Topic 6 : Debt Market and The Structure of Interest Rate (2)

EE431/438

Federic Mishkin, The Economics of Money, Banking and Financial Markets Chapter 4 - 6
(available at the reserve section of the library, HG173 .M57 2007)

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1. Measuring Interest Rate

- 4 types of financial instruments : Simple Loans,Fixed-Payment Loan, Coupon Bond,Discount Bond
- Interest rate = yield-to-maturity of each of these instrument
- If holding period $\neq$ life of the asset,
  - rate of return may be different from interest rate.
  - Prices and returns more volatile for long-term bonds
  - No interest-rate risk for any bond whose maturity equals holding period.

2. Real Interest Rate Vs Nominal Interest Rate
3. The behavior of Interest rates: Loanable Fund Theory(bond market), Liquidity Preference Frame work (money market)
4. Risk and Term Structure of Interest Rate

Introduction

- In practice, there are many rates of interest; deposit rates (saving, time deposits), lending rates, government bonds, corporate bonds
- Interest rates varies because different levels of risk of the borrowers and/or different borrowing periods
- The behavior of interest rate, Bond market $\Leftarrow$ Any bond market, aggregate/specific bond market
- Why bonds with the same term to maturity have different interest rates $\Leftarrow$ the risk structure of interest rate
- Bond's term to maturity $\Rightarrow$ interest rates $\Rightarrow$ the term structure of interest rates

Why bonds with the same term to maturity have different interest rates? 4 important factors

1. Default Risk:

- the risk which occurs when the issuer of the bond is unable or unwilling to make interest rate payment when promised or the face value when the bond matures
  - Corporate suffering big losses might be more likely to suspend interest payments on its bonds. This means its bonds have high default risk.
  - Default-free bonds = government bonds : because government can always increases taxes (however, in the international debt market, government bonds are not considered risk-free. We focuses on the case where government bonds are risk-free.)
  - The spread between interest rates and risk-free rate is called ....

- a bond with default risk (any corporate bonds) always have risk premium .... 0 and an increase in its default risk will ..... the risk premium
- default risk $\rightarrow$ interest rate : the information is important for both buyers and sellers to price the bond correctly
- perfect information $\rightarrow$ market efficiency
- Information about default risk is provided by “credit rating agencies” ; Standard and Poor’s , Moody’s, TRIS

Rating			
Moody's	S&P	Fitch	Definitions
Aaa	AAA	AAA	Prime Maximum Safety
Aa1	AA-	AA-	High Grade High Quality
Aa2	AA	AA	
Aa3	AA-	AA-	
A1	A+	A+	Upper Medium Grade
A2	A	A	
A3	A-	A-	
Baa1	BBB+	BBB+	Lower Medium Grade
Baa2	BBB	BBB	
Baa3	BBB-	BBB-	
Ba1	BB+	BB+	Non Investment Grade
Ba2	BB	BB	Speculative
Ba3	BB-	BB-	
B1	B-	B-	Highly Speculative
B2	B	B	
B3	B-	B-	
Caa1	CCC+	CCC	Substantial Risk
Caa2	CCC	—	In Poor Standing
Caa3	CCC-	—	
Ca	—	—	Extremely Speculative
C	—	—	May be in Default
—	—	DDD	Default
—	—	DD	—
—	D	D	

2. Liquidity :

- liquidity = how easy an asset can be quickly converted in to the medium of exchange, with a little loss of value
- The more liquid an asset is, ... desirable it is.
- Which one is more liquid, government bonds or corporate bonds? or they are similar in terms of liquidity?
- The difference between government bond yields and corporate bond yields reflects both bond's default risk and liquidity.

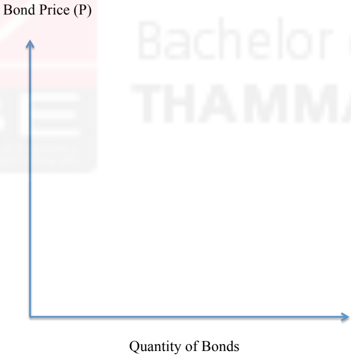
3. Income tax considerations

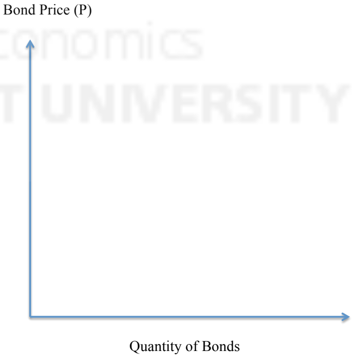
- some bonds are exempt from income taxes
- buyers consider their returns after taxes
- therefore, those bonds which are tax-free will pay a lower interest rate than it should do if they are not tax-free

Interest rate risk premium of a bond = Interest rate on the bond - interest rate on default free bonds with the same maturity

What will happen to the risk premium if

- default risk of a corporate bond increase?
- liquidity of a corporate bond decrease relative to the government bonds?
- income tax on the bond interest increases?





4.2 Term Structure of Interest Rates

- Bonds with identical risk, liquidity, and tax characteristics may have different interest rates because the time remaining to maturity is different
- Yield curve: a plot of the yield on bonds with differing terms to maturity but the same risk, liquidity and tax considerations
- Generally, when talking about the yield curve, it refers to the yield on government bonds
- In most cases (normal situations),
  1. Yield curve slopes ....
  2. Interest rates on bonds of different maturities move together over time
- three theories explain why bonds with differing terms to maturity have different yields to maturity: which one can explain the two findings the best
- note that what information the yield curve does contain remains a topic of debate in economics

4.2.1 Segmented Market Theory

- Assumption : bonds of different maturities are not substitutes at all
- Result
  - market for bonds with different maturies are totally separated from one another
  - interest rates (YTM) and bond prices for each bonds with different maturities are determined by the demand and sypply of the bonds in each market only
- Does segmented market theory can explain the first fact, the yield curve usually slopes upward?
  - yields on bonds with longer maturity is ....
  - yield on bonds with shorter maturity is ....
  - This means the demand for bonds with .... maturity is higher
- Does segmented market theory can explain the second fact, the yields on bond with different maturity usually move together?
  - Yes/No.. why?

4.2.2 Expectation Theory

- Assumption: bonds of different maturities are perfect substitutes (with the same level of risk, liquidity, taxation)
- Result : For a given investment period, at equilibrium, is it possible to have the returns from investment in bonds with different maturities?
- Let $i_{n,t}$ is the interest rate on bonds with n years time to maturity, at time t
- Consider a two-years investment period

$$\begin{aligned} \text{Buy and hold} &= \text{Roll Over} \\ (1+i_{2,t})^2 &= \end{aligned}$$

- Consider a n years investment period

$$i_{n,t} = \frac{i_{1,t} + i^e_{1,t+1} + i^e_{1,t+2} + ... + + i^e_{1,t+n-1}}{n}$$

Example: Given the following information, in 2011

- Government bond, ttm = 3 years, YTM = 6%
- Government bond, ttm = 2 years, YTM = 4%
- Government bond, ttm = 1 years, YTM = 2%

What is the expected YTM on a government bond with 1 year time to maturity in 2012 and 2013?

Example: Given the following information, in 2011

- Government bond, ttm = 3 years, YTM = 5%
- Government bond, ttm = 2 years, YTM = 6%
- Government bond, ttm = 1 years, YTM = 8%

What is the expected YTM on a government bond with 1 year time to maturity in 2012 and 2013?

- According to Expectation Theory,
  - upward sloping yield curve $\rightarrow$ the market expects the interest rate to ....
  - downward sloping yield curve $\rightarrow$ the market expects the interest rate to ....
  - flat yield curve $\rightarrow$ the market expects the interest rate to ....
- How well the theory can explain the two findings?
  - 1. yield curve usually slopes upwards $\rightarrow$ ....
  - 2. the yields on bond with different maturity usually move together?

4.2.3 Liquidity Premium & Preferred Habitat Theories

4.2.3.1 Preferred Habitat Theory

- Assumption : Bonds of different maturities are partial (not perfect) substitutes
- Result: Investors have a preference for bonds of one maturity over another. They will be willing to buy bonds of different maturities only if they earn a somewhat higher expected return

$$i_{n.t} = \frac{i_{1,t} + i^e_{1,t+1} + i^e_{1,t+2} + ... + + i^e_{1,t+n-1}}{n} + \eta_{n,t}$$

$\eta_{n,t}$ is term premium for bonds with n time to maturity at time t
η is .... for bonds with the time to maturity that the investor likes the most, it is .... bonds with a different time to maturity

4.2.3.2 Liquidity Premium

- Assumption : Bonds of different maturities are partial (not perfect) substitutes. Investors prefer short-term bonds over long-term ones because short-term bonds are more liquid
- Result: Investors will be willing to buy bonds of longer term maturities only if they earn a somewhat higher expected return.

$$i_{n.t} = \frac{i_{1,t} + i^e_{1,t+1} + i^e_{1,t+2} + ... + + i^e_{1,t+n-1}}{n} + \eta_{n,t}$$

- Therefore, η is .... for long-term bonds, it is .... for short-term bonds.
- How well the theory can explain the two findings?
  - 1. yield curve usually slopes upwards $\rightarrow$ ....
  - 2. the yields on bond with different maturity usually move together?
- flat/ downward sloping yield curve