

# Lecture 2B: Interest Rates

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## Risk Structure of Interest Rates

- among bonds w/ same maturity some pay higher interest rate due to
  - risk of default
  - taxes
  - liquidity

## Term Structure of Interest Rates

- bonds w/ different terms to maturity pay different interest rates

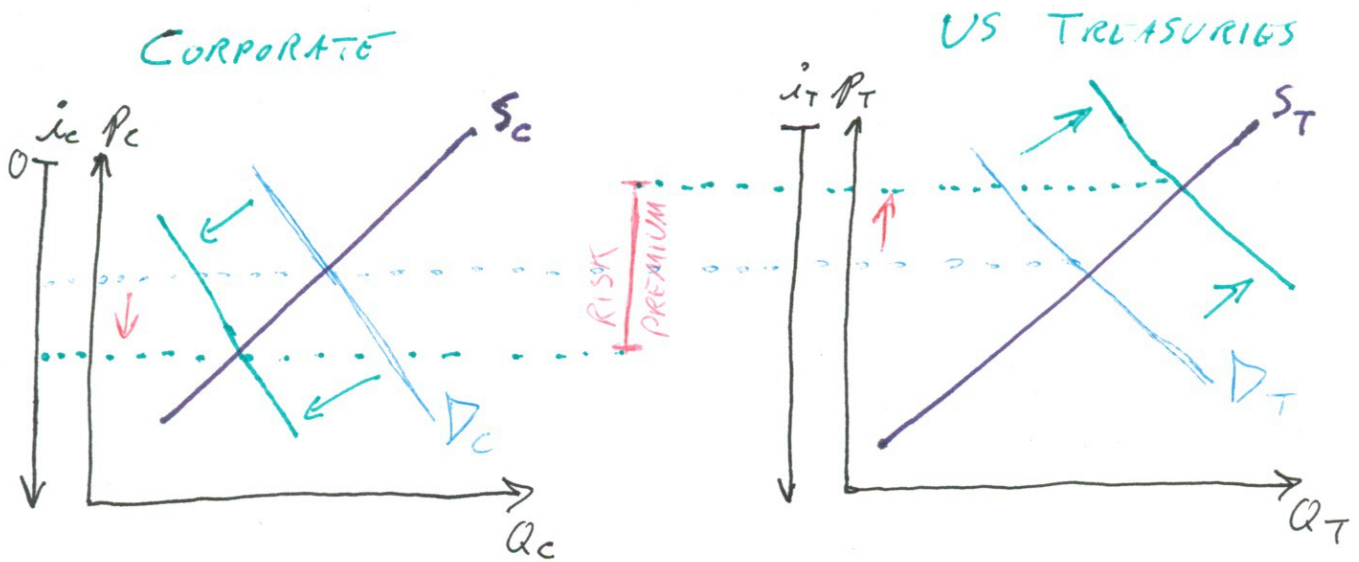
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## RISK STRUCTURE

- risk of default
  - US Treasury Bills considered safest
  - others riskier
    - corporation or state/local gov't may suspend interest payments on its bonds
  - US gov't can always (in principle) raise taxes to pay interest on bonds

→ "risk premium"

- measures how much additional interest must be paid to compensate for the additional risk



- In example above, corporate bonds and treasuries initially ~~are~~ pay same interest rate
- But if corporation's probability of default increases investors will
  - demand fewer corporates (raising  $i_C$ )
  - demand more Treasuries (reducing  $i_T$ )
- A bond with default risk will always have positive risk premium + ~~the~~ premium will ~~increase~~ increase with ~~the~~ probability of default.

## → liquidity

- an asset that can be quickly and cheaply converted to cash is considered "more liquid" than one that is infrequently traded
- US Treasuries are most liquid
- Corporate bonds are less liquid because fewer bonds for any one corporation are traded (so harder to find buyer)
- so there is less demand for less liquid bonds (which pushes down their price + pushes up their interest rate)
- "risk premium" would be more accurately described as "risk + liquidity premium"

## → income tax considerations

- state + local governments have defaulted
- municipal bonds are less liquid
- nonetheless, they carry a lower interest rate
- WHY? TAXES
- interest payments on municipal bonds are exempt from income taxes



◦ Example:

	US Treasury	Municipal
Face Value	\$1000	\$1000
Coupon Payment	\$100	\$80
Interest Rate	10%	8%
AFTER TAX interest rate	6.5%	8%

(Assumes that your marginal tax rate is 35%)

- Municipal bonds interest payments are exempt from ~~taxation~~ income tax
- US Treasury bonds interest payments are NOT exempt from income tax
- Raising the after-tax interest rate on a bond will increase demand for that bond
  - pushing up its price
  - pushing down its interest rate

# TERM STRUCTURE of INTEREST RATES

- for bonds with same
  - risk
  - liquidity
  - tax considerations
- but different term to maturity
- we can plot yield curve which can be
  - upward sloping
  - flat
  - downward sloping (inverted)

## empirical facts

- #1 interest rates on bonds of different maturities move together over time
- #2 when short-term interest rates are low yield curve is more likely to have an upward slope  
when short-term interest rates are high yield curve is more likely to slope downward (be inverted)
- #3 yield curves almost always slope upward

- Expectations theory explains #1 + #2
- segmented markets theory explains #3
- liquidity premium theory explains #1, #2 + #3

expectations theory

- interest rate on a long-term bond should <sup>approximately</sup> equal the average of short-term interest rates over the life of the bond
- ASSUMES that bonds are perfect substitutes  
i.e. if expected return on one is less than that of another at different maturity, investors will sell the first + buy the second until returns are equalized

<u>EXPECTATION</u>	2012	2013	2014	2015	2016
one-year	5%	6%	7%	8%	9%

THEN interest rate on five-year should be approximately 7%

interest rate on two-year should be approximately 5.5%



→ expectations theory suggests that an upward sloping yield curve reflects expectation of rising interest rates in the future

→ fact #1 - interest rates on bonds of different maturities move together

- historically, increases in short-term rates followed by higher short-term rates
- so if short-term rates rise today people will expect them to stay higher in future
- consequently, long-term rates should also rise because they are (approximately) the average of short-term rates

→ fact #2 - when short-term rates low, people will expect them to rise in future generating upward sloping yield curve

→ expectations theory does not explain why yield curve usually slopes upward

## segmented markets theory

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- ASSUMES that bonds are NOT substitutes at all. Instead the markets for different maturity bonds are completely separate.
- Investors have strong preferences for maturity of a particular length
- EXAMPLE: if you are saving for retirement or if you are saving for your young child's college education, then you would prefer to hold long-term bonds
- fact #3 - yield curves almost always slope upward
  - if most investors prefer short-term maturities with little interest rate risk, then there will be less demand for longer term securities
- ~~But~~ Note however that segmented markets theory fails to explain facts #1 + #2
  - does not explain why rates move together
  - does not explain why yield curves slope upward/downward when short-term rates low/high



## Liquidity Premium Theory

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→ a hybrid of expectations theory and segmented markets theory

→ ASSUMES Bonds are ~~not~~ substitutes, but are not perfect substitutes, so investors may prefer one maturity over another

→ given that short-term bonds carry less interest rate risk, investors must be offered a higher interest rate to compensate for the additional interest rate risk associated longer-term bonds

## Preferred Habitat Theory

→ investors have preference for a given maturity, but may be persuaded to purchase bond of different maturity if they can ~~even~~ be compensated for higher expected return

→ so yield curve slopes upward (at most times) because investors tend to ~~not~~ prefer short-term bonds

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Given that Liquidity Premium ~~Theory~~  
Theory + Preferred Habitat Theory explain  
all three factors, we can use them  
to explain the yield curve

- when yield curve's <sup>upward</sup> slope is very steep, investors expect short-term interest rates to rise
- when yield curve is only moderately upward sloping, investors expect short-term interest rates to remain same
- when yield curve is flat, investors expect moderate decrease in short-term rates
- when yield curve is downward sloping, investors expect short-term interest rates to fall sharply