

Overview of Lecture 7



- Stock Valuation

Market Capitalization Rates

- Define for ABC Corp:
 - P_0 = the current stock price (at time 0) .
 - P_1 = the expected stock price in one year (at time 1) .
 - DIV_1 = expected dividend received during the year ending at 1.

- **Expected return = $r = (DIV_1 + P_1 - P_0)/(P_0)$**

This return combines DIV_1 and the capital gain ($P_1 - P_0$).
 r is also called **market capitalization rate**.

- Example: $P_0 = \$100$, $P_1 = \$110$, $DIV_1 = \$5$:
 $r = (5 + 110 - 100)/100 = 15/100 = .15 = 15\%$.

Current Prices and Expectations

- This equation for r can be rearranged to be a PV:

$$P_0 = \frac{DIV_1 + P_1}{1 + r}$$

- The current P_0 = the present value of $(DIV_1 + P_1)$
- Example: $DIV = 5$, $P_1 = \$110$, $r = .15$

$$P_0 = (5 + 110)/(1.15) = 115/(1.15) = \$100.$$

Stock Prices and More Expectations

- P_0 depends on expected P_1 :

$$P_0 = (DIV_1 + P_1) / (1 + r)$$

- But what determines expected P_1 ?

$$P_1 = (DIV_2 + P_2) / (1 + r)$$

- Now substitute P_1 value in P_0 equation:

$$P_0 = \frac{DIV_1}{(1 + r)^1} + \frac{DIV_2 + P_2}{(1 + r)^2}$$

Stock Prices and Still More Expectations

- So we have P_0 depending on DIV_1 , DIV_2 , and P_2 :

$$P_0 = \frac{DIV_1}{(1+r)^1} + \frac{DIV_2 + P_2}{(1+r)^2}$$

- And P_2 depends on P_3 and DIV_3 , and so on.
- If we keep substituting for each later P , we get:

$$P_0 = \sum_{t=1}^{\infty} \frac{DIV_t}{(1+r)^t}$$

- The current stock price equals the **present value of all expected future dividends.**

$P_0 \equiv$ present value of all future stock dividends

■ FAQs:

- Can a company not paying dividends still have value?
- What if the firm never pays dividends?
- How do we determine future dividends anyway?
- Does this take capital gains into account?
- What about investor with a short horizon (like 1 year)?
- Is it better to use earnings than dividends?

Some Questions...

- What does the current share price tell us?
 - PV of all expected future dividends
- How do we determine the appropriate discount rate for discounting these dividends?
- How do we estimate the future dividends?
- Is fast growth a good thing? A bad thing? Anything?
- What are “EPS”, “dividend yield”, “PE ratio”?
- What does a P/E ratio tell us?

Stock Quotes

(WSJ, Thursday 9/21/00)

ADR: American
Depository Receipt

pf: Preferred stock

52 WEEKS		STOCK	SYM	YLD			VOL 100s	HI		LO	CLOSE	NET CHG
HI	LO			DIV	%	PE		HI	LO			
-A-A-A-												
2650	1006	AAR	AIR	.34	2.8	9	1206	1244	1075	1213	+ 013	
28	1925	ABM Indus	ABM	.62	2.3	15	248	2750	2688	2688	- 063	
2650	1938	ABN Am ADR	ABN	1.28e	5.6	...	563	2338	2294	23	- 019	
24	1919	ABN Am pfA	pfA	1.88	8.1	...	590	2319	23	2313	- 013	
2269	1888	ABN Am pfB	pfB	1.78	8.1	...	342	2194	2175	2188	- 013	
2625	2025	ACE CapTr	CapTr	1.73e	6.8	...	54	2544	2506	2544	+ 031	
3725	1406	ACE Ltd	ACL	.52	1.4	17	7889	3713	3631	3650	- 050	
78	1760	ACE Ltd	ADPDES	1.42e	1.8	...	26	7725	77	7725	+ 089	

This is really
 $26.875 = 26 \frac{7}{8}$

- **Dividend:** 4 x most recently quarterly dividend.
- **Dividend Yield:** Dividend / Closing Price
 - For ABM, $0.62 / 26.88 = 2.3\%$
- **PE Ratio:** = Closing Price / latest 4 quarters **earnings per share (EPS)**.
 - $EPS = \text{Earnings (exc. extraordinary items)} / \text{Fully diluted \# shares.}$
 - Why do some stocks not list a PE ratio?

From Last Class...

- Last time we found that

$$P_0 = \sum_{t=1}^{\infty} \frac{DIV_t}{(1+r)^t} = \frac{DIV_1}{1+r} + \frac{DIV_2}{(1+r)^2} + \frac{DIV_3}{(1+r)^3} + \dots$$

- Stock price equals the PV of all future dividends.
 - True no matter how long I expect to hold the security.
 - » If I buy today at P_0 , and sell in 1 year, the price I expect to receive, P_1 , will depend on all future dividends.

Example

- The Gizmo Company expects short term growth:
 - In period 1, it will pay a dividend of \$5 per share;
 - Dividends then grow at a rate of 10% per period until and including the period 5 dividend.
 - After that no further growth is expected.
 - The market discounts the dividend stream at 15%.
- How much is a share worth?
 - PV of all dividends = PV (div. 1 – 5) + PV (div. 6 on)

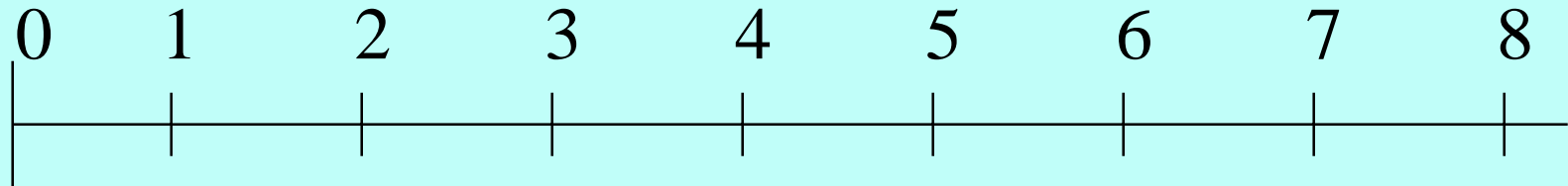
growing
annuity

perpetuity

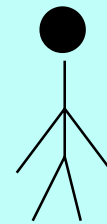
Valuing dividends 6 on



Year



Sam purchases
the perpetuity in
year 5.



7.32 7.32 7.32
(= 5 x 1.1⁴)

Payments from the
perpetuity.

Example

- The stock's value consists of two parts.
 - Part 1 is a growing annuity in periods 1 through 5.
 - Part 2 is a perpetuity, with its first payment in period 6.

$$\begin{aligned} \text{PV(Annuity)} &= \frac{5}{1.15} + \frac{5(1.1)^1}{1.15^2} + \dots + \frac{5(1.1)^4}{1.15^5} \\ &= \frac{5}{.15 - .1} \left[1 - \left(\frac{1.1}{1.15} \right)^5 \right] = 19.93 \end{aligned}$$

$$\text{PV(Perpetuity)} = \frac{7.32}{(.15)(1.15)^5} = 24.26.$$

- Total PV = 19.93 + 24.26 = 44.19

Simple Dividend Growth Model: How to Determine Cap Rate r ?

- Assume a stock's dividend will grow at a rate g .
We can express the current stock price as:

$$P_0 = \text{DIV}_1 / (r - g)$$

- But how do we determine r , the “cap” rate?
 - Sometimes we know P_0 , DIV_1 and g for a similar stock.
 - Then we can use that information to compute r :
 - $r = \text{DIV}_1 / P_0 + g$
 - We then apply the computed r to the stock of concern.

Simple Dividend Growth Model: Computing Cap Rate r : Example

- We are trying to price ABC stock
- We have market information on XYZ:
 - Date 1 expected dividend is \$2 per share.
 - Dividend expected to grow at 3% a year.
 - At date 0, stock price is \$20.
- What is the market capitalization rate?
$$r = \text{DIV}_1/P_0 + g = 2/20 + .03 = .13 = 13\%.$$

Simple Dividend Growth Model: How to determine growth rate g ?

- It is also important to know how to estimate g :
- Assume firm pays out a constant percentage of earnings and invests the rest:
 - **Earnings per share** = EPS_t
 - Dividend **Payout ratio** = DIV_t/EPS_t .
 - **Plowback ratio** = $1 - \text{Payout ratio} = 1 - DIV_t/EPS_t$
- Also, assume constant return on equity (ROE):
 - $ROE = EPS/\text{Book Value Per Share}$ (BVPS)
 - BVPS is a measure of accumulated investments.

Simple Dividend Growth Model: Determining g

- Step 1: Estimate Payout and Plowback ratios
 - Payout ratio = DIV/EPS .
 - Plowback ratio = $1 - \text{DIV}/\text{EPS}$.
- Step 2: Estimate Return on Equity
 - $\text{ROE} = \text{EPS}/\text{BVPS}$.
- Step 3: Compute $g = \text{plowback} \times \text{ROE}$

$$\text{plowback} \times \text{ROE} = \left(1 - \frac{\text{DIV}}{\text{EPS}}\right) \left(\frac{\text{EPS}}{\text{BVPS}}\right) = \frac{\text{EPS} - \text{DIV}}{\text{BVPS}} = \frac{\text{Investment/share}}{\text{BVPS}}.$$

Warning

- We now have a key equation:

$$g = \text{plowback} \times \text{ROE}$$

- **Warning:** Using this formula requires that the plowback ratio and ROE remain constant forever.
- If they do not, the formula will not necessarily provide accurate estimates.

Simple Dividend Growth Model: ABC Example for Growth Rate g

■ Information:

- $EPS_1 = \$10$, $DIV_1 = \$2$, $BVPS = 100$.
- The plowback ratio and ROE are constant.
- What is g ?

■ Compute:

- Plowback ratio = $1 - 2/10 = .80$
- $ROE = 10/100 = .10$
- $g = (\text{plowback})(ROE) = (.80)(.10) = .08 = 8\%$ per year.

Example – Change in Investment strategy for DEF

- At present, for company DEF,
 - $EPS_1 = \$10$.
 - $DIV_1 = \$8$.
 - $BVPS = \$100$.
- Using the perpetual growth model, the market values the stock at \$110.

DEF Co. Example

- DEF discovers a new investment opportunity:
 - Project return is same as its previous projects.
 - It raises its plowback ratio to finance new investment.
 - As a result next period's dividend falls to \$6.
 - What will the stock sell for now?
- Start with available information:
 - $DIV = \$8$, $EPS = \$10$, $BVPS = \$100$. $P_0 = \$110$.
- Now what is missing?
 - $g = (\text{plowback})(ROE)$; market cap rate r .

DEF Co. Example

- Computations:

$$\text{Plowback ratio} = 1 - \text{DIV}/\text{EPS} = 1 - 8/10 = .20$$

$$\text{ROE} = \text{EPS}/\text{BVPS} = 10/100 = .10$$

$$g = (\text{Plowback})(\text{ROE}) = .20 \times .10 = .02$$

$$r = \text{DIV}_1/P_0 + g = 8/110 + .02 = .0927$$

(Why can we compute r from the firm's data?)

- You now know everything there is to know in determining the firm's value after the investment.

DEF Co. Example

- We need to calculate how the factors in the model change as a result of the **new investment**:

$$\text{Plowback ratio} = 1 - \text{DIV}/\text{EPS} = 1 - 6/10 = .40$$

$$\text{ROE} = .10 \text{ (same as prior to investment)}$$

$$g = .40 \times .10 = .04$$

$$P_0 = \text{DIV}_1 / (r - g) = 6 / (.0927 - .04) = 113.85$$

- Stock price is **up \$3.85**. Why?
 - (Remember ROE of new project is same as old)

Which Firm has Highest Value? (10% market cap rate for all)

- Firm A: BVPS = 100, $EPS_1 = 10$, $DIV_1 = 10$

– Plowback = 0.0, ROE = .10, so $g = 0.0$

$$P_A = 10 / .10 = 100$$

- Firm B: BVPS = 100, $EPS_1 = 10$, $DIV_1 = 6$

– Plowback = .40, ROE = .10, so $g = .04$

$$P_B = 6 / (.1 - .04) = 100$$


- Firm C: BVPS = 150, $EPS_1 = 10$, $DIV_1 = 2$

– Plowback = .80, ROE = .067, so $g = .0533$

$$P_C = 2 / (.10 - .0533) = 42.6$$

Which Firm has Highest Value?

Interpretation

- 
- Why do firms A and B have the same value?
 - ROE is the same as the market capitalization rate.
 - Thus, all their investments have a NPV of zero.
 - Different plowback ratios are of no consequence.
 - Investing in zero NPV projects cannot change a firm's value!
 - Why does firm C have the lowest value?
 - Because its investments have **NEGATIVE** NPVs.
 - The firm's projects have $ROE = .066$; but $r = .10$.
 - Every dollar they invest pays only 66 cents in present value!