash flow (per share) generated by capital, net of maintaining productive capacity.

$$EPS_t = ROE \times BE_{t-1}$$

Retained Earnings and Dividends

Terminology

- **Plowback Ratio (b):** The fraction of earnings that is retained.
- **Payout Ratio (1-b):** The fraction of earnings that is paid out as a dividend.

$$\text{Payout Ratio} = 1 - b$$
$$\text{Div}_t = \text{EPS}_t \times (1 - b)$$

Example: Consider a firm with BE_0 = \$50, return on equity of 10%, and a plowback ratio of 0.5. What is BE_1?

- EPS_1 is based on *last* year's BE_0 and ROE

$$\text{EPS}_1 = \text{BE}_0 \times \text{ROE} = \$50 \times 0.1 = \$5$$

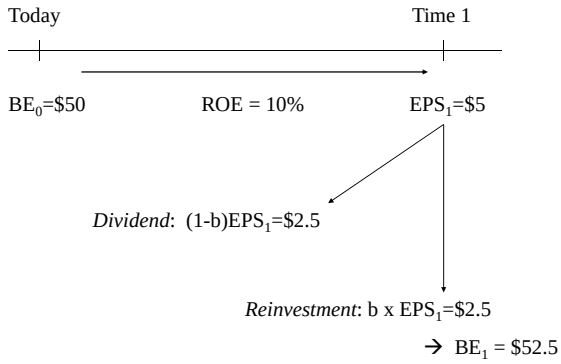
- The reinvestment is the part of the EPS_1 that is plowed back into the firm (b=50%)

$$\text{Reinvestment}_1 = b \times \text{EPS}_1 = 0.5 \times \$5 = \$2.5$$

- Thus the book equity BE_1 (after reinvestment) will be \$52.5

- The growth rate is: $g = \frac{2.50}{50} = 5\%$

So what did we do…



Determining Growth Rates

Growth in BE:

$$BE_t - BE_{t-1} = EPS_t \times b = BE_{t-1} \times ROE \times b$$

$$\Rightarrow \frac{BE_t - BE_{t-1}}{BE_{t-1}} = ROE \times b$$

Growth in EPS

$$EPS_t = BE_{t-1} \times ROE \Rightarrow \frac{EPS_t - EPS_{t-1}}{EPS_{t-1}} = ROE \times b$$

Growth in Dividends

$$DIV_t = (1-b) \times EPS_t \Rightarrow \frac{DIV_t - DIV_{t-1}}{DIV_{t-1}} = ROE \times b$$

$$\boxed{g = ROE \times b}$$

So…does the plowback ratio matter?

Example 1: Firm A has an ROE of 5% , current BE = $20/share, its cost of capital is r=5%. What is current share price if the plowback ratio is b=0, b=0.5.

- <u>b=0</u> $\Rightarrow g = ROE \times b = 0$

$$P_0 = \frac{DIV_1}{r-g} = \frac{ROE \times BE \times (1-b)}{0.05-0} = \frac{1}{0.05} = \$20$$

- <u>b=0.5</u> $\Rightarrow g = ROE \times b = 2.5\%$

$$P_0 = \frac{DIV_1}{r-g} = \frac{ROE \times BE \times (1-b)}{0.05-0.025} = \frac{0.5}{0.025} = \$20$$

Example 2: Firm A has an ROE of 5% , current BE = \$20/share, its cost of capital is r=7%. What is current share price if the plowback ratio is b=0, b=0.5.

- b=0 $\Rightarrow g = ROE \times b = 0$

$$P_0 = \frac{DIV_1}{r - g} = \frac{ROE \times BE \times (1-b)}{0.07 - 0} = \frac{1}{0.07} = \$14.28$$

- b=0.5 $\Rightarrow g = ROE \times b = 2.5\%$

$$P_0 = \frac{DIV_1}{r - g} = \frac{ROE \times BE \times (1-b)}{0.07 - 0.025} = \frac{0.5}{0.045} = \$11.1$$

- Why are prices different?

Do we earn higher returns on "better" firms' equity?

Example: Firm A has an ROE of 5%. Its current BE = \$20/share, its cost of capital is r=8%, and its plowback ratio is b=0.

$$g = ROE \times b = 0$$

- What dividend do you expect to receive in one year?

$$DIV = EPS \times (1-b) = BE \times ROE \times (1-b) = \$20 \times 0.05 \times 1 = \$1$$

- What is the current share price? $P_0 = \frac{DIV_1}{r} = \frac{\$1}{0.08} = \$12.5$
- What is the expected price next year?

$$P_0 = \frac{DIV_1 + P_1}{1+r} \Rightarrow P_1 = \$12.5(1.08) - \$1 = \$12.5$$

- What capital gain and total return will you earn from investing in this firm?

$$\text{capital gain} = 0, \ \text{return} = \frac{DIV_1 + P_1 - P_0}{P_0} = \frac{1}{12.5} = 0.08$$

Example (continued): Firm B is as Firm A (ROE of 5%, current BE = \$20/share, , cost of capital r=8%) with plowback ratio of b=0.5.

$$g = ROE \times b = 5\% \times 0.5 = 2.5\%$$

- What dividend do you expect to receive in one year?

$$DIV = EPS \times (1-b) = BE \times ROE \times (1-b) = \$20 \times 0.05 \times 0.5 = \$0.5$$

- What is the current share price? $P_0 = \frac{DIV_1}{r - g} = \frac{\$0.5}{0.08 - 0.025} = \$9.09$
- What is the expected price next year?

$$P_0 = \frac{DIV_1 + P_1}{1+r} \Rightarrow P_1 = \$9.09(1.08) - \$0.5 = \$9.32$$

- What is the capital gain and total return?

$$\text{capital gain} = \frac{P_1 - P_0}{P_0} = 2.5\%, \ \text{return} = \frac{0.5 + 9.32 - 9.09}{9.09} = 0.08$$

Firm A is making better financial decisions by choosing plowback ratio of 0. Investors know this and are willing to pay more for equity of Firm A but the return they receive on their investment is the same.