Chapter 6: Stocks

Major Stock Markets

Largest Exchanges by Market Capitalization of Listed Stocks

1. New York Stock Exchange (NYSE): $21 Trillion (market cap)
    - Founded in 1792 primarily to trade government bonds.
2. Nasdaq: $9 Trillion
    - Founded in 1971 as first electronic stock market.
3. Tokyo Stock Exchange: $6 Trillion
4. Shanghai Stock Exchange: $5 Trillion
5. London Stock Exchange: $4 Trillion
    - Founded in 1801, but tracing roots to 1571.

U.S. Market Structure

- Trading is “fragmented”—stocks trade on a variety of exchanges.
- Exchanges are not the only place trading occurs.
- “Over-the-counter” (~23%)
  - Bilateral agreement between private parties
  - No exchange supervision (“off-exchange” trading)
  - 23% of trade
- “Dark Pools” (~14%)
  - Private trading networks
  - Used by institutional investors

Major Stock Indices

- Dow Jones Industrial Average (DJIA)
  - 30 large stocks on NYSE and Nasdaq
  - Invented by Charles Dow in 1896
- Standard & Poor's 500 (S&P)
  - 500 large stocks on NYSE and Nasdaq
  - Reflects risk-to-return characteristics of large U.S. stocks
- Wilshire 5000
  - Market capitalization weighted index of U.S. stocks
  - "Total Market Index"—3,492 stocks as of Dec. 31, 2017

Stock Returns

- The **holding period return** is the return an investor earns between any two points in time, including dividends.

$$HPR = D / P_0 + (P_1 - P_0) / P_0$$

- D / P_0 is the **dividend yield**
- $(P_1 - P_0) / P_0$ is called **capital gains**

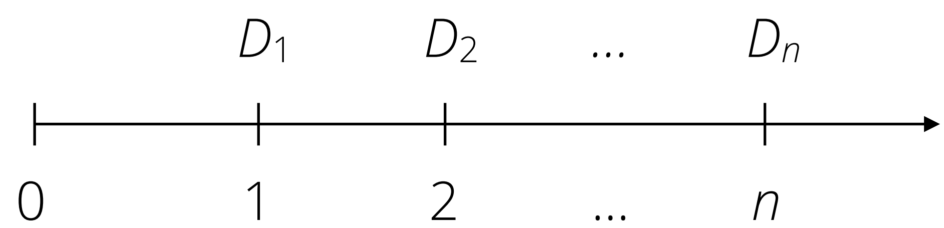
Stock Valuation

- What influences stock prices? What ***should*** determine prices?
- **Theme**: “Price is the present value of expected future cash flows”
- For stocks, future cash flows are (ultimately) dividends.
- Dividends are (ostensibly) paid from earnings, and future earnings depend on investment decisions.
- Therefore, we should either discount dividend payments (dividend discount model) or earnings and investment (net present value of future investment).

The Dividend Discount Model

Basic Model

- Assume we buy a stock and we hold on to it to collect dividends.
- The purchase generates a sequence of cash flows:

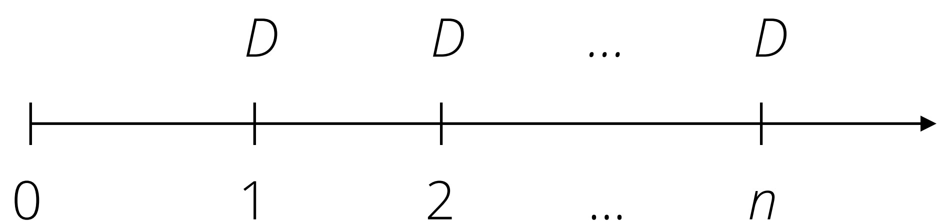


- The present value of the dividend payments today is

$$P_0 = D_1 / (1 + r) + \dots + D_n / (1 + r)^n + \dots$$

No Growth Model

- There is no simple formula for the general model, but assuming structure for dividends will give us one.
- Start by assuming all the dividends are the same:

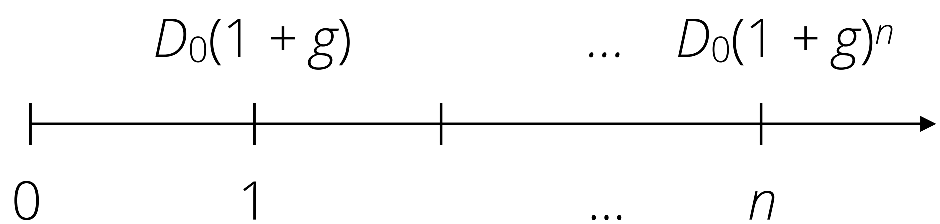


- The cash flows form a perpetuity and their present value is

$$\boldsymbol{P_0 = D / r}$$

Constant Growth Model

- Next, assume the dividends grow at a constant rate g.
- The assumption means that $D_n = D_0(1 + g)^n$



- The cash flows form a **growing perpetuity** and their present value is

$$\boldsymbol{P_0 = D_0(1 + g) / (r - g) = \mathrm{D}_1 / (\mathrm{r} - \mathrm{g})}$$

Constant Growth Model

- As long as g < r, higher growth implies a higher valuation.
- Note that $g < r$. If not, then the formula breaks down:
  - $g = r$ ➟ P0 = ∞
  - $g > r$ ➟ $P_0 < 0$
- Constant growth is a generalization of the no growth model.
- It is a slightly more realistic model—companies need to grow in the long run.

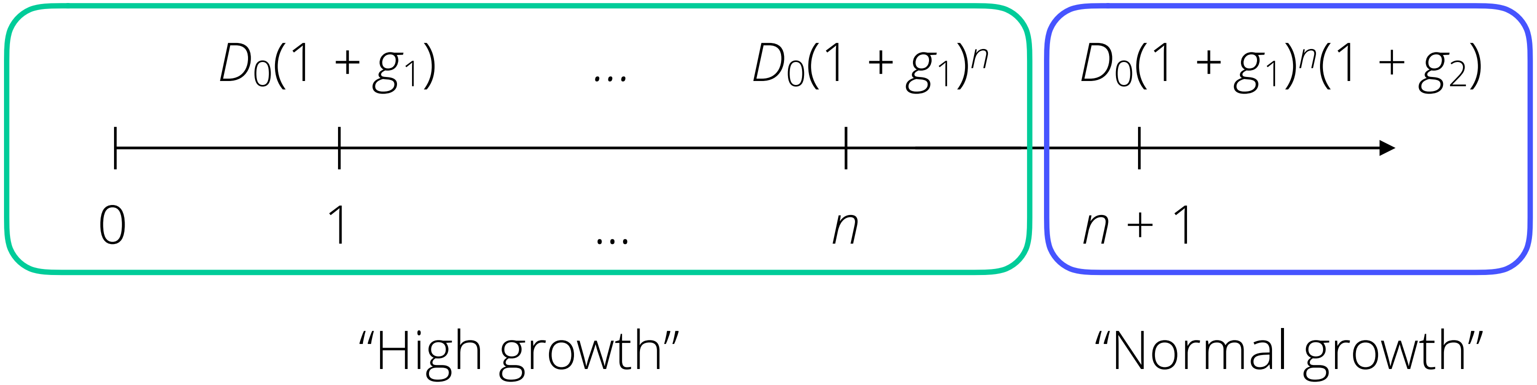
Constant Growth Model

- **Example** How much would you pay for a share of IBM if the dividend you expect to receive next year is $3 and you expect dividends to grow at 5.74% per year. Assume your discount rate is 7.5%.

- What if the dividend *today* is $3 instead?

Two-Stage Model

- Sometimes a stock has a *temporarily* high growth rate ($g_1 > r$).
- This is fine, as long as growth eventually returns to a reasonable level ($g_2 < r$).
- Model this situation with two-stages: a “high growth” stage followed by a “normal growth” stage:



Two-Stage Model

- The high growth stage is a **growing annuity** with present value

$$P^1 = D_1/(r - g)(1 - (1 + g)^n/(1 + r)^n)$$

- The second stage is a growing perpetuity with present value

$$P^2 = D_{n+1} / [(r - g)(1 + r)^n]$$

- The price of the stock is therefore

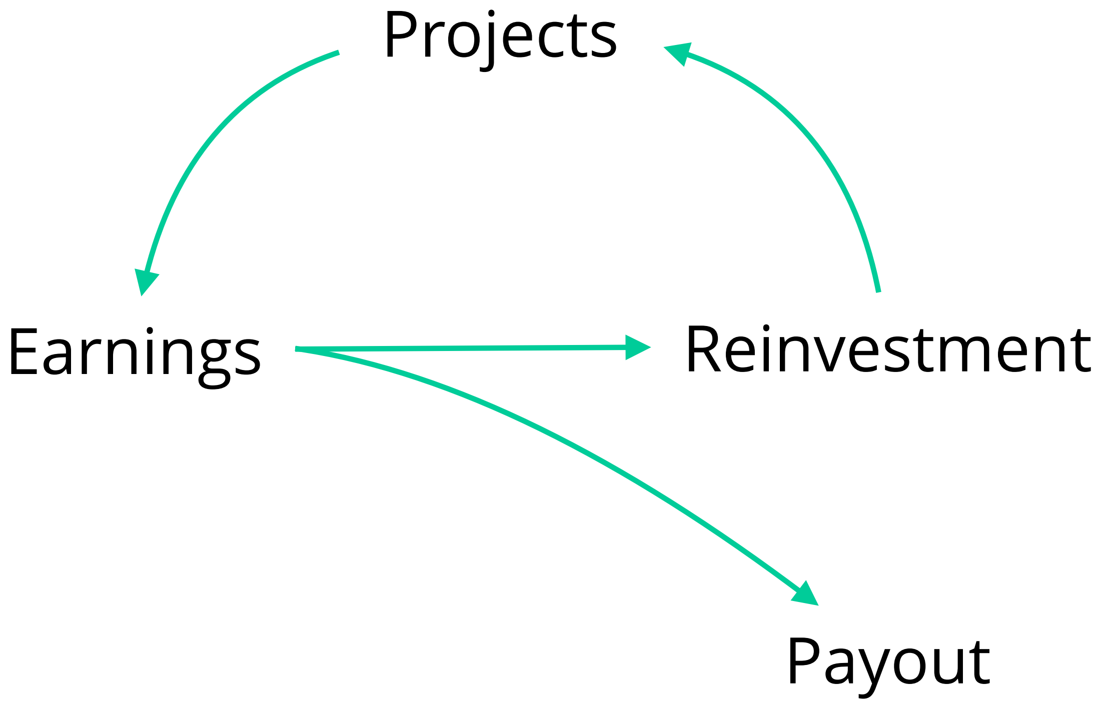
$$P_0 = P^1 + P^2$$

Two-Stage Model

- **Example** Suppose IBM has an investment opportunity that will lead to a growth rate of 10% for four years. If the dividend next year is expected to be \$3 and normal growth for IBM is 4%, what is IBM worth today? Assume a 7.5% discount rate.

Earnings, Dividends, and Growth

The Investment Cycle



Earnings, Dividends & Growth

- Consider a simplified company that makes no new investment.
- No new investment ➟ g = 0.
- The company pays out all earnings as dividends ➟ EPS = D = $10
- Assume a discount rate of 10%.
- How much is the company worth?

$$P_0 = EPS\ /\ r = D\ /\ r = \$10\ /\ 0.10 = \$100$$

Earnings, Dividends & Growth

- Now suppose that the company decides to make an investment.
- It invests all of next year's earnings and is able to generate a 20% return (ROI = 0.20).
- Each year following the investment, EPS in \$2 (\$10 x 0.20) higher than before.
- How much is the company worth now?

Earnings, Dividends & Growth

- Update the timeline to include the investment cash flows:

	+10	+10		+10		(existing assets)
	-10	+2		+2		(investment)
	+0	**+12**	…	**+12**	…	
0	1	2	…	n	…	

- A constant dividend from t = 1, so P_1 = \$12 / 0.1 = \$120
- Now discount to the present: P_0 = \$120 / 1.1 = \$109.09

Earnings, Dividends & Growth

- Alternatively, value the existing assets and the investment separately.
- We already know the value of the existing assets:

$$PV(\text{existing assets}) = \$10 / 0.1 = \$100$$

- The value of the investment is

$$PV(\text{investment}) = (-\$10 + \$2 / .1) / 1.10 = \$9.09$$

- Thus, **P_0 = PV(existing assets) + PV(investment)** = \$109.09.

Earnings, Dividends & Growth

- What if the project only generates 5% ROI?

$$P_0 = \$10 / 0.1 + (-\$10 + \$0.5 / 0.10) / 1.10 = \$95.45 < \$100$$

- What if the project only generates 10% ROI?

$$P_0 = \$10 / 0.1 + (-\$10 + \$1 / 0.10) / 1.10 = \$100$$

Earnings, Dividends & Growth

- More generally…
- (Case 1) ROI > r ➟ *Shareholder value increases by PV(investment)*
- (Case 2) ROI = r ➟ *No change in value.*
- (Case 3) ROI < r ➟ *Shareholder value decreases by PV(investment)*

- All three cases are consistent with shareholders.
- In the first (third) case, the firm has an investment that generates higher (lower) returns than the alternative (10%), so they are willing to pay more (less).
- In the middle case, investors don't care what the firm does with earnings—they make the same return either way.

Net Present Value of Future Investment

- This example suggests a simple “formula” for stock valuation.
- Let NPVFI = PV(future investment). Then

$$\mathbf{P_0 = EPS_1 / r + NPVFI}$$

- First term is the value of the first assuming no growth.
- Second term is the present value of all future investment, also known as **Present Value of Growth Opportunities (PVGO)**.
- Useful to re-arrange the formula: $P_0 - EPS_1 / r = NPVFI$
- We can use this to discover “implied” growth of companies from current valuations.