Topic 4. Bond market

- The issuer of a bond pays a fixed periodical interest and is obliged to repay the debt at the maturity time.
- Issuers: governments, municipalities, companies.
- Contrary to the stock, the bond holders do not own a company, they lend to a company.
- They also are usually limited term while shareholding in a company is indefinite.

Bonds: coupon vs zero-coupon,

Traded at discount vs premium

Consol - infinite life government bond

YTM

- YTM = Yield to Maturity = Implicit constant interest rate based on future cash flows and current price of a bond.
- YTM=Discount rate that makes future cash flows equal to current price.

Coupon yield = Annual coupon/Price

Купон

Я получила купон,

Но не купон на скидку.

Это и не талон

На полученье напитка.

Это живые деньги,

Приходят ко мне регулярно,

Ведь в портфеле моем

Облигаций доля изрядна.

(В. Добрынская)

Bond prices, coupons and yields

- A "5% bond" means that the coupon payment is 5% of the principal payment of par value
- The YTM of a bond is determined by market pricing whereas the coupon yield is fixed at issuance
- If required return is above (below) the coupon rate, then the bond price will be below (above) par value

Example

- A German Government bond (Bund) pays a 5.375 percent annual coupon, every year for 6 years. The par value of the bond is 100 EURO
- Assume YTM at 3.8%
- Cash flows:

'05	'06	'07	'08	'09	'10
5.375	5.375	5.375	5.375	5.375	105.375

- Present value:

$$PV = \frac{5.375}{1.038} + \frac{5.375}{(1.038)^2} + \frac{5.375}{(1.038)^3} + \frac{5.375}{(1.038)^4} + \frac{5.375}{(1.038)^5} + \frac{105.375}{(1.038)^6} =$$

$$= \$108.31$$

- The price of a 5.375% German Government Bond at a 2.0% YTM is as follows:

$$PV = \frac{5.375}{1.02} + \frac{5.375}{(1.02)^2} + \frac{5.375}{(1.02)^3} + \frac{5.375}{(1.02)^4} + \frac{5.375}{(1.02)^5} + \frac{105.375}{(1.02)^6} =$$

$$= \$118.90$$

Term structure of interest rates

- Shows dependence of YTM on maturity
- The constant discount rate that makes the price of the interest bearing instrument equal to the implied PV is called the Yield to Maturity (YTM)
- The set of YTMs on single-payment bonds is called the yield curve

  Zero-coupon bonds:

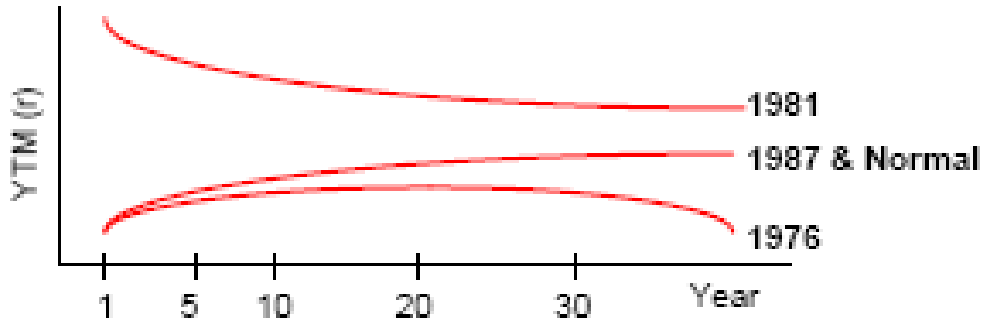
  1-year bond: $P_1=N/(1+r_1)$

  2-year bond: $P_2=N/(1+r_2)^2$

  …

  N-year bond: $P_N=N/(1+r_N)^N$

Yield curve



3 empirical facts of the yield curve:

1. Interest rates on bonds of different maturities move together over time
2. When ST rates are low, the yield curve is upward sloping, when high – downward sloping (inverted)
3. Most often, the yield curve is upward sloping and concave.

Theories of term structure

- Expectations theory

Assumption: Bonds of different maturities are perfect substitutes

Example: Invest in a two-year bond or invest in a one-year bond and re-invest the proceeds in another one-year bond in one year

$$(1+r_{2,t})^2 = (1+r_{1,t})(1+r^e_{1,t+1})$$

$$1+2r_{2,t}+r^2_{2,t} = 1+r_{1,t}+r^e_{1,t+1}+r_{1,t}r^e_{1,t+1}$$

$$2r_{2,t} \approx r_{1,t}+r^e_{1,t+1} \quad \text{or} \quad r_{2,t} \approx \frac{r_{1,t}+r^e_{1,t+1}}{2}$$

In general:

$$r_{nt} = \frac{r_t + r^e_{t+1} + r^e_{t+2} + \ldots + r^e_{t+n-1}}{n}$$

⇨ Explains facts 1 and 2, but not 3.

- Market segmentation hypothesis

Assumption: Different investors are active in the short-rate and long-rate bond markets
(no substitutability)

⇨ YTMs are determined separately by supply and demand equilibrium in the "local" markets. Longer-term bonds are more risky and require term premium.

⇨ Explains fact 3, but not 1 and 2.

- Liquidity premium theory

Assumption: Bonds of different maturities are imperfect substitutes and investors prefer short-term bonds because of lower liquidity risk

⇨ Demand a liquidity premium on long-term bonds:

$$r_{nt} = \frac{r_t + r_{t+1}^e + r_{t+2}^e + \ldots + r_{t+n-1}^e}{n} + l_{nt}$$

where l_{nt} rises with t.

⇨ Explains facts 1, 2 and 3.

What does such a term structure mean?