ECON 233 Finance 1- Week 8

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Why buy Premium Bonds guaranteeing capital loss at maturity?

- A bond is a **premium bond** when the price it is trading at is higher than the face value.
- This happens because the coupon returns from holding the bond is more than enough to compensate for the capital loss.
- What matters is the YTM and not the price. If a bond has higher yield than a par bond, then it demands a higher price too.
- Compare 2 bonds. Assume market interest rate is 4%
  - Bond A - Coupon 4% (paid annually), Face Value $1000, maturity 5 years. Price - ?
  - Bond B - Coupon 6% (paid annually), Face Value $1000. maturity 5 years. Price-?
  - What is the YTM?

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  - What is the YTM?
- $$1089.04 = \sum_{t+1}^{5} \frac{60}{(1+y)^t} + \frac{1000}{(1+y)^5}$$

Coupon and YTM of discount and premium bond

- **Assume there are two bonds from the same industry with the same risk and maturity (technically, the same duration). One is a discount bond and the other one is a premium bond. Which one is likely to have the higher coupon rate and YTM, and why?**
- When does a bond sell at a premium?

Coupon and YTM of discount and premium bond

- **Assume there are two bonds from the same industry with the same risk and maturity (technically, the same duration). One is a discount bond and the other one is a premium bond. Which one is likely to have the higher coupon rate and YTM, and why?**
- When does a bond sell at a premium? When coupon rates are higher than the market yield enough to compensate for the capital loss later on.
- When does a bond sell at a discount?

Coupon and YTM of discount and premium bond

- **Assume there are two bonds from the same industry with the same risk and maturity (technically, the same duration). One is a discount bond and the other one is a premium bond. Which one is likely to have the higher coupon rate and YTM, and why?**
- When does a bond sell at a premium? When coupon rates are higher than the market yield enough to compensate for the capital loss later on.
- When does a bond sell at a discount? When coupon rates are lowe than the market yield so that the capital gain at maturity compensates for the interest loss today.
- If the discount and premium bonds with the low and high coupon rates are priced correctly, then both should have the same YTMs! They are otherwise identical.
- If not, then you buy whichever has higher YTM and drive up its price so that they are equal again! Arbitrage opportunity.

Immunization

- Immunization's goal is to balance price risk and reinvestment risk to hedge one's position against interest rate volatility.
- Increase in interest rates - capital loss but reinvesting gets more profits and vice versa.
- Choose portfolio duration so that the duration of assets = duration of liabilities.

- Given
  - YTM=10% (EAR, flat yield curve)
  - Liability: pay \$1,000 in 2 years: PV = 826, D_L=2
  - Bond from ex.: 5% coupon, P_B = 876, D_B = 2.85
  - 1-year zero: P_Z = 909.1, D_Z = 1
- Portfolio with duration matching
  - Duration of liability = Duration of assets
  - $2 = w_B*2.85 + (1-w_B)*1 \Leftrightarrow w_B=.54$
  - Invest .54 * 826= \$446 in B, .46 * 826= \$380 in Z
  - Buy 446/876=.51 bonds and 380/909=.42 zeros

Price of Stock

- Price of a stock is the PV of the expected cash flows.

$$P_0 = \frac{D_1}{(1+r)} + \frac{D_2}{(1+r)^2} + \cdots + \frac{D_T + P_T}{(1+r)^T}$$

or

$$P_0 = \sum_{t=0}^{\infty} \frac{D_t}{(1+r)^t}$$

- Constant growth model assumes dividends grow at a constant rate g

$$P_0 = \sum_{t=0}^{\infty} \frac{D_0(1+g)^t}{(1+r)^t} = \frac{D_0(1+g)}{(r-g)} = \frac{D_1}{r-g}$$

Determinants of Intrinsic Value of Stock

- $P_0 = \dfrac{D_0(1+g)}{(r-g)} = \dfrac{D_1}{r-g}$
- $P_1 = \dfrac{D_2}{r-g} = \dfrac{D_1(1+g)}{r-g} = P_0(1+g)$
- Sustainable Growth Rate, g

  $g = b * ROE_0$ or

  $g = b * \dfrac{ROE_1}{(1 - b * ROE_1)}$

Effect of b on price

- $P_0 = \frac{D_1}{r-g} = \frac{E_1(1-b)}{r-ROE*b}$
- $\frac{\partial P_0}{\partial b} = \frac{-E_1}{r-ROE*b} - \frac{E_1(1-b)(-ROE)}{(r-ROE*b)^2} = \frac{-E_1}{r-g} + \frac{ROE*E_1(1-b)}{(r-g)^2}$
- $= \frac{E_1}{r-g}\left(\frac{ROE(1-b)}{r-g} - 1\right)$
- First factor > 0 (assuming positive earnings)
- Second factor > 0 iff
  - ROE (1-b) > r - g
    ⇔ROE - g > r - g
    ⇔ROE > r
- $\frac{\partial P_0}{\partial b} > 0$ whenever ROE > r

What can you say about the value of a stock with constant dividend growth where the growth rate is larger than the discount rate?

- $P_0 = \dfrac{D_1}{r - g}$
- If $g > r$ then denominator is negative!
- $P = \sum_{t=1}^{\infty} D_o \dfrac{(1+g)^t}{(1+r)^t}$
- This expression diverges to infinity if dividends grow unconditionally faster.
- Intuitively, the model breaks down because if you have an asset that gives you abnormal profits forever then it is "priceless" in the market.

Differences between stocks and bonds

Bonds	Common stock
• No ownership	• Ownership interest
• Creditors do not have voting rights	• Common stockholders can vote
• Interest is tax deductible	• Dividends are not tax deductible
• Fixed interest payments	• Variable dividend payments (can be 0)
• Creditors can sue if payments are missed	• Shareholders can't sue if dividends are missed
• Excess debt can lead to bankruptcy	• An all-equity firm cannot be forced into bankruptcy



- In addition, bonds have a maturity date, stocks can be held indefinitely.
- Bond holders get preference when a company is liquidated. Then preferred stock holders and lastly common stock holders.

Value of Bitcoin according to dividend discount model

- According to the dividend discount model - $P = \sum_{t=0}^{\infty} \frac{D_t}{(1+r)^t}$
- But BTC pays no interest, coupons, dividends etc., so $D_t = 0 \forall t$.
- Intrinsic value of BTC is zero since it never produces any cash flows.
- The market value of BTC however is determined by the forces of demand and supply which is based on expectations, beliefs, speculation etc.
- Sometimes BTC is also used as a shadow currency exchange market for certain private transactions. Especially in countries whose currency is not particularly desirable. (There are research papers on this, if you are interested).

$g = b * ROE$

- Dividend growth in the Gordon model: $g = ROE \times b$.
- Increasing b (retaining more earnings) raises g but reduces current dividends.
- Higher reinvestment increases firm value **only if** $ROE > r$.
- If $ROE < r$, it is better to give the shareholders the dividends instead that they can reinvest themselves and earn a higher return.
- When $ROE > r$, the firm is the best reinvestor of capital and high b is optimal.
- Therefore, increasing b is not always in shareholders' best interest - depends on ROE relative to the required return r.