

# Bond Features, Sectors and Valuation

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Sanford J Leeds, Esq., CFA

[sandy.leeds@mcombs.utexas.edu](mailto:sandy.leeds@mcombs.utexas.edu)

## Slide 1: US Treasuries (Bonds and Notes) -- Key Features

1. considered to be **risk free**
2. classified as Note or Bond based on original maturity:
  - a. **notes** have original maturities of 2, 3, 5 and 10 years
  - b. **bonds** have original maturities of 20 or 30 years
3. fixed coupons
  - a. paid semiannually
4. prices are quoted in 32nds
  - a. 97:21 = 97.65625% of par = \$976.66
  - b. par:03 = 100.09375% of par = \$1,000.94
  - c. 102:14+ = 102.453125% of par = \$1,024.53
5. "on-the-run" vs "off-the-run" issues
  - a. **on-the-run:**
    - (i) recently issued
    - (ii) more actively traded (more liquid)
    - (iii) provides better info about market yields
  - b. **off-the-run issues:**
    - (i) older issues that are no longer on-the-run
6. sold at auction
  - a. highest bid (lowest yield) that clears the market
  - b. "**noncompetitive bids**" are also accepted

## Slide 2: Other Sovereign Debt

1. refers to debt issued by central governments
2. can be issued:
  - a. in country's own domestic market
  - b. another country's market
  - c. Eurobond market
3. typically issued in currency of issuer
  - a. if issued in different currency, can have lower rating

### **QUESTION:**

Why could sovereign debt have a lower rating if issued in a different currency?

### Slide 3A: Treasury Inflation Protected Securities (TIPS)

1. par value is adjusted with CPI
  - a. increase in par value is taxed as income in year of adjustment
  
2. coupon is a percentage of par
  - a. coupon rate stays same, but coupon payment increases
  
3. YTM reflects a "**real rate of return**"

#### **QUESTION:**

Why would you buy a TIP rather than a traditional UST note?

### Slide 3B: TIPS

Imagine that you buy a Treasury Inflation Protected Security for \$1020. The coupon rate is 3%. Assume annual coupons (even though they are s/a in the real world). After you buy the bond, inflation is 2% during the next year. Calculate your coupon payment during the next two years.

#### Keys to Solution:

TIPS are different than most bonds. Most bonds pay a coupon on par value of \$1000. TIPS have an increasing principal amount. Currently it is \$1020 for this bond.

So, at the end of the year, you receive  $3\% \times \$1020 = \$30.60$ .

At the end of the year, the principal is also adjusted for inflation.

Thus, the principal will become  $(\$1020 \times 1.02) = \$1040.40$

At the end of the second year, you will receive a coupon equal to:

$$3\% \times \$1040.40 = \$31.21.$$

**2. Imagine that during the second year, the inflation rate is 2.5%. The bond matures at the end of that second year. How much principal do you receive?**

The principal would be adjusted one final time:

$$\$1040.40 \times (1.025) = \mathbf{\$1,066.41}$$

At maturity, you would receive \$1,066.41 (plus you would have also just received your \$31.21 coupon payment).

## Slide 4: Treasury Strips

1. Treasury issues notes and bonds and allows certain dealers to:
  - a. strip the coupon payment from the principal
  - b. repackage the cash flows
  - c. sell them separately as zero coupon bonds
  
2. slightly different designations:
  - a. ci = coupon strips
  - b. bp = principal from stripped bonds
  - c. np = principal from stripped notes

NOTE: these are all the same, but some countries treat them differently for tax purposes (this is why they are designated)

### **QUESTION:**

Why would you want to buy a zero coupon bond rather than a bond with coupons?

## Slide 5: Agency Debt

### 1. Two classifications:

- a. federally related institutions
- b. government sponsored entities

### 2. Federally Related Institutions

- a. owned by US gov't
  - (i) exempt from SEC registration
  - (ii) backed by full faith and credit of gov't
- b. e.g., Ginnie Mae

### 3. Gov't Sponsored Entities

- a. privately owned, but publicly chartered (created by Congress)
  - (i) credit risk exists
- b. e.g., Fed'l Farm Credit System, Fed'l Hom Loan Bank System, Fannie Mae, Freddie Mac, Sallie Mae

### Question:

Why would an investor buy an agency bond, rather than a UST?

## Slide 6: Municipal Bonds

### 1. 2 types

#### a. **general obligation bond**

- (i) unlimited tax GO bond
  - (A) full faith and credit of municipality
  - (B) backed by all taxing power
- (ii) double barreled bonds
  - (A) backed by taxing power plus...
  - (B) fees, grants, special charges
- (iii) appropriation backed obligations
  - (A) state may act as a "backup" to bond
  - (B) usually a moral obligation rather than legal obligation
- (iv) public credit enhancement
  - (A) state or fed'l guarantee
  - (B) legally enforceable
  - (C) usually with school bonds

#### b. **revenue bond**

- (i) don't require voter approval

### 2. some are insured and some are prerefunded

#### a. **insured**

- (i) especially common in revenue bond market

#### b. **prerefunded**

- (i) have UST in escrow to back up all of borrowing

## Slide 7: Corporate Debt

1. borrowing by companies
  - a. UST + risk premium
  
2. can be classified as:
  - a. secured debt
  - b. unsecured debt
  
3. **secured debt** is backed by:
  - a. personal property
    - (i) e.g., machinery, vehicles, patents
  - b. financial assets
    - (i) e.g., stocks, bonds, notes
    - (ii) marked to market
    - (iii) may have to pledge more if value decreases
  - c. real property
    - (i) e.g., land and buildings
  
4. **unsecured debt (debentures)**
  - a. general claim
  - b. may be:
    - (i) senior debt
    - (ii) subordinated debentures
  
5. can have credit **enhancements** (guarantees of others)
  - a. third party guarantees
    - (i) parent companies
  - b. letters of credit
    - (i) bank guarantees that they will advance funds to service debt
  - c. bond insurance

## Slide 8: Rating Agencies

1. assessing probability that payments will be made
  - a. firm specific factors
  - b. issue specific factors
  
2. firm-specific factors:
  - a. past repayment history
  - b. quality of mgt
  - c. industry outlook
  - d. firm strategy
  - e. debt level of firm
  - f. operating cash flow
  - g. other sources of liquidity
  - h. competitive position
  - i. regulatory environment
  - j. financial mgt and controls
  - k. susceptibility to event risk and political risk
  
3. debt issue specific factors
  - a. priority of claim being rated
  - b. value / quality of any collateral pledged to secure the data
  - c. covenants of the debt issue
  - d. any guarantees or obligations for parent company support

### **QUESTION:**

Why might you see bonds with the same time to maturity and same rating, yet they are trading at different yields (spreads to UST)?

## Slide 9: Mortgage Backed Securities

1. bonds backed by pools of mortgage loans
2. mortgage loans serve two purposes:
  - a. collateral
  - b. provide the cash flow
3. cash flow from mortgage is different:
  - a. **amortizing**
    - (i) i.e., principal + interest
  - b. **prepayment risk**
    - (i) creates reinvestment risk
4. typical "**passthrough**" bond:
  - a. pool thousands of mortgages together
  - b. sell participation certificates (percentage ownership)
  - c. interest and principal pmts collected and passed through
    - (i) small fee
  - d. common issuers include Ginne Mae, Fannie Mae and Freddie Mac

## Slide 10: Collateralized Mortgage Obligations

1. a derivative mortgage backed security
  - a. created from mortgage passthroughs
  
2. different **tranches** (slices) -- different claims on cash flows...example:
  - a. Tranche I -- short term
    - (i) receives net interest and principal until completely paid off
  
  - b. Tranche II -- intermediate term
    - (i) receives interest
    - (ii) starts receiving principal after Tranche I paid off
  
  - c. Tranche III -- long term
    - (i) receives interest
    - (ii) starts receiving principal after Tranches I and II are paid off
  
3. other structures
  - a. prepayments only affect some of the tranches
    - (i) redistribute prepayment risk
  
4. purposes of CMOs
  - a. create securities with various maturity ranges
  
  - b. redistribute prepayment risk

## Slide 11: Asset Backed Securities

1. just like mortgage backed securities, except...
  - a. instead of mortgages...
    - (i) credit card debt, auto loans, bank loans, corporate receivables
2. assets in ABS are transferred to **special purpose vehicle**
  - a. shields assets from general creditors
    - (i) allows ABS to get a higher credit rating
3. may also use some sort of credit enhancement

## Slide: Collateralized Debt Obligation

1. an asset backed security
  - a. collateral is underlying pool of other debt instruments or even other CDOs
  
2. **CDO includes CBOs and CLOs**
  - a. collateral of CBO is bonds
  - b. collateral of CLO is loans
  
3. tranches are created based on seniority of claims
  - a. separate credit ratings
  
4. two different reasons they are created
  - a. **capture spread (arbitrage CDO)**
    - (i) spread b/t:
      - (A) rate earned on underlying assets; and
      - (B) rate promised to CDO holder
  
  - b. **balance sheet CDO**
    - (i) bank or insurance company trying to get loan exposure off books

## Slide 13A: Treasury Bills

1. discount instruments
2. three maturity cycles
  - a. 28, 91 and 182 days (4 week, 3 month, 6 month)
  - b. sometimes "cash management" bills (few days to six months)
    - (i) deal w/ cash shortages prior to receipt of tax payments
3. this is the true "risk free instrument"
  - a. no default risk
  - b. minimal interest rate risk
4. yields are quoted in various ways:
  - a. **bank discount method**
  - b. **bond equivalent yield**
  - c. **effective annual rate (EAY)**

## Slide 13B: Bank Discount Method, Bond Equivalent Yield and EAR

A 185 day T-bill is priced at \$9,850. State the return using the bank discount method.

$$r_{bd} = \frac{10000 - P}{10000} \times \frac{360}{n}$$

$$r_{bd} = \frac{10,000 - 9,850}{10,000} \times \frac{360}{185} = 2.92\%$$

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A 185 day T-bill is priced at \$9,850. State the return using the bond equivalent yield.

$$r_{bey} = \frac{10000 - P}{P} \times \frac{365}{n}$$

$$r_{bey} = \frac{10,000 - 9,850}{9,850} \times \frac{365}{185} = 3.00\%$$

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A 185 day T-bill is priced at \$9,850. State the return using the effective annual rate.

$$EAR_{Tbill} = \left( 1 + \frac{(10000 - P)}{P} \right)^{365/n} - 1$$

$$EAR_{Tbill} = \left( 1 + \frac{(10,000 - 9,850)}{9,850} \right)^{365/185} - 1 = 3.03\%$$

## Slide 14: Commercial Paper

1. s/t unsecured debt
  - a. borrow money at rates lower than bank rates
  - b. generally used to finance s/t assets (receivables and inventory)
2. maturities up to 270 days
3. pure discount
4. most buyers hold to maturity (not an active secondary market)
5. paper can be either:
  - a. directly placed
    - (i) sold directly to large investors
  - b. dealer placed
    - (i) investment firms have commercial paper desks
6. issuers keep unsecured line of credit open in case they can't issue paper

## Slide 15: Negotiable CDs

1. permit the owner to sell the CD in the secondary market at any time
  - a. domestic CDs
    - (i) negotiable CDs issued by US banks in the US
  - b. Eurodollar CDs
    - (i) dollar denominated CDs issued by:
      - (A) foreign banks
      - (B) branches of US banks outside US
2. generally pay LIBOR
3. maturities of days up to 5 years

## Slide 16: Bankers' Acceptance

1. guarantees by a bank that a loan will be repaid
2. usually originates in import / export business
  - a. importer's bank guarantees pmt
  - b. exporter takes this guarantee to exporter's bank
    - (A) exporter receives PV of payment
  - c. exporter's bank presents evidence of shipment to importer's bank
  - d. importer's bank "accepts" the evidence of shipment
    - (A) now you have accepted promise to pay money in future
3. exporter's bank can hold acceptance or sell it
  - a. most purchasers hold until maturity (not a liquid market)
4. you are only going to lose if failure of BOTH:
  - a. importer
  - b. importer's bank

## Slide 17: Basic Bond Terminology for an Semi-Annual Coupon Bond

Corporation or gov't is borrowing money and issuing an IOU. Picture it like this:

IBM 8% Bond; <b>SEMIANNUAL COUPONS</b> Maturing 6-30-2014 \$1000 Par Value Issued 7-1-2007						
\$40 12/30/2007	\$40 12/30/2008	\$40 12/30/2009	\$40 12/30/2010	\$40 12/30/2011	\$40 12/30/2012	\$40 12/30/2013
\$40 6/30/2008	\$40 6/30/2009	\$40 6/30/2010	\$40 6/30/2011	\$40 6/30/2012	\$40 6/30/2013	\$40 6/30/2014

**If the bond has an 8% coupon rate, but the coupons are paid semiannually:**

1. there are **twice as many coupons**, each for half the amount
2. the price of the bond is going to be slightly different:
  - (A) **present value of annuity of \$40 payments** (discounted at  $[\cdot 5 \times \text{ytm}]$ ) for 14 six month periods
  - (B) **present value of \$1000 par value** (discounted at  $[\cdot 5 \times \text{ytm}]$ ) for 14 six month periods

### **IMPORTANT NOTE:**

In the real world, bonds **no longer have physical coupons**; the bonds are "**registered**" and the coupon payments are automatically sent to the registered owner. Before bonds were "registered," they were referred to as "**bearer**" bonds. If you lost a "bearer" bond, you had no recourse.

## Slide 18: Calculating the Price of a Semi-Annual Coupon Bond

Calculate the price of the seven year bond with 8% coupons (s/a).  
Use a yield of 7%, 8%, and 9%.

$n = 14$   
 $l = 3.5$   
 $pmt = 40$   
 $fv = 1000$   
 $pv = ?$

**\$1,054.60**

**premium**

coupon rate > ytm

$n = 14$   
 $l = 4$   
 $pmt = 40$   
 $fv = 1000$   
 $pv = ?$

**\$1,000.00**

**par**

coupon rate = ytm

$n = 14$   
 $l = 4.5$   
 $pmt = 40$   
 $fv = 1000$   
 $pv = ?$

**\$948.89**

**discount**

coupon rate < ytm

## Slide 19: Calculating Bond Prices Between Coupon Dates -- UST

You are buying a UST bond and the trade settles on August 23rd. The bond pays s/a coupons on March 15th and September 15th.

The bond has 6% coupon rate and is priced to yield 5%. It matures on September 15th of next year. Calculate the dirty price and clean price of this bond.

(Assume that neither this year nor next year is a leap year.)

### Step 1: Calculate the price of the bond as of the last coupon date.

Last coupon date was March 15th. At that time:

$$n = 3$$

$$l = 2.5$$

$$\text{pmt} = 30$$

$$\text{fv} = 1000$$

$$\text{pv} = ? \quad \$1,014.28$$

### Step 2: Calculate the dirty price.

$$\text{Dirty Price} = \$1,014.28(1.025)^{(161/184)}$$

$$\text{Dirty Price} = \mathbf{\$1,036.43}$$

#### Days

March = 16

April = 30

May = 31

June = 30

July = 31

Aug = 23

Days = 161

#### Total Days

March = 16

April = 30

May = 31

June = 30

July = 31

Aug = 31

Sep = 15

Total Days = 184

### Step 3: Calculate the clean price.

$$\text{Clean Price} = \text{Dirty Price} - \text{Accrued Interest} \quad \text{Accrued Interest} = (161 / 184) \times \$30 = \$26.25$$

$$\text{Clean Price} = \$1,036.43 - \$26.25 = \mathbf{\$1,010.18}$$

## Slide 20: Covenants

### 1. **negative covenants**

- a. can't sell collateral
- b. can't pledge assets for other debt
- c. can't borrow more unless certain fin'l conditions are met
- d. no dividends unless earning above certain amount

### 2. **affirmative covenants**

- a. pay interest and principal on timely basis
- b. pay all taxes and claims when due
- c. maintain property in good condition
- d. maintain certain fin'l ratios
- e. submit reports to trustee

### 3. **covenant "lite"**

- a. bond with no (or few) covenants

## Slide 21: Zero Coupon Bonds

1. no coupons
  - a. return comes from buying bond at deep discount and price appreciates to par
  - b. bond's price rises exponentially toward maturity
2. longer term Treasuries sometimes "**stripped**" -- turned into zero coupon bonds
3. priced as if s/a coupons
4. taxed as if investor is receiving yield each year
  - a. no tax advantage for zero coupon or low coupon bonds
  - b. basis increases over time, so you don't have huge gain upon sale

## Slide 22: Accrual Bonds

1. make no periodic interest pmts (similar to zero coupon)
2. sold close to par (different than zero coupon bond)
3. interest accrues and at maturity receive par + accrued interest

## Slide 23: Step-Up Notes

1. coupon rate increases over time
  - a. increase may be once or more
  
2. example (seven year bond):
  - a. 6% coupon first two years
  - b. 6.50% coupon third year
  - c. 7% coupon for last four years

## Slide 24: Deferred Coupon Bonds

1. initial coupon payments are deferred for some period
2. coupon payments accrue and compound
3. after deferral period, coupons paid as lump sum
4. then, bond pays regular coupons for remainder of period

## Slide 25: Floating Rate Securities

1. coupon rate varies with specified interest rate or index
2. normally adjusts every six or twelve months
3. sometimes, there are limits on adjustment:
  - a. **caps**
    - (i) limit on how high a coupon rate could go
  - b. **floor**
    - (i) limit on how low a coupon rate could go
  - c. **collar**
    - (i) both a cap and a floor

## Slide 26: Amortizing Loans

1. amortizing loans have payments that are combination:
  - a. interest
  - b. principal
  
2. different than typical bond:
  - a. coupon payment (interest)
  - b. receive face value (principal) at end
  
3. amortizing loans usually have **prepayment risk**

## Slide 27: Convertible Bonds

1. give bondholders an option to exchange each bond for a specified number of shares of common stock
  - a. an **exchangeable bond** is one which converts into stock of another firm
  
3. usually issued with "conversion premium"
  - stock price has to increase in order for conversion to be valuable
  
3. lower coupons (and lower yield to maturity)
  - a. investors are buying "hybrid"
  
4. if stock price drops, could become "**busted convertible**"
  - a. trades like straight bond (with very low coupon)
    - (i) price must drop to make yield attractive
  
5. may also be callable
  - a. if stock price increases, company may call bond
  - b. referred to as a "**forced conversion**"

## Slide 28: Callable Bonds

1. allow issuer to "call" bond early
2. an "option" for the issuer
  - a. pay for option with higher YTM
3. issuers desire this option in case interest rates drop
  - a. or, may not want to live by covenants
4. usually, call protection for limited period
  - a. afterwards **"currently callable"**
5. may be several call dates
  - a. call price usually declines over time
6. nonrefundable bonds
  - a. prohibit call for purpose of re-issuing debt at lower coupon rate

## Slide 29: Sinking Fund Provisions

1. indenture provision which REQUIRES issuer to retire portion of issue each year
  - a. requirement means it is different than a callable bond
  
2. sinking fund provisions -- two methodologies
  - a. cash payment
    - (i) deposit cash w/ trustee who uses selection method to retire portion
    - (ii) bonds typically retired at par
  
  - b. delivery of securities
    - (i) issuer purchases bonds in open market and delivers to trustee
      - (A) trustee retires bonds
    - (ii) less expensive if bonds trading below par
  
3. accelerated sinking fund provisions
  - a. allow issuer to retire a larger amount of issue than is required by sinking fund provision
    - (i) usually has a limit

### **Some More Terminology**

redeemed bond -- called through call option or sinking fund

refunded -- lower coupon bond sold to provide funds to pay off current bond

## Slide 30: Puttable Bonds

1. allow bondholder to "put" bond back to issuer early
2. this is a valuable option for bondholder
  - a. pays for this option by accepting lower YTM