

Lecture Notes for Chapter 3 of
MACROECONOMICS:
An Introduction
**Savings and
Investment**

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In this chapter we will discuss-

- How savings becomes investment.
- Banks and other financial intermediaries - their role in the economy.
- Stocks and bonds.
- How to find out what the interest rate is.
- Long and short term interest rates - how they have behaved over time.
- The "yield curve."

Now we know that
"Savings equals investment"

But how do dollars *saved*
become dollars *invested*?

How can Blue Skies Airlines buy a 787?

- If it borrows from a bank it agrees to:
 - Repay the principal on schedule.
 - Pay interest, say, 10%.
 - Pledge the 787 as collateral.
- Why is Blue Skies willing to pay interest?
- Where did the bank get the \$125 million?

What does the bank do?

- It provides four services:
 - 1. Lower transactions costs
 - 2. Lower information costs
 - 3. Liquidity
 - 4. Diversification

Transactions costs:

- What would it be like if households lent to Blue Skies directly?
- What would be the costs?
- Banks are convenient!
- Lower costs for savers *and* borrowers.

Information costs:

- What if households had to gather information about Blue Skies?
 - Is Blue Skies a good credit risk?
 - Is the loan a good deal?
 - What happens if Blue Skies fails to pay?
 - Good luck!
- Banks specialize in knowing this.
- Lower costs for savers *and* borrowers.

Liquidity:

- Convertible into cash quickly at low cost.
- Bank's loan to Blue Skies is illiquid, but saver's deposit at the bank is liquid.
- Banks convert illiquid assets (loans) into liquid assets (savers' deposits).
- For providing liquidity bank gets the spread between interest earned on loan and interest paid on deposits.

Diversification:

- Each depositor participates in all loans.
- A bad loan has only a fractional impact.
- Bank deposits are insured by the Federal Deposit Insurance Corporation.
- That shifts risk to all of us!

What are “Financial intermediaries?”

- Channels of saving to investment.
- Banks are only one. All offer:
 - Lower transaction costs
 - Lower information costs
 - Liquidity
 - Diversification
- Many offer tax benefits.
- Examples include>>>

Life insurance.....

- “Whole life” is insurance *and* savings.
- Not highly liquid.
- Income earned free of current tax.
- The insurance companies make long term loans in real estate.

Pension funds.....

- Not liquid
- Contribution not taxed until retirement.
- Neither are dividends and interest earned by the fund.
- “Defined contribution” plans invest in stocks and bonds.
- IRAs are do-it-yourself pensions funds.

Mutual funds.....

- Each mutual fund share participates in a portfolio of stocks and bonds.
- Fastest growing, largest intermediaries.
- Many types of mutual funds.
 - ↗ Growth, income, small cap, large cap, bond, balanced, international, internet, Asia, etc!
- Offer IRAs and variable annuities.

Mutual funds provide:

- Liquidity
 - ↗ "Open end" funds sell & redeem shares every day at market value.
- Low transaction cost, "no load funds."
- Low information cost
 - ↗ they select investments.
 - ↗ easy to get information on funds.
- Diversified holdings of many stocks.

Source of confusion: "Investment" has 2 meanings.

- 100 shares of Amazon.com are a *financial investment*.
- Amazon's new warehouse is a *capital investment*.
- Both are part of process that turns savings into new capital goods.

Stocks

- Each share is an equal owner.
- Shares are "stock."
- The value of shares is determined by supply and demand.
 - on the floor of the NYSE, and NASDAQ.
- Stocks are very liquid.

Wall Street

- Large cap stocks traded on NYSE, an actual place.
- Small cap stocks traded on NASDAQ, a virtual marketplace.
 - Exceptions: Microsoft and Intel.
- "Transparency": transactions - price and number of shares are displayed on "ticker tape" and broadcast world wide.

SEC is the umpire on Wall Street.

- Securities and Exchange Commission established by 1934 law.
- All securities must be cleared by SEC.
- All public companies must file regular audited reports with SEC.
- Guiding principle is "full disclosure" - give investors all relevant information, then let market decide value.

If Blue Skies Airline sells shares

- “Investment bank” markets new shares
- What do investors get for \$10 per share?
 - Right to cast one vote per share.
 - Participation in profits and dividends.
 - Limited liability.
 - But you can lose your \$10!

But stocks are risky!

- If firm prospers, profits and dividends rise.
- If not, may receive no dividend
- Investor can reduce risk by diversifying, owning shares in many companies.
- Easily done in a mutual fund.

What is a bond?

- A contract between
 - the issuer of the bond, the borrower
 - and the owner of the bond, the lender.
- Pays face value at maturity and interest in the form of periodic “coupons.”
- At maturity, a bond ceases to exist.
- Described by issuer, coupon, & maturity.
- Prices are quoted for face value of \$100, determined by supply and demand.

A bond is-

- Like a loan, a promise to repay with interest, but issuer pays whomever owns the bond.
- Like stocks, bonds are “negotiable securities” and more liquid than loans.

What if the issuer fails to pay?

- Bond in *default*.
- In bankruptcy bondholders may get nothing
- “Credit risk”
- Usually bonds are issued by governments and large corporations.
- Smaller firms usually borrow from banks.
- “Junk bonds” bought by large investors.

How is the coupon determined?

- At time of issue, coupon is set so bond will sell at face value, “at par.”
- The less reputable the borrower, the higher is the coupon required.
- Coupon is determined by the market.
- Bond owner never receives more than promised!

Why do bond prices fluctuate?

- We want to understand how bond prices changes as interest rates change.
- What are some of the different kinds of bonds?
- What are 'Long Term' and 'Short Term' interest rates and how have they moved over time?
- What is the 'yield curve'?

Interest Rates and Bond Yields

- Interest rate a key variable in the economy, affects cost of capital & durable goods.
- U.S. Treasury bonds pay the least because "Treasuries" are "default free." Why?
- Treasuries are the most liquid of all bonds, recognized around the world, \$5 trillion!!
- Yield on Treasuries is benchmark rate.

Bond yield is percent gain from purchase to maturity:

$$\text{yield} = \frac{\text{amount gained}}{\text{price paid}} \cdot 100\%$$

Gain = what you get minus the price you paid, so:

$$\text{yield} = \frac{(\text{face value} + \text{coupon}) - \text{price}}{\text{price}} \cdot 100\%$$

"T Bonds, Notes & Bills" in the WSJ

- "Notes" < 10 years, "bills" < 1 year.
- Min face value is \$1,000, quoted per \$100.
- "Rate" is the coupon as % of \$100.
- "Maturity" is month and year, & "n" a note.
- "Bid" & "Asked" are the buying and selling prices of the bond in dollars and 32nds.
- "Ch" is the price change in 32nds of a dollar.
- "Ask Yld" is based on asked price.

Look at one year Treasuries:

- Usually two.
- Calculate yields.
- Do you agree with the WSJ?
They have nearly the same yield; why?
- What would happen if they didn't?

New one-year T note.

- What must the coupon be for investors to be willing to pay “par” or \$100 for it?
- Enough so the new bond yields as much as existing one year notes.
- Conclusion:
The coupon on the new note must equal the interest rate.

What was the interest rate when a bond was issued?

- Have interest rates risen or fallen?
- Have the bond prices risen or fallen?
- How does the price change relate to change in interest rates?

T bonds are not free of risk!

- Future interest rates are uncertain!
- “Interest rate risk” takes two forms:
 - “Price risk”
 - ↗ bond price changes when rates change.
 - “Income risk”
 - ↗ cannot be sure of rate when reinvest.

When yield goes from 5% to 6% what happens to price?

$$\text{Price} = \frac{\$100 + \text{coupon}}{1 + \text{yield}/100\%}$$

$$\text{Price} = \frac{\$105}{1 + .05} = \$100$$

$$\text{Price} = \frac{\$105}{1 + .06} = \$99$$

- Solve for *Price*.
- Coupon is \$5.
 - If the yield is 5%, the price is \$100.
 - If the yield is 6%, the price is \$99.
- A rise of 1% point in yield results in a 1% loss in market value!

Why does the price fall \$1?

$$\text{yield} = \frac{\$100 + \text{coupon} - \text{price}}{\text{price}} \cdot 100\%$$

$$\text{yield} = \frac{\$100 - \text{price}}{\text{price}} \cdot 100\% + \frac{\text{coupon}}{\text{price}} \cdot 100\%$$

$$\text{yield} = \text{price appreciation yield} + \text{coupon yield}$$

- At a price at \$100, price appreciation is zero, so the yield is just coupon yield, 5%.
- When rates rise 1% point, price falls to \$99, adding 1% price appreciation yield.
- The coupon cannot and will not change!

Bond prices move inversely with interest rates!

- When rates rise, bond prices fall.
- When rates fall, bond prices rise.
- Coupon and face value are fixed, only the market price can change!
- Yield adjusts through change in price.
- This is why there is interest rate risk!

Income risk:

- T bill has very little price risk.
- But what will be interest rate when it matures?
- Income risk argues for matching maturity to time you will need money.

The price-yield relationship for long term bonds:

- Discount (\$100-price) is earned over years, but yield is on a per year basis.
- Exact math is more complex
- Good approximation:
 - ↗ divide the discount by maturity,
 - ↗ add coupon, then divide by price.

Example:

10 year bond with coupon \$7.25

- Issued yesterday at par to yield 7.25%.
- Today interest rates jump to 9%.
- Price must drop to about \$91! Why?
- Price will appreciate 10% over 10 years, about 1% point per year.
- Price appreciation yield of 1% + coupon yield of 8% = 9% yield.
- Big ouch if you bought that bond!

Consols mature in eternity.

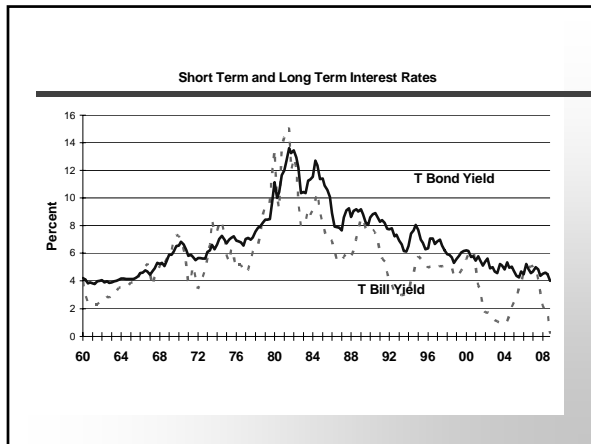
- Never matures, pays coupon forever.
- Math is easy:
 - ↗ yield = coupon/price
 - ↗ therefore: price = coupon/yield
 - ↗ Example: If coupon is \$5 & price \$80,
yield = $5/80 = .0625 = 6.24\%$
- A useful approximation for long term bonds
- Try the 30 year T bond and see if it works.

How does price change with a change in yield on a consol?

- Percent change in price equals minus the percentage change in yield.
- Example: long rates rise from 5% to 6%, long term bond prices fall 20%!
- When long term rates rose in 1994, bond holders lost about 15%!
- Long term bonds have the greatest price risk!

Behavior of long and short term interest rates:

- Annualized yield on T bill is benchmark short term rate.
- Yield on long term T bonds is benchmark long term rate
- All other interest rates of same maturity will be higher, e.g. mortgages
- One exception: tax exempt bonds issued by municipalities.



Some observations:

- Long and short term rates differ. Why?
 - ↗ very different time horizons
 - ↗ T bill promises to pay for short time, T bond pays a much longer time
 - ↗ these are different promises.
 - ↗ also, their interest rate risks are different.
- Interest rates have varied greatly
 - ↗ creating huge gains and losses.

And -

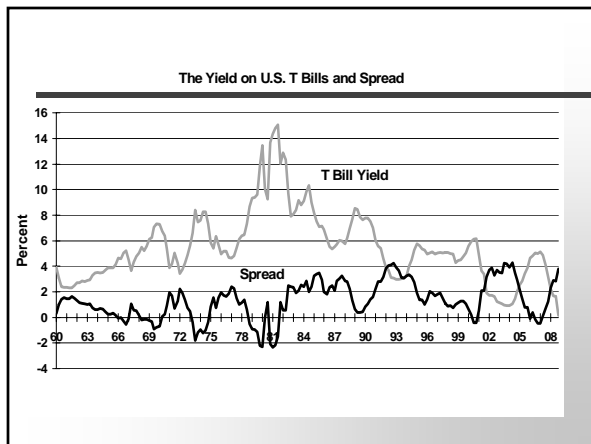
- Long term rate is usually higher.
 - ↗ on balance, investors have to be paid a "risk premium" to hold long bonds.
- Long rate varies less and moves more slowly than does the short term rate.
 - ↗ explained by the expectations theory of the term to maturity structure of interest rates.

Expectations Theory of the Term to Maturity Structure of Interest Rates:

- Investors have the choice between
 - Rolling over T bills
 - or holding T bonds.
- So they compare long rate today with short rates they expect in the future.
- If they expect short rates to rise, long rate must be higher than short rate.

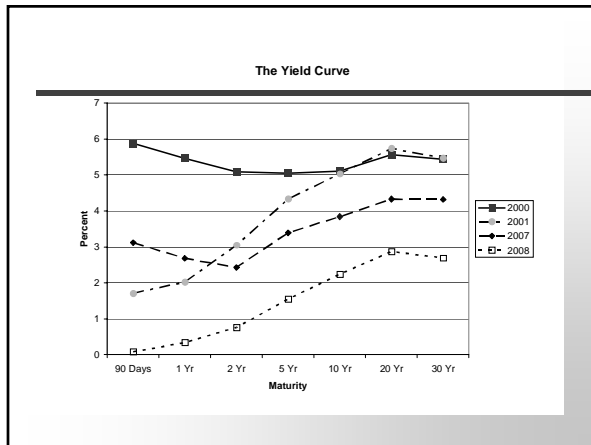
Does the expectations theory work?

- Implies spread between T bond and T bill rates forecasts T bill yield.
- If spread is unusually large, that implies T bill rates expected to rise.
- 2004 spread was large, and T bill rates did rise sharply in 2005-06!
- Following chart shows that the spread usually does signal the direction:



What is the "Yield Curve"?

- Yield as a function of maturity
- Menu of choices offered to bond buyers
- Typical shape:
 - ↗ upward slope, reflecting risk premium
 - ↘ dip at long end
- Important tool of investment analysis
- In the WSJ
- Online @ bloomberg.com/markets



The End!
