

# Chapter 6

## Treasury and Agency Securities Markets

### The Roles of Treasury Securities

- Two factors account for the prominent role of U.S. Treasury securities:
  - i. *volume* (in terms of dollars outstanding)
  - ii. *liquidity*
- The Department of the Treasury is the largest single issuer of debt in the world.
- The large volume of total debt and the large size make the Treasury market the **most active** and hence the **most liquid** market in the world.
- The **bid-ask spread** is considerably narrower than in other sectors of the bond market.

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### Types of Treasury Securities

- ✓ The Treasury issues both marketable and non-marketable securities.
  - ✓ marketable: heavily traded in secondary markets
  - ✓ nonmarketable: hold by government-managed fund and can't be transferred
- ✓ Our focus here is on marketable securities.
- ✓ Marketable Treasury securities are categorized as
  - ✓ *fixed-principal securities*
  - ✓ *inflation-indexed securities*.
- ✓ Fixed-income principal securities include:
  - i. Treasury bills
  - ii. Treasury notes
  - iii. Treasury bonds

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### Treasury Bills, Notes and Bonds

- T-bills, T-notes and T-bonds issued by the U.S. Treasury to finance the national debt and other federal government expenditures
- Backed by the full faith and credit of the U.S. government and are default risk free
- T-bills
  - Maturities up to one year
  - No coupon payment
  - Mature at par value
  - Sold on discount basis
  - Return to the investor is the difference between the maturity value and the purchase price

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## Treasury Bills, Notes and Bonds

- T-notes and T-bonds
  - Coupon issues
  - Notes: 1-10 years
  - Bonds: 10+ -30 years
  - Sold by auction by the Federal Reserve banks
    - issued at approximately par and matured at par value.
  - Pay relatively low rates of interest (yields to maturity)
  - Given their longer maturity, not entirely risk free due to interest rate fluctuations
  - Pay coupon interest semiannually

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## Treasury Inflation Protection Securities (TIPS)

- Design to protect the inflation risk
  - Issued since 1997
- The principal is adjusted according to the CPI-U (Consumer Price Index for all Urban Consumers)
  - Inflation-adjusted principal
  - Principal is adjusted periodical (semiannual) by multiplying the inflation rate
  - Example:
    - period 1:  $100,000 \times (1 + 1.5\%) = 101,500$
    - period 2:  $101,500 \times (1 + 1\%) = 102,515$

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## Treasury Inflation Protection Securities (TIPS)

- The coupon rate on an issue is set at a fixed rate
  - Each coupon payment is the fixed coupon rate multiplied by the inflation-adjusted principal
  - Example:
    - period 1:  $1.75\% \times 101,500 = 1,776.25$
    - period 2:  $1.75\% \times (102,515) = 1,794.01$
- The inflation rate used to adjust the principal is
  - The ratio of the CPI-U (reference CPI) for the settlement date to the CPI-U for the issue date
  - There is three-month lagged for CPI-U
    - The May 1 reference CPI is the CPI-U reported in February

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## The Treasury Auction Process

- ✓ The Public Debt Act of 1942 grants the Department of the Treasury considerable discretion in deciding on the terms for a marketable security.
- ✓ An issue may be sold on an
  - ✓ interest-bearing or discount basis
  - ✓ competitive or other basis,
- ✓ Congress imposes a restriction on the **total amount of bonds outstanding**.

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## The Primary Market in Treasury Securities

- Treasury securities are sold in the primary market through **sealed-bid auctions**
  - Bills with maturities of 4, 13, 26 and 52 weeks are offered on a regular cycle
  - **Cash management bills** on an irregular interval
  - Notes and bonds issues are not on regular cycles
- Reopening
  - Offer additional amount of outstanding securities
- Debt buyback program
  - The Treasury redeems outstanding unmatured Treasury securities by purchasing them in the secondary market through **reverse auctions**

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## The Primary Market in Treasury Securities

- Auction process
  - investors submit applications for either competitive or noncompetitive bid
    - competitive bids specify both yield and quantity wish to buy
    - noncompetitive bids specify only quantity only
  - noncompetitive bid will be accepted anyway
    - maximum 5 million for each noncompetitive bidder
  - First deducting the total noncompetitive tenders from the total securities being auctioned, remainder is the amount for competitive bid
  - competitive bid will be accepted from the lowest yield (highest price) up, until the total amount of issues is fulfill

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## The Primary Market in Treasury Securities

- Auction process
  - The highest yield accepted is referred to as the **stop-out yield (or high yield)**
  - All successful bidders are awarded at the stop-out yield
    - Single-price auctions (Dutch auction)
  - The Treasury adjust the coupon rate and the price so that the yield offered on the security is approximately equal to the stop-out yield
    - The securities are sold near the par value

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## Secondary Market

- ✓ The secondary market for Treasury securities is an over-the-counter market where a group of U.S. government securities dealers offer continuous bid and ask prices on outstanding Treasuries.
- ✓ There is virtual 24-hour trading of Treasury securities.
- ✓ The three primary trading locations are New York, London, and Tokyo.
- ✓ The normal settlement period for Treasury securities is the business day after the transaction day (“next day” settlement).

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## Secondary Market (continued)

- ✓ The most recently auctioned issue is referred to as the *on-the-run issue* or the *current issue*.
- ✓ Securities that are replaced by the on-the-run issue are called *off-the-run issues*.
- ✓ There may be more than one *off-the-run issue* with approximately the same remaining maturity as the *on-the-run issue*.
- ✓ Treasury securities are traded **prior to** the time they are **issued**
  - ✓ *when-issued market*, or *wi market*.
- ✓ When-issued trading for both bills and coupon securities extends from the day the **auction is announced until the issue day**.

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## Treasury Securities (continued)

- ✓ Government dealers trade with the investing public and with other dealer firms.
  - ✓ through intermediaries known as *interdealer brokers*.
- ✓ Dealers leave firm bids and offers with interdealer brokers who display **the highest bid and lowest offer** in a computer network tied to each trading desk and displayed on a monitor.
- ✓ Dealers use interdealer brokers because of the speed and efficiency with which trades can be accomplished.

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## Price quotes for Treasury bills

- T-bill is quoted on a **bank discount basis**

$$Y_d = \frac{D}{F} \times \frac{360}{t}$$

- $Y_d$ : bank discount yield
- $D$ : dollar discount (= face value – bill price)
- $F$ : face value
- $t$ : number of days remaining to maturity
- Example
  - A treasury bill with 100 days to maturity, a face value of \$100,000, and selling for \$99,100, the bank discount yield is

$$D = 100,000 - 99,100 = 900$$

$$Y_d = \frac{900}{100,000} \times \frac{360}{100} = 3.24\%$$

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## Price quotes for Treasury bills

- Given the bank discount yield, calculate the bill price

$$D = Y_d \times F \times \frac{t}{360} = 0.0324 \times 100,000 \times \frac{100}{360} = 900$$

$$\text{price} = F - D = 100,000 - 900 = 99,100$$

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## Bond Equivalent and CD Equivalent Yield

- Problem for the quoted yield on a bank discount basis
  - Return measure is based on a face-value investment rather than on the actual dollar amount invested
  - Yield is annualized according to a 360-day rather than a 365-day year
- Two alternative yields are often used
  - Bond equivalent yield

$$BEY = \frac{D}{\text{purchase price}} \times \frac{365}{t} = \frac{900}{99100} \times \frac{365}{100} = 3.31\%$$

- CD equivalent yield (also called *money market equivalent yield*)

$$CD \text{ equivalent yield} = \frac{360Y_d}{360 - t(Y_d)} = \frac{360(0.0324)}{360 - 100(0.0324)} = 0.327$$

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## Price quotes for Treasury coupon securities

- T-bonds and T-notes are quoted on a price basis
  - One point equals 1% of par
  - Prices below 1 points is shown in 32nds
  - Example:
    - $96-14 = 96 + 14/32 = 96.4375$  per 100 of par value

Quote	No. of 32nds	Price per \$100 par
91-19	19	91.59375
107-22	22	107.6875
109-06	6	109.1875

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## Quotes on Treasury Coupon Securities (continued)

- ✓ The 32nds are themselves often split by the addition of a plus sign or a number.

Quote	No. of 32nds	No. of 64ths	No. of 256ths	Price per \$100 par
91-19+	19	1	0	91.609375
107-222	22	0	2	107.6953125
109-066	6	0	6	109.2109375

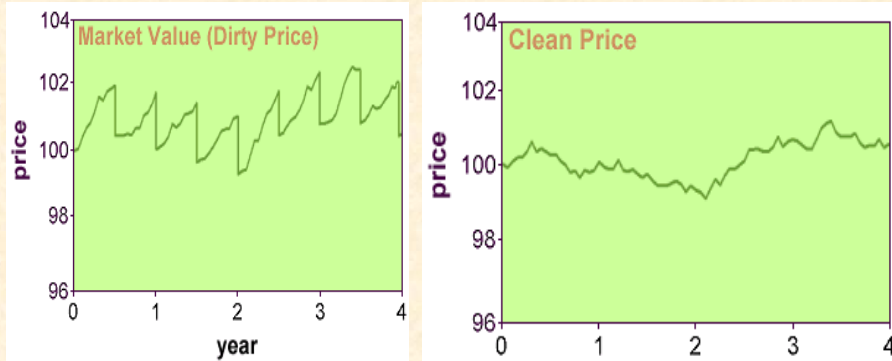
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## Accrued Interest

- The portion of the coupon payment accrued between the last coupon payment and the settlement day.
  - normally, settlement takes place 1 to 2 days after a trade date.
- At settlement, the buyer must pay the seller the purchase price of the T-note or T-bond plus accrued interest.
- Clean price: without accrued interest
- Dirty/full price: clean price + accrued interest

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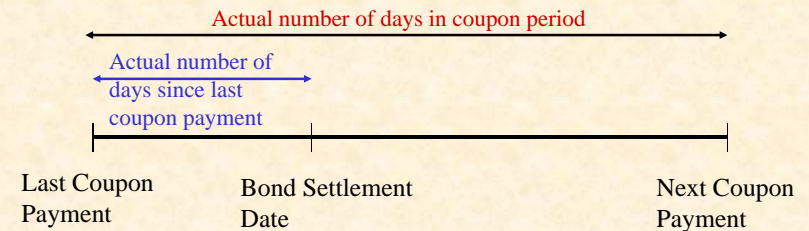
## Why Clean Price?



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## Accrued Interest Calculation

$$\text{accrued interest} = \frac{\text{int}}{2} \times \frac{\text{actual number of days since last coupon payment}}{\text{actual number of days in coupon period}}$$



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## Day Count Convention

- ✓ The number of days in the accrued interest period and the coupon period may not be simply the actual number of calendar days between two dates.
- ✓ For Treasury coupon securities, the day count convention used is to determine the **actual number** of days between two dates.
- ✓ This is referred to as the *actual/actual day count convention*.

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## Day Count Conventions: Actual/Actual

- The first “actual” refers to the actual number of days in a month.
- The second refers to the actual number of days in a year.
- Example: For coupon-bearing Treasury securities, the number of days between June 17, 1992, and October 1, 1992, is **106**.  
 → 13 days (June), 31 days (July), 31 days (August), 30 days (September), and 1 day (October).

## Day Count Conventions:30/360

- Each month has 30 days and each year 360 days.
- The number of days between June 17, 1992, and October 1, 1992, is 104.
  - 13 days (June), 30 days (July), 30 days (August), 30 days (September), and 1 day (October).
- In general, the number of days from date1 to date2 is

$$360 \times (y2 - y1) + 30 \times (m2 - m1) + (d2 - d1)$$

Where Date1  $\equiv$  (y1,m1, d1) Date  $\equiv$  (y2,m2, d2)

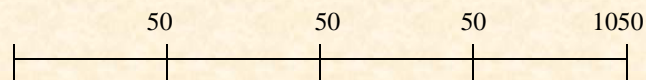
## Stripped Treasury Securities

- The Treasury **does not** issue zero-coupon notes or bonds.
- Demand for zero-coupon instruments with no credit risk,
  - Private sector has created such securities.
    - Trademark products
      - Treasury Income Growth Receipts (TIGRs)
      - Merrill Lynch in 1982
- Profit potential for a dealer who strips lies in arbitrage resulting from the mispricing of the security.
- The process of separating the interest on a bond from the underlying principal is called *coupon stripping*.

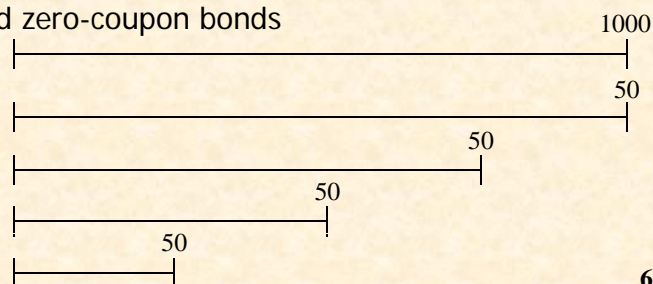
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1. Purchase Treasury bonds and deposit them in a bank custody account
2. Issue receipts representing an ownership in each coupon payment on the underlying Treasury bond
3. Issue a receipt representing an ownership of the underlying Treasury bond's principal

Original bond



Stripped zero-coupon bonds



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## Stripped Treasury Securities

- Zero-coupon Treasury securities were first created in August 1982 by dealer firms.
- The problem with these securities:
  - identified with particular dealers
  - therefore reduced liquidity.
  - involved legal and insurance costs
- At 1985, Separate Trading of Registered Interest and Principal of Securities (STRIPS) program
  - All Treasury notes and bonds (fixed-principal and inflation-indexed) are eligible for stripping.
  - The zero-coupon Treasury securities created under the *STRIPS* program are direct obligations of the U.S. government.

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## Confusion of “Stripped Treasury”

- Today, a stripped Treasury typically means a *STRIPS* product.
- However, because there are trademark products and other types of pre-STRIPS zero-coupon products still outstanding, an investor should clarify what product is the subject of the discussion.

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## Stripped Treasury Securities

- On dealer quote sheets and vendor screens STRIPS are identified by whether the cash flow is created from
  - coupon (called *ci*),
  - principal from a Treasury bond (called *bp*),
  - or principal from a Treasury note (called *np*).
- Strips created from the coupon are called *coupon strips* and those from the principal are called *principal strips*.
- Distinction is between coupon strips and principal strips is due to the tax treatment by non-U.S. entities
  - See next slide

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## Tax Treatment

- ✓ A disadvantage of stripped Treasury securities:
  - ✓ accrued interest is taxed each year even though interest is not paid.
  - negative cash flow because tax payments on interest **earned but not received in cash**
  - For foreign buyers in some countries
    - interest from principal strips are treated as capital gain
    - lower tax

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## Reconstructing a Bond by STRIPs

- Are the sum of the sale price of the components of STRIPs equal to the price of the original Treasury security?
  - Reconstitution
    - Buying a series of zero coupon bond and synthesizing the cash flows of a Treasury security
  - The process of coupon stripping and reconstituting **prevents** the actual spot rate curve observed on zero-coupon Treasuries from **departing significantly** from the theoretical spot rate curve

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## Stripped Treasury Securities

- In reality, the sum of the sale price of the components of STRIPs is often **greater than** the fair present value of the original Treasury security
  - Investors are willing to pay a small premium because the **individual payments can be used in duration matching strategies or cash matching strategies that limit the investor's risk**
  - For instance, maintaining a given duration with coupon paying bonds requires periodic bond trading which generates transaction costs and perhaps tax consequences. **Use of STRIPs avoids these costs**
- This provides the motivation for creating STRIPs

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## Federal Agency Securities

- To provide funding for certain sectors of the economy
  - have a difficult time raising funds
  - such as agriculture, housing, small businesses, and college students
- Beginning in 1916, the U.S. federal government created special agencies to make direct loans or guarantee private loans to these “disadvantaged” borrowers
- The agency market has soared in recent years, with the volume of outstanding securities climbing from about \$2 billion during the 1950s to almost \$2 trillion today
- Agency securities are generally short to medium term in maturity (running out to about 10 years)

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## Federal Agency Securities

- The most active buyers of agency securities include banks, state and local governments, government trust funds, and the Federal Reserve System
- The Federal Reserve is authorized to conduct **open market operations** in agency debts
- Major securities dealers who handle U.S. government securities also generally trade in agency issues

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## Types of Federal Credit Agencies

- **Government owned corporation**
  - Legally a part of the government structure, and their borrowing and lending activities are included in the federal budget
  - Export-Import Bank (EXIM)
  - Farmers Home Administration (FMHA)
  - Government National Mortgage Association (Ginnie Mae)
  - Federal Deposit Insurance Corporation (FDIC)
  - Tennessee Valley Authority (TVA)
    - The major issuer of Federal agency securities
    - Provide flood control, navigation, and agriculture and industrial development
    - The largest public power system in the U.S.
    - Finance its capital requirements through internally generated funds and by issuing debt
    - TVA debt is not guaranteed by the U.S. government

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## Types of Federal Credit Agencies

- **Government-sponsored enterprises (GSEs)**

Federally chartered but privately owned. Their borrowing and lending activities are not reflected in the federal government's budget.

- To reduce the cost of capital for certain borrowing sectors
  - Farmers, homeowners, and students
- Issue securities directly to the marketplace
- Examples:
  - Federal National Mortgage Association (Fannie Mae)
  - Federal Home Loan Mortgage Corp (Freddie Mac)
  - Federal Agricultural Mortgage Corporation
  - Federal Farm Credit Bank System (FFCB)
  - Federal Home Loan Bank System