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 ADVANCED FINANCIAL INSTRUMENTS AND MARKETS
Lecture No. 05
Determinants of Asset Prices and
Interest Rates

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Today's Discussion

- * Principles of Assets Pricing
- * Interest Rates and Theories of Interest




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Principles of Pricing Financial Assets

* The market price of an asset equals:

$$P = \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \frac{CF_3}{(1+r)^3} + \dots + \frac{CF_N}{(1+r)^N}$$

where: P = the price of the financial asset
 CF_t = cash flow at end of year t (t=1,2,...,N)
 N = maturity of the financial asset
 r = appropriate discount rate



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Appropriate Discount Rate

* The appropriate discount rate is equal to:

$$r = RR + IP + DP + MP + LP + EP$$

where: RR = the real rate of interest
 IP = the inflation premium
 DP = the default risk premium
 MP = the maturity premium
 LP = the liquidity premium
 EP = the exchange-rate risk premium


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Price and Asset Properties

- * The price of a financial asset is *inversely* related to its discount rate.
- * As the discount rate rises, the price falls.
- * As the discount rate falls, the price rises.
- * Reversibility in the form of commissions and transfer fees reduce the price of the asset.


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Effect of Asset Properties on the Discount Rate

Asset Properties	Discount Rate
Default Risk	Positive
Liquidity Risk	Positive
Convertibility	Negative
Currency Risk	Positive

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Tax Treatment

- * After-tax discount rate equals

Pretax discount rate \times (1 - marginal tax rate)

- * If the marginal tax rate is expected to increase, the after-tax discount rate will decrease
- * If the marginal tax rate is expected to decrease, the after-tax discount rate will increase

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Price Volatility of Financial Assets

- * The required rate of return or required *yield* of an asset is inversely related to its price.
- * The *sensitivity* of the asset's price to a change in the required yield will not be the same for all assets.
- * Changes in the required yield are measured in terms of *basis points*.

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Price Sensitivity of Financial Assets

- * The price sensitivity of a financial asset to a given change in yield is affected by the asset's:
 - * Maturity
 - * Coupon
 - * Yield level

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Price Sensitivity of Financial Assets

- * **Maturity**
 - * The longer the maturity of an asset, the greater the price sensitivity to a change in the required yield.
- * **Coupon Rate**
 - * The lower the coupon rate, the greater the price sensitivity to a change in the required yield.
- * **Level of Interest Rates**
 - * The lower the prevailing yield level, the greater the price sensitivity to a change in the required yield.

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Measuring Price Sensitivity to Interest Rate Changes

- * For a small decrease in required yield, the percentage change in price is:

$$\frac{P_- - P_0}{P_0}$$

Where: P_- = asset price if required yield decreases
 P_0 = initial asset price

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Measuring Price Sensitivity to Interest Rate Changes

- * The average percentage change in price per basis point change in required yield is:

$$\frac{P_- - P_+}{2P_0(\Delta y)100}$$

Where: P_- = asset price if yield decreases
 P_+ = asset price if yield increases
 P_0 = initial asset price
 Δy = change in required yield

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Asset Properties and Duration

- * For bonds with the same coupon rate and the same yield, the bond with the longer maturity will have the greater duration.
- * For bonds with the same maturity and the same yield, the bond with the lower coupon rate will have the greater duration.
- * The lower the initial yield, the greater the duration for a given bond.

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Relationship between Duration and Price Sensitivity

- * An estimate of the percentage change in the price of a financial asset is:

$$-\text{Duration} \times (\Delta y) \times 100$$

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Modified Duration and Effective Duration

- * Modified Duration
 - * Assumes future cash flows from an asset do not change with changes in interest rates.
- * Effective Duration
 - * Assumes future cash flows from an asset change with changes in interest rates.

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Interest Rates

- * An *interest rate* is the price paid by a borrower to a lender for the use of resources that will be used during some time period then returned.
- * Real rate
- * Risk-free rate
- * Short-term rate



Theories of Interest Rates

- * Fisher's Classical Approach
- * Loan able Funds Theory
- * Keynes' Liquidity Preference Theory



Fisher's Classical Approach

- * Supply of Savings
 - * Marginal rate of time preference
 - * Income
 - * Reward for saving
- * Demand for Borrowed Resources
 - * Marginal productivity of capital
 - * Rate of interest
- * Equilibrium Rate of Interest



Fisher's Law


- * Nominal Rate of Interest (i)
- * Real Rate of Interest (r)
- * Premium for Expected Inflation (p)
- * Fisher's Law

$$(1 + i) = (1 + r)(1 + p)$$

or

$$i = r + p$$


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The Loanable Funds Theory

- * Demand for and Supply of Funds by Firms, Governments, and Households
 - * Changes in the money supply
 - * Government deficits
 - * Changes in preferences by households
 - * New investment opportunities for firms
- * Equilibrium Rate of Interest


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The Liquidity Preference Theory

- * Demand for Money Balances
 - * Transactions demand
 - * Precautionary demand
 - * Speculative demand
- * Supply of Money
- * Equilibrium Rate of Interest

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Changes in the Demand for Money and Interest Rates

- * Liquidity Effect
 - * If increasing, causes the interest rate to rise.
- * Income Effect
 - * If increasing, causes the interest rate to rise.
- * Price Expectations Effect
 - * If increasing, causes the interest rate to rise.
- * Net Effect:
 - * The interest rate may rise, fall, or remain unchanged, depending on the net effect of changes in desired liquidity, income, and price expectations.

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Features of a Bond

- * Time to Maturity
- * Principal or Par Value
- * Coupon Interest
- * Yield-to-Maturity (YTM)
 - * If $YTM = \text{coupon rate}$, market price = par value
 - * If $YTM > \text{coupon rate}$, market price < par value
 - * If $YTM < \text{coupon rate}$, market price > par value

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Determinants of the Structure of Interest Rates

- * The Base Interest Rate
- * Risk Premiums Are Determined By:
 - * Issuer Type
 - * Credit risk
 - * Term to maturity
 - * Embedded options
 - * Taxability of interest
 - * Liquidity

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Types of Issuers

- * Treasury Market Sector
- * Corporate Market Sector
 - * Utilities
 - * Industrials
 - * Finance
 - * Banks
- * Intermarket and intramarket Sector

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Term to Maturity

- * The volatility of a bond's price is influenced by its maturity.
- * The longer the maturity of a bond, the greater its price sensitivity to a change in market yields.
- * Maturity spread or yield curve spread

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The Yield Curve

- * Relationship between yield and maturity for bonds of the same credit quality but different maturities.
- * Yield curve shapes
 - * Normal
 - * Inverted
 - * Flat
 - * Humped

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Using the Yield Curve to Price a Bond

- * Any financial asset can be viewed as a package of zero-coupon instruments.
- * Maturity of an instrument is the coupon payment date or maturity date.
- * Value of the asset equals the total value of the component zero-coupon instruments.
- * Spot Rate
- * Rate on zero-coupon bond

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Theoretical Spot Rate Curve

- * The process of creating a yield curve based on theoretical spot rates is called bootstrapping.
- * The theoretical value of a bond is equal to the present value of its periodic cash flows discounted at the corresponding theoretical spot rate for each period.

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Forward Rates

- * Market's Consensus Prediction of Future Interest Rates
- * The implied forward rate is calculated from either the spot rates or yield curve.
- * The yield curve can be used to calculate the implied forward rate for any investment horizon or any sub-period within that horizon.

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Relationship Between Spot Rates and Short-Term Forward Rates

* The relationship between the spot rate on an instrument maturing in six months (the current six-month spot rate), and the implied monthly forward rates for the next six months is:

$$z_t = [(1 + z_1)(1 + f_1)(1 + f_2)(1 + f_3)...(1 + f_{t-1})]^{1/t} - 1$$

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Forward Rate as a Hedgeable Rate

- * Forward rates do not predict future interest rates.
- * Forward rates do indicate how an investor's expectations must differ from the market consensus in order to make the correct decision.

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Determinants of the Shape of the Term Structure

- * (Pure) Expectations Theory
- * Liquidity Theory
- * Preferred Habitat Theory
- * Market Segmentation Theory

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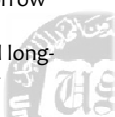
Pure Expectations Theory

- * Yields on bonds with different maturities are based only on expectations of future short-term rates.
- * Term structure might be normal, inverted, humped, or flat.
- * Ignores price risk and reinvestment risk.
- * Interpretations include broad, local and return-to-maturity.



Liquidity Theory

- * Yields on bonds with different maturities are based only on expected future rates plus a liquidity premium that increases with maturity.
- * Term structure might be normal or flat.
- * Presupposes that all lenders want to lend short-term and all borrowers want to borrow long-term.
- * In reality, there are lenders for short and long-terms and borrowers for short and long-terms.



Preferred Habitat Theory

- * Yields on bonds with different maturities are based only on demand and supply at each maturity.
- * Term structure might be normal, inverted, humped, or flat.
- * Issuers and buyers of bonds have maturity preferences but will shift to other maturities if the prices or yields are attractive enough.
- * Yields are completely unrelated to expectations of future rates.



Market Segmentation Theory

- * Yields on bonds with different maturities are based only on demand and supply at each maturity.
- * Term structure might be normal, inverted, humped, or flat.
- * Issuers and buyers of bonds have maturity preferences and will not shift to another maturity because each maturity is a separate market.
- * Yields are completely unrelated to expectations of future rates.

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Thank You!

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