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Financial Institutions and Markets

Prof. Jitendra Mahakud
Department of Humanities and Social Sciences
Indian Institute of Technology Kharagpur

Theories of Interest Rate Determination-I

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What is Interest?

- Interest is the price the borrowers must pay to lenders to obtain the use of money for a period of time.
- As all the other prices are determined in different markets, the equilibrium rate of interest is also determined by the forces of supply and demand in the financial markets.

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Theories

- The Classical Theory,
- The Loanable Funds Theory
- The Keynesian Theory

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Classical Theory

- The rate of interest is a real phenomenon in the sense that it is determined by the real factors
- It is the supply of savings and the demand for investment that determine the equilibrium rate of interest.

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Supply of Savings

- The aggregate saving is the difference between the total national income and the total consumption expenditure.
- The savings may be effected by individuals, households, business, and the government.
- From savings point of view interest rate is a reward for sacrifice or abstinence or waiting involved in the act of supplying savings

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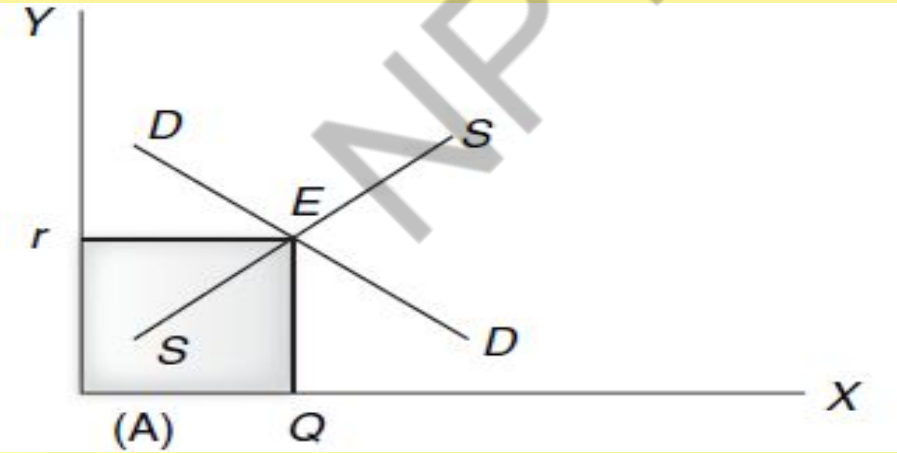
Demand for Investment

- Firms and other economic units demand capital to make profits by producing goods
- The investment takes place because by investing in roundabout or indirect methods or processes of production, economic units expect to obtain more consumption in future by sacrificing present consumption.
- The opportunities to produce more effectively by using roundabout methods of production determine investment demand.

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Interest Rate Determination

- While the saving schedule is upward sloping, the investment schedule is downward sloping.
- The equilibrium rate of interest is determined by the interaction of these saving and investment schedules in the economy



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Loanable Fund Theory

- According to this theory, rate of interest is determined by the demand for and supply of loanable funds.
- In this regard this theory is more realistic and broader than the classical theory of interest
- The loanable funds theory discards the independence of the interest rate from the behaviour of money and banks.
- According to this theory, the real supply and demand curves determining interest rates should have added to them a component of the supply of saving which is associated with the creation of new money or credit

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Demand for Loanable Funds

- **Investments**
  - Investment refers to the expenditure for the purchase of making of new capital goods including inventories
  - There is an inverse relationship between the demands for loanable funds for investment to the rate of interest
- **Hoarding**
  - To satisfy their desire for liquidity.
  - The demand for loanable funds for hoarding purpose is a decreasing function of the rate of interest.
  - At low rate of interest demand for loanable funds for hoarding will be more and vice-versa
- **Dissaving**
  - This demand comes from the people at that time when they want to spend beyond their current income
  - Tt is also a decreasing function of interest rate

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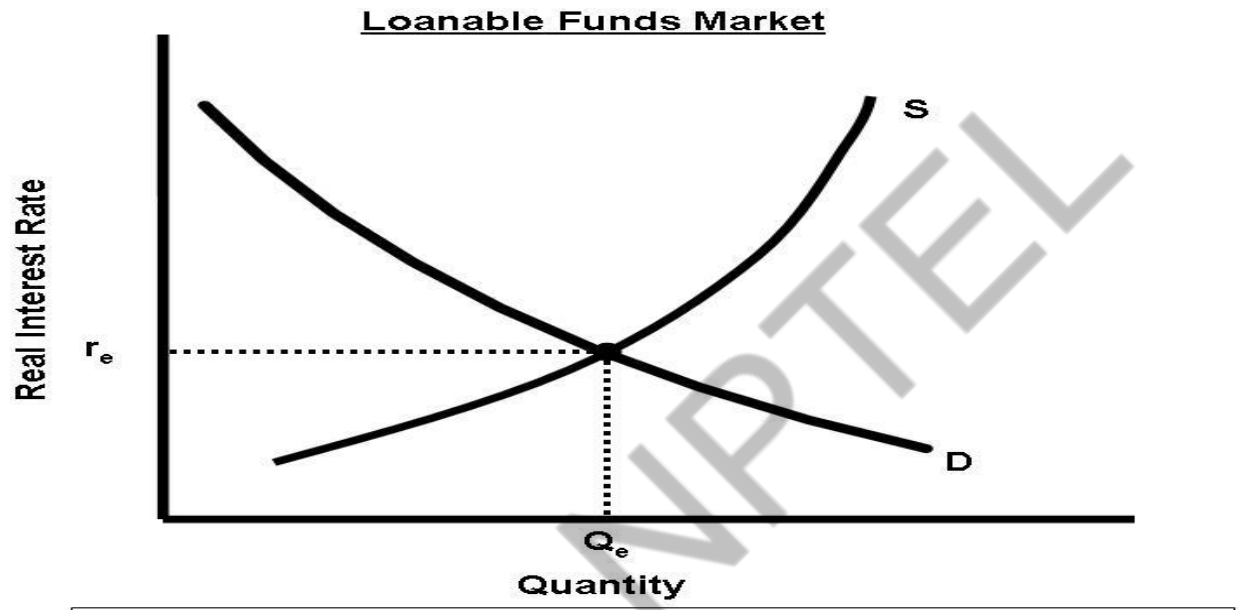
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Supply of Loanable Funds

- **Savings**
  - Individuals as well as business firms will save more at a higher rate of interest and vice-versa
- **Bank Money**
  - The banks advance loans to the businessmen through the process of credit creation. The money created by the banks adds to the supply of loanable funds.
- **Disinvestment**
  - Disinvestment occurs when the existing stock of capital is allowed to wear out without being replaced by new capital equipment.
  - High rate of interest leads to higher disinvestment
- **Dishoarding**
  - Individuals may dishoard money from the past hoardings at a higher rate of interest
  - If the rate of interest is low dishoarding would be negligible

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Interest Rate Determination



Equilibrium exists where the demand curve intersects supply.

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Reference

•Bhole, L. M., and Mahakud, J. *Financial institutions and markets: structure, growth and innovations, 6e*. Tata McGraw-Hill Education, 2017.

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Theories of Interest Rate Determination-II

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Keynesian Theory

- According to Keynes, interest rate is a purely monetary phenomenon. This means that the rate of interest, at least in the short-run, is determined by the monetary factors, i.e., it depends on the actions of the monetary authorities (the Central Bank and the Government), and on the attitude of economic units towards holding money as an alternative to holding bonds.
- In other words, interest rate is determined by the interaction between the supply of money and demand for it in the economic system.

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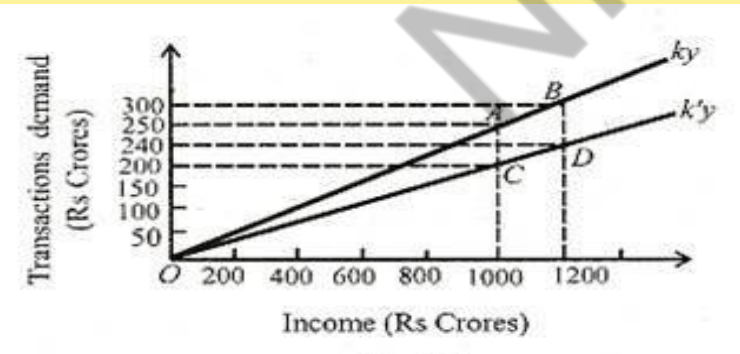
Motives for Demand for Money

- The demand to hold money is called the "liquidity preference".
- There are three motives or reasons behind the demand for liquidity or liquidity preference of individuals, firms, and institutions: (a) transactions motive, (b) precautionary motive, and (c) speculative motive.

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Transactions Demand for Money

- Amount of money which consumers need for transactions purpose mostly for buying and selling of goods and services
- Factors affecting transactions demand for money:
  - Income, spending habits, time interval after which income is received, banking developments, Industrial structure
  - **Income**
    - Let transactions demand for money is: MT = f (Y), where, MT= Transactions demand for money, Y = Income
    - It can be written: MT = KY, where 0<K<1
    - The slope of the transactions demand for money is positively sloped, dMT/dY >0



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Transactions Demand for Money Cont…

- Frequency of income receipt i.e. the length of time period which elapses between the receipt of money income and its disbursement
  - Shorter the pay period, smaller will be the amount of money required for the transaction purpose
- Banking developments
  - Alternative modes of payment declines MT
- Industrial structure
  - Vertical integration declines the MT

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Precautionary Demand for Money (MP)

- Money demanded to meet unforeseen contingencies
- Factors affecting precautionary demand for money are:
  - Nature of business
  - Access to money market
  - Degree of conservatism
  - Degree of liquidity of the assets
  - Income
- MP = f(Y)

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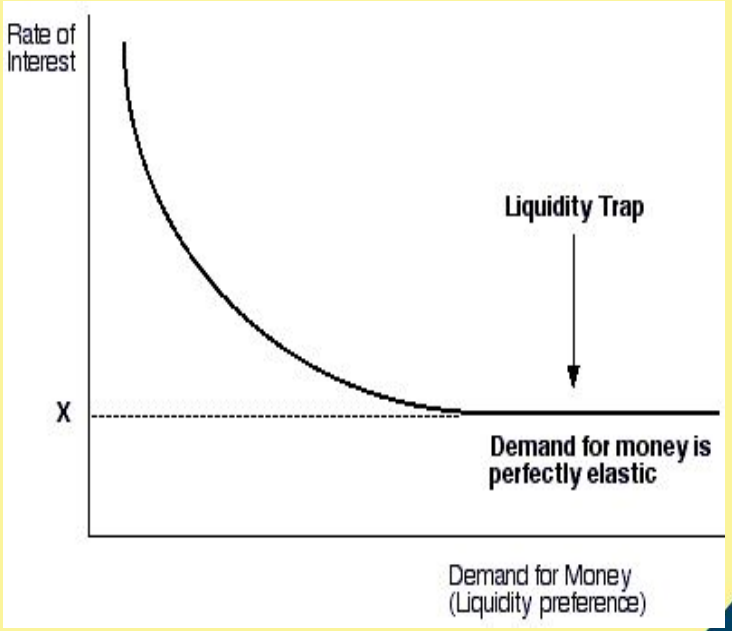
Speculative Demand for Money (MSP)

- Amount of money people hold for making speculations in the financial markets
- There is an inverse relationship between interest rates and the speculative demand for money
- Relationship between interest rate and speculative demand for money is called the Liquidity Preference Curve
- Interest elasticity of speculative demand for money increases as the interest rate declines
- The MSP= f(r), where r = interest rate

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Liquidity Trap

- The rate of interest at which the speculative demand for money becomes perfectly elastic is called liquidity trap
- At the liquidity trap interest rate, the wealth holders hold their entire wealth in the form of money instead of holding the interest bearing bonds
- At the liquidity trap rate of interest, money becomes perfect substitute for bonds



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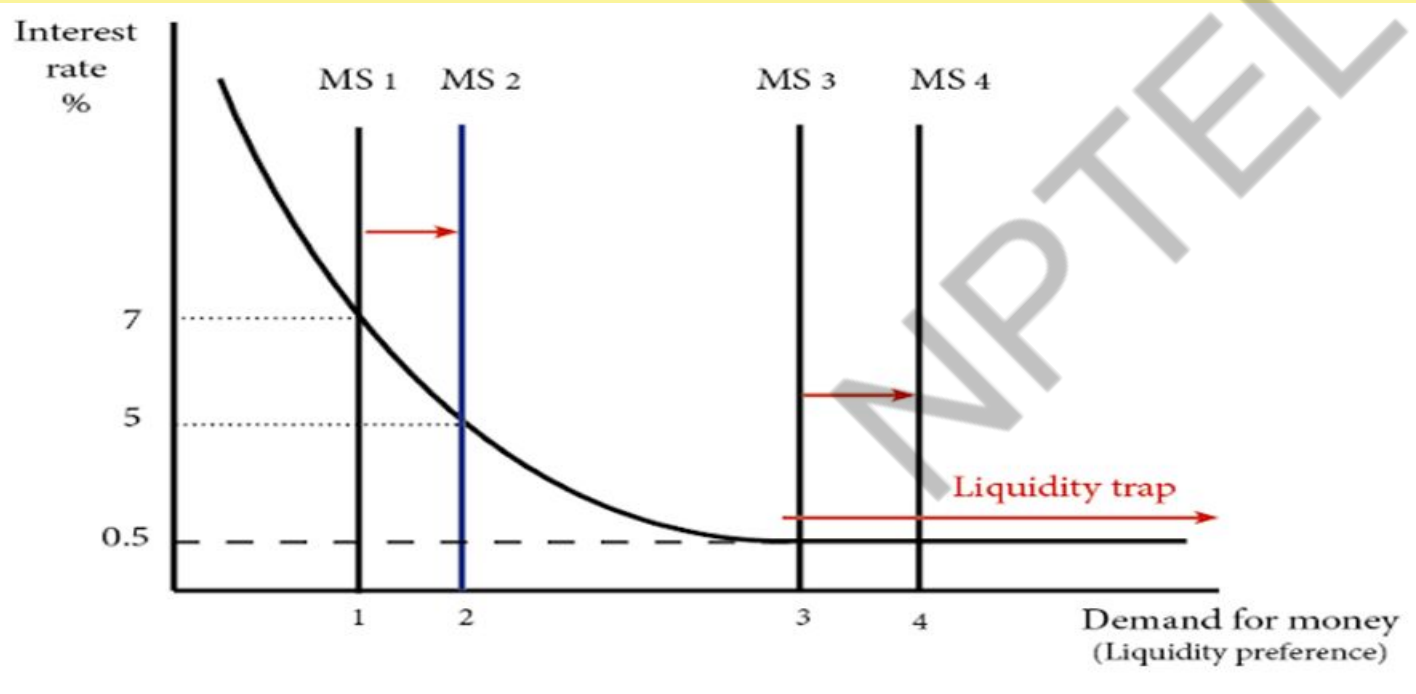
Total Demand for Money (TMD)

- TMD = MT + MP + MSP
- As MP is also a function of Y we can combine MT and MP
- Now TMD = f (Y) + f (r)

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Interest Rate Determination

In this theory money supply is exogenously determined, i.e., it is determined by the monetary authorities



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References

•Reilly, F. K., and K. C. Brown. *Investment analysis and portfolio management*, 10e. Cengage Learning, 2012.

•Johnson, R. Stafford. *Bond evaluation, selection, and management*, 2e. John Wiley & Sons, 2010.

•Bhole, L. M., and Mahakud, J. *Financial institutions and markets: structure, growth and innovations, 6e*. Tata McGraw-Hill Education, 2017.

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Term Structure Theories of Interest Rate-I

What is Term Structure Interest Rate?

- What determines the difference between long-term and short-term interest rates, i.e. what is it that determines the term structure of interest rates?
- What determines the general structure of interest rates?
- Term Structure examines the relationship between YTM and maturity, M.
- The plot of YTM against M for bonds measures the yield curve

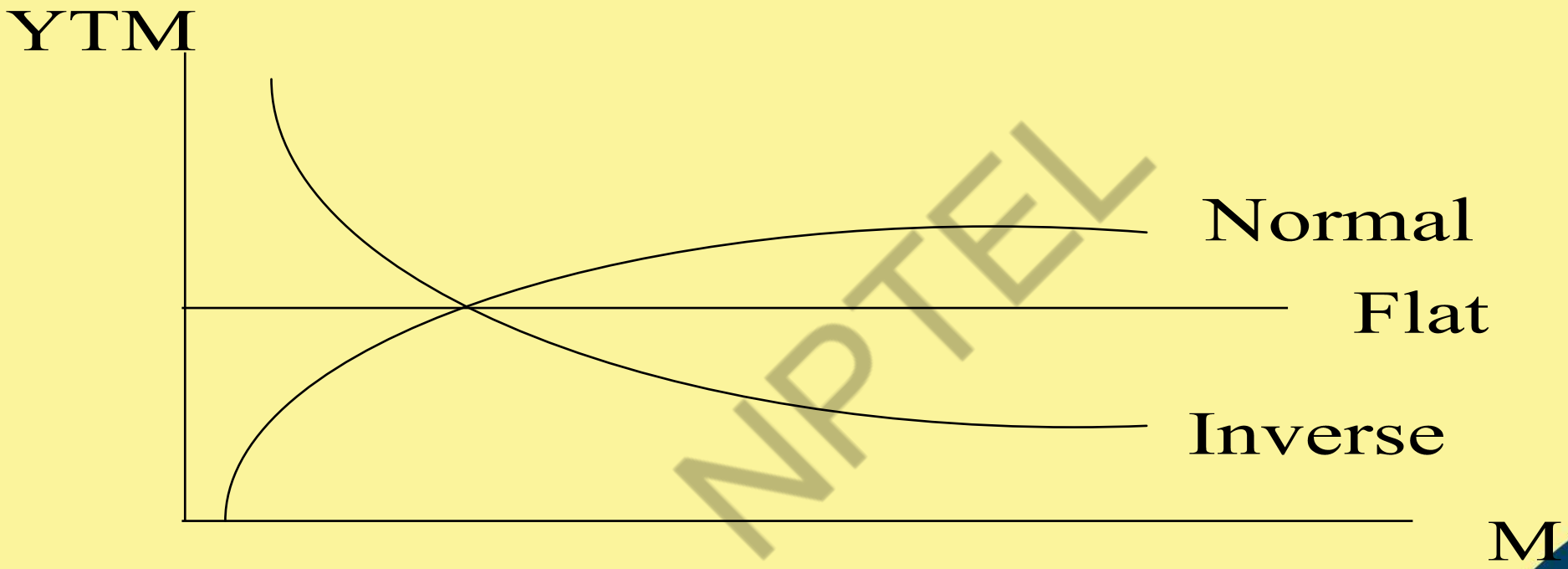
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Shape of the Yield Curve

- Yield curves can be ***positively-sloped*** with long-term rates being greater than shorter-term ones. Such yield curves are called ***normal*** or ***upward sloping curves***. They are usually convex from below, with the YTM flattening out at higher maturities.
- Yield curves can also be ***negatively-sloped***, with short-term rates greater than long-term ones. These curves are known as ***inverted*** or ***downward sloping yield curves***. Like normal curves, these curves also tend to be convex, with the yields flattening out at the higher maturities.
- Yield curves can be relatively ***flat***, with YTM being invariant to maturity.

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Shape of the Yield Curve Cont...



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Shape of the Yield Curve Cont…

- The actual shape of the yield curve depends on:
  - The types of bonds under consideration (e.g., AAA bond versus B bond)
  - Economic conditions (e.g., economic growth or recession, tight monetary conditions, etc.)
  - The maturity preferences of investors and borrowers
  - Investors' and borrowers' expectations about future rates, inflation, and the state of economy.

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Term Structure Theories

- Pure Expectations Theory
- Liquidity Premium Theory
- Preferred Habitat Theory
- Market Segmentation Theory

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Pure Expectations Theory

- **Assumptions**
  - There is a perfect competition in financial markets.
  - The investors are rational, i.e., they wish to maximise the yield of their holding period.
  - Investors have a perfect foresight, and a large enough body of investors hold uniform expectations about the future level and changes of short-term interest rates and security prices.
  - There are no transactions costs.
  - Securities of different maturities are perfect substitutes for each other, i.e., they are homogeneous.
  - Holding period is the period of time for which the investor plans to hold or actually holds the security. It may be the same as the maturity period or it may differ from the latter. If it is longer than the maturity period, the investor must reinvest; if it is shorter, he must sell the security before the maturity period is over

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Pure Expectations Theory Cont…

- With the help of these assumptions, it is posited that today's long-term rate is the unbiased (arithmetic or geometric) average of the current short-term rate and the successive forward or expected one-period short-term rates during the period of long-term loan.
- It is represented as follows:
- $\left(1+R_n^t\right) = \left[\left(1+R_1^t\right)\left(1+r_1^{t+1}\right) \ldots\ldots\ldots\ldots\ldots \left(1+r_1^{t+n-1}\right)\right]^{1/\mathrm{N}}$
- Where:
- R_n = The actual long-term rate
- N = Term to maturity
- R_1= Current 1-year rate
- r= Expected 1 year rate (forward rate)

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Pure Expectations Theory Cont…

The general formula for computing the j-period forward rate beginning at time t+n as of time t is:

$$r_{jt}^{t+n} = \sqrt[j]{\frac{\left(1 + R_{n+j}^{t}\right)^{n+j}}{(1 + R_{n}^{t})^{n}}} - 1$$

Example: Suppose that the seven-year spot rate is 15% and six-year spot rate is 13%. The forward rate one-years from now implied by these spot rates can be calculated as follows:

$$\frac{\left(1+{}^{t}R_{7}\right)^{7}}{\left(1+{}^{t}R_{6}\right)^{6}} - 1$$

$$= \frac{(1+0.15)^{7}}{(1+0.13)^{6}} - 1 = \frac{(1.15)^{7}}{(1.13)^{6}} - 1 = 0.277 = 27.7\%$$

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Summary

- The long-term rate will be higher than the short- term rate (i.e., the yield curve will be upward sloping) only if investors expect future short-term spot rates to be higher than the current short-term spot rate.
- Similarly, the long-term rate will be lower than the short-term rate (the yield curve will be downward sloping) when investors expect future short-term spot rates to fall below the current short-term spot rate.
- If no changes in future short-term spot rates are expected, the long and short rate will be equal to each other (the yield curve will be flat)
- the pure expectations theory views expectations about the future short-term interest rates as the only determinant of the term structures of interest rates

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References

•Reilly, F. K., and K. C. Brown. *Investment analysis and portfolio management*, 10e. Cengage Learning, 2012.

•Johnson, R. Stafford. *Bond evaluation, selection, and management*, 2e. John Wiley & Sons, 2010.

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Term Structure Theories of Interest Rates-II

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Liquidity Preference Theory

- LPT can be thought of as an extension of the Pure Expectations Theory
- PET does not consider risk (i.e., it assumes a risk neutral world)
- Long-term bonds are more price sensitive to interest rate changes than short-term bonds. As a result, the prices of long-term securities tend to be more volatile and therefore more risky than short-term securities
- The ***Liquidity Premium Theory*** (LPT), also referred to as the ***Risk Premium Theory*** (RPT), posits that there is a liquidity premium for long-term bonds over short-term bonds

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Liquidity Preference Theory Cont...

- The premium is over and above the average of the current and expected short rates. Thus, this theory implies the existence of the upward sloping yield curve more often than not. The liquidity premium theory is represented as follows:

$$(1 + R_N^t) = [(1 + R_1^t)(1 + r_{1t}^{t+1} + L_2) \ldots\ldots\ldots\ldots\ldots (1 + r_{1t}^{t+N-1} + L_N)]^{1/N}$$

L represents the liquidity premium and it is expected to increase with maturity as the volatility increases with maturity.

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Liquidity Preference Theory Cont...

- The liquidity premium theory highlights the preference for liquidity and the desire to minimise the sum of income risk and capital risk as the additional factors determining the term structure of rates
- Given that long-term bond are more responsive to interest rate changes, there is more risk holding a longer term bond for one period, with the risk increasing the greater the bond's maturity
- As a result, LPT asserts that investors will hold longer maturity bonds if they offer higher yields than the expected future rate, with the risk premium increasing with the terms to maturity
- This would suggest that the yield curve is governed by the condition that the expected spot rate is equal to the forward rate plus a liquidity premium (LP) equal to a maturity spread (RLT – RST), with the premium increasing with maturity

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Market Segmentation Theory (MST)

- MST posits that the yield curve is determined by supply and demand conditions unique to each maturity segment
- MST assumes that markets are segmented by maturity
- MST does recognize the interdependence between markets in different sectors. For example, MST does assume that short-term investors will substitute between short-term Treasuries and corporate commercial paper depending on their relative rates or that long-term investors will substitute between long-term Treasuries and long-term corporate depending on their relative rates

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Market Segmentation Theory Cont...

Short-Term Market

- Supply of short-term corporate bonds depends on business demand for short-term assets such as inventories, accounts receivables, and the like
- Demand for short-term corporate bonds comes investors looking to invest their excess cash for short periods
- The demand for short-term bonds by investors and the supply of such bonds by corporations ultimately determine the rate on short-term corporate bonds

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Market Segmentation Theory Cont...

Long-Term Market

- Supply of long-term bonds comes from corporations trying to finance their long-term assets (plant expansion, equipment purchases, acquisitions, etc.)
- Demand for such bonds comes from investors, either directly or indirectly through institutions (e.g., pension funds, mutual funds, insurance companies, etc.), who have long-term liabilities and horizons
- The demand for long-term bonds by investors and the supply of such bonds by corporations ultimately determine the rate on long-term corporate bonds

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Market Segmentation Theory : Illustration

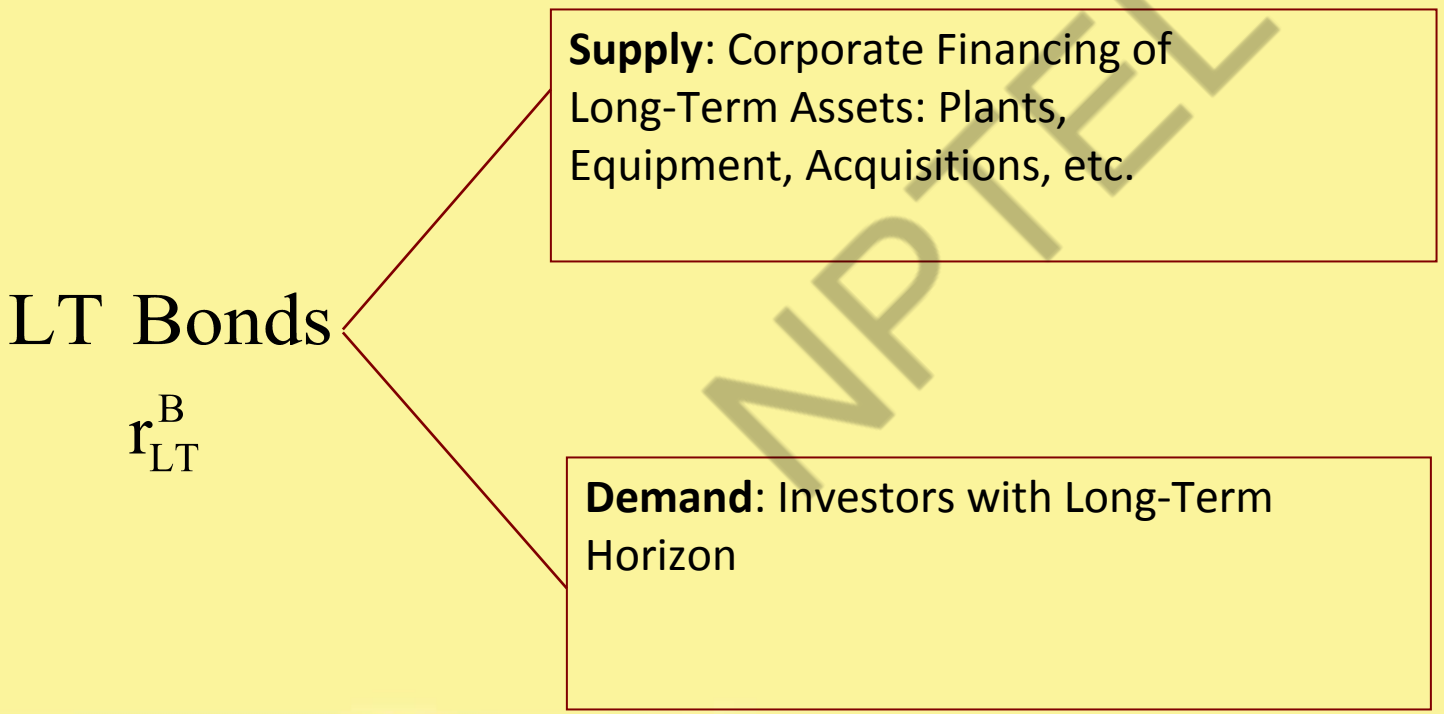
Short-Term Market



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Market Segmentation Theory : Illustration

Long-Term Market



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Market Segmentation Theory Cont...

- Important to MST is the idea of unique or independent markets
- According to MST, the short-term bond market is unaffected by rates determined in the intermediate or long-term markets, and vice versa
- Independence assumption is based on the premise that investors and borrowers have a strong need to match the maturities of their assets and liabilities

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Market Segmentation Theory Cont...

- In general, the positions and the shapes of yield curves depend on the factors that determine the supply and demand for short-term, intermediate, and long-term bonds: economic state (GDP and wealth), expected inflation, credit risk, relative liquidity, and the sales and purchases by the Treasury, central bank, and foreign central bank

- Changes in these factors will cause a change in the structure of interest rates that will be reflected by different shifts and twists in the yield curves

Example:

- If the yield curve were initially positively sloped, then an economic or financial change that increased short-term Treasury rates would cause the yield curve to become flatter
- If the yield curve were initially negatively sloped, then the rate change would cause the curve to become even more negatively sloped
- In general, we can describe such an impact as having a ‘tendency’ to cause the yield curve to become negatively sloped

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Reference

- Bhole, L.M and Mahakud, J (2017), Financial Institutions and Markets, Sixth Edition, McGraw Hill Education (India) Private Limited, Chennai, India

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Term Structure Theories of Interest Rate-III

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Preferred Habitat Theory (PHT)

- Preferred Habitat Theory, PHT, assumes that investors and borrowers are willing to give up their desired maturity segment and assume market risk if rates are attractive

- PHT asserts that investors and borrowers will be induced to forego their perfect hedges and shift out of their preferred maturity segments when supply and demand conditions in different maturity markets do not match

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Preferred Habitat Theory Cont...

- PHT is a necessary extension of the MST:
  - If an economy is poorly hedged (e.g., more investors want short-term investments and more borrowers want to borrow long term), then the market will not be in equilibrium.
  - In such cases, short-term and long-term rates will change and the markets will clear as investors and borrowers give up their hedge.

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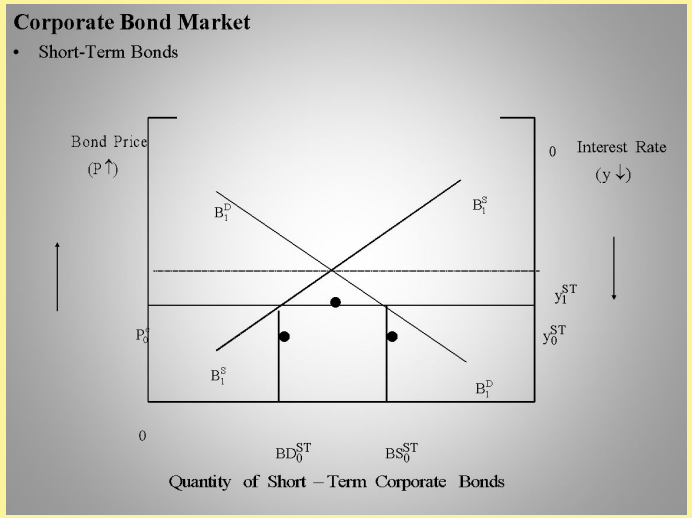
Preferred Habitat Theory Cont...

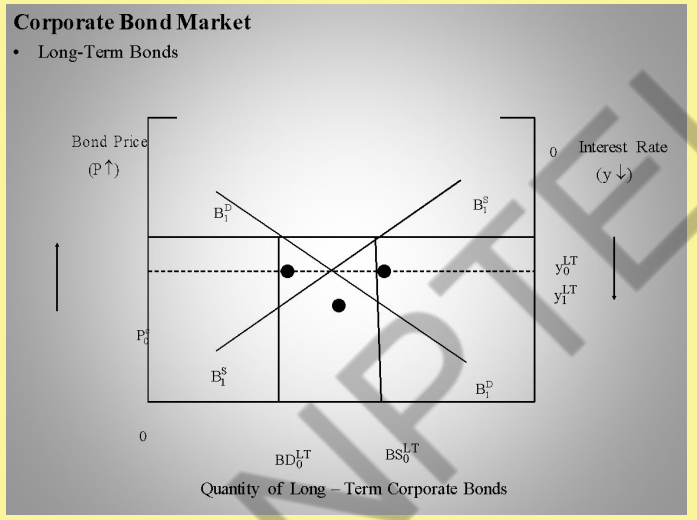
- In the long-term market, the excess supply would force issuers to lower their bond prices, thus increasing bond yields and inducing some investors to change their short-term investment demands.
- In the short-term market, the excess demand would cause bond prices to increase and rates to fall, inducing some corporations to finance their long-term assets by selling short-term claims.
- Ultimately, equilibriums in both markets would be reached with long-term rates higher than short-term rates, a premium necessary to compensate investors and borrowers/issuers for the market risk they've assumed.

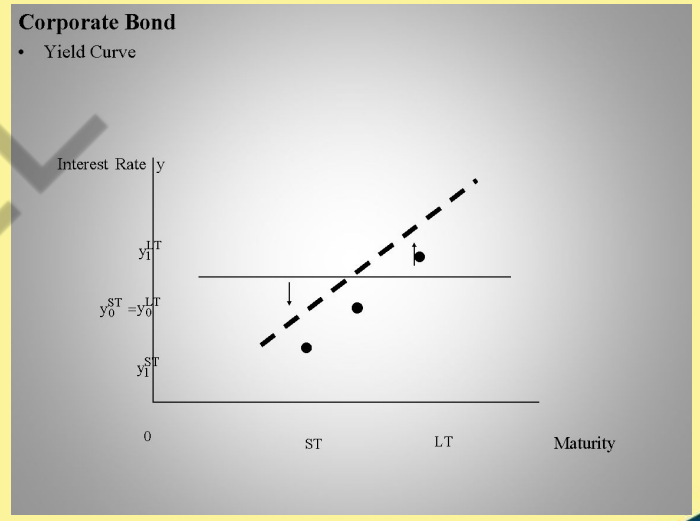
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Preferred Habitat Theory Cont...

The equilibrium adjustment is illustrated below







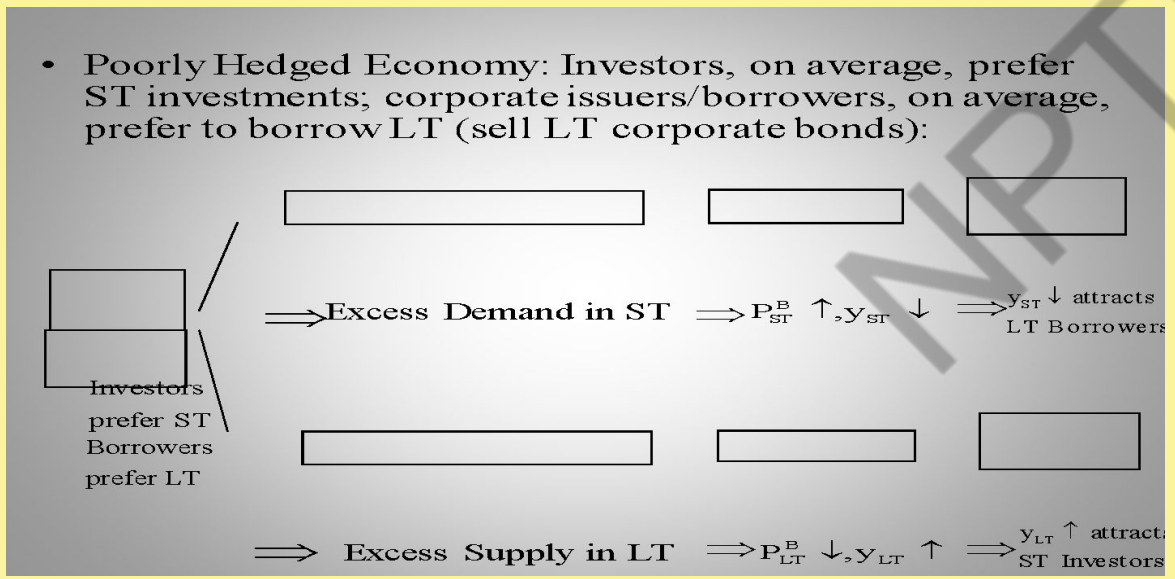
Bond demand in each segment is assumed to depend directly on its own segment's rate and the rate in the other segment

Bond supply in each segment is assumed to depend inversely on its own rate and on the rate in the other segment.

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Preferred Habitat Theory Cont...

The excess supply in the long-term market would force issuers to lower their bond prices, increasing long-term bond yields, and the excess demand in the short-term market would cause short-term bond prices to increase and their yields to fall



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Preferred Habitat Theory Cont...

- As long-term bond yields increase and short-term yields decrease, some investors would change their short-term investment demands or preference, increasing their demand for higher yielding long-term bonds (movement down the long-term bond demand curve) and decreasing their demand for lower yielding short-term bonds (movement up the short-term demand curve).
- The decrease in short-term rates and the increase in long-term rates would induce some corporations to finance their long-term assets by selling short-term claims. This would lead to a substitution in which corporations would increase their sale of the lower yielding short-term bonds (movement up the short-term bond supply curve), and decrease their sale on the higher yielding long-term bonds (movement down the long-term supply curve).

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Other Factors affecting Term Structure of Interest Rate

- Current and expected inflation
  - Inflation uncertainty causes uncertainty about interest rates, thus inflation risk renders long-term rates to be higher than the short-term rates
- Existence of transactions costs
  - Two opposing forces: (i) Given the holding period, the transactions costs are lower, the longer the term to maturity because the number of transactions would be lower. (ii) the transactions costs tend to increase with the length of time to maturity because of the greater risk of long-term securities to dealers who make the market.
  - Whether the yield curve would be downward sloping or upward sloping will depend upon the relative strength of these two forces

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Other Factors affecting Term Structure of Interest Rate Cont…

- **Default Risk**
  - It refers to the possibility of the failure to meet the terms of a loan agreement, of delay in payment, of total non-payment, of partial non-payment of interest and/or principal amount
- **Call Risk**
  - Interest rates on callable bonds will have to be higher than the rates on bonds without a call feature. The difference between the two can be called a "call risk premium
- **Marketability or Liquidity**
  - The security which is easily marketable earns a lower rate of interest than the one whose marketability is limited or restricted

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References

•Reilly, F. K., and K. C. Brown. *Investment analysis and portfolio management*, 10e. Cengage Learning, 2012.

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