Interest Rate

Definition

Price of debt capital (rent on borrowed money), expressed as an annual percentage of amount borrowed

Importance

Influences other asset prices

Influences general level of economic activity

Determination

Interest rates are set in credit markets ("loanable funds")

      Demand: Borrowers (deficit units)
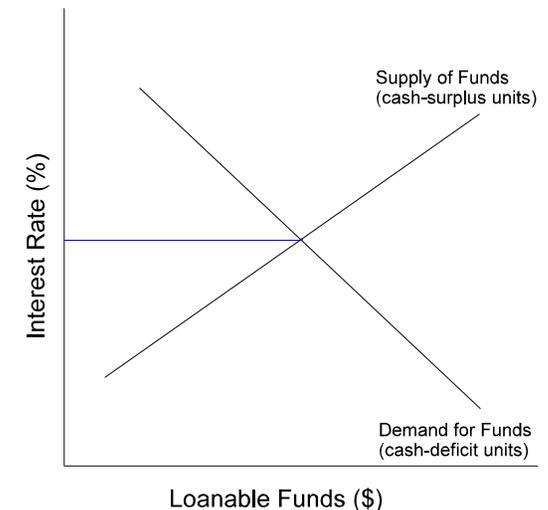
      Supply: Lenders (surplus units)

Issue(s)

What determines the interest rate on a specific instrument at a specific time?

or   What determines the *general* level of interest rates?

      What determines the *spread* between rates on different instruments?

Supply of Funds (cash-surplus units)

Demand for Funds (cash-deficit units)

Interest Rate (%)
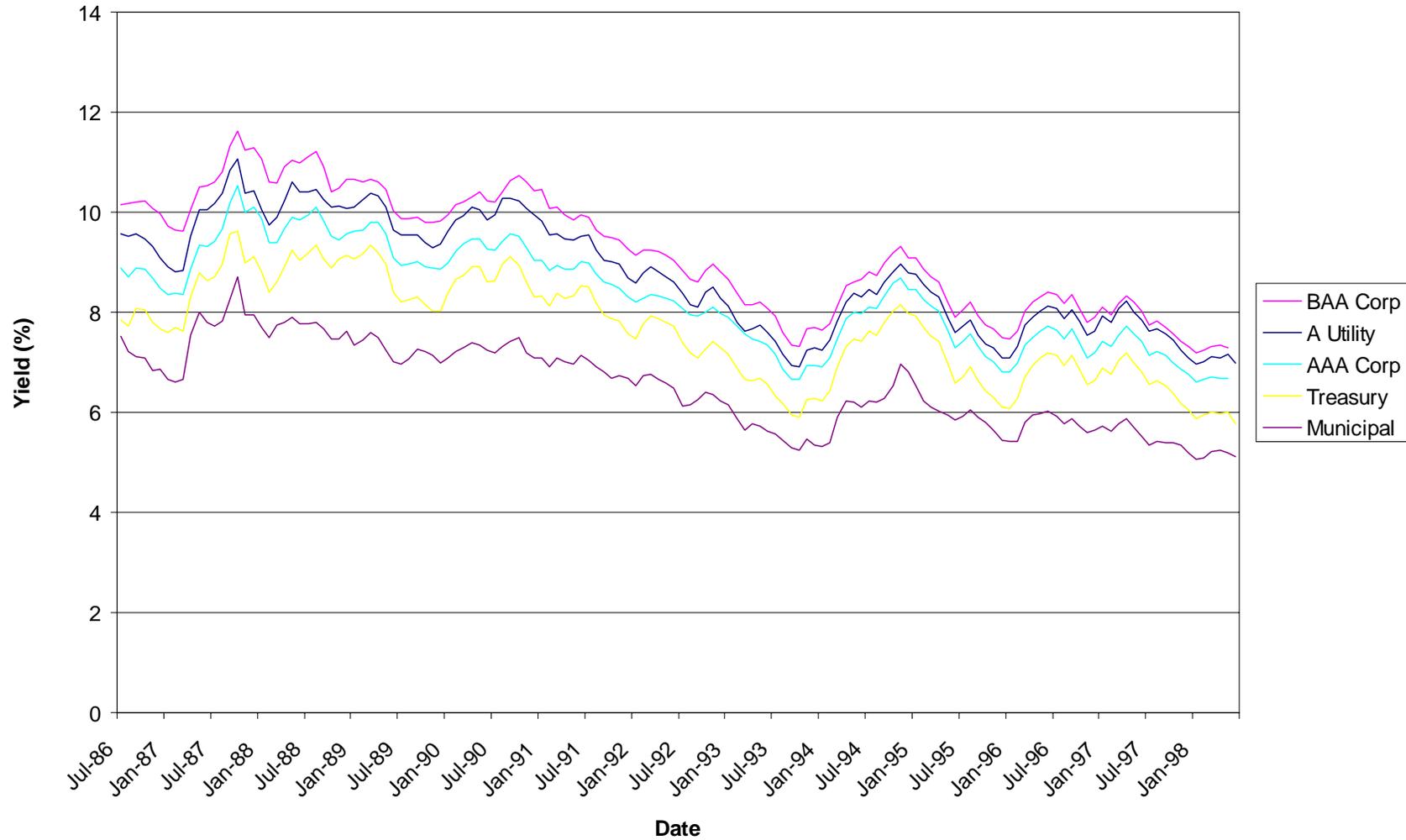
Loanable Funds ($)

Issue: General Level of Interest Rates

Annual Inflation Rates and Long-Term Interest Rates
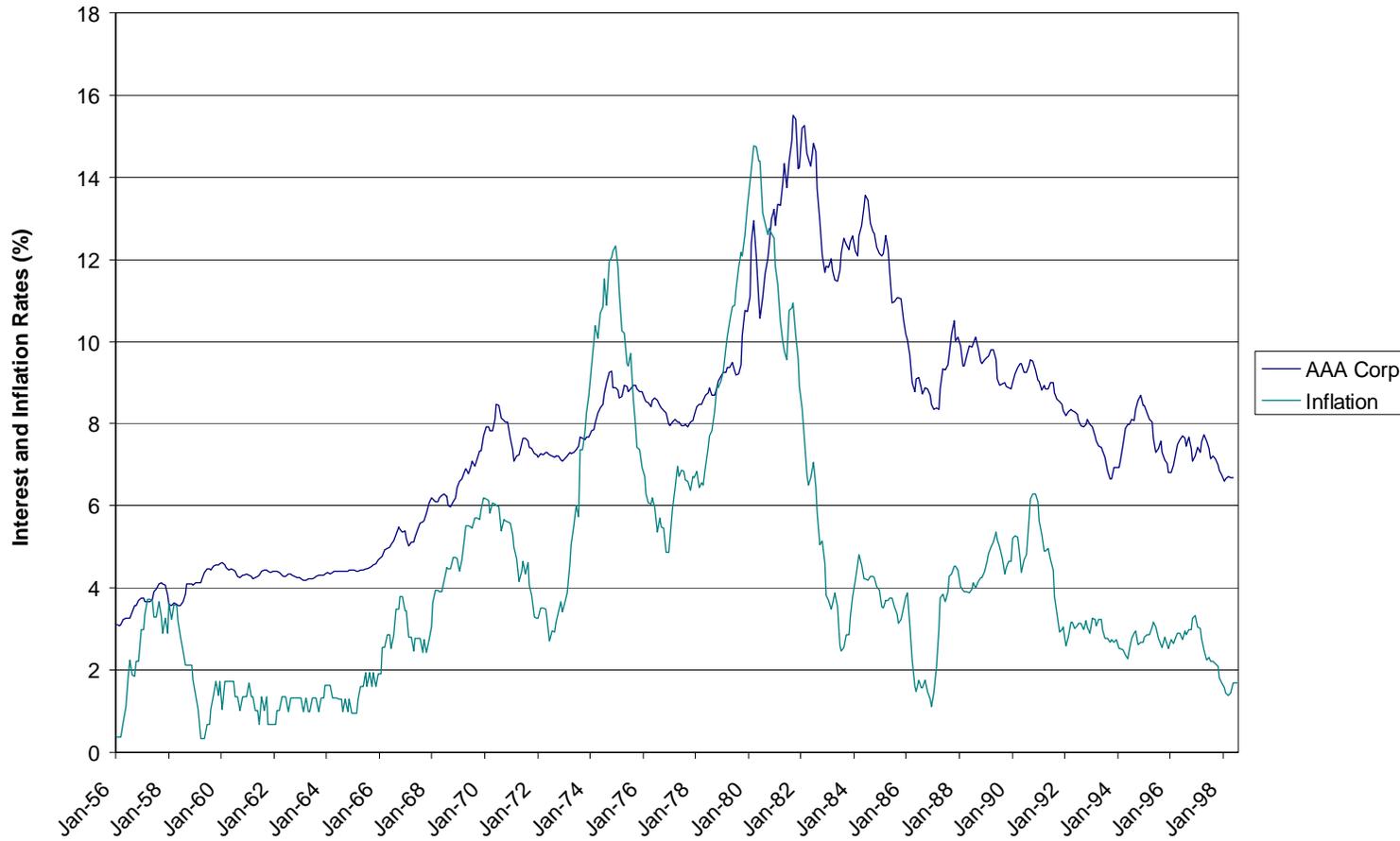
Issue: Spreads between Interest Rates

Yields on Bonds with Differing Characteristics
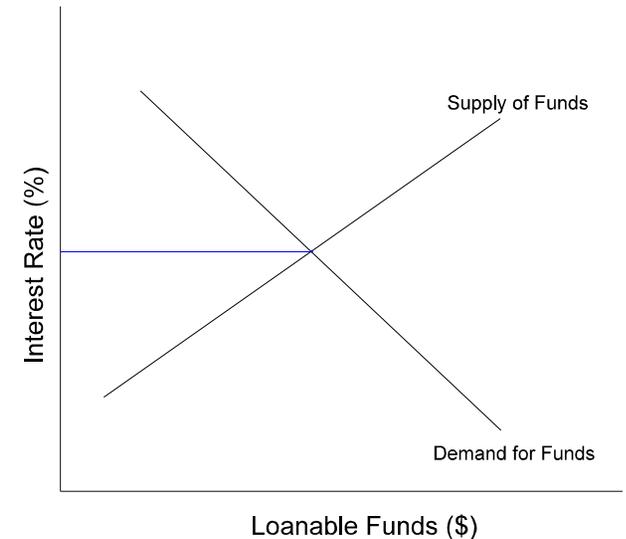
Determinants of Real Interest Rates

(Assume, for simplicity, that no inflation is expected)

Primary

Demand: Borrowers with best production opportunities
will bid most

Supply: Lenders with the least urgent desire to spend
will accept least ("time preference")

Result: Capital flows from those with the least urgent
uses to those with the most urgent uses

Secondary

Federal Reserve monetary policy	shifts supply curve
Federal deficit	shifts demand curve
Balance of payments	shifts supply curve
Taxes	shifts either/both curves

Pricing of Debt

Many types of debt exist, distinguished by the characteristics of their cash flows
    Size
    Timing
    Risk

Each type has its own market and interest rate, determined by its own supply and demand
These rates are interdependent, due to substitution

The rate for any particular loan depends on
    the general level of interest rates (risk-free rate, common to all loans)
    specific characteristics of the contract itself (risk premium, specific to this loan)

Interest rate on instrument i

$$k_i = \underbrace{\text{Risk-free Rate}}_{k_{RF}} + \underbrace{\text{Risk Premium}_i}_{RP_i}$$

Risk-free Rate ($\Rightarrow$ General Level)

Basis for all rates

What you charge a borrower who is sure to repay

> *Real* risk-free rate   what you charge, if you expect no inflation during the life of the loan (once called the "corn rate")

> *Nominal* risk-free rate   what you charge, if you expect inflation (marked-up); actually observed (e.g., T-Bill rate)

Effect of Expected Inflation (Fisher Effect)

Loan contracts generally specify *number* of dollars to be repaid (*nominal* terms)

Inflation will reduce *purchasing power* of dollars repaid (*real* terms)

To preserve purchasing power, we build our expectation of inflation into the interest rate that we ask/offer

$$ \underbrace{k_{RF}}_{\textit{nominal} \text{ risk-free rate}} = \underbrace{k^{*}}_{\textit{real} \text{ risk-free rate}} + \underbrace{IRP}_{\text{inflation risk premium}} $$

When our *expectations* about inflation change, interest rates change in the same direction, by (approximately) the same amount.

Inflation and Interest Rates: Example

Suppose you lend a friend $1000 for 1 year			$k^* = 0\%$
	Year 0	**Year 1**	**Interest Rate**
Expected inflation rate	0%		
Your Cash Flows (nominal)	(1000)	1000	0%
Actual inflation rate	0%		
Price Level (CPI)	100%	100%	
Purchasing Power of your CFs (real)	(1000)	1000	0%
Actual inflation rate	100%		
Price Level (CPI)	100%	200%	
Purchasing Power of your CFs (real)	(1000)	500	-50%
Expected inflation rate	100%		
Your Cash Flows (nominal)	(1000)	2000	100%
Actual inflation rate	100%		
Price Level (CPI)	100%	200%	
Purchasing Power of your CFs (real)	(1000)	1000	0%

before the fact: $k_{RF} = k^* + IRP$

after the fact: $rate = \dfrac{repayment - loan}{loan}$

Risk Premium ($\Rightarrow$ Spread)

Unique
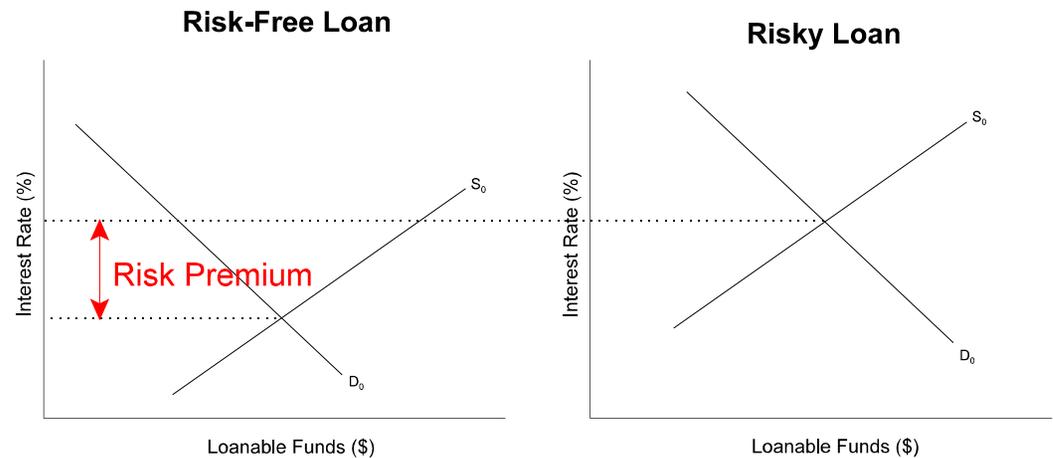Each instrument has its own risks and its own risk premium

Risk Premiums
Default Risk Premium (DRP_i)
    for default risk
Liquidity Premium (LP_i)
    for illiquidity of market
Maturity Risk Premium (MRP_i)
    for interest rate risk

Risk-Free Loan

Interest Rate (%)

Risk Premium

S_0

D_0

Loanable Funds ($)

Risky Loan

Interest Rate (%)

S_0

D_0

Loanable Funds ($)

Risk premium on instrument i: $RP_i = DRP_i + LP_i + MRP_i$

Interest rate on instrument i: $k_i = \underbrace{\underbrace{\text{Risk-free Rate}}_{k_{RF}}}_{k^* + IRP} + \underbrace{\underbrace{\text{Risk Premium on } i}_{RP_i}}_{DRP_i + LP_i + MRP_i}$

Interest Rate Risk Premiums: Example

Component	3-Month T-bill	20-Year T-bond	30-Year Bonds T-bond	Corporate AAA	OTC
Real risk-free rate	2.5%	2.5%	2.5%	2.5%	2.5%
Expected inflation rate	6.5%	6.5%	6.5%	6.5%	6.5%
Default risk premium				2.0%	3.0%
Liquidity premium					1.0%
Maturity risk premium		1.0%	2.0%	2.0%	2.0%
Nominal risk-free rate	9.0%	9.0%	9.0%	9.0%	9.0%
Risk premium	0.0%	1.0%	2.0%	4.0%	6.0%
Observed rate	**9.0%**	**10.0%**	**11.0%**	**13.0%**	**15.0%**

$$k_i = \left(k^* + IRP\right) + \left(DRP_i + LP_i + MRP_i\right)$$