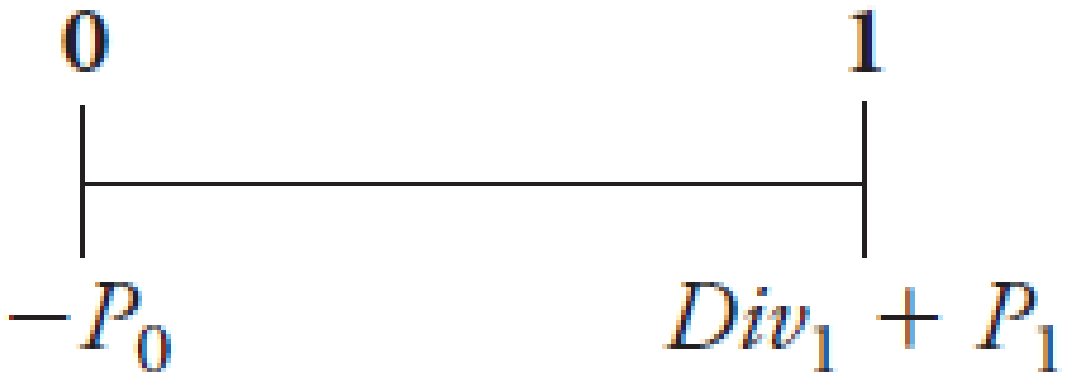
Introduction to Finance

L13 & L14

Stock valualtion

- *Div*1 be the total dividends paid per share of the stock during the year.
- **Equity cost of capital**, *rE*, is the expected return of other investments available in the market with equivalent risk to the firm's shares



Dividend-Discount Model:

- Dividend yield, Capital gain, capital gain rate, total return

$$P_0 = \frac{Div_1 + P_1}{1 + r_E}$$

Total Return

$$r_E = \frac{Div_1 + P_1}{P_0} - 1 = \underbrace{\frac{Div_1}{P_0}}_{\text{Dividend Yield}} + \underbrace{\frac{P_1 - P_0}{P_0}}_{\text{Capital Gain Rate}}$$

Example:

- Suppose you expect Walgreen Company to pay dividends of $1.40 per share and trade for $80 per share at the end of the year. If investments with equivalent risk to Walgreen's stock have an expected return of 8.5%, what is the most you would pay today for Walgreen's stock? What dividend yield and capital gain rate would you expect at this price?

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- P0=75.02

Multi-year investor

$$P_1 = \frac{Div_2 + P_2}{1 + r_E}$$

$$P_0 = \frac{Div_1 + P_1}{1 + r_E} = \frac{Div_1}{1 + r_E} + \frac{1}{1 + r_E}\overbrace{\left(\frac{Div_2 + P_2}{1 + r_E}\right)}^{P_1}$$

$$= \frac{Div_1}{1 + r_E} + \frac{Div_2 + P_2}{(1 + r_E)^2}$$

$$P_0 = \frac{Div_1}{1 + r_E} + \frac{Div_2 + P_2}{(1 + r_E)^2}$$

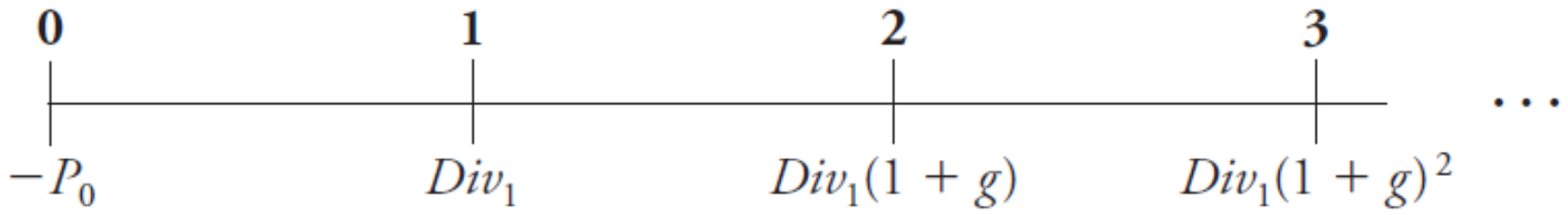
Setting the stock price equal to the present value of the future cash flows

Dividend-Discount Model

$$P_0 = \frac{Div_1}{1 + r_E} + \frac{Div_2}{(1 + r_E)^2} + \cdots + \frac{Div_N}{(1 + r_E)^N} + \frac{P_N}{(1 + r_E)^N}$$

- We can continue this process for any number of years by replacing the final stock price with the value that the next holder of the stock would be willing to pay.
- *The price of the stock is equal to the present value of the expected future dividends it will pay*.

Dividend-Discount Model



- The simplest forecast for the firm's future dividends states that they will grow at a constant rate, *g*, forever.

Constant dividend growth

Constant Dividend Growth Model

$$P_0 = \frac{Div_1}{r_E - g}$$

- Constant growth perpetuity
- According to the **constant dividend growth model**, the value of the firm depends on the dividend level for the coming year, divided by the equity cost of capital adjusted by the expected growth rate of dividends.

Constant dividend growth

Valuing a Firm with Constant Dividend Growth

- Consolidated Edison, Inc. (Con Edison, is a regulated utility company that services the New York City area. Suppose Con Edison plans to pay $2.60 per share in dividends in the coming year. If its equity cost of capital is 6% and dividends are expected to grow by 2% per year in the future, estimate the value of Con Edison's stock.
- An: $65

Divedend versus investment

- The firm's share price increases with the current dividend level, *Div*1, and the expected growth rate, *g*.
- To maximize its share price, a firm would like to increase both these quantities. Often, however, the firm faces a trade-off: Increasing growth may require investment, and money spent on investment cannot be used to pay dividends.

$$Div_t = \underbrace{\frac{\text{Earnings}_t}{\text{Shares Outstanding}_t}} \times \text{Dividend Payout Rate}_t$$

Dividends

- Firm can increase its dividend in 3 ways

1. It can increase its earnings (net income).
2. It can increase its dividend payout rate.
3. It can decrease its shares outstanding.

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Dividends

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- Assume – Shares outstanding is fixed (no new shares issued or no buy back of existing shares)
- Then the trade of is between option 1 and 2 to increase dividend
- A firm can do one of two things with its earnings:
  - It can pay them out to investors,
  - or it can retain and reinvest them.
- By investing more today, a firm can increase its future earnings and dividends.

Dividend v/s Investment

- If all increases in future earnings result exclusively from new investment made with retained earnings, then
- Change in Earnings = New Investment * Return on New Investment -----(1)
- New Investment = Earnings * Retention Rate ----- (2)
- Substituting these Eq.2 in Eq.1 and dividing by earnings gives an expression for the growth rate of earnings:
- Earnings Growth Rate =Change in Earnings/ Earnings
- **Earnings Growth Rate (g) = Retention Rate * Return on New Investment**
- This growth rate- known as firm's sustainable growth rate

Dividend v/s Investment : Profitability

- **Earnings Growth Rate (g) = Retention Rate * Return on New Investment**
- Thus, firm can increase g by increasing retention rate, i.e. increasing retained earnings
- However, if the firm retains more earnings, it will be able to payout less of those earnings (low dividend pay out rate) and hence low dividend
- If a firm wants to increase its share price, should it cut its dividend and invest more, or should it cut investment and increase its dividend? the answer will depend on the profitability of the firm's investments.

Example

- Crane Sporting Goods expects to have earnings per share of $6 in the coming year. Rather than reinvest these earnings and grow, the firm plans to pay out all of its earnings as a dividend. With these expectations of no growth, Crane's current share price is $60.

Example: Case I

- Suppose Crane could cut its dividend payout rate to 75% for the foreseeable future and use the retained earnings to open new stores. The return on its investment in these stores is expected to be 12%. Assuming its equity cost of capital is unchanged, what effect would this new policy have on Crane’s stock price?

Solution

- r_E *?*
- *Dividend?*
- *g?*
- *Dividend yield?*
- *New policy-dividend?g? Share Price (Po)?*

Case II

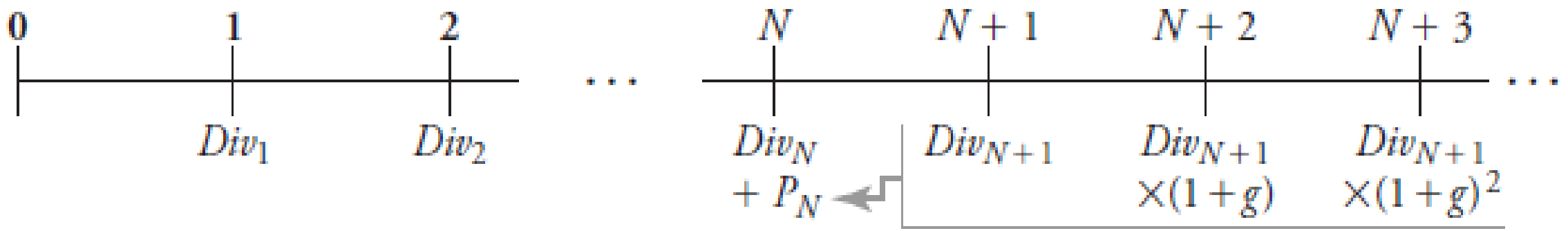
- Suppose that the return on these new investments is 8%, rather than 12%. Given its expected earnings per share this year of $6 and its equity cost of capital of 10%, what will happen to Crane's current share price in this case?

- Comparing both cases- the effect of cutting firms dividend to grow crucially depends on the return on new investment (RoNI)
- Case 1: RoNI of 12% exceeds (>) equity cost of capital (10%). Hence new investment has a positive NPV
- Case 2: RoNI of 8% is lower than (<) equity cost of capital (10%). Hence new investment has a negative NPV (even though it will lead to earnings growth)
- Thus, cutting the firms dividend to increase investment (i.e. increase g) will raise stock price if and only if the new investment have a positive NPV

Changing growth rates

- Successful young firms often have very high initial earnings growth rates. During this period of high growth, firms often retain 100% of their earnings to exploit profitable investment opportunities.
- As they mature, their growth slows to rates more typical of established companies. At that point, their earnings exceed their investment needs and they begin to pay dividends.
- We cannot use the constant dividend growth model to value the stock of such a firm, for several reasons. First, these firms often pay *no* dividends when they are young.
- Second, their growth rate continues to change over time until they mature.
- However, we can use the general form of the dividend-discount model to value such a firm by applying the constant growth model to calculate the future share price of the stock *PN* once the firm matures and its expected growth rate stabilizes:

Changing growth rates



- if the firm is expected to grow at a long-term rate *g* after year *N* + 1, then from the constant dividend growth model:

$$P_N = \frac{Div_{N+1}}{r_E - g}$$

Dividend-Discount Model with Constant Long-Term Growth

$$P_0 = \frac{Div_1}{1 + r_E} + \frac{Div_2}{(1 + r_E)^2} + \cdots + \frac{Div_N}{(1 + r_E)^N} + \frac{1}{(1 + r_E)^N}\left(\frac{Div_{N+1}}{r_E - g}\right)$$

Example changing growth rate

- Small Fry, Inc., has just invented a potato chip that looks and tastes like a french fry. Given the phenomenal market response to this product, Small Fry is reinvesting all of its earnings to expand its operations. Earnings were $2 per share this past year and are expected to grow at a rate of 20% per year until the end of year 4. At that point, other companies are likely to bring out competing products. Analysts project that at the end of year 4, Small Fry will cut investment and begin paying 60% of its earnings as dividends and its growth will slow to a long-run rate of 4%. If Small Fry's equity cost of capital is 8%, what is the value of a share today?

Solution

- Use Small Fry's projected earnings growth rate and payout rate to forecast its future earnings and dividends as shown below

	Year	0	1	2	3	4	5	6
Earnings								
1	EPS Growth Rate (versus prior year)		20%	20%	20%	20%	4%	4%
2	EPS	$2.00	$2.40	$2.88	$3.46	$4.15	$4.31	$4.49
Dividends								
3	Dividend Payout Rate		0%	0%	0%	60%	60%	60%
4	Dividend		$ —	$ —	$ —	$2.49	$2.59	$2.69

Solution

From year 4 onward, Small Fry's dividends will grow at the expected long-run rate of 4% per year. Thus, we can use the constant dividend growth model to project Small Fry's share price at the end of year 3. Given its equity cost of capital of 8%,

$$P_3 = \frac{Div_4}{r_E - g} = \frac{\$2.49}{0.08 - 0.04} = \$62.25$$

We then apply dividend-discount model with P3 as terminal price value

$$P_0 = \frac{Div_1}{1 + r_E} + \frac{Div_2}{(1 + r_E)^2} + \frac{Div_3}{(1 + r_E)^3} + \frac{P_3}{(1 + r_E)^3} = \$49.42$$

- Thus dividend-discount model is flexible enough to handle any forecasted pattern of dividends.
- However, the dividend-discount model is sensitive to the dividend growth rate, which is difficult to estimate accurately.