180.101 Elements of Macro - TA Section - Week 9

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Slides: `https://github.com/QingyuanFang/TA_ElementsOfMacro`

Pre-recorded video

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Fisher Equation

- **Fisher Equation** describes the relation between the nominal interest rate (i), inflation (π) and the real interest rate (r)

$$1 + i = (1 + r) \cdot (1 + \pi) \Rightarrow i = r + \pi + r \cdot \pi$$

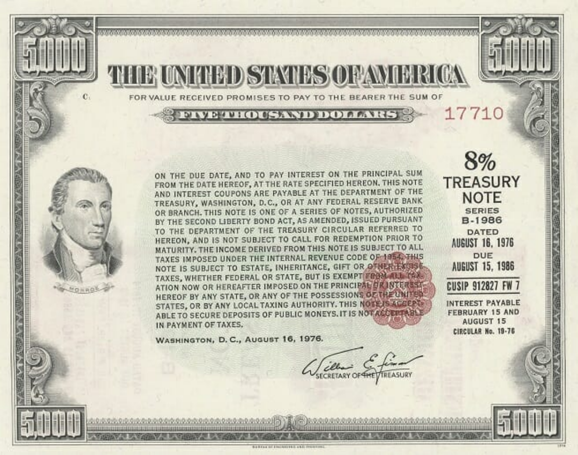
- Normally, r and π are quite small, and $(r \cdot \pi)$ is even smaller. We have the approximation:

$$i = r + \pi$$

- **Ex-ante** real interest rate: $r = i - \pi^e$
- **Ex-post** real interest rate: $r = i - \pi^a$

Bond

- **Principal**: the amount of money loaned out (also referred to as **face/par value**)
- **Coupon rate**: the interest rate paid on that loan
- **Maturity**
- **Market price**: the price of a bond in the bond market (price referred to by Prof. Barbera). → This may not be equal to the principal!



Bond

- An example
  - Principal $= \$5000$
  - Annual coupon rate $= 8\%$. Annual coupon payment $= \$400$
  - Maturity $= 10$ years
- I purchased this treasuary note at \$4800 (market price) on its issue date.
- **Current yield** $= \frac{\text{Annual Coupon Payment}}{\text{Market Price}} = \frac{400}{4800} \times \%100 = 8.33\%$
- **Yield to maturity** is the number y such that:

$$\text{Market price} = \frac{C}{1+y} + \frac{C}{(1+y)^2} + \cdots + \frac{C}{(1+y)^{M-1}} + \frac{C + \text{Principal}}{(1+y)^M}$$

Solution: $y = 8.30\%$

Notes on Bond Price and Yield

- Bond yield and coupon rate are different concepts
- Bond price and its OWN yield are inversely related
- Bond price and the current interest rates are inversly related
- Yield is determined by **duration** and **default risk**

Infer Market Expectations

- **Expected inflation** = T-bond yield - TIPS yield
- **Expected default risk** based on corporate bond spread
  Q2(4): T-bond yield = 3.25%. risk premium = 2% , $i^{\text{Replay}} = 9\%$, Default loss = 60%

$$1 + \text{T-bond yield} + \text{risk premium} = (1-\lambda)\cdot(1+i^{\text{Replay}}) + \lambda\cdot(1-\text{Default Loss})$$

- **Expected interest rate** based on term structure of T-Bills
  Example: at t, we can either buy the 1-yr US treasury bond then roll over at $t+1$ and $t+2$, or buy the 3-yr US treasury bond.

$$(1+r_t^{3y})^3 = (1+r_t^{1y})\cdot(1+E_t[r_{t+1}^{1y}])\cdot(1+E_t[r_{t+2}^{1y}]) + \text{term premium}$$

  Approximation:

$$r_t^{3y}\cdot 3 = r_t^{1y} + E_t[r_{t+1}^{1y}] + E_t[r_{t+2}^{1y}] + \text{term premium}$$

Short Run Phillips Curve

$$\pi_t = \pi^e + \alpha(U^* - U_t)$$

- π^e: inflation expectation
- U^*: natural rate of unemployment