Topic 2 : Debt Market and The Structure of Interest Rate

Federic Mishkin, The Economics of Money, Banking and Financial Markets: Chapter 4 - 6

(available at the reserve section of the library, HG173 .M57 2007)

EE431: 1/2016

Contents

1 Introduction

- Structure of financial market classified by the nature of the claims: Equity market and Debt market
- Debt Instruments, Bonds, Debentures : issued to borrow the money
- Fixed income (predetermined)
- "yield" on a bond can be more predictable than an equity instrument
- Bond yields $\Rightarrow$ interest rate$\Rightarrow$ economic and financial decisions
- The objective of this topic: to understand the interest rate

2 Measuring Interest Rates

2.1 What defines a bond?

A prototypical bond is a contract that commits the issuers to make a definite sequence of payments until a specified terminal date.

"a contract" between two parties: borrowers(issuers, sellers) and lenders(buyers)

- **Bond market: primary, secondary market**
- **Important Features of the Bond**

  (1) Coupons : "a definite sequence of payment"
  coupon : the interest rate that the issuer pays to the bond holders. Usually this rate is fixed throughout the life of the bond.
  coupon date : the dates on which the issuer pays the coupon to the bond holders.

  (2) Par value of face value : the amount on which the issuer pays interest, the principal amount per unit

  (3) Maturity (redemption) date : "a specified terminal date" , the date on which the issuer has to repay the principal amount.

Example :
Double A PLC.
Par value: 1000 Baht
Issue date: 25 August 2015
Maturity date: 25 August 2016
Issue term: 1 years
Coupons: Fixed 6%,
Payment Frequency: Yearly
Credit Rating: BBB
Distribution: public offering

- Issued price = 1,000 Baht (normally, issued price is equal to the par value)
- Bond price is changing over time.
- An investor may purchase this bond at a price $\lessgtr$ par value; depending on the economic condition

- Coupon payment =
  - If the price is 900, bond yield 6%
  - Interest rate $\Rightarrow$ Bond yield , Interest Rate $\uparrow$ Bond Price $\downarrow$.

2.2 Four types of debt instruments

1. **A simple loans** : The loan that must be repaid at the maturity date, along with an additional payment for the interest.

   example: a simple loan, par value = 100 Baht, coupon = 5 Baht, ttm = 2 years

2. **Discount bond**: repays the par value at its maturity date (zero-coupon bond), has discounted price

   example: a discount bond, par = 1000 Baht, sold at 909.1 Baht, ttm = 2 years

3. **Coupon bond:** Pays the owner a fixed interest payment every year until the maturity date, when the par value (or face value) is repaid

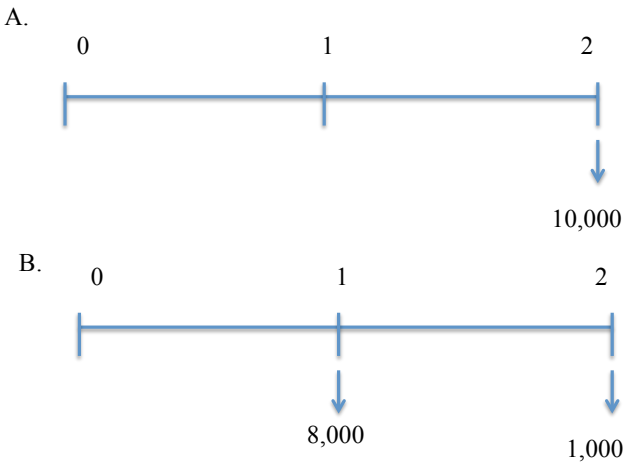
example: Coupon bond, par = 1000 Baht, coupon rate 5%, ttm = 5 years

4. **Fixed payment loans**: pays the same amount every period

   example : a fixed payment loan, par = 1000 Baht, pay 237.4 Baht yearly for 5 years

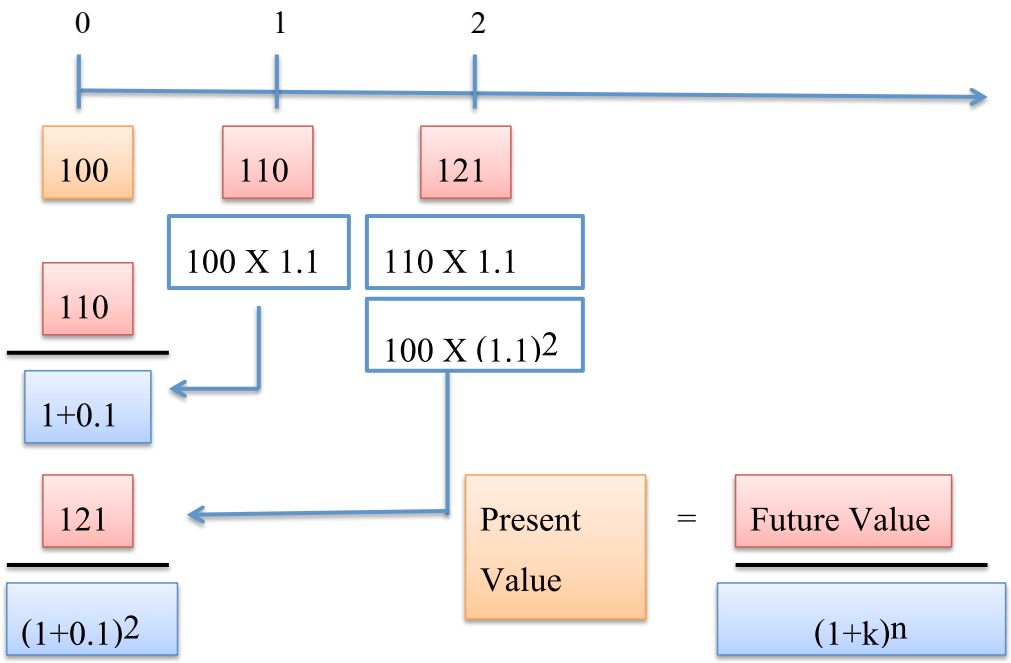
2.3 Bond Price

- Different bonds offer different patterns of payment
- How to compare the returns on each bond?



  - Which one is better?

- "Time Value of Money"
- 1 baht at different time has different value
- $1 received today is worth more than $1 received tomorrow : Why?
- "opportunity cost"
- cannot compare $ (amount) received at different time directly
- compare the value at "the same time"



- The formula is based on the concept of compound interest:

$$(1+k)^n PV = FV,$$
$$PV = \frac{FV}{(1+k)^n},$$

where k is the discount rate, PV is present value and FV is future value, n is the number of years

  - The higher k, the ..... is the PV
  - To compare two bonds, compare its PV of cash flow

  - Decision to buy or not to buy the bond: compare PV of CF with the price of the bond

- Example: Coupon Bond, Par = 1,000 Baht, Price = 900 Baht, coupon rate 5%, ttm = 5 years, k = 4%. Will you buy in this bond?

  - How's about if the bond price is 1,100 Baht?
  - How's about if the bond price is 800 Baht?

- Example : Fixed payment loan, Price = 10,000 Baht, ttm = 5 years, payment = 2374 Baht at the end of each year. Will you buy this fixed payment loan? k = 7%

- selling/buying $\Rightarrow$ Bond price

  - PV of CF < Bond price, ... , Bond Price.....
  - PV of CF = Bond price,..... , Bond Price.....
  - PV of CF > Bond price,..... , Bond Price.....
  - At equilibrium, price = PV of cash flows payment; k is determined by?
  - Valuation Principle : Price = $\sum_{t=1}^{n} \frac{CF_t}{(1+k)^t}$
  - Where does "k" (the discount rate) come from?

- Example : Consider a coupon bond, ttm = 6 years, coupon rate 10%, par = 10,000 Baht. What this bond price would be if k= 10%, 12% and 8%?

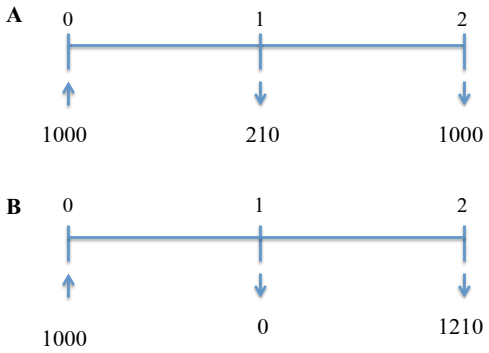
k= 12% PV of CF = ... × ..... + ... ×.....
k =10% PV of CF = ... × ..... + ... ×.....
k = 8% PV of CF = ... × ..... + ... ×.....

- **For coupon bond**

k > Coupon rate Price ..... Par at .....
k = Coupon rate Price ..... Par at .....
k < Coupon rate Price ..... Par at .....

2.4 Measuring Interest rate

- Bond Market Price = $\sum_{t=1}^{n} \frac{CF_t}{(1+k)^t} \rightarrow k = i$ = interest rate (required rate of return) on the bond (if hold to maturity)
- Yield to maturity(YTM) : the interest rate that equates the present value of cash flow payments with its value today
- When the interest rate ↑, the bond price .....
- Why do we have to measure interest rate this way?



- Simple Interest Rate : Both A and B, simple interest rate = ...
- YTM : For B, i = ... For A, i ..... 10%.
- YTM takes into account the time value of money.

Example: A simple loan, ttm = 2 years, price = face value = 1000 Baht, sold at par, coupon = 210 Baht. Find YTM
We want to find the interest rate that solves,

$$PV = \text{price} = \frac{C + F}{(1+i)^n}$$

Example: A fixed payment loan, ttm = 2 years, price = 917.455 Baht, pay 550 Baht each year, Find YTM.
We want to find the interest rate that solves,

$$PV = \text{price} = \frac{FP}{(1+i)} + \frac{FP}{(1+i)^2} + \frac{FP}{(1+i)^3} + ... + \frac{FP}{(1+i)^n}$$

Example: A coupon bond, ttm = 6 years, coupon rate 5%, par = 1000 Baht, Price = 950.826 Baht, Find YTM. (Guess, YTM .... 5%)

- We want to find the interest rate that solves,
  $PV = \text{price}=\frac{C}{(1+i)} + \frac{C}{(1+i)^2} + \frac{C}{(1+i)^3} + ... + \frac{C+F}{(1+i)^n}$

- **Why it is important to know how to calculate YTM?**

Example: Consider a 14% coupon bond with the par value of 4,000 Baht, selling for 5,006.572 Baht. The bond will mature in 7 years. The coupon payment is made annually. Calculate the yield to maturity. Explain.

- Is it possible that cash inflow from bonds is less than cash outflow? Notice that k, i is always positive.
- If we hold the bonds until its maturity date?
- If we do not hold the bonds until its maturity date (we sell it out before its maturity date)?
- Yield VS. Return
- Yield = rate of return on bonds, if we hold the bond to its maturity date
- Return = actual rate of return on bonds that we actually get from investing in a bond
- Consider 2 coupon bonds, same coupon rate, same YTM, different maturities
  1. A coupon bond, ttm = 10 years, coupon rate 5%, par = 1000 Baht, YTM = 5%
  2. A coupon bond, ttm = 2 years, coupon rate 5%, par = 1000 Baht, YTM = 5%

- Bond Price Sensitivity: Longer is maturity, ... is % price change associated with interest rate change

- Actual Rate of Return may not be equal to the bond yield.

$$\begin{aligned}\text{Actual Rate of Return} &= \frac{\text{Cash Inflow-Cash Outflow}}{\text{Cash Outflow}} \\ &= \frac{(\text{interest +sell price}) - \text{purchase price}}{\text{purchase price}} \\ &=\end{aligned}$$

Example: Consider a 5% coupon bond with the par value of 1,000 Baht. The bond will mature in 5 years. You bought the bond at par value. You hold it for a year and then you sell it at 1200 Baht. Calculate the rate of return you get from investing in the bond.

One-year Returns on Different-Maturity 10%-Coupon-Rate Bonds When Interest Rates Rises from 10% to 15%, Initial Price = purchase price =1,000

years to maturity	Price next year	Initial Current Yield	Rate of Capital Gain	Rate of Return
30				
20				
10				
5				
1				

- Price next year for the bond with 30 years to maturity

- Price next year for the bond with 20 years to maturity

- Price next year for the bond with 10 years to maturity

- Price next year for the bond with 5 years to maturity

- Bond whose return = yield is bond that maturity ..... holding period
  - For bonds with maturity > holding period, i ↑ P ....., implying capital .....
  - Bond with high initial interest rate can still have negative return if
    - holding period .... time to maturity
    - at the time the bond is sold, the market interest rate is ..... than the market interest rate at the time when the bond is purchased. This makes the sell price ... than the purchase price, implying capital loss.
    - when the capital loss is ..... initial current yield, the rate of return is .....
  - **Prices and returns ..... volatile for long-term bonds because have ..... interest-rate risk**

Bond Price Sensitivity

- $\Delta i \rightarrow \Delta P$
- "bond price volatility" affects an investor's decision to invest in bonds
- Longer is maturity, ... is % price change associated with interest rate change
- However, "time to maturity" is not enough to capture "bond price sensitivity".

- Other charateristics of a bond affect its price sensitivity. For example, "coupon rate" and "yield to maturity"
- Macualay (1938) Duration, bond price sensitivity
- Duration $= \left| \frac{\Delta\%P}{\Delta\%(1+i)} \right| = \sum_{t=1}^{n} \frac{PV(CF_t)}{\text{market price}} \times t$
- The larger is duration, the bond price is ..... sensitive to interest rate
- Duration is the percentage change in price for the "percentage change" in bond yield
- Duration is weighted average the times until those fixed cash flows are received. Thus, duration is measured in "years"
- Duration is ..... the maturity of the bonds.
- Modified Duration : Modified duration $= \left| \frac{\Delta\%P}{\Delta i} \right| = \frac{\text{Duration}}{1+YTM}$
- Modified Duration is the percentage change in price for a "change" in bond yield.

Example: Consider a coupon bond, par value 1,000 Baht, coupon rate 8%, maturity 3 years, sold at 1026.2456 Baht, find modified duration and interpret its meaning.

Example : A 5-year corporate bond paying an annual coupon of 8% is sold at a price reflecting a yield-to-maturity of 8% per year. One year passes and the interest rates remain unchanged. Assuming a flat term structure and holding all other factors constant, the bond's price during this period will have

(1) increased (2) decreased (3) remained constant (4)cannot be determined with the data given

Example : A 5-year corporate bond paying an annual coupon of 8% is sold at a price reflecting a yield-to-maturity of 6% per year. One year passes and the interest rates remain unchanged. Assuming a flat term structure and holding all other factors constant, the bond's price during this period will have

(1) increased (2) decreased (3) remained constant (4)cannot be determined with the data given

Summary

- Bond Price VS. Par Value
- Interest Rate VS. Coupon Rate
- Bond Price = $\sum_t \frac{CF_t}{(1+k)^t}$
- discount rate VS. interest rate
- The discount rate is the rate applied in calculating present value, to convert future value into present value. It is called discount rate because present value is lower than its future value. The discount rate is the rate that discounts(reduces) the future value into present value.
- People may apply different discount rates to evaluate a price of a bond, which they are willing to pay.
- Each person's reservation price reflects each own opinion on the quality of the bond.
- A bond's market price reflects the market opinion on the quality of the bond.
- YTM is the discount rate that equates present value of future cashflows from bonds with its market price.
- If we apply a discount rate which is different from YTM, the present value of cashflows from a bond is not equal to its market price. In other words, we think that the value of the bond is different from its market value.
- If we apply a high discount rate on a particular bond, this means that we are willing to pay a low price. In other words, we require a high rate of return from investment in that bond.

- If we apply a low discount rate on a particular bond, this means that we are willing to pay a high price. In other words, we require a low rate of return from investment in that bond.
- A discount rate is the required rate of return an investor demands for investing in a particular investment.
- YTM is the discount rate that equates present value of future cashflows from bonds with its market price.
- YTM is the market required rate of return from bonds (if hold to maturity).
- YTM is the economic measurement of interest rate.
- When YTM (interest rate) $\uparrow$, bond price $\downarrow$.
- Different bonds have different degrees of price-sensitivity.
- The valuation of ther assets can be done in the same way : Price $= \sum_{t=1}^{n} \frac{CF_t}{(1+k)^t}$, where k is the market's required rate of return of the asset being considered
- Required rate of return is high, the price of the asset is .....
- Bond price sensitivity can be measured by Duration (years), Modified Duration (%)
- $D = \left| \frac{\Delta\%P}{\Delta\%(1+i)} \right|, D^* = \left| \frac{\Delta\%P}{\Delta i} \right|$
- a little increase in interest rate $\rightarrow$ a big decrease in bond price $\Rightarrow$ the bond is very price sensitive.
- a big increase in interest rate $\rightarrow$ a little decrease in bond price $\Rightarrow$ the bond is not very price sensitive.
- Bonds with longer maturities are more price sensitive than bonds with shorter maturities, given the same coupon rate and the same YTM.
- Able to calculate a bond price, given interest rate.
- Able to calculate the interest rate, given a bond price.

- There is one-to-one mapping from bond price to interest rate.
- One interest rate results in one bond price.
- One bond price results in one interest rate.

3 Nominal Interest Rates (i) and Real Interest Rates (r)

- Real Value VS. Nominal Value
- Which one the effect of a change in the price level is eliminated?
- For example, real GDP VS. nominal GDP
- Changes in the price level $\Rightarrow$ a difference between "real" and "nominal value"
- Price $\uparrow$, Purchasing power $\downarrow$
- Nominal value may $\uparrow$ but real value $\downarrow \Rightarrow$ "Money Illusion"
- Bond : pay the price to day , receive cash flow payment in the future
- Price $\uparrow$, the purchasing power of the cash flow received $\downarrow$
- Nominal interest rate : the effect of a change in the price level is not eliminated
- Real interest rate : the effect of a change in the price level is eliminated
- YTM = ... interest rates
- Example: Lend your friend 1000 Baht, 1 year, your friend returns you (principal + interest) 1100 Baht. $PI_0 = 100$, $PI_1 = 125$. What is the nominal interest rate you charge your friend? What is the real interest rate you get ?

- Example: Lend your friend 1000 Baht, 1 year, and you want 10% real interest rate. What is the nominal interest rate you will charge your friend?
  - Price level at the begining of the year =PI_0 = 100. At the end of the year inflation rate is 0%.
  - Price level at the begining of the year =PI_0 = 100. At the end of the year inflation rate is 25%.

- $(1+r)(1+\pi^e) = (1+i)$
- $i = r + \pi^e$
- Fisher Equation : Nominal Interest Rate (i) = Real Interest Rate(r) + Expected Inflation Rate(π^e)

Discussion:
"Deflation is a problem for highly indebted economies because the value of debt is fixed in nominal terms, but the ability to service it suffers as incomes decline with prices. Furthermore, because central banks cannot force interest rates below zero, deflation means that real interest rates must always be positive."

Source: The Economist, 2013, Inflation is falling but bonds are unloved.

4 The Behavior of Interest Rates

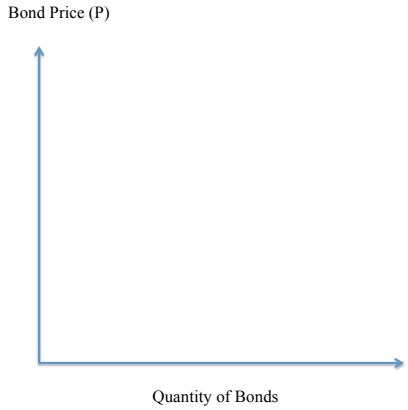
- The price of a corporate bond may fluctuate until the maturity date.
- Changes in overall interest rates in the economy are the primary cause of most bond price fluctuations.
- The value of corporate bonds decreases when overall interest rates increase.
- In contrast, the value of corporate bonds rises when overall interest rates decrease.
- The market value of a bond may also be affected by the financial condition of the company.
- This section will talk about the behaviour of interest rates, how overall interest rates in the economy change.
- Two main approaches considered : 1. loanable fund theory and 2. liquidity preference framework.
- Bond Price = $\sum_t \frac{CF_t}{(1+k)^t}$; k is yield to maturity.
- Bond Price $\uparrow \Longleftrightarrow$ Interest Rate $\downarrow$, Bond Price $\downarrow \Longleftrightarrow$ Interest Rate $\uparrow$.

4.1 Loanable Fund Theory :

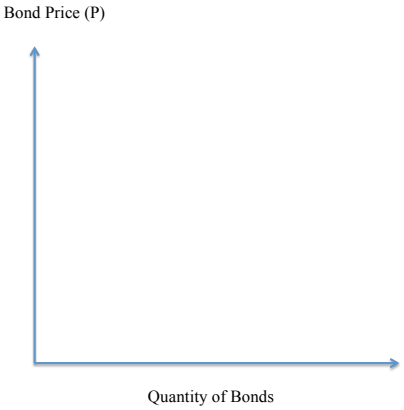
Interest Rate $\Leftarrow$ Bond Demand (loanable fund supply) and Bond Supply (loanable fund demand)

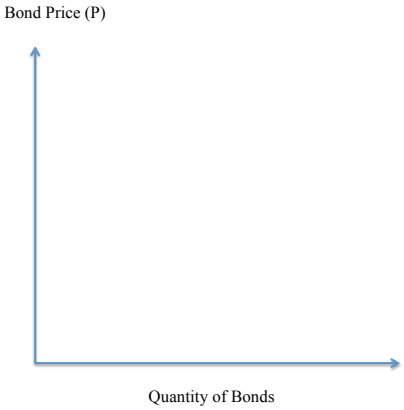
Determinants of Bond Demand (B^d)
1. Wealth $\uparrow$, B^d.....
2. Expected return on bonds relative to other assets $\uparrow$, B^d.....
$r \uparrow$, B^d.....
*** π^e **constant,** $i \uparrow$ **Bond Price ....,** r **.....** B^d**.....,** ***
i constant , $\pi^e \uparrow$**,** r ....., B^d.....
3. Liquidity relative to other asset s$\uparrow$, B^d.....
4. Riskiness relative to other assets $\uparrow$, B^d.....

- Shift in Bond Demand : example



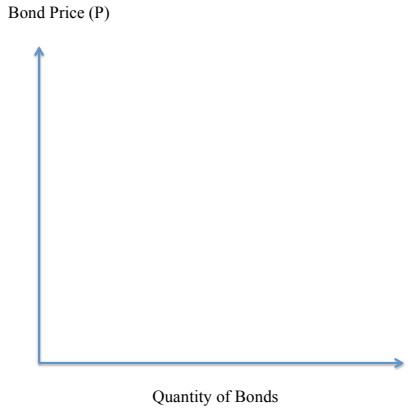
– Suppose Bond demand shift to the right,
  - total wealth.....
  - liquidity of bonds relative to the other assets .....
  - risk relative to other assets .....



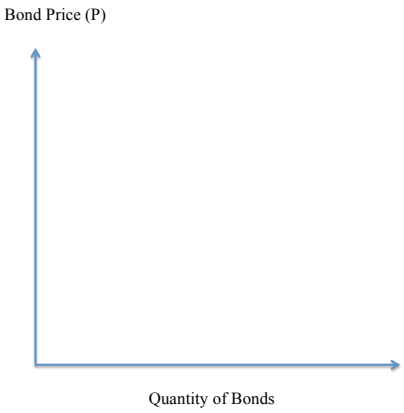


Determinants of Bond Supply (B^s)
1. Expected Profitability ↑ , B^s.....
2. Expected Inflation : π^e ↑, r ....., all i, B^s.....
*** π^e **constant,** i ↑ **Bond Price ... ,** r **....,** B^s...., ***
3. Government Borrowing: Government Borrowing ↑, B^s.....

- Shift in Bond Supply



  - Suppose Bond Supply shift to the right,
    - profitability of investments .....
    - expected inflation .....
    - government deficit .....

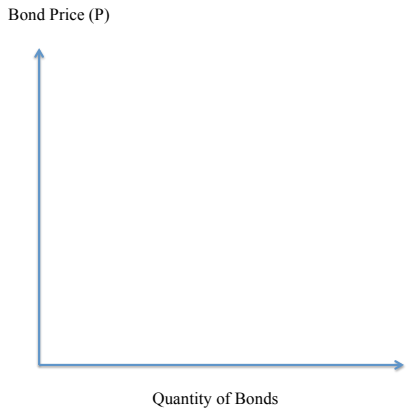


- Suppose $\pi^e \uparrow$
- Bond Demand shift to ..... and Bond Supply shift to .....
- Equilibrium Bond Price ..... , Equilibrium nominal interest rate ..... Equilibrium quantity .....
- Recall : Fisher equation $\Rightarrow i = r +$ ..... , implying $\pi^e \uparrow$, i .....
- "Fisher effect"

Discussion:
"When it comes to bonds, inflation has generally been the key determinant: rising prices reduce the buying power of fixed-interest payments and principal. The 1970s was a catastrophic decade for the bond markets. But in 2013 the general trend has been for inflation to fall, while bond yields have risen. That is an odd combination."

Source: The Economist, 2013, Inflation is falling but bonds are unloved.

- Response to a business cycle expansion



  - In a business cycle expansion, income and wealth are rising.
  - Bond Demand shift to .....
  - and Bond Supply shift to .....
  - Equilibrium Bond Price ..... ,
  - Equilibrium nominal interest rate .....
  - Equilibrium quantity .....

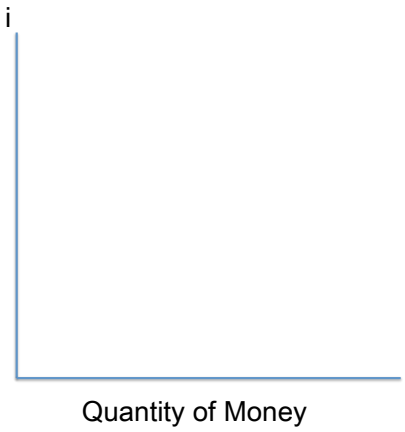
Discussion :
Paragraph 1 : "It is the one thing that was not supposed to happen. On April 4th the Bank of Japan (BoJ) announced its shock-and-awe plan to purchase ¥7 trillion ($68 billion) of government bonds from the public and double the monetary base. But instead of producing rising bond prices and falling yields, the central bank's actions have so far led to the opposite.

Paragraph 2 :… The heart of the problem is that the bank's twin aims—generating inflation and bringing down yields—are somewhat contradictory. …"
(The Economist, 2013)

- How does the BoJ's aim to bring down yields by purchasing government bonds from the public affect the bond market and interest rate?
- How does the BoJ's aim to generate inflation affect the bond market and interest rate?
- Do you agree with the second paragraph of the news?
- According to the first paragraph of the news, what is the total effect of BoJ's policy actions on bond prices and interest rate?

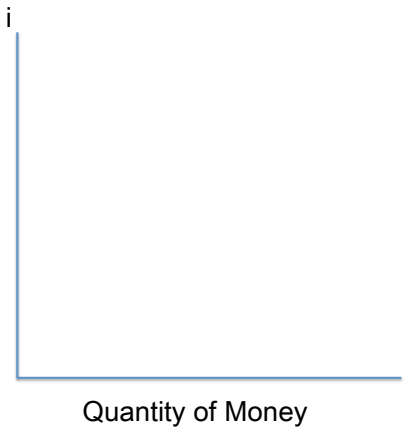
4.2 Liquidity Preference Framework (Keynesian)

- two main assets people use to store their wealth : Money and Bonds
- $M^d + B^d = M^s + B^s =$ total wealth
- $M^d = M^s \rightarrow B^d = B^s$. Whenever money market is in equilibrium, bond market must be in equilibrium.
- Analysing money market is equivalent to analysing bond market
- Liquidity preference framework $\rightarrow$ analyse the money market
- Money Demand
  - Transaction demand
  - Precautionary demand
  - Speculative demand
- Money Supply
  - controlled by the central bank



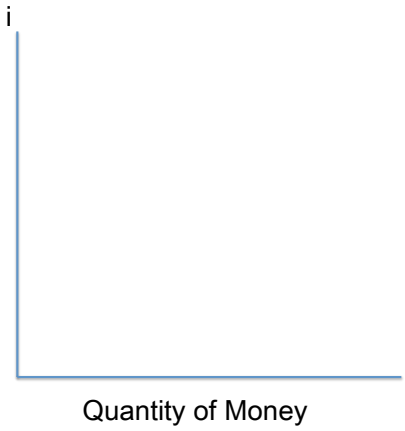
- If interest rate is lower than the equilibrium interest rate,
- there will be excess money .....
- agents will ..... (buy/sell) more bonds,
- then bond price..... (increases/decreases),
- therefore the interest rate ..... (increases/decreases)

- Shift in money supply



  - Suppose money supply shift to the right, caused by
  - the central bank ..... money supply
  - How does the central bank raise the money supply?
    - open market operation, ... securities
    - ..... policy interest rates

- Shift in money demand



  - Suppose money demand shift to the right, caused by
  - income .....
  - price level .....

5 Structure of Interest Rates

- 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

- 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

5.1 Risk Structure of Interest Rate

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

- Suppose there are 3 options in the market:
- Option 1 : Government bond with 4 % interest rate
- Option 2 : PTT bond with 4 % interest rate
- Option 3 : THAI bond with 4 % interest rate.
- Assume that they have the same maturity date.
- Which one is your 1st choice? Which one is your 2nd choice? Why?

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
- 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	

- Examples of TRIS ratings (www.trisrating.com)

PTT EXPLORATION AND PRODUCTION PLC
30/05/2014

Company Rating:	AAA
Issue Ratings:	
PTTEP183A: Bt2,500 million senior debentures due 2018	AAA
PTTEP195A: Bt5,000 million senior debentures due 2019	AAA
PTTEP12PA: Bt5,000 million subordinated capital debentures	AA
PTTEP196A: Bt8,200 million senior debentures due 2019	AAA
PTTEP296A: Bt11,400 million senior debentures due 2029	AAA
Rating Outlook:	Stable

THAI AIRWAYS INTERNATIONAL PUBLIC COMPANY LIMITED
15/12/2014

Company Rating:	A+
Issue Ratings:	
THAI155A: Bt3,000 million senior unsecured debentures due 2015	A+
THAI165A: Bt2,000 million senior unsecured debentures due 2016	A+
THAI16DA: Bt2,000 million senior unsecured debentures due 2016	A+
THAI17OA: Bt4,000 million senior unsecured debentures due 2017	A+
THAI185A: Bt1,555 million senior unsecured debentures due 2018	A+
THAI185B: Bt1,445 million senior unsecured debentures due 2018	A+
THAI185C: Bt5,000 million senior unsecured debentures due 2018	A+
THAI188A: Bt1,250 million senior unsecured debentures due 2018	A+
THAI192A: Bt1,000 million senior unsecured debentures due 2019	A+
THAI192B: Bt1,200 million senior unsecured debentures due 2019	A+
THAI19OA: Bt1,500 million senior unsecured debentures due 2019	A+
THAI19DA: Bt1,230 million senior unsecured debentures due 2019	A+
THAI208A: Bt1,250 million senior unsecured debentures due 2020	A+
THAI212A: Bt1,000 million senior unsecured debentures due 2021	A+
THAI215A: Bt833 million senior unsecured debentures due 2021	A+
THAI215B: Bt2,167 million senior unsecured debentures due 2021	A+
THAI21DA: Bt1,340 million senior unsecured debentures due 2021	A+
THAI222A: Bt2,000 million senior unsecured debentures due 2022	A+
THAI22OA: Bt1,500 million senior unsecured debentures due 2022	A+
THAI238A: Bt1,500 million senior unsecured debentures due 2023	A+
THAI242A: Bt1,000 million senior unsecured debentures due 2024	A+
THAI243A: Bt1,500 million senior unsecured debentures due 2024	A+
THA24DA: Bt1,430 million senior unsecured debentures due 2024	A+
Rating Outlook:	Negative

2. Liquidity :

- liquidity = how easy an asset can be quickly converted in to the medium of exchange, with a little loss of value

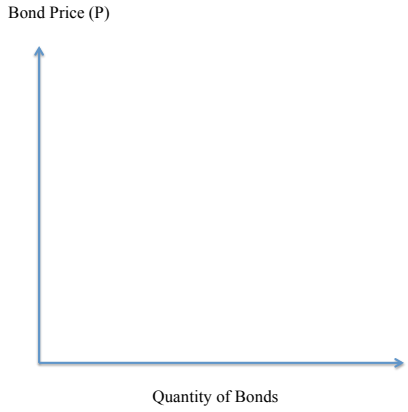
- The more liquid an asset is, ... desirable it is.
- Which one is more liquid, government bonds or corporate bonds?
- The difference between government bond yields and corporate bond yields reflects both bond's default risk and liquidity.

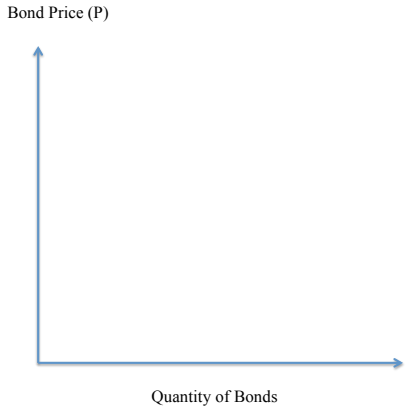
3. Income tax considerations

- 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?





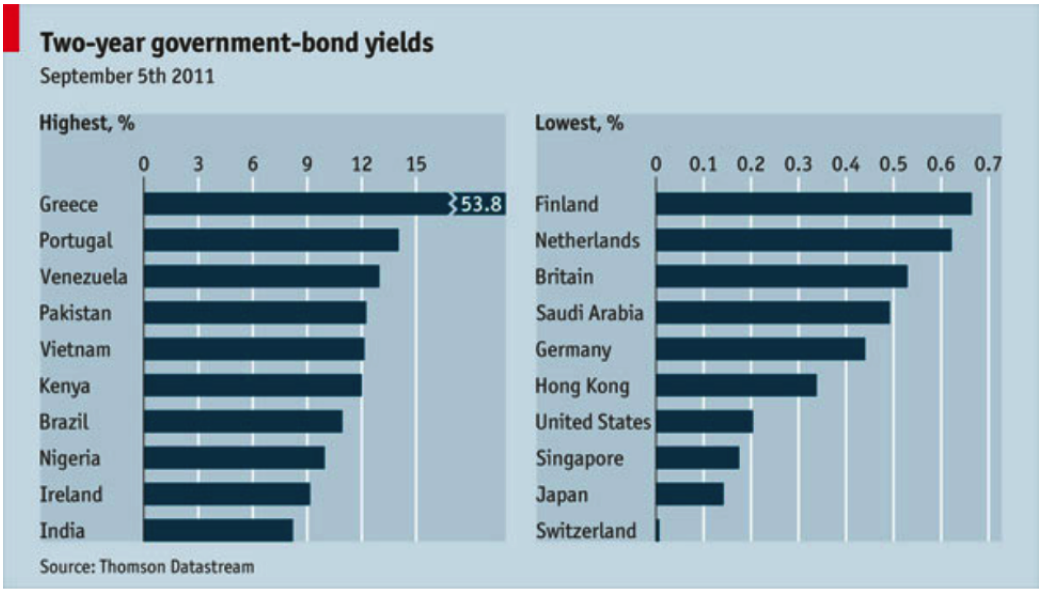
- Corporate Bond Market
  - Risk of corporate bonds ↑

    - * Risk of corporate bonds relative to Treasury bonds ..... $\Rightarrow$ Demand for corporate bonds (B_C^d) ....., B_C^d shifts to the .....
    - * Price of corporate bonds .....
  - Treasury Bond Market
    - * Relative risk of Treasury bonds .....
    - * Demand for Treasury bonds (B_G^d) ....., B_G^d shifts to the .....
    - * Price of Treasury bonds .....
  - Outcome: Risk premium, $i_C - i_G$, ...

Drachmatic yields

Sep 6th 2011. by The Economist online

Which governments are perceived to issue the riskiest and the safest debt? HOW much does Mr Market dislike Greece's sovereign debt? The chart below, which shows the ten countries with the highest-yielding two-year paper, puts Athens in the kind of company that Greeks are unused to keeping. Shorterdated Greek government bonds have even higher yields. On the other side of the ledger, money has flooded to safe havens like Switzerland, leading the Swiss government to announce measures to put a ceiling on the value of the Swiss franc. This brings its own risks, as our Buttonwood columnist points out.



5.2 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. Shape : Yield curve slopes .....
    2. Shiftness of Yield Curve (Movement): 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

5.2.1 Segmented Market Theory

- Assumption : bonds of different maturities are not substitutes at all
- Result
    - market for bonds with different maturities are totally separated from one another
    - interest rates (YTM) and bond prices for each bonds with different maturities are determined by the demand and supply 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?

- Segmented Market Theory explains Fact 1 that yield curve is usually upward sloping People typically prefer short holding periods and thus have higher demand for short-term bonds, which have higher price and lower interest rates than long bonds.

  - Segmented Market Theory does not explain Fact 2 because assumes long and short rates determined independently.

5.2.2 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, the returns from investment in bonds with different maturities must be equal.
- 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

  1. Buy \$1 of one-year bond and when it matures buy another one-year bond
  2. Buy \$1 of two-year bond and hold it

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

- Consider a n years investment period

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

  - In words: Interest rate on long bond = average short rates expected to occur over life of long bond

Example : One-year interest rate over the next five years 5%, 6%, 7%, 8% and 9%

- Interest rate on two-year bond = ...
- Interest rate for five-year bond = ...
- Interest rate for one to five year bonds: 5%, 5.5%, 6%, 6.5% and 7%.

Example: Given the following information, in 2016

- 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 2016 and 2017?

Example: Given the following information, in 2016

- 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 2016 and 2017?

- 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?
- Expectations Hypothesis cannot explain Fact 1 that yield curves are usually upward.
    - Short rates as likely to fall in future as rise, so average of future short rates will not usually be higher than current short rate: therefore, yield curve will not usually slope upward. There is no clear evidence that investors usually anticipate increases in interest rates.
    - Expectations Hypothesis explains Fact 2 that short and long rates move together.
    - If $i_{1,t} \uparrow$, then $i_{2,t}$, $i_{3,t}$, $i_{4,t}$, ... $\uparrow$. $i_{n,t} = \dfrac{i_{1,t} + i^e_{1,t+1} + i^e_{1,t+2} + ... + +i^e_{1,t+n-1}}{n}$

5.2.3 Liquidity Premium & Preferred Habitat Theories

5.2.3.1 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

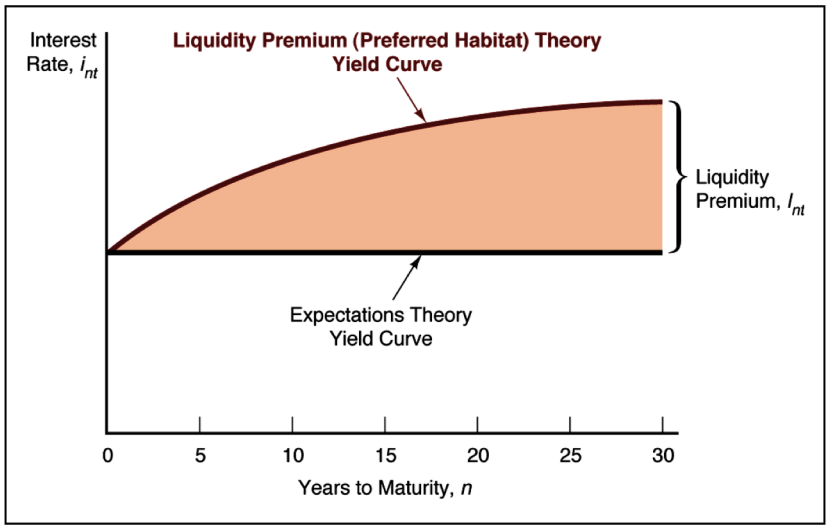
η is ..... for bonds with the time to maturity that the investor likes the most, it is ..... bonds with a different time to maturity

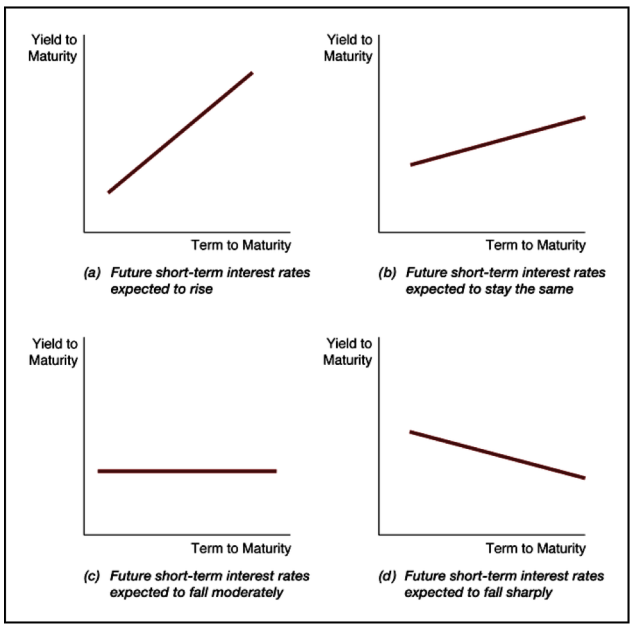
5.2.3.2 Liquidity Premium

- 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.
- The liquidity premium is predicted to be positive.





- 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?

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

- Liquidity Premium Theory explains Fact 1 of usual upward sloped yield curve by investors' preferences for short-term bonds. Liquidity premium is predicted to be positive.
- It also explains Fact 2 using same explanations as expectations hypothesis because it has average of future short rates as determinant of long rate.

Fixed-income fortune teller

Jan 3rd 2009, by The Economist | NEW YORK

IN AMERICA **an inverted yield curve**—which occurs when long-term Treasury notes have a lower yield than their shorter-term counterparts—is now 7-1 when it comes to **predicting recessions since 1960**. **In 2006** economists scratched their heads at the **inverted curve**, **wondering if this time it would be different.** Wishful thinking led many to think so:

In the past several months, a variety of Federal Reserve officials, market gurus, and general prognosticators have weighed in on the issue, a good many of them concluding it unlikely that **the current inversion signals an incipient recession**. **What determines the relationship between the yield curve and future economic activity remains an open question for economists.** That may be because **what drives the relationship changes over time.**

In 2006 the yield curve was inverted, but arguably, for different reasons than before. Implicit inflation targeting appeared to be successful and credible. It was not outrageous to believe lower expected inflation decreased the premium on long-dated governments. It was also the peak of the savings glut. Remember how we worried about global imbalances rather than a misallocation of capital? The savings glut increased the demand for long-term governments, lowering their yields. In retrospect the inverted curve, reflecting the influx of capital (which contributed to the bubble) and a naive belief in price stability (which made us complacent about risk), did signal our undoing, but for reasons we did not anticipate.

If an inverted curve signals a looming recession, a steep curve tends to forecast a recovery. Does that mean we can take comfort in the steep curve we see today? Paul Krugman does not think so. He reckons the yield curve simply mirrors expectations of future Fed policy. The Fed is currently targeting a 0% fed funds rate, so the long end of the curve reflects that rates can not fall any further.

Another reason the curve steepened is because of the flight to quality/liquidity. These days nothing spells risk-free liquidity like T-bills. These assets are in hot demand which lowers their yield to near (and even below) zero. I find it remarkable that, with all the debt the American government plans on issuing, the curve is not even steeper. I wonder which of these factors (and the ones we overlooked) we will say was significant in two years.

When it comes to the yield curve, the more things change the more they stay the same. The slope might change for different reasons, but what it means for the economy seems to endure. Let's hope so.

Source : http://www.economist.com/blogs/freeexchange