Lecture 4 Stock Analysis (2019.2.25)

- **Recap**
  - Interest rate : simple vs. compound
    $A(1+nr)$ $A(1+\frac{r}{m})^{mn}$, Ae^{nr}
  - PV, FV, NPV, IRR (reinvestment risk)
  - Bond analysis : yield to maturity (yield, IRR)
    (in riskfree environment) spot rate, forward rate, duration

4.1 Introduction

Stock : residual claim (NO riskfree stock!)

- common stock
- preferred stock

stock pricing < payoff, discount rate (more complicated than bonds)

4.2.1 Discount Dividend Model (DDM)

D_t : dividend
S_t : ex-dividend price
r : discount rate

$$S_0 = \frac{D_1 + S_1}{1+r} = \frac{D_1 + \frac{D_2 + S_2}{1+r}}{1+r}$$

$$= \frac{D_1}{1+r} + \frac{D_2}{(1+r)^2} + \frac{S_2}{(1+r)^2}$$

$$= \cdots\cdots$$

$$S_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1+r)^t}$$

DDM: Stock price is determined by future dividend (expected)

Assume $D_t = D_1 (1+g)^{t-1}$

$$S_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1+r)^t} = \sum_{t=1}^{\infty} \frac{D_1 (1+g)^{t-1}}{(1+r)^t}$$

$$= \frac{D_1}{1+g} \sum_{t=1}^{\infty} \left(\frac{1+g}{1+r}\right)^t \qquad (g<r \text{ for risk compensation})$$

$$= \frac{D_1}{1+g} \cdot \frac{\frac{1+g}{1+r}}{1 - \frac{1+g}{1+r}}$$

$$S_0 = \frac{D_1}{r-g} \qquad \text{(Gordon Model 1959)}$$

- S_0 is sensitive to r and g (r, g are small)

  g : forecasted growth rate of dividend

  r : question to be solved by CAPM.

4.2.2 Transversality Condition (TVC)

$$S_0 = \frac{D_1}{1+r} + \frac{D_2}{(1+r)^2} + \cdots = \sum_{t=1}^{\infty} \frac{D_t}{(1+r)^t} + \lim_{t\to\infty} \frac{S_t}{(1+r)^t}$$

Assumed in DDM : $\lim_{t\to\infty} \frac{S_t}{(1+r)^t} = 0$ (TVC)

(starting point of expectation)

If $\lim_{t\to\infty} \frac{S_t}{(1+r)^t} > 0$ → bubble!

TVC ~ No-bubble condition

4.3 PE

$$D_t = k E_t$$

$$\Rightarrow \frac{S_0}{E_1} = \frac{k}{r-g} \qquad \cdots\cdots (*)$$

Example: $E_1 = 10$, $k = 0.4$, $g = 0.16$, $r = 0.2$

$$\frac{S_0}{E_1} = \frac{k}{r-g} = \frac{0.4}{0.2-0.16} = 10$$

if $g = 0.18$, $\frac{S_0}{E_1} = 20$

- Question: 2 stocks with different PE, which one will offer higher rate of return to investors?

$$\text{rate of return} = \frac{D_1 + S_1}{S_0} - 1$$

$$= \frac{D_1 + \frac{D_2}{r-g}}{\frac{D_1}{r-g}} - 1$$

$$= \frac{(r-g)D_1 + (1+g)D_1}{D_1} - 1$$

$$= r \quad \text{(NOT affected by PE!)}$$

- Discount rate is the rate of return required by investors. Determination of r is the key.
- Box 4-1: House price - rental ratio (P/R)

	r	growth rate of rental	P/R
China	0.1	0.08	50
U.S.	0.1	0.05	20

(equation * with $k=1$)

Difference of P/R between China and U.S. can be explained by different growth rates of rental.

- PE in real world
  - value investing (finding under-valued stock)
  - trailing PE S_0/E_0 (Typos in the textbook!)
  - forward PE S_0/E_1

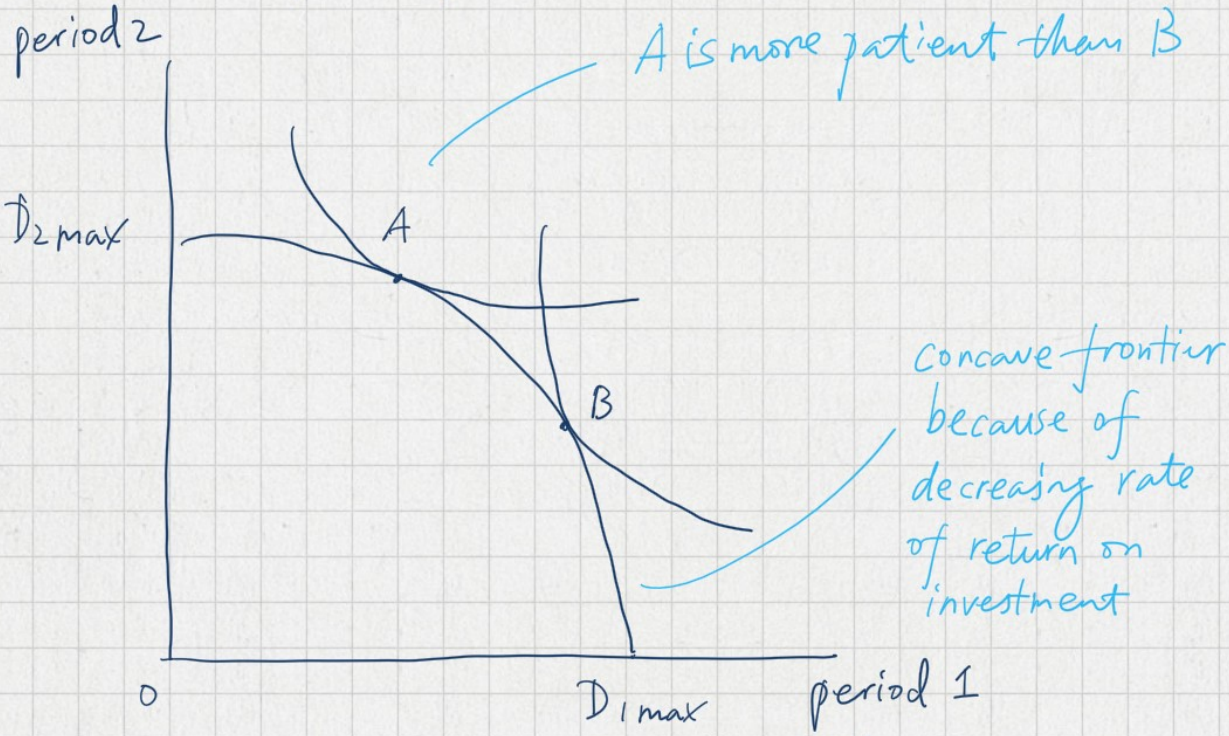
4.4 Stock Corporation

- How dividend ratio k is determined?

$$E = I + D$$

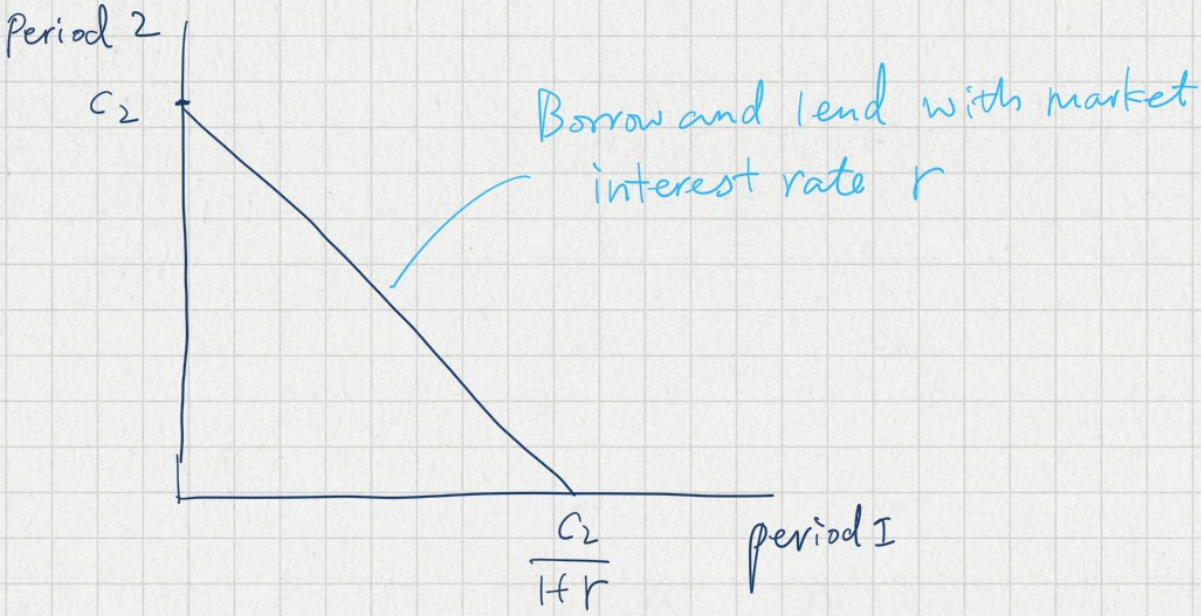
earings investment dividend

- Dividend-possibility frontier

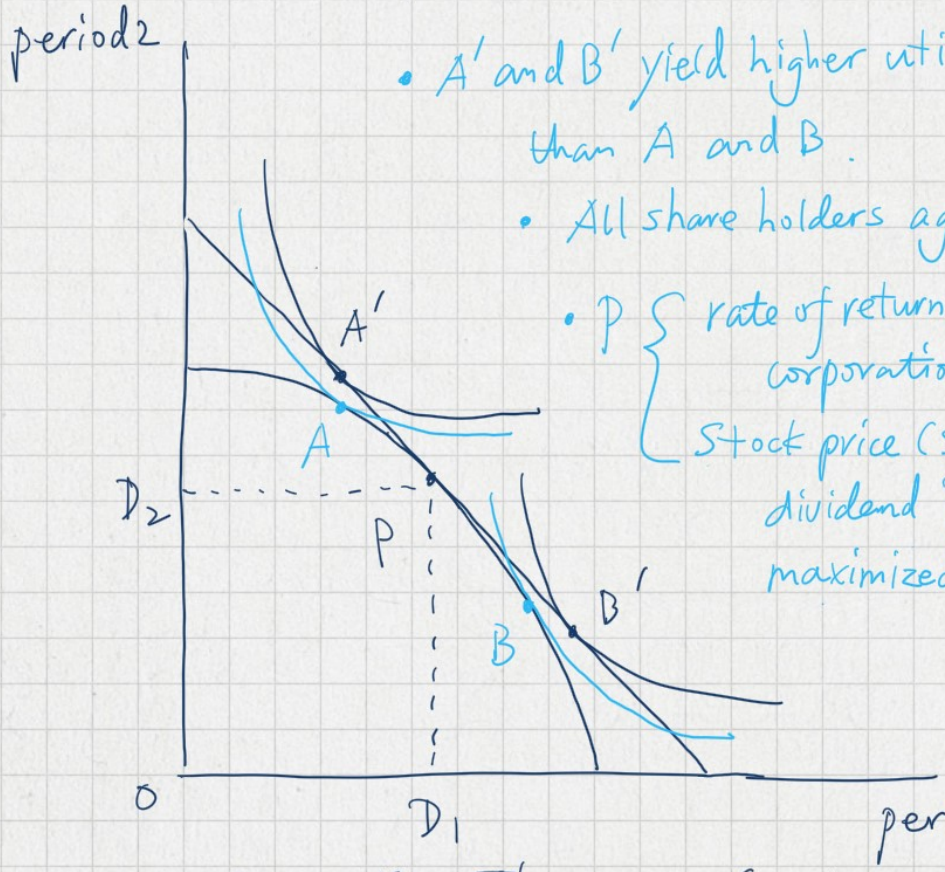


A and B have different opinions on how to pay dividend. What the corporation should do?

- Market opportunity Line



- Dividend-possibility frontier + opportunity line



- A' and B' yield higher utilities than A and B.
- All share holders agree to P
- P { rate of return of the corporation = r
  Stock price (sum of discounted dividend $D_1 + \frac{D_2}{1+r}$) maximized at P

- Fisher Separation Theorem (Fisher 1930)

  Step 1: Corporations make investment (dividend) decisions to maximize stock price. (evaluation of the corp. made by the market)

  Step 2: Shareholders borrow/lend to maximize their utility, after receiving dividend.

4.5 Some Remarks

- Stock price reflects the evaluation of the corp. made by the market.
- Stock companies' behaviors are determined by the market (shareholders and potential shareholders) barbarians at the gate
- Some specialities of A-share market.

4.6 Conclude: • Asset price ⟷ economic activities
• Discount rate r ? (CAPM)