CHAPTER 12

Government Bonds

U.S. Treasury bonds are among the safest investments available because they are secured by the considerable taxing powers of the federal government. Many bonds issued by federal government agencies, and by state and local municipal governments are also nearly free of default risk. Consequently, government bonds are generally excellent vehicles for conservative investment strategies seeking predictable investment results.

The largest and most important debt market is that for debt issued by the federal government of the United States. This market is truly global in character since a large share of federal debt is sold to foreign investors, and it thereby sets the tone for debt markets around the world. In contrast, the market for debt issued by states and municipalities is almost exclusively a domestic market since almost all U.S. municipal securities are owned by U.S. investors. These two broad categories make up the government bond market. In this chapter, we examine securities issued by federal, state, and local governments, which combined represent more than $7 trillion of outstanding securities.

12.1 Government Bond Basics

The U.S. federal government is the largest single borrower in the world. In 1999 the gross public debt of the U.S. government was more than $5 trillion. Part of this debt is financed internally, but the bulk is financed by the sale of a wide array of debt securities to the general public. Responsibility for managing outstanding government debt belongs to the U.S. Treasury, which acts as the financial agent of the federal government.

The U.S. Treasury finances government debt by issuing marketable securities and nonmarketable securities. Most of the gross public debt is financed by the sale of marketable securities at regularly scheduled Treasury auctions. Marketable securities include Treasury bills, Treasury notes, and Treasury bonds, often simply called T-bills, T-notes, and T-bonds, respectively. Outstanding marketable securities trade among investors in a large, active financial market called the Treasury market. Nonmarketable securities include U.S. Savings Bonds, Government Account Series, and State and Local Government Series. Many individuals are familiar with U.S. Savings Bonds since they are sold only to individual investors. Government Account Series are issued to federal government agencies and trust funds, in particular, the Social Security Administration trust fund. State and Local Government Series are purchased by municipal governments.

Treasury security ownership is registered with the U.S. Treasury. When an investor sells a U.S. Treasury security to another investor, registered ownership is officially transferred by notifying the U.S. Treasury of the transaction. However, only marketable securities allow registered ownership to be transferred. Nonmarketable securities do not allow a change of registered ownership and therefore cannot trade among investors. For example, a U.S. Savings Bond is a nonmarketable security. If an investor wishes to sell a U.S. Savings Bond, it must be redeemed by the U.S. Treasury. This is normally a simple procedure, since most banks handle the purchase and sale of U.S. Savings Bonds for their customers.

Another large market for government debt is the market for municipal government debt. There are more than 80,000 state and local governments in the United States, almost all of which have some form of outstanding debt. In a typical year, well over 10,000 new municipal debt issues are brought to market. Total municipal debt outstanding in the United States is about $2 trillion. Of

this total, individual investors hold about half, either through direct purchase or indirectly through mutual funds. The remainder is split about equally between holdings of property and casualty insurance companies and commercial banks.

> **(***marg. def.* **face value** The value of a bill, note, or bond at its maturity when a payment of principal is made. Also called *redemption value*.)
>
> **(***marg. def.* **discount basis** Method of selling a Treasury bill at a discount from face value.)
>
> **(***marg. def.* **imputed interest** The interest paid on a Treasury bill determined by the size of its discount from face value.)

12.2 U.S. Treasury Bills, Notes, Bonds, and STRIPS

Treasury bills are short-term obligations that mature in one year or less. They are originally issued with maturities of 13, 26, or 52 weeks. A T-bill entitles its owner to receive a single payment at the bill's maturity, called the bill's **face value** or *redemption value*. The smallest denomination T-bill has a face value of $1,000. T-bills are sold on a **discount basis**, where a price is set at a discount from face value. For example, if a $10,000 bill is sold for $9,500, then it is sold at a discount of $500, or 5 percentt. The discount represents the **imputed interest** on the bill.

Treasury notes are medium-term obligations with original maturities of 10 years or less, but more than 1 year. They are normally issued with original maturities of 2, 5, or 10 years, and have face value denominations as small as $1,000. Besides a payment of face value at maturity, T-notes also pay semiannual coupons.

Treasury bonds are long-term obligations with much longer original-issue maturities. Since 1985, the Treasury has only issued T-bonds with a maturity of 30 years in its regular bond offerings.

Like T-notes, T-bonds pay their face value at maturity, pay semi-annual coupons, and have face value denominations as small as $1,000.

The coupon rate for T-notes and T-bonds is set according to interest rates prevailing at the time of issuance. For example, if the prevailing interest rate for a Treasury note of a certain maturity is 5 percent, then the coupon rate - that is, the annual coupon as a percent of par value - for a new issue with that maturity is set at or near 5 percent. Thus a $10,000 par value T-note paying a 5 percent coupon would pay two $250 coupons each year. Coupon payments normally begin six months after issuance and continue to be paid every six months until the last coupon is paid along with the face value at maturity. Once set, the coupon rate remains constant throughout the life of a U.S. Treasury note or bond.

> **(***marg. def.* **STRIPS** Treasury program allowing investors to buy individual coupon and principal payments from a whole Treasury note or bond. Acronym for *Separate Trading of Registered Interest and Principal of Securities*)

Treasury STRIPS are derived from Treasury notes originally issued with maturities of 10 years, and from Treasury bonds issued with 30-year maturities. Since 1985, the U.S. Treasury has sponsored the **STRIPS** program, an acronym for *Separate Trading of Registered Interest and Principal of Securities*. This program allows dealers to divide Treasury bonds and notes into *coupon strips* and *principal strips*, thereby allowing investors to buy and sell the strips of their choice. Principal strips represent face-value payments and coupon strips represent coupon payments. For example, a 30-year maturity T-bond can be separated into 61 strips, representing 60 semiannual coupon payments and a single face value payment. Under the Treasury STRIPS program, each of these strips can be separately registered to different owners.

The terms “STRIPS” and “strips” can sometimes cause confusion. The acronym STRIPS is used when speaking specifically about the Treasury STRIPS program. However, the term *strips* now popularly refers to any separate part of a note or bond issue broken down into its component parts. In this generic form, the term strips is acceptable.

> **(**marg. def. **zero coupon bonds** A note or bond paying a single cash flow at maturity. Also called *zeroes*.)

Since each strip created under the STRIPS program represents a single future payment, STRIPS securities effectively become **zero coupon bonds** and are commonly called *zeroes*. The unique characteristics of Treasury zeroes makes them an interesting investment choice. The potential benefits of STRIPS in an investor’s portfolio are discussed in the *Wall Street Journal* article reprinted in the nearby Investment Updates box.

Investment Updates. Zero-coupon bonds

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12.2a What are some possible reasons why individual investors might prefer to buy Treasury STRIPS rather than common stocks?

12.2b What are some possible reasons why individual investors might prefer to buy individual Treasury STRIPS rather than whole T-notes or T-bonds?

The yield to maturity of a zero coupon bond is the interest rate that an investor will receive if the bond is held until it matures. Table 12.1 lists bond prices for zero coupon bonds with face value of $10,000, maturities of 5, 10, 20, and 30 years, and yields from 3 percent to 15 percent. As shown,

a $10,000 face-value zero coupon bond with a term to maturity of 20 years and an 8 percent yield has a price of $2,082.89.

Table 12.1 about here.

Figure 12.1 graphs prices of zero coupon bonds with a face value of $10,000. The vertical axis measures bond prices and the horizontal axis measures bond maturities. Bond prices for yields of 4, 8, and 12 percent are illustrated.

Figure 12.1 about here.

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12.2c For zero coupon bonds with the same face value and yield to maturity, is the price of a zero with a 15-year maturity larger or smaller than the average price of two zeroes with maturities of 10 years and 20 years? Why?

Figure 12.2 about here.

Treasury Bond and Note Prices

Figure 12.2 displays a partial *Wall Street Journal* listing of prices and other relevant information for Treasury securities. Notice that Treasury notes and bonds are listed together, but there are separate sections for Treasury bills and Treasury STRIPS. The sections for Treasury bills and STRIPS were discussed in detail in Chapter 9. We discuss the section for Treasury notes and bonds next.

Treasury bond and note price quotes are stated on a percentage of par basis where, for example, a price of 102 equals par value plus 2 percent. Fractions of a percent are stated in thirty-seconds. Thus a price stated as 102:28 is actually equal to 102 + 28/32, or 102.875. To illustrate, the first column in the section for notes and bonds in Figure 12.2 states the annual coupon rate. The next two columns report maturity in month-year format. Dealer bid and asked price quotes come next, followed by changes in ask quotes from the previous day. The last column gives the yield to maturity implied by an asked price quote. The letter n next to various maturity dates indicates a T-note. The absence of the letter n indicates a T-bond

The quoted maturities for certain T-bonds have two years listed. For example, look at the bond issue with a maturity listed as Nov 09-14. This means that the bond matures in November 2014, but it is callable at par value any time after November 2009. When a T-bond is called, bondholders surrender their bonds to receive a cash payment equal to the bond's par value. Because the Nov 09-14 bond pays an 11.75 percent coupon but has a much lower yield to maturity, this bond has a price well above par value. It is likely that this bond will be called at its earliest possible call date in November 2009. Therefore, the reported asked yield is actually a yield to call. A **yield to call (YTC)** is the interest rate for a bond assuming the bond will be called at its earliest possible call date and the bond holder will hold the bond until it is called. When a callable T-bond has a price above par, the reported yield is a yield to call.

> (*marg. def.* **yield to call (YTC)** The interest rate on a bond that assumes the bond will be called at its earliest possible call date.)

Since 1985, the Treasury has issued only noncallable bonds. Thus the cluster of callable bonds in Figure 12.2 were all issued before 1985, and all listed bonds with a maturity of 2015 or later are noncallable bonds issued in 1985 or later.

Since Treasury bonds and notes pay semiannual coupons, bond yields are stated on a semiannual basis. The relationship between the price of a note or bond and its yield to maturity was discussed in Chapter 10. For convenience, the bond price formula from that chapter is restated here:

$$\text{Bond price} = \frac{\text{Annual coupon}}{YTM} \times \left(1 - \frac{1}{(1 + YTM/2)^{2M}} \right) + \frac{\text{Face value}}{(1 + YTM/2)^{2M}}$$

Figure 12.3 illustrates the relationship between the price of a bond and its yield to maturity for 2-year, 7-year, and 30-year terms to maturity. Notice that each bond has a price of 100 when its yield is 8 percent. This indicates that each bond has an 8 percent coupon rate, because when a bond's coupon rate is equal to its yield to maturity, its price is equal to its par value.

Figure 12.3 about here.

(marg. def. **bid-ask spread** The difference between a dealer's ask price and bid price.)

The difference between a dealer's asked and bid prices is called the **bid-ask spread**. The bid-ask spread measures the dealer's gross profit from a single round-trip transaction of buying a security at the bid price and then selling it at the asked price.

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12.2d What would Figure 12.3 look like if the three bonds all had coupon rates of 6 percent or had coupon rates of 10 percent?

12.2e In Figure 12.2, which Treasury issues have the narrowest spreads? Why do you think this is so?

12.2f Examine the spreads between bid and asked prices for Treasury notes and bonds listed in a recent *Wall Street Journal*.

Table 12.2 General Auction Pattern for U.S. Treasury Securities

Security	Purchase Minimum	Purchase in Multiples of	General Auction Schedule
13-Week Bill	$1,000	$1,000	Weekly
26-Week Bill	$1,000	$1,000	Weekly
52-Week Bill	$1,000	$1,000	Every 4 Weeks
2-Year Note	$1,000	$1,000	Monthly
5-Year Note	$1,000	$1,000	February, May, August, November
10-Year Note	$1,000	$1,000	
30-Year Bond	$1,000	$1,000	February, August, November

Inflation-Indexed Treasury Securities

In recent years, the U.S. Treasury has issued securities that guarantee a fixed rate of return in excess of realized inflation rates. These inflation-indexed Treasury securities pay a fixed coupon rate on their current principal, and adjust their principal semiannually according to the most recent inflation rate.

For example, suppose an inflation-indexed note is issued with a coupon rate of 3.5 percent and an initial principal of $1,000. Six months later, the note will pay a coupon of $1,000 × 3.5% / 2 = $17.50. Assuming 2 percent inflation over the six months since issuance, the note's principal is then increased to $1,000 × 102% = $1,020. Six months later, the note pays $1,020 × 3.5% / 2 = $18.20 and its principal is again adjusted to compensate for recent inflation.

Price and yield information for inflation-indexed Treasury securities is reported in the *Wall Street Journal* in the same section with other Treasury securities, as shown in Figure 12.2..Locating the listing for inflation-indexed Treasury securities in Figure 12.2, we see that the first and second columns report the fixed coupon rate and maturity, respectively. The third and fourth columns report current bid/ask prices and the price change from the previous trading day. Prices for inflation-indexed securities are reported as a percentage of current accrued principal. The fifth and sixth columns list an inflation-adjusted yield to maturity and current accrued principal reflecting all cumulative inflation adjustments.

12.3 U.S. Treasury Auctions

The Federal Reserve Bank conducts regularly scheduled auctions for Treasury bills, notes, and bonds. Specifically, 13- and 26-week bills are auctioned on a weekly basis and 52-week bills are auctioned every four weeks. Two-year notes are auctioned monthly; longer maturity notes are auctioned each quarter. Bonds are sold three times per year. A statement regarding the face value quantity of bills, notes, or bonds to be offered is announced before each auction. Table 12.2 summarizes the auction schedule and purchase conditions for U.S. Treasury securities. However, from time to time the Treasury may change this schedule slightly.

At each Treasury auction, the Federal Reserve accepts sealed bids of two types: competitive bids and noncompetitive bids. Competitive bids for T-bills specify a bid price and a bid quantity. The bid price is what the bidder is willing to pay and the bid quantity is the face value amount that the bidder will purchase if the bid is accepted. Noncompetitive bids specify a only bid quantity since the price charged to noncompetitive bidders will be determined by the results of the competitive auction process. Individual investors can submit noncompetitive bids, but only Treasury securities dealers can submit competitive bids.

> (*marg. def.* **stop-out bid** The lowest competitive bid in a U.S. Treasury auction that is accepted.)

At the close of bidding, all sealed bids are forwarded to the U.S. Treasury for processing. As a first step, all noncompetitive bids are accepted automatically and are subtracted from the total issue amount. Then a **stop-out bid** is determined; this is the price at which all competitive bids are sufficient to finance the remaining issue amount. Competitive bids at or above the stop-out bid are accepted and bids below the stop-out bid are rejected.

Since 1998, all U.S. Treasury auctions have been single-price auctions in which all accepted competitive bids pay the stop-out bid. The stop-out bid is also the price paid by noncompetitive bidders. For example, suppose an auction for T-bills with $20 billion of face value receives $28 billion of competitive bids and $4 billion of noncompetitive bids. Noncompetitive bids are automatically accepted, leaving $16 billion for competitive bidders. Now suppose the stop-out bid for this $16 billion amount is $9,700 for a $10,000 face value T-bill. Accepted competitive bidders and all noncompetitive bidders pay this price of $9,700.

The process is similar for T-bond and T-note issues, except that bids are made on a yield basis where competitive bids state yields instead of prices. A coupon rate for the entire issue is then set according to the average competitive-bid yield.

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12.3a The Federal Reserve announces an offering of Treasury bills with a face value amount of $25 billion. The response is $5 billion of noncompetitive bids along with the following competitive bids:

Bidder	Price bid	Quantity bid
A	$9,500	$5 bil.
B	$9,550	$5 bil.
C	$9,600	$5 bil.
D	$9,650	$5 bil.
E	$9,700	$5 bil.

In a single-price auction, which bids are accepted and what prices are paid by each bidder? How much money is raised by the entire offering?

12.4 U.S. Savings Bonds

The U.S. Treasury offers an interesting investment opportunity for individual investors in the form of savings bonds. Two types of savings bonds are currently available, Series EE and Series I. Other types exist, but they are either no longer available or can be obtained only by converting one type for another. For more information, you should consult the official U.S. Savings Bonds website (www.savingsbonds.gov), or the Bureau of Public Debt website (www.publicdebt.treas.gov).

Series EE Savings Bonds

Series EE bonds are available in face value denominations ranging from $50 to $10,000, but the original price of a Series EE bond is always set at exactly half its face value. Thus, Series EE bonds are sold to resemble zero coupon securities. However, individuals purchasing Series EE bonds receive semiannual interest accruals. Each May 1 and November 1, the Treasury sets the interest rate on EE bonds at 90 percent of the yield on newly issued five-year maturity T-notes. For example, suppose the yield on newly issued five-year maturity T-notes is 5.56 percent. In this case, the Treasury will set an interest rate of .90 × 5.56% = 5.0% on savings bonds for the next six months. This interest is paid as an accrual to the redemption value of the bond, where the current redemption value is the original price of the bond plus all prior accrued interest.

Series I Savings Bonds

Series I bonds are also available in face value denominations ranging from $50 to $10,000, but they are originally sold at face value. Each May 1 and November 1, the Treasury sets the interest rate on Series I bonds at a fixed rate plus the recent inflation rate. In this way, Series I bonds are indexed to inflation. For example, suppose the fixed rate is 3 percent, and the recent inflation rate is 2 percent. In this case, the Treasury will set an interest rate of 3% + 2% = 5% for the next six months. This interest is paid as an accrual to the redemption value of the bond.

Savings bonds offer several tax advantages to individual investors. First, as with all U.S. Treasury securities, savings bonds are not subject to state or local taxes. Also, federal income tax payment on U.S. Savings Bond interest is deferred until the bonds are redeemed. With all factors

considered, their overall attractiveness has led individual investors to hold almost $200 billion of U.S. Savings Bonds.

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12.4a Compare the methods by which interest is paid for Series I savings bonds and inflation-indexed Treasury securities.

12.5 Federal Government Agency Securities

Most U.S. government agencies consolidate their borrowing through the Federal Financing Bank, which obtains funds directly from the U.S. Treasury. However, several federal agencies are authorized to issue securities directly to the public. For example, the Resolution Trust Funding Corporation, the World Bank, and the Tennessee Valley Authority issue notes and bonds directly to investors. Bonds issued by U.S. government agencies share an almost equal credit quality with U.S. Treasury issues. Although most agency debt does not carry an explicit guarantee of the U.S. Government, a federal agency on the verge of default would probably receive government support to ensure timely payment of interest and principal on outstanding debt. This perception is supported by historical experience and the political reality that Congress would likely feel compelled to rescue an agency that it created if it became financially distressed.

What makes government agency notes and bonds attractive to many investors is that they offer higher yields than comparable U.S. Treasury securities. However, the market for agency debt is less active than the market for U.S. Treasury debt, and therefore the spread between dealers' bid and asked prices is greater for agency issues than for Treasury issues. For example, Figure 12.4

presents dealer price quotes for agency issues as reported in the *Wall Street Journal*. The listing format is the same as for Treasury notes and bonds described previously, except that callable bonds are indicated by an asterisk with only the maturity date shown.

Figure 12.4 about here.

If you compare bid and asked dealer price quotes for agency bonds listed in Figure 12.4 with similar Treasury bonds listed in Figure 12.2, you will find that agency bonds have a higher bid-asked spread than Treasury bonds. The reason for the higher bid-ask spread is that agency bond trading volume is much lower than Treasury bond trading volume. To compensate for the lower volume, dealers charge higher spreads. Thus trading agency bonds is more costly than trading Treasury bonds. Consequently, agency bonds are usually purchased by institutional investors planning to hold the bonds until they mature. Another reason for the higher yields on agency bonds compared to Treasury bonds is that interest income from agency bonds is subject to state and local taxation, whereas Treasury interest payments are subject only to Federal taxation.

To illustrate, we consider a specific bond issue from the Tennessee Valley Authority (TVA). The TVA is a federally-owned utility company operating in, you guessed it, the Tennessee River Valley. In 1992, the TVA sold a $1 billion issue of 50-year maturity bonds in a public offering. This was the first time in several decades that a U.S. government-affiliated issuer sold bonds with a 50-year term to maturity. Pension funds and insurance companies purchased most of the bonds to match the 8.25 percent coupons with future contractual payments to retirees and insurance beneficiaries.

The TVA offering included $500 million of stripped coupon bonds and $500 million of bonds without a strips feature. The issue matures in 2042 but is callable after 20 years at a call price of 106.

The call price is the amount bondholders will receive when the bond is called. “Nonstrippable” bonds were sold with a yield to maturity of 8.515 percent, or .58 percent more than the yield on then current 30-year maturity Treasury bonds. The principal strips were sold to yield 8.94 percent, and yields on coupon strips varied according to their payment dates.

The generous call price of 106 implies that if the bonds are called at the earliest possible call date in 2012, their yield will be more than the originally stated yield to maturity. To evaluate a potential early call, bond investors often refer to a bond's yield to call. As discussed in Chapter 10, a bond's yield to call is the interest rate for a bond assuming that the bond is called at the earliest possible call date. The TVA bonds originally sold at an average price of about 96:30, or $96.9375, with a yield to call of 8.69 percent, or .175 percent more than the yield to maturity of 8.515 percent.

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12.5a In Figure 12.4, find the price quotes for the Tennessee Valley Authority bond issue discussed immediately above maturing in 2042.

12.5b From a recent issue of the *Wall Street Journal*, find the price quotes for the Tennessee Valley Authority bond issue discussed immediately above. What is the spread between their bid and asked prices?

12.5c Examine spreads between bid and asked prices for government agency notes and bonds listed in a recent *Wall Street Journal*. What is the typical bid-asked spread?

12.5 Municipal Bonds

Municipal notes and bonds are intermediate- to long-term interest-bearing obligations of state and local governments or agencies of those governments. The defining characteristic of municipal notes and bonds, often called "munis," is that coupon interest is usually exempt from federal income tax. Consequently, the market for municipal debt is commonly called the *tax-exempt market*. Most of the 50 states also have an income tax, but their tax treatment of municipal debt interest varies. Only a few states exempt coupon interest on out-of-state municipal bonds from in-state income tax, but most states do allow in-state municipal debt interest an exemption from in-state income tax. In any case, state income tax rates are normally much lower than federal income tax rates, and state taxes can be used as an itemized deduction from federal taxable income. Consequently, state taxes are usually a secondary consideration for municipal bond investors.

The federal income tax exemption makes municipal bonds attractive to investors in the highest income tax brackets. This includes many individual investors, commercial banks, and property and casualty insurance companies — precisely those investors who actually hold almost all municipal debt. However, yields on municipal debt are less than on corporate debt with similar features and credit quality. This eliminates much, but not all, of the advantage of the tax exemption. Therefore, tax-exempt investors, including pension funds and retirement accounts of individuals, nonprofit institutions, and some life insurance companies, normally do not invest in municipal bonds. Instead, they prefer to invest in higher-yielding corporate bonds.

> (*marg. def.* **default risk** The risk that a bond issuer will cease making scheduled payments of coupons or principal or both.)

Municipal bonds are typically less complicated investments than corporate bonds. However, while municipal debt often carries a high credit rating, **default risk** does exist. Thus, investing in municipal debt requires more care than investing in U.S. Treasury securities.

Table 12.3 about here.

To illustrate some standard features of a municipal bond issue, Table 12.3 a summarizes the issue terms for a hypothetical bond issue by the city of Bedford Falls. We see that the bonds were issued in December 1999 and mature 30 years later in December 2029. Each bond has a face value denomination of $5,000 and pays an annual coupon equal to 6 percent of face value. The annual coupon is split between two semiannual payments each June and December. Based on the original offer price of 100, or 100 percent of par value, the bonds have a yield to maturity of 6 percent. Bedford Falls bonds are call-protected for 10 years, until January 2009. Thereafter, the bonds are callable any time at par value.

. (*marg. def.* **general obligation bonds (GOs)** Bonds issued by a municipality that are secured by the full faith and credit of the issuer.)

The Bedford Falls bonds are **general obligation bonds (GOs)**, which means that the bonds are secured by the full faith and credit of the city of Bedford Falls. "Full faith and credit" means the power of the municipality to collect taxes. The trustee for the bond issue is the Potters Bank of Bedford Falls. A trustee is appointed to represent the financial interests of bondholders and administer the sinking fund for the bond issue. A sinking fund requires a bond issuer to redeem for cash a fraction of an outstanding bond issue on a periodic basis. The sinking fund in this example requires that beginning 10 years after issuance, the city must redeem at par value $2.5 million of the bond issue

each year. At each annual redemption, a fraction of the bond issue is called and the affected bondholders receive the par value call price.

Municipal Bond Features

Municipal bonds are typically callable, pay semiannual coupons, and have a par value denomination of $5,000. Municipal bond prices are stated as a percentage of par value. Thus a price of 102 indicates that a bond with a par value of $5,000 has a price of $5,100. By convention, however, municipal bond dealers commonly use yield quotes rather than price quotes in their trading procedures. For example, a dealer might quote a bid-yield of 6.25 percent for a 5 percent coupon bond with seven years to maturity, indicating a willingness to buy at a price determined by that yield. The actual dollar bid price in this example is $4,496.14, as shown in the following bond price calculation.

$$\frac{\$250}{.0625} \times \left(1 - \frac{1}{(1.03125)^{14}} \right) + \frac{\$5{,}000}{(1.03125)^{14}} = \$4{,}649.99$$

Because there are many thousands of different municipal bond issues outstanding, only a few large issues trade with sufficient frequency to justify having their prices reported in the financial press. A *Wall Street Journal* listing of some actively traded municipal bonds is seen in Figure 12.5. The listing reports the name of the issuer, the coupon rate and maturity of the issue, the most recent bid price quote and the change from an earlier price quote, and a yield to maturity based on a dealer's bid yield.

Figure 12.5 about here.

(*marg. def.* **call provision** A feature of a municipal bond issue that specifies when the bonds may be called by the issuer and the call price that must be paid.)

A **call provision** is a standard feature of most municipal bond issues. A call provision allows an issuer to retire outstanding bonds before they mature, usually to refund with new bonds after a fall in market interest rates. When the bond is called, each bondholder receives the bond's call price in exchange for the bond. However, two bond features often limit an issuer's call privilege. First, callable municipal bonds usually offer a period of call protection following their original issue date. Since a bond issue is not callable during this period, the earliest possible call date is the end of the call protection period. Second, a call price is often specified with a call premium. A call premium is the difference between a bond's call price and its par value. A common arrangement is to specify a call premium equal to one year's coupons for a call occurring at the earliest possible call date. This is then followed by a schedule of call premium reductions, until about 5 to 10 years before maturity when the call premium is eliminated entirely. Thereafter, the bond issue is callable any time at par value.

(*marg. def.* **serial bonds** Bonds issued with maturity dates scheduled at intervals, so that a fraction of the bond issue matures in each year of a multiple-year period.)

Municipal bonds are commonly issued with a serial maturity structure, hence the term **serial bonds**. In a serial bond issue, a fraction of the total issue amount is scheduled to mature in each year over a multiple-year period. As an example, a serial bond issue may contain bonds that mature in each year over a 5-year period, with the first group maturing 11 years after the original issue date, and the last group maturing 15 years after issuance. The purpose of a serial maturity structure is to spread out the principal repayment, thereby avoiding a lump-sum repayment at a single maturity date.

(*marg. def.* **term bonds** Bonds from an issue with a single maturity date.)

When an entire bond issue matures on a single date, the bonds are called **term bonds**. Term bonds normally have a sinking fund provision. A sinking fund is a trustee-managed account to which the issuer makes regular payments. Account reserves are dedicated toward redeeming a fraction of the bond issue on each of a series of scheduled redemption dates. Each redemption usually proceeds by lottery, where randomly selected bonds are called and the affected bondholders receive the sinking fund call price. Alternatively, scheduled redemptions can be implemented by purchasing bonds from investors at current market prices. This latter option is usually selected by the issuer when the bonds are selling at a discount from par value. The motive for a sinking fund provision is similar to that for a serial maturity structure; it provides a means for the issuer to avoid a lump-sum principal repayment at a single maturity date.

(*marg. def.* **put bonds** Bonds that can be sold back to the issuer.)

Some municipal bonds are putable, and these are called **put bonds**. The holder of a put bond, also called a *tender offer bond*, has the option of selling the bond back to the issuer, normally at par value. Some put bonds can be tendered any time, wheras others can be tendered only on regularly scheduled dates. Weekly, monthly, quarterly, semiannual, and annual put date schedules are all used. Notice that with a put bond, maturity is effectively the choice of the bondholder. This feature protects bondholders from rising interest rates and the associated fall in bond prices. However, a putable bond will have a higher price than a comparable nonputable bond. The price differential simply reflects the value of the put option to sell back the bonds.

(marg. def. **variable-rate notes** Securities that pay an interest rate that changes according to market conditions. Also called *floaters*.)

While most municipal bonds maintain a constant coupon rate (hence the term fixed-rate bonds), interest rate risk has induced many municipalities to issue **variable-rate notes**, often called *floaters*. For these debt issues, the coupon rate is adjusted periodically according to an index-based rule. For example, at each adjustment the coupon rate may be set at 60 percent of the prevailing rate on 91-day maturity U.S. Treasury bills. A variable-rate note may also be putable, in which case it is called a *variable-rate demand obligation*, often abbreviated to VRDO. A stipulation attached to most VRDOs allows the issuer to convert an entire variable-rate issue to a fixed-rate issue following a specified conversion procedure. Essentially, the issuer notifies each VRDO holder of the intent to convert the outstanding VRDO issue to a fixed-rate issue on a specific future date. In response, VRDO holders have the option of tendering their VRDOs for cash, or they can accept conversion of their VRDOs into fixed-rate bonds. In the late 1980s, following a decade of volatile interest rates, VRDOs made up about 10 percent of the total value of outstanding municipal bonds.

Investment Updates box.

For the first time in 1993, several municipalities issued bonds with strippable coupons and principal, called *muni-strips*. Like the U.S. Treasury STRIPS program, muni-strips allow separate trading of registered interest and principal. The *Wall Street Journal* story of an issue of muni-strips offered by the government of Puerto Rico appears in the nearby Investment Updates box. Puerto Rico is a protectorate of the United States and bonds issued by the government of Puerto Rico are not subject to taxation of coupon interest. Another part of the Puerto Rico bond offering is composed of inverse floaters. Inverse floaters are like the variable- or floating-rate bonds discussed above. However, inverse floaters pay a variable coupon rate that moves inversely with market interest rates.

That is, higher interest is paid when market interest rates fall and lower interest is paid when market interest rates rise.

Inverse floaters are created by splitting the interest payments of a bond issue with fixed coupons. For example, suppose a municipality issues $10 million face value bonds paying fixed 6 percent coupons. The bonds are placed in a trust, and the fixed annual $600,000 coupons are used to pay interest on floaters and inverse floaters that are issued as claims on the trust. Initially, the interest payments may be split equally between the floaters and inverse floaters. Later, if market interest rates increase, interest payments on the floaters will rise and interest payments on the inverse floaters will fall. If market interest rates decrease, floater interest will fall and inverse floater interest will rise. Total interest payments to floaters and inverse floaters will remain constant.

> (*marg. def*. **revenue bonds** Municipal bonds secured by revenues collected from a specific project or projects.)

Types of Municipal Bonds

There are two basic types of municipal bonds: **revenue bonds** and **general obligation bonds**, often referred to as GOs. General obligation bonds are issued by all levels of municipal governments, including states, counties, cities, towns, school districts, and water districts. They are secured by the general taxing powers of the municipalities issuing the bonds. For state governments and large city governments, tax revenue is collected from a diverse base of income taxes on corporations and individuals, sales taxes, and property taxes. In contrast, tax revenues for smaller municipalities are largely derived from property taxes, although sales taxes have become increasingly important.

Because of their large, diverse tax bases, general obligation bonds issued by states and large cities are often called *unlimited tax bonds* or *full faith and credit bonds*.

However, some general obligation bonds are called *limited tax bonds*. The distinction between limited and unlimited tax bonds arises when a constitutional limit or other statutory limit is placed on the power of a municipality to assess taxes. For example, an amendment to the California state constitution, popularly known as Proposition 13 when it was enacted, placed rigid limits on the ability of California municipalities to assess taxes on real estate.

Revenue bonds constitute the bulk of all outstanding municipal bonds. **Revenue bonds** are bonds secured by proceeds collected from the projects they finance. Thus the credit quality of a revenue bond issue is largely determined by the ability of a project to generate revenue. A few examples of the many different kinds of projects financed by revenue bonds are listed below.

Airport and seaport bonds:	Used to finance development of airport and seaport facilities. Secured by user fees and lease revenues.
College dormitory bonds:	Used to finance construction and renovation of dormitory facilities. Secured by rental fees.
Industrial development bonds:	Used to finance development of projects ranging from factories to shopping centers. Secured by rental and leasing fees.
Multifamily housing bonds:	Used to finance construction of housing projects for senior citizens or low-income families. Secured by rental fees.
Highway and road gas tax bonds:	Used to finance highway construction. May be secured by specific toll revenues, or general gas tax revenues.
Student loan bonds:	Used to purchase higher-education guaranteed student loans. Secured by loan repayments and federal guarantees.

(*marg. def*. **hybrid bonds** Municipal bonds secured by project revenues with some form of general obligation credit guarantees.)

Many municipal bonds possess aspects of both general obligation and revenue bonds; these are called **hybrid bonds**. Typically, a hybrid is a revenue bond secured by project-specific cash flows, but with additional credit guarantees. A common form of hybrid is the *moral obligation bond*. This is a state-issued revenue bond with provisions for obtaining general revenues when project-specific resources are inadequate. Usually, extra funds can be obtained only with approval of a state legislature, which is said to be "morally obligated" to assist a financially distressed state-sponsored project. However, a moral obligation is not a guarantee, and the likelihood of state assistance varies. Municipal bond credit analysts consider each state's history of assistance as well as current state financial conditions when evaluating the credit-quality enhancement of the moral obligation. In general, experienced municipal bond investors agree that a state will first service its own general obligation debt before providing service assistance to moral obligation debt. This is evidenced by the typically higher yields on moral obligation debt compared to general obligation debt.

Since 1983, all newly issued municipal bonds have had to be registered - that is, with the identity of all bondholders registered with the issuer. With registered bonds, the issuer sends coupon interest and principal payments only to the registered owner of a bond. Additionally, it is now standard practice for registered bonds to be issued in book entry form; bondholders are not issued printed bond certificates but instead receive notification that their ownership is officially registered. The actual registration record is maintained by the issuer in computer files. This contrasts with the now defunct practice of issuing bearer bonds, where coupon interest and principal were paid to anyone presenting the bond certificates.

Municipal Bond Credit Ratings

Municipal bond credit rating agencies provide investors with an assessment of the credit quality of individual bond issues. As part of the issuance and credit rating process, the rating agency is paid a fee to assign a credit rating to a new bond issue, to periodically reevaluate the issue, and to make these ratings available to the public. The three largest municipal bond credit rating agencies are Moody's Investors Service, Standard and Poor's Corporation, and Fitch Investors Service. Among them, they rate thousands of new issues each year. Table 12.4 compares and briefly describes the credit rating codes assigned by these three agencies.

Table 12.4 about here.

The highest credit rating that can be awarded is "*triple-A*", which indicates that interest and principal are exceptionally secure because of the financial strength of the issuer. Notice that *triple-A* and *double-A* ratings are denoted as AAA and AA, respectively, by Standard and Poor's and Fitch, but as Aaa and Aa, respectively by Moody's. Also notice that "*triple-B*" and "*double-B*" ratings - that is, BBB and BB - respectively, by Standard and Poor's and Fitch correspond to "*B-double-a*" and "*B-single-a*" ratings - that is, Baa and Ba, respectively - by Moody's. The same pattern holds for C ratings.

The highest four credit ratings, BBB or Baa and above, designate investment-grade bonds. As a matter of policy, many financial institutions will invest only in investment-grade bonds. Lower rankings indicate successively diminishing levels of credit quality. Ratings of BB or Ba and below designate speculative-grade bonds. Individual investors should probably avoid speculative-grade

bonds. A rating of C or below indicates that actual or probable default makes the bond issue unsuitable for most investors.

It is not unusual for the ratings assigned to a particular bond issue to differ slightly across credit rating agencies. For example, a bond issue may be rated AA by Standard and Poor's, Aa by Moody's, but only A by Fitch. When this occurs, it usually reflects a difference in credit rating methods rather than a disagreement regarding basic facts. For example, Moody's may focus on the budgetary status of the issuer when assigning a credit rating, while Standard and Poor's may emphasize the economic environment of the issuer. Remember that Standard & Poor's, Moody's, and Fitch are competitors in the bond rating business, and, like competitors in any industry, they try to differentiate their products.

(*marg. def.* **insured municipal bonds** Bonds secured by an insurance policy that guarantees bond interest and principal payments should the issuer default.)

Municipal Bond Insurance

In the last two decades, it has become increasingly common for municipalities to obtain bond insurance for new bond issues. **Insured municipal bonds**, besides being secured by the issuer's resources, are also backed by an insurance policy written by a commercial insurance company. The policy provides for prompt payment of coupon interest and principal to municipal bondholders in the event of a default by the issuer. The cost of the insurance policy is paid by the issuer at the time of issuance. The policy cannot be canceled while any bonds are outstanding. With bond insurance, the credit quality of the bond issue is determined by the financial strength of the insurance company, not just the municipality alone. Credit rating agencies are certainly aware of this fact. Consequently, a

bond issue with insurance can obtain a higher credit rating than would be possible without insurance, and therefore sell at a higher price.

Municipal bond insurance companies manage default risk in three ways. First, they insure bond issues only from municipalities that have a good credit rating on their own. Second, municipal bond insurers diversify default risk by writing insurance policies for municipalities spread across a wide geographic area. Third, and perhaps most important, to compete in the municipal bond insurance business insurers must maintain substantial investment portfolios as a source of financial reserves. Without sizable reserves, a company's insurance policies are not credible and municipalities will avoid purchasing insurance from them.

12.7 Equivalent Taxable Yield

Consider an individual investor who must decide whether to invest in a corporate bond paying annual coupon interest of 8 percent or a municipal bond paying annual coupon interest of 5 percent. Both bonds are new issues with a triple-A credit rating, both bonds sell at par value, and the investor plans to hold the bonds until they mature. Since both bonds are purchased at par value, their coupon rates are equal to their originally stated yields to maturity. For the municipal bond this is a tax-exempt yield, and for the corporate bond this is a taxable yield.

Clearly, if the investment was for a tax-exempt retirement account, corporate debt is preferred since the coupon interest is higher and tax effects are not a consideration. But if the investment is not tax-exempt, the decision should be made on an aftertax basis. Essentially, the investor must decide which investment provides the highest return after accounting for income tax on corporate debt interest. This is done by comparing the tax-exempt yield of 5 percent on municipal bonds with an

equivalent taxable yield. An equivalent taxable yield depends on the investor's marginal tax rate and is computed as follows.

$$\text{Equivalent taxable yield} = \frac{\text{Tax-exempt yield}}{1 - \text{Marginal tax rate}}$$

For example, suppose the investor is in a 35 percent marginal tax bracket. Then a tax-exempt yield of 5 percent is shown to correspond to an equivalent taxable yield of 7.69 percent as follows:

$$\text{Equivalent taxable yield} = \frac{5\%}{1 - .35} = 7.69\%$$

In this case, the investor would prefer the taxable yield of 8 percent for the corporate bond rather than the equivalent taxable yield of 7.69 percent for the municipal bond.

Alternatively, the investor could compare the aftertax yield on the corporate bond with the tax-exempt yield on the municipal bond. An aftertax yield is computed as follows.

$$\text{Aftertax yield} = \text{Taxable yield} \times (1 - \text{Marginal tax rate})$$

To change the example, suppose that the investor is in a 40 percent marginal tax bracket. This results in an aftertax yield of 4.8 percent, as shown below.

$$\text{Aftertax yield} = 8\% \times (1 - 0.40) = 4.8\%$$

In this case, the tax-exempt yield of 5 percent on the municipal bond is preferred to the aftertax yield of 4.8 percent on the corporate bond.

Another approach is to compute the critical marginal tax rate that would leave an investor indifferent between a given tax-exempt yield on a municipal bond and a given taxable yield on a corporate bond. A critical marginal tax rate is found as follows.

$$\text{Critical marginal tax rate} = 1 - \frac{\text{Tax-exempt yield}}{\text{Taxable yield}}$$

For the example considered here, the critical marginal tax rate is 37.5 percent, determined as follows:

$$\text{Critical marginal tax rate} = 1 - \frac{5\%}{8\%} = 37.5\%$$

Investors with a marginal tax rate higher than the critical marginal rate would prefer the municipal bond, whereas investors in a lower tax bracket would prefer the corporate bond.

CHECK THIS

12.7a An investor with a marginal tax rate of 30 percent is interested in a tax-exempt bond with a yield of 6 percent. What is the equivalent taxable yield of this bond?

12.7b A taxable bond has a yield of 10 percent and a tax-exempt bond has a yield of 7 percent. What is the critical marginal tax rate for these two bonds?

(*marg. def.* **private activity bonds** Taxable municipal bonds used to finance facilities used by private businesses.)

12.8 Taxable Municipal Bonds

The Tax Reform Act of 1986 imposed notable restrictions on the types of municipal bonds that qualify for federal tax exemption of interest payments. In particular, the 1986 act expanded the definition of **private activity bonds**. Private activity bonds include any municipal security where 10 percent or more of the issue finances facilities used by private entities and is secured by payments from private entities.

Interest on private activity bonds is tax-exempt only if the bond issue falls into a so-called qualified category. Qualified private activity bonds that still enjoy a tax-exempt interest privilege include public airport bonds, multifamily housing bonds, nonvehicular mass commuting bonds, and various other project bonds. The major types of private activity bonds that do not qualify for tax-exempt interest are those used to finance sports stadiums, convention facilities, parking facilities, and industrial parks. However, these taxable private activity bonds may still enjoy exemption from state and local income tax. In any case, as a result of the 1986 act and the continuing need to finance private activity projects, new issues of taxable municipal revenue bonds frequently are sold with yields similar to corporate bond yields.

12.9 Summary and Conclusions

This chapter covers the topic of government bonds, including U.S. Treasury bonds, notes, and bills, and state, city, county, and local municipal bonds. In this chapter, we saw that:

1. The U.S. federal government is the largest single borrower in the world with over $5 trillion of debt. Responsibility for managing this debt belongs to the U.S. Treasury, which issues Treasury bills, notes, and bonds at regular auctions to finance government debt.

2. Treasury bills are short-term obligations that are sold on a discount basis. Treasury notes are medium-term obligations that pay fixed semi-annual coupons as well as a payment of face value at maturity. Treasury bonds are long-term obligations that pay their face value at maturity and pay fixed semiannual coupons.

3. The U.S. Treasury sponsors the STRIPS program, where Treasury bonds and notes are broken down into principal strips, which represent face value payments, and coupon strips, which represent individual coupon payments. Since each strip created under the STRIPS program represents a single future payment, strips effectively become zero coupon bonds.

4. Several federal agencies are authorized to issue securities directly to the public. Bonds issued by U.S. government agencies have a credit quality almost identical to U.S. Treasury issues. Government agency notes and bonds are attractive to many investors because they offer higher yields than comparable U.S. Treasury securities. However, the market for agency debt is less active than the market for U.S. Treasury debt and investors are potentially subject to state income taxes on agency debt interest, while U.S. Treasury debt interest is not subject to state taxes.

5. Another large market for government debt is the market for municipal government debt. Total municipal debt outstanding currently exceeds $2 trillion divided among almost all of the more than 80,000 state and local governments in the United States. Individual investors hold about half of this debt, while the remainder is roughly split equally between holdings of property and casualty insurance companies and commercial banks.

6. Municipal notes and bonds are intermediate- to long-term interest-bearing obligations of state and local governments or agencies of those governments. Municipal debt is commonly called the tax-exempt because the coupon interest is usually exempt from federal income tax, which makes municipal bonds attractive to investors in the highest income tax brackets. However, yields on municipal debt are less than yields on corporate debt with similar features and credit quality, thus eliminating much of the advantage of the tax exemption.

7. Most municipal bonds pay a constant coupon rate, but some municipal notes pay variable coupon rates that change according to prevailing market interest rates. Also, a call provision is a standard feature of most municipal bond issues. A call provision allows an issuer to retire outstanding bonds before they mature. When the bond is called, each bondholder receives the bond's call price in exchange for returning the bond to the issuer.

8. There are two basic types of municipal bonds: revenue bonds and general obligation bonds. Revenue bonds, constituting the bulk of all outstanding municipal bonds, are secured by proceeds collected from the projects they finance. General obligation bonds, which are issued by all levels of municipal governments, are secured by the general taxing powers of the municipalities issuing the bonds.

9. As part of the process for issuing municipal bonds to the public, a rating agency is paid a fee to assign a credit rating to a new bond issue. In the last two decades, it has become increasingly common for municipalities to obtain bond insurance for new bond issues through an insurance policy written by a commercial insurance company. With bond insurance, the credit quality of the bond issue is determined by the financial strength of the insurance company, not the municipality alone.

Key terms

face value
discount basis
imputed interest
coupon rate
STRIPS
zero coupon bond
yield to call (YTC)
bid-ask spread
stop-out bid
call provision
general obligation bond (GOs)
serial bond
term bond
put bond
variable-rate note
revenue bond
hybrid bond
default risk
insured municipal bond
private activity bond

Get Real!

This chapter covered government bonds, a large and important market. How should you put your knowledge to work? Begin by purchasing (in a simulated brokerage account) the various types of government securities that are out there. Observe their relative price movements over time.

You should also learn more about buying Treasury securities. A great place to go is the Bureau of Public Debt's website, www.publicdebt.treas.gov. There you can examine and download the forms needed to bid in the regular auctions; you can obtain the current auction schedule; and you can inspect the results of previous auctions. You can also read about the *TreasuryDirect* program, which is probably the most convenient and least expensive way of purchasing Treasury issues.

Beyond this, you will find that there are special Treasury securities that we did not discuss in the chapter such as SLGS ("slugs"). Take a few minutes to read up on these less commonly encountered securities. You will also find detailed information about savings bonds.

If you try to purchase municipal bonds in a simulated brokerage account, you may find that you are not able to. The reason is that the market for municipals is so thin for any given issue that getting the needed price information isn't possible. The important practical implication is that the same municipal bond may be quoted at different prices by different dealers, so it pays to shop around. Also, if you ever wanted to sell a municipal issue, you would find that the lack of liquidity of the vast majority of issues leads to very large bid-ask spreads. Municipal bonds are thus best suited for buy and hold investors.

STOCK-TRAK FAST TRACK

TRADING GOVERNMENT BONDS WITH STOCK-TRAK

U.S. Treasury bonds are avilable for trading through your Stock-Trak account. The list of available bonds changes from time to time and you should consult the Stock-Trak website (www.mhhe.com/cj) for the most recent list. Ticker symbols for Treasury bonds are not necessary to submit buy and sell orders. However, special ticker symbols are used by Stock-Trak to identify Treasury bonds in you account statements. The following is a sample of some U.S. Treasury bonds and their Stock-Trak ticker symbols:

Ticker	Description	Explanation
B-T067	Jul 06 7	7 percent coupon, July 2006 maturity
B-T266	Feb 26 6	6 percent coupon, February 2026 maturity

Since all Treasury bonds are free of default risk, the only factors that affect their prices are related to the structure of interest rates in the economy. If you expect interest rates to increase, then you can benefit from the resulting fall in bond prices by short selling bonds. On the other hand if you expect interest rates to decrease, you should buy bonds and wait for the resulting increase in bond prices.

STOCK-TRAK EXERCISES

1. Buy the longest- and shortest-maturity Treasury issues in equal dollar amounts. Observe which yields the greatest return over your investment period.
2. Invest equal amounts in similar-maturity Treasury bonds and corporate bonds. What is their yield spread? Observe which provides the highest return over your investment period.

3. If buying and selling Treasury bonds seems too conservative, you can get more bang for your buck by trading futures contracts on Treasury bonds. The futures contract on the 30-year T-bond has the ticker symbol US and only requires a $2,000 margin deposit for a contract on a $100,000 bond. If this high-powered form of T-bond trading interests you, then refer to the Stock-Trak section in Chapter 16 for details.

Chapter 12
Government Bonds
Questions and Problems

Review Problems and Self-Test

1. **Treasury Yields** A callable Treasury bond's price is 140:25. It has a coupon rate of 10 percent, makes semiannual payments, and matures in 21 years. What yield would be reported in the financial press?

2. **Equivalent Yields** A particular investor faces a 40 percent tax rate. If a AA-rated municipal bond yields 4 percent, what must a similar taxable issue yield for the investor to be impartial to them?

Answers to Self-Test Problems

1. First, note that this is a callable issue selling above par, so the yield to call will be reported. All callable Treasury bonds are callable at face value five years before they mature. Thus, to calculate the yield to call all we have to do is pretend the bond has 16 years to maturity instead of 21. We therefore have a bond with a price of 140.78125 (after converting from thirty-seconds), a coupon of 10 percent paid semiannually, and a maturity of 16 years (or 32 periods). Verify using the standard bond formula from Chapter 10 that the semiannual yield to call is 3 percent, so the reported yield would be 6 percent.

2. The equivalent taxable yield is the municipal yield "grossed up" by one minus the tax rate: 4%/(1 - .40) = 6.67%.

Test Your IQ (Investment Quotient)

1. **Zero coupon bond** What is the yield to maturity (YTM) on a zero-coupon bond?

a. the interest rate realized if the bond is held to maturity
b. the interest rate realized when the bond is sold
c. the coupon yield for an equivalent coupon bond
d. a fixed rate when the bond is issued

2. **Treasury notes** The coupon rate for a Treasury note is set

a. the same for all Treasury note issues
b. by a formula based on the size of the Treasury note issue
c. according to prevailing interest rates at time of issuance
d. according to the supply and demand for money

3. **Treasury bonds** What is the dollar value of a U.S. Treasury bond quoted at 92:24? (*1990 CFA exam*)

a. $922.75
b. $922.40
c. $927.50
d. indeterminable

4. **Treasury bills** Treasury bills are sold on a discount basis, meaning that the difference between their issued price and their redemption value is

a. the same for all T-bill issues
b. the imputed interest on the T-bill
c. never less than the issued price
d. the bond equivalent yield for the T-bill

5. **Treasury auctions** Which of the following statements about single-price Treasury auctions is false?

a. competitive bidders pay the stop-out bid
b. non-competitive bidders pay the stop-out bid plus a small premium
c. non-competitive bidders pay the stop-out bid
d. all of the above are true

6. **Savings Bonds** The interest rate on Series I Savings Bonds is reset every six months as

a. 90 percent of the rate on newly issued 5-year T-notes
b. 90 percent of the rate on newly issued 5-year T-notes plus the recent inflation rate
c. a fixed rate plus the recent inflation rate
d. an adjustable rate plus the recent inflation rate

7. **Agency Bonds** Which statement applies to a bond issued by an agency of the U.S. Government? (*1992 CFA exam*)

a. it is exempt from the federal income tax on interest
b. it becomes a direct obligation of the U.S. Treasury in case of default
c. it is secured by assets held by the agency
d. none of the above

8. **Agency Bonds** Which is true for bonds issued by all agencies of the U.S. government? (*1989 CFA exam*)

a. they become direct obligations of the U.S. Treasury
b. they are secured bonds backed by government holdings
c. they are exempt from federal income tax
d. none of the above

9. **Municipal Binds** Which of the following constitutes the bulk of all outstanding municipal bonds?

a. revenue bonds
b. general obligation bonds
c. moral obligation bonds
d. private activity bonds

10. **Revenue Bonds** A revenue bond is distinguished from a general obligation bond in that revenue bonds have which of the following characteristics? (*1990 CFA exam*)

a. they are issued by counties, special districts, cities, towns and state-controlled authorities, whereas general obligation bonds are only issued by the states themselves
b. they are typically secured by limited taxing power, whereas general obligation bonds are secured by unlimited taxing power
c. they are issued to finance specific projects and are secured by the revenues of the project being financed
d. they have first claim to any revenue increase of the tax authority issuing

11. Insured Municipal Bonds Which of the following is not a method used by municipal bond insurers to manage default risk?

a. only insure bonds from municipalities with a good credit rating
b. diversify default risk by writing insurance policies for municipalities spread across a wide geographic area
c. maintain substantial investment portfolios as a source of financial reserves
d. all of the above are used to manage default risk

12. Insured Municipal Bonds Which one of the following generally is not true of an insured municipal bond? (*1991 CFA exam*)

a. The price on an insured bond is higher than that on an otherwise identical uninsured bond
b. The insurance can be canceled in the event the issuer fails to maintain predetermined quality standards
c. The insurance premium is a one-time payment made at the time of issuance
d. The insurance company is obligated to make all defaulted principal and/or interest payments in a prompt and timely fashion

13. Taxable Equivalent Yield A municipal bond carries a coupon of 6 3/4 percent and is trading at par To a taxpayer in the 34 percent tax bracket, what would the taxable equivalent yield of this bond be? (*1992 CFA exam*)

a. 4.5 percent
b. 10.2 percent
c. 13.4 percent
d. 19.9 percent

14. Taxable Equivalent Yield A 20-year municipal bond is currently priced at par to yield 5.53 percent. For a taxpayer in the 33 percent tax bracket, what equivalent taxable yield would this bond offer? (*1991 CFA exam*)

a. 8.25 percent
b. 10.75 percent
c. 11.40 percent
d. none of the above

15. **Taxable Equivalent Yield** The coupon rate on a tax-exempt bond is 5.6 percent, and the coupon rate on a taxable bond is 8 percent. Both bonds sell at par. At what tax bracket (marginal tax rate) would an investor be indifferent between the two bonds? (*1994 CFA exam*)

a. 30.0 percent
b. 39.6 percent
c. 41.7 percent
d. 42.9 percent

Questions and Problems

Core Questions

1. **Bills versus Bonds** What are the key differences between T-bills and T-bonds?

2. **Notes versus Bonds** What are the key differences between T-notes and T-bonds?

3. **Zeroes** What two Treasury securities are zeroes?

4. **Spreads** What are typical spreads for T-notes and T-bonds? Why do you think they differ from issue to issue?

5. **Agencies versus Treasuries** From an investor's standpoint, what are the key differences between Treasury and agency issues?

6. **Municipals versus Treasuries** From an investor's standpoint, what are the main differences between Treasury and municipal issues?

7. **Serial Bonds** What are serial bonds? What purpose does this structure serve?

8. **VRNs** In the context of the muni market, what are variable rate notes? What is likely true about their risks as compared to those of ordinary issues?

9. **Revenues versus General Obligation Munis** What is the difference between a revenue bond and a general obligation bond?

10. **Private Activity Munis** What is a private activity muni? What type of investor would be interested?

Intermediate Questions

11. **Treasury Prices** A Treasury issue is quoted at 127:23 bid and 127:25 ask. What is the least you could pay to acquire a bond?

12. **Treasury Prices** A noncallable Treasury bond has a quoted yield of 6.4 percent. It has a 6 percent coupon and 12 years to maturity. What is its price?

13. **Treasury Yields** In Figure 12.2, locate the Treasury bond with the longest maturity (this is the so-called bellwether bond). Verify that, given the ask price, the reported yield is correct.

14. **Callable Treasury Bonds** Examine the yields on the callable issues in Figure 12.2 that mature in 2014. Why do think the yields are so much smaller than those reported for the noncallable issues maturing in 2015?

15. **Tax Equivalent Yields** A taxable corporate issue yields 7 percent. For an investor in a 28 percent tax bracket, what is the equivalent aftertax yield?

16. **Tax Rates** A taxable issue yields 8 percent, and a similar municipal issue yields 6 percent. What is the critical marginal tax rate?

17. **Treasury versus Municipal Bonds** Treasury and municipal yields are often compared to calculate critical tax rates. What concerns might you have about such a comparison? What do you think is true about the calculated tax rate?

18. **Callable Treasury Bonds** For a callable Treasury bond selling above par, is it necessarily true that the yield to call will be less than the yield to maturity? Why or why not?

19. **Callable Agency Issues** For a callable agency bond selling above par, is it necessarily true that the yield to call will be less than the yield to maturity? Why or why not?

20. **Callable Treasury Bonds** Locate the callable bond with a final maturity of Nov 2014 in Figure 12.2. Verify that the reported yield is correct given the ask price of 154:21.

Chapter 12
Government Bonds
Answers and solutions

Answers to Multiple Choice Questions

1. **A**
2. **C**
3. **C**
4. **B**
5. **B**
6. **C**
7. **D**
8. **D**
9. **A**
10. **C**
11. **D**
12. **B**
13. **B**
14. **A**
15. **A**

Answers to Questions and Problems

Core Questions

1. T-bills are pure discount, zero-coupon instruments with original maturities of a year or less. T-bonds are straight coupon bonds with original maturities greater than ten years. A small number of T-bonds are callable.

2. The main difference is that T-notes have original maturities of ten years or less. Also, a small number of T-bonds are callable, but no notes are.

3. T-bills and STRIPS.

4. Spreads are generally in the range of one to six ticks, where a tick is 1/32. The main reason that some issues have narrower spreads are that some are much more heavily traded. In particular, the most recently auctioned issues of each maturity (called the “on-the-run” issues) dominate trading and typically have relatively narrow spreads.

5. Agencies have slightly more credit risk. They are subject to state taxes, they have a variety of call features, and they are less liquid (and have wider spreads). These factors translate into a somewhat higher yield. Agencies offer a wider variety of maturities and bond types as well.

6. Treasuries are subject to federal taxes, but not state and local taxes. Munis are tax-exempt at the federal level. They are usually exempt at the state level only within the issuing state. Munis can have significantly greater default risk, and they are, for the most part, much less liquid. Munis are generally callable whereas most Treasuries are not.

7. Serial bonds are bond issues which feature a series of maturity dates, meaning that the entire issue does not come due at once. This structure reduces the chance of a "crisis at maturity" in which the issuer cannot obtain the funds needed to pay off the entire issue in one shot.

8. Variable rate notes (VRNs) are munis with floating coupons.

9. A general obligation (GO) muni is backed by the full faith and credit (i.e., the taxing power) of the issuer. A revenue bond is backed only by the revenue produced from a specific project or activity.

10. A private activity muni is a taxable muni. They are issued to finance activities that do not qualify for tax-exempt status. Since they have no tax preference, they are ordinary bonds much like corporate bonds and appeal to similar investors.

Intermediate Questions

11. The minimum face value is $1,000. You must pay the ask price of 127:25, or 127.78125 percent of face. This amounts to $1,277.8125

12. This is a straight bond valuation just like those in Chapter 10. Using the standard bond pricing formula, verify that the answer is $966.84724 per $1,000 face. The price would be quoted at 96:22.

13. This is a standard yield to maturity calculation just like those in Chapter 10. The bellwether issue matures in 30 years. It's ask price is quoted at 99:11, or $993.4375 per $1,000 face. The coupon rate is 5.25 percent, paid semiannually. Given this information, check that the yield is in fact 5.2939 percent. Note however that it is important here that the bellwether bond matures in almost exactly 30 years. The standard bond pricing formula implicitly assumes that the first coupon payment is six months away. When this is not true, a modification is necessary to account for the fractional period.

14. These issues are selling well above par, so they will likely be called in 2009 absent a tremendous shift in interest rates. Their yields to call are reported, and these yields reflect the fact the bonds probably will mature early.

15. The equivalent after-tax yield is (1 - .28) multiplied by 7, or 5.04 percent.

16. The marginal tax rate is 1 - .06/.08 = 25%.

17. To a certain extent, it's an apples and oranges issue. Munis are much less liquid, have greater default risk, are generally callable fairly early in their lives, and may be subject to state taxes. These factors increase muni yields. As a result, when critical tax rates are calculated, they are likely to be too low. A better approach is compare munis to corporate bonds with similar features and risks. An even better approach is to compare taxable and nontaxable munis.

18. It is true. The reason is that Treasuries are callable at par. Going back to Chapter 10, if two premium bonds have the same price and the same coupon rate, but different maturities (i.e., the call date and the final maturity date), the one with the shorter maturity has the lower yield. This has to be true because of the "pull to par," i.e., the fact that for a given yield a premium bond's price will decline as maturity approaches.

19. It is not true in general because agency securities are frequently callable at prices above par; it may well be that the yield to call is greater for issues selling moderately above par.

20. Once we recognize that this is a premium issue, so its yield to call is reported, this is a straight yield to maturity calculation. We just pretend the issue matures in 2009. The price is $1,543.75 per $1,000 face; the coupon rate is 11.75 percent. It matures in 11 years. Verify that the calculated yield is actually 5.1975, which rounds to 5.20, or one basis point higher than reported. The reason is that the price is rounded to nearest 32nd *after* the yield is calculated, so it is often not possible to precisely check the numbers.

Table 12.1 Zero coupon bond prices - $10,000 face value

Yield to maturity (%)	Bond maturity 5 years	10 years	20 years	30 years
3.0	8616.67	7424.70	5512.62	4092.96
3.5	8407.29	7068.25	4996.01	3531.30
4.0	8203.48	6729.71	4528.90	3047.82
4.5	8005.10	6408.16	4106.46	2631.49
5.0	7811.98	6102.71	3724.31	2272.84
5.5	7623.98	5812.51	3378.52	1963.77
6.0	7440.94	5536.76	3065.57	1697.33
6.5	7262.72	5274.71	2782.26	1467.56
7.0	7089.19	5025.66	2525.72	1269.34
7.5	6920.20	4788.92	2293.38	1098.28
8.0	6755.64	4563.87	2082.89	950.60
8.5	6595.37	4349.89	1892.16	823.07
9.0	6439.28	4146.43	1719.29	712.89
9.5	6287.23	3952.93	1562.57	617.67
10.0	6139.13	3768.89	1420.46	535.36
10.5	5994.86	3593.83	1291.56	464.17
11.0	5854.31	3427.29	1174.63	402.58
11.5	5717.37	3268.83	1068.53	349.28
12.0	5583.95	3118.05	972.22	303.14
12.5	5453.94	2974.55	884.79	263.19
13.0	5327.26	2837.97	805.41	228.57
13.5	5203.81	2707.96	733.31	198.58
14.0	5083.49	2584.19	667.80	172.57
14.5	4966.23	2466.35	608.29	150.02
15.0	4851.94	2354.13	554.19	130.46

Table 12.3 City of Bedford Falls General Obligation Bonds

Issue amount	$50 million	Bond issue represents a total face value amount of $50 million.
Issue date	12/15/99	Bonds offered to public on December 15, 1999.
Maturity date	12/31/29	All remaining principal must be paid at maturity on December 31, 2029.
Par value	$5,000	Each bond has a face value of $5,000.
Coupon rate	6 percent	Annual coupons of $300 per bond.
Coupon dates	12/31, 6/30	Semiannual coupons of $150.
Offering price	100	Offer price is 100 percent of par value.
Yield to maturity	6 percent	Based on stated offer price.
Call provision	Callable after 12/31/09	Bonds are call-protected for 10 years.
Call price	100	Bonds are callable at par value.
Trustee	Potters Bank of Bedford Falls	The trustee is appointed to represent the bondholders and administer the sinking fund.
Sinking fund	$2.5 million annual par redemptions after 12/31/09	City must redeem at par value $2.5 million of the bond issue each year beginning in 2010.

Table 12.4 Municipal Bond Credit Ratings

Standard & Poor's	Moody's	Fitch	Rating Description
Investment-Grade Bond Ratings			
AAA	Aaa	AAA	Highest credit quality
AA	Aa	AA	High credit quality
A	A	A	Good credit quality
BBB	Baa	BBB	Satisfactory credit quality
Speculative-Grade Bond Ratings			
BB	Ba	BB	Speculative credit quality
B	B	B	Highly speculative quality
CCC	Caa	CCC	Poor credit quality
CC	Ca	CC	Probable default
Extremely Speculative-Grade Ratings			
C	C	C	Imminent default
D		DDD DD, D	In default

Investment Updates (WSJ 5/29/96)

Zero-Coupon Bonds Offer Safety Net

YOUR MONEY MATTERS

By VANESSA O'CONNELL
Staff Reporter of THE WALL STREET JOURNAL

With stock prices at dizzying levels, many individual investors are understandably nervous about keeping their balance if the long bull market suddenly stumbles.

But the traditional safety-net strategy of shifting some money into certificates of deposit and conventional bonds, or simply putting new money into such fixed-income investments, can seem fairly ho-hum.

For people looking for added security but with a touch of pizazz, some advisers are recommending long-term zero-coupon Treasury bonds, or "strips," as they are known.

Strips, which are created by investment firms that split Treasury bonds from their coupon payments, are sold at deep discounts to their face value. They don't make periodic interest payments. Instead, their value builds over the years, guaranteeing a predetermined compound rate of return to investors who hang on until maturity.

Along the way, prices of zero-coupon bonds can gyrate violently, rising sharply when interest rates fall and plunging when rates rise.

The Ups and Downs

Annual return on a new 20-year zero-coupon Treasury bond purchased with a yield of 7% and sold after one, three or five years when interest rates have fallen or risen.

TIME HELD	GAIN AT 6.5% YIELD	GAIN/LOSS AT 8% YIELD
One year	21%	-7%
Three years	11	3
Five years	9	5

Source: The Leuthold Group

But for investors who can afford to wait out the price dips, the prospect of handsome profits if rates drift lower makes zeros a safety net with the bounce of a trampoline. "Your downside is protected, but your upside is unknown," says James E. Wilson, a Columbia, S.C., financial planner.

The best time to invest in strips is just after the bond market gets pummeled, when prices are low and yields are high. But even at today's prices, Treasury strips could deliver higher returns than stocks during the next few years, with considerably less risk, argues James Floyd, senior research analyst at Leuthold Group in Minneapolis.

Suppose you want at least $100,000 when you retire 20 years from now. You can buy 100 20-year Treasury strips, each with a face value of $1,000. Your cost: about $25,000, including a broker's markup of some $675. Your yield would be about 7%.

If rates drop this year, with new strips yielding 6.5%, you could sell yours, pocketing a 21% gain.

Of course, if interest rates rocket higher, with new strips yielding 8%, you would lose 7% if you sold. But even that would hurt less than a 10% to 35% plunge in the stock market, which Mr. Floyd figures is as much as stock prices could fall.

And if you held the strips until they matured – or until rates fell again – you would be guaranteed to gain. Stocks offer no such assurance.

Figure 12.1 Zero Coupon Bond Prices ($10,000 Face Value)

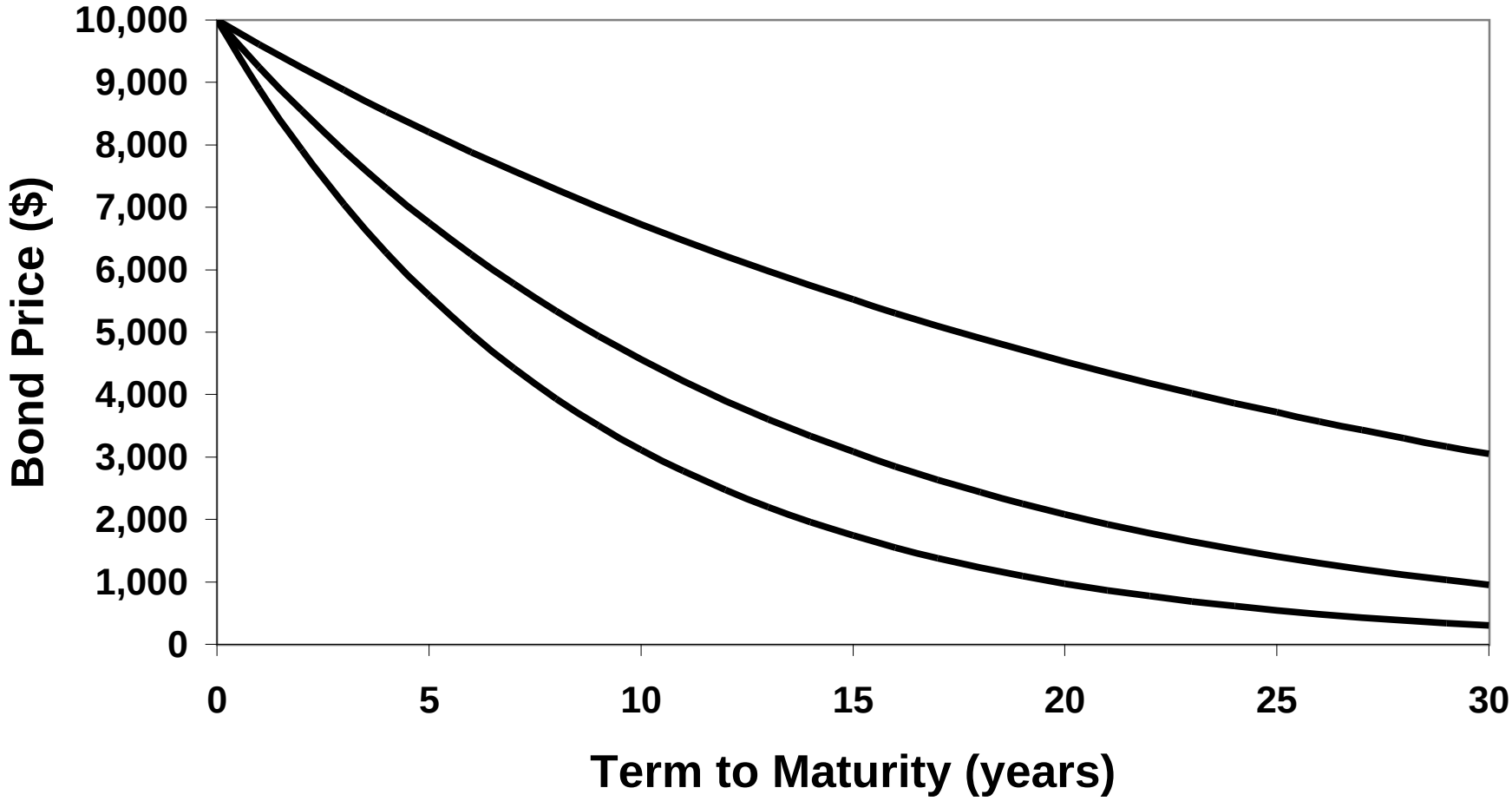

Figure 12.2 U.S. Treasury Securities

TREASURY BONDS, NOTES & BILLS

Tuesday, November 17, 1998

Representative and Indicative Over-the-Counter quotations based on $1 million or more.

Treasury bond, note and bill quotes are as of mid-afternoon. Colons in bond and note bid-and-asked quotes represent 32nds; 101:01 means 101 1/32. Net changes in 32nds. Treasury bill quotes in hundredths, quoted in terms of a rate discount. Days to maturity calculated from settlement date. All yields are to maturity and based on the asked quote. Most recently auctioned treasury bonds and notes, and current 13-week and 26-week bills are boldfaced. For bonds callable prior to maturity, yields are computed to the earliest call date for issues quoted above par and to the maturity date for issues quoted below par. n-Treasury note. i-Inflation-indexed. wi-When issued. iw-Inflation-indexed when issued; daily change is expressed in basis points.

Source: Dow Jones/Cantor Fitzgerald.

U.S. Treasury strips as of 3 p.m. Eastern time, also based on transactions of $1 million or more. Colons in bid-and-asked quotes represent 32nds; 99:01 means 99 1/32. Net changes in 32nds. Yields calculated on the asked quotation. ci-stripped coupon interest. bp-Treasury bond, stripped principal. np-Treasury note, stripped principal. For bonds callable prior to maturity, yields are computed to the earliest call date for issues quoted above par and to the maturity date for issues below par.

Source: Bear, Stearns & Co. via Street Software Technology Inc.

GOVT. BONDS & NOTES

Rate	Maturity Mo./Yr.	Bid	Asked	Chg.	Ask Yld.
10 3/4	Aug 05	132:28	133:02	-5	4.93
5 7/8	Nov 05n	106:04	106:06	-4	4.82
5 5/8	Feb 06n	104:22	104:24	-6	4.84
9 3/8	Feb 06	126:27	127:01	-6	4.90
6 7/8	May 06n	112:01	112:05	-7	4.92
7	Jul 06n	112:25	112:29	-7	4.95
6 1/2	Oct 06n	109:27	109:31	-6	4.96
3 3/8	Jan 07i	96:24	96:25	-5	3.84
6 1/4	Feb 07n	108:20	108:22	-6	4.95
7 5/8	Feb 02-07	107:27	107:29	-4	4.95
6 5/8	May 07n	111:03	111:07	-6	4.99
6 1/8	Aug 07n	107:27	107:29	-7	5.00
7 7/8	Nov 02-07	110:16	110:20	-4	4.91
3 5/8	Jan 08i	98:16	98:17	-2	3.82
5 1/2	Feb 08n	104:08	104:10	-6	4.91
5 5/8	May 08n	105:02	105:03	-7	4.95
8 3/8	Aug 03-08	114:11	114:15	-4	4.92
4 3/4	**Nov 08n**	**98:31**	**99:00**	**-7**	**4.88**
8 3/4	Nov 03-08	116:22	116:26	-2	4.91
9 1/8	May 04-09	119:19	119:23	-7	4.98
10 3/8	Nov 04-09	127:14	127:20	-7	4.98
11 3/4	Feb 05-10	135:19	135:25	-6	5.01
10	May 05-10	127:03	127:09	-7	5.02
12 3/4	Nov 05-10	144:23	144:29	-8	5.05
13 7/8	May 06-11	154:05	154:11	-9	5.07
14	Nov 06-11	157:25	157:31	-7	5.08
10 3/8	Nov 07-12	137:05	137:11	-6	5.14
12	Aug 08-13	151:15	151:21	-8	5.18
13 1/4	May 09-14	164:11	164:17	-5	5.19
12 1/2	Aug 09-14	159:09	159:15	-8	5.20
11 3/4	Nov 09-14	154:06	154:12	-8	5.19
11 1/4	Feb 15	164:04	164:10	-16	5.30
10 5/8	Aug 15	157:15	157:21	-16	5.36
9 7/8	Nov 15	149:02	149:08	-14	5.41
9 1/4	Feb 16	141:30	142:04	-12	5.45
7 1/4	May 16	119:26	120:00	-10	5.46
7 1/2	Nov 16	122:23	122:29	-9	5.48
8 3/4	May 17	137:18	137:24	-10	5.48
8 7/8	Aug 17	139:08	139:14	-8	5.48
9 1/8	May 18	143:01	143:07	-10	5.49
9	Nov 18	142:01	142:07	-10	5.49
8 7/8	Feb 19	140:24	140:30	-8	5.50
8 1/8	Aug 19	131:30	132:04	-7	5.51
8 1/2	Feb 20	137:01	137:07	-7	5.51
8 3/4	May 20	140:13	140:19	-9	5.51
8 3/4	Aug 20	140:20	140:26	-7	5.51
7 7/8	Feb 21	129:31	130:05	-7	5.51
8 1/8	May 21	133:11	133:17	-7	5.51
8 1/8	Aug 21	133:15	133:21	-9	5.51
8	Nov 21	132:05	132:11	-7	5.50
7 1/4	Aug 22	122:25	122:31	-8	5.51
7 5/8	Nov 22	127:30	128:04	-6	5.50
7 1/8	Feb 23	121:14	121:20	-7	5.50
6 1/4	Aug 23	110:04	110:08	-7	5.49
7 1/2	Nov 24	127:17	127:23	-6	5.49
7 5/8	Feb 25	129:12	129:18	-6	5.49
6 7/8	Aug 25	119:06	119:10	-6	5.49
6	Feb 26	107:09	107:11	-5	5.48
6 3/4	Aug 26	117:24	117:28	-6	5.49
6 1/2	Nov 26	114:11	114:15	-5	5.48
6 5/8	Feb 27	116:09	116:13	-4	5.48
6 3/8	Aug 27	113:02	113:06	-5	5.46
6 1/8	Nov 27	110:03	110:07	-3	5.42
3 5/8	Apr 28i	98:07	98:08	....	3.72
5 1/2	Aug 28	102:15	102:16	-6	5.33
5 1/4	**Nov 28**	**99:10**	**99:11**	**-8**	**5.29**

U.S. TREASURY STRIPS

Mat.	Type	Bid	Asked	Chg.	Ask Yld.
May 19	ci	31:12	31:18	– 5	5.71
Aug 19	ci	30:29	31:03	– 5	5.72
Aug 19	bp	31:00	31:06	– 5	5.70
Nov 19	ci	30:15	30:21	– 6	5.71
Feb 20	ci	30:01	30:07	– 5	5.71
Feb 20	bp	30:05	30:11	– 4	5.70
May 20	ci	29:20	29:26	– 5	5.71
May 20	bp	29:23	29:29	– 5	5.70
Aug 20	ci	29:06	29:12	– 5	5.71
Aug 20	bp	29:09	29:15	– 5	5.70
Nov 20	ci	28:25	28:31	– 5	5.71
Feb 21	ci	28:12	28:18	– 5	5.71
Feb 21	bp	28:18	28:24	– 5	5.68
May 21	ci	28:01	28:07	– 5	5.71
May 21	bp	28:04	28:10	– 5	5.69
Aug 21	ci	27:22	27:28	– 5	5.70
Aug 21	bp	27:26	27:31	– 4	5.68
Nov 21	ci	27:12	27:17	– 5	5.69
Nov 21	bp	27:15	27:21	– 5	5.67
Feb 22	ci	26:31	27:05	– 5	5.69
May 22	ci	26:21	26:27	– 5	5.68
Aug 22	ci	26:11	26:17	– 5	5.67
Aug 22	bp	26:18	26:24	– 5	5.63
Nov 22	ci	26:01	26:07	– 5	5.66
Nov 22	bp	26:05	26:11	– 5	5.64
Feb 23	ci	25:23	25:29	– 5	5.65
Feb 23	bp	25:30	26:04	– 5	5.61
May 23	ci	25:12	25:18	– 5	5.65
Aug 23	ci	25:02	25:08	– 5	5.64
Aug 23	bp	25:18	25:24	– 5	5.56
Nov 23	ci	24:23	24:29	– 5	5.64
Feb 24	ci	24:11	24:17	– 5	5.65
May 24	ci	24:02	24:08	– 4	5.64
Aug 24	ci	23:25	23:31	– 4	5.63
Nov 24	ci	23:16	23:22	– 4	5.62
Nov 24	bp	23:24	23:30	– 5	5.58
Feb 25	ci	23:13	23:18	– 4	5.58
Feb 25	bp	23:17	23:22	– 5	5.56
May 25	ci	23:03	23:09	– 4	5.58
Aug 25	ci	22:26	23:00	– 4	5.57
Aug 25	bp	22:29	23:03	– 4	5.56
Nov 25	ci	22:18	22:23	– 4	5.57
Feb 26	ci	22:04	22:10	– 4	5.59
Feb 26	bp	22:15	22:21	– 4	5.53
May 26	ci	21:27	22:01	– 4	5.58
Aug 26	ci	21:19	21:24	– 4	5.57
Aug 26	bp	21:22	21:27	– 4	5.56
Nov 26	ci	21:09	21:15	– 4	5.57
Nov 26	bp	21:12	21:18	– 4	5.56
Feb 27	ci	20:29	21:03	– 4	5.59
Feb 27	bp	21:06	21:11	– 4	5.54
May 27	ci	20:26	21:00	– 4	5.55
Aug 27	ci	20:26	20:31	– 4	5.51
Aug 27	bp	20:30	21:03	– 4	5.49
Nov 27	ci	21:05	21:11	– 4	5.40
Nov 27	bp	21:06	21:12	– 4	5.39

TREASURY BILLS

Maturity	Days to Mat.	Bid	Asked	Chg.	Ask Yld.
Nov 19 '98	1	3.95	3.87	+0.17	3.92
Nov 27 '98	9	3.30	3.22	–0.14	3.27
Dec 03 '98	15	3.16	3.08	–0.22	3.13
Dec 10 '98	22	3.81	3.73	–0.18	3.79
Dec 17 '98	29	3.46	3.38	–0.20	3.44
Dec 24 '98	36	4.00	3.96	–0.14	4.03
Dec 31 '98	43	3.94	3.90	–0.19	3.97
Jan 07 '99	50	4.06	4.02	–0.11	4.10
Jan 14 '99	57	4.08	4.04	–0.10	4.12
Jan 21 '99	64	4.35	4.33	–0.11	4.42
Jan 28 '99	71	4.27	4.25	–0.08	4.35
Feb 04 '99	78	4.35	4.33	–0.09	4.43
Feb 11 '99	85	4.33	4.31	–0.09	4.41
Feb 18 '99	**92**	**4.34**	**4.33**	**–0.06**	**4.44**
Feb 25 '99	99	4.31	4.29	–0.09	4.40
Mar 04 '99	106	4.33	4.31	–0.10	4.43
Mar 11 '99	113	4.32	4.30	–0.09	4.42
Mar 18 '99	120	4.35	4.33	–0.06	4.45
Mar 25 '99	127	4.32	4.30	–0.08	4.43
Apr 01 '99	134	4.35	4.33	–0.07	4.46
Apr 08 '99	141	4.35	4.33	–0.07	4.47
Apr 15 '99	148	4.36	4.34	–0.06	4.48
Apr 22 '99	155	4.36	4.34	–0.06	4.48
Apr 29 '99	162	4.35	4.33	–0.06	4.48
May 06 '99	169	4.34	4.32	–0.07	4.47
May 13 '99	176	4.33	4.31	–0.08	4.46
May 20 '99	**183**	**4.35**	**4.34**	....	**4.50**
May 27 '99	190	4.35	4.33	–0.06	4.49
Jun 24 '99	218	4.26	4.24	–0.05	4.40
Jul 22 '99	246	4.34	4.32	–0.08	4.49
Aug 19 '99	274	4.33	4.31	–0.10	4.48
Sep 16 '99	302	4.33	4.31	–0.07	4.49
Oct 14 '99	330	4.33	4.31	–0.06	4.50
Nov 12 '99	359	4.28	4.27	–0.06	4.47

INFLATION-INDEXED TREASURY SECURITIES

Rate	Mat.	Bid/Asked	Chg.	*Yld.	Accr. Prin.
3.625	07/02	99-18/19	+07	3.733	1021
3.375	01/07	96-24/25	–05	3.805	1032
3.625	01/08	98-16/17	–02	3.803	1012
3.625	04/28	98-07/08	....	3.723	1011

*-Yld. to maturity on accrued principal.

Figure 12.3 Bond Prices ($10,000 Face Value)

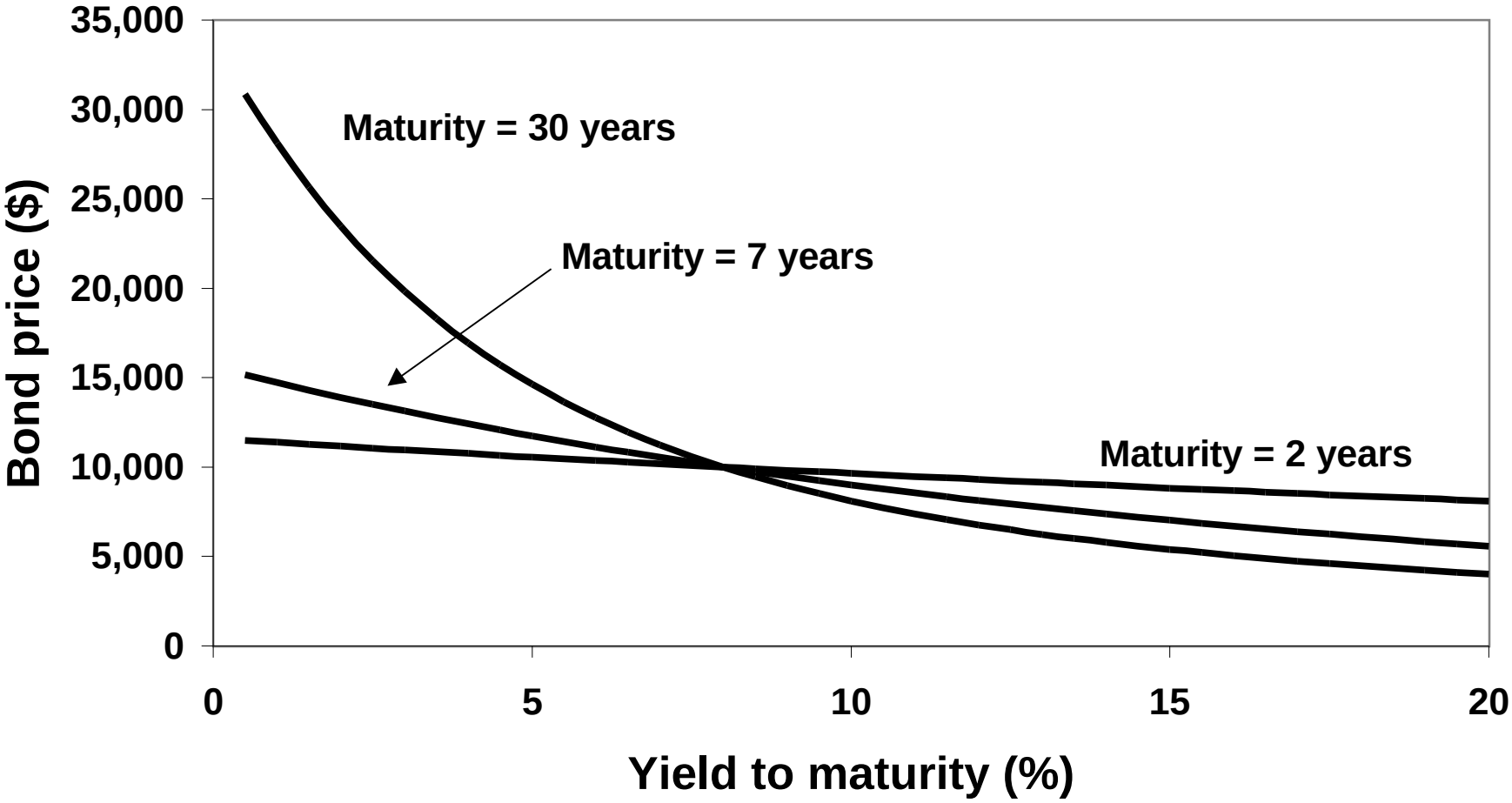

Figure 12.4 Agency Securities

GOVERNMENT AGENCY ISSUES

Tuesday, November 17, 1998

Over-the-Counter mid-afternoon quotations based on large transactions, usually $1 million or more. Colons in bid-and-asked quotes represent 32nds; 101:01 means 101 1/32.

All yields are calculated to maturity, and based on the asked quote. * -- Callable issue, maturity date shown. For issues callable prior to maturity, yields are computed to the earliest call date for issues quoted above par, or 100, and to the maturity date for issues below par.

Source: Bear, Stearns & Co. via Street Software Technology Inc.

Federal Home Loan Bank

Rate	Mat.	Bid	Asked	Yld.
5.39	1-99	100:03	100:05	4.41
9.30	1-99	100:26	100:29	4.20
5.43	2-99	100:06	100:09	4.37
6.44	4-99	100:23	100:26	4.39
8.60	6-99	102:06	102:09	4.65
6.11	6-99	100:24	100:27	4.68
8.45	7-99	102:12	102:15	4.70
5.60	7-99	100:02	100:05	5.36
5.66	7-99*	100:05	100:08	3.40
6.26	8-99	100:28	100:31	4.84
8.60	8-99	102:22	102:25	4.82
5.87	10-99	100:26	100:29	4.83
8.38	10-99	103:03	103:06	4.83
5.00	10-99*	100:01	100:04	4.32
5.80	11-99	100:24	100:27	4.89
8.60	1-00	104:08	104:11	4.77
5.75	1-00*	99:30	100:01	5.71
5.53	2-00	100:22	100:25	4.86
5.78	5-00*	100:13	100:16	4.76
6.18	10-00*	100:14	100:17	4.79
6.00	11-00*	100:06	100:09	3.75
5.62	1-01	101:20	101:23	4.76
5.91	1-01*	100:00	100:03	5.87
5.58	2-01*	99:30	100:02	5.55
6.07	6-01*	100:02	100:06	3.76
6.00	8-01*	100:05	100:09	1.73
5.20	9-01	100:02	100:06	5.12
6.18	10-02	104:01	104:05	5.01
5.66	1-03	102:22	102:28	4.88
5.37	1-03	101:00	101:06	5.05
6.25	1-03*	99:26	100:00	6.25
5.42	1-03	102:01	102:07	4.82
6.07	1-03*	100:04	100:10	4.44
6.05	2-03*	100:04	100:10	4.58
6.27	2-03*	100:06	100:12	4.58
6.27	2-03*	100:00	100:06	4.18
6.25	3-03*	100:02	100:08	2.51
6.03	5-03*	102:04	102:10	5.03
5.76	6-03	103:12	103:18	4.88
5.57	9-03	101:27	102:01	5.09
5.63	9-03	101:29	102:03	5.13
5.13	9-03	99:29	100:03	5.10
6.02	10-03*	99:11	99:17	6.13
9.50	2-04	121:18	121:24	4.78
6.00	3-04*	100:01	100:07	4.04
7.25	6-05*	100:04	100:10	4.01
7.00	7-07*	101:21	101:27	5.83
7.00	8-07*	101:29	102:03	5.71
7.25	11-07*	100:30	101:04	1.93
5.80	9-08	102:05	102:13	5.48
7.50	10-12*	101:10	101:16	4.57
7.50	11-12*	100:13	100:19	2.76

Resolution Funding Corp.

Rate	Mat.	Bid	Asked	Yld.
8.13	10-19	129:27	130:03	5.65
8.88	7-20	140:02	140:10	5.63
9.38	10-20	140:31	141:07	5.97
8.63	1-21	137:07	137:15	5.64
8.63	1-30	134:15	134:23	6.12
8.88	4-30	147:16	147:24	5.62

Federal Farm Credit Bank

Rate	Mat.	Bid	Asked	Yld.
5.54	1-99	100:01	100:03	4.69
5.27	2-99*	100:02	100:05	3.74
5.60	5-99	100:10	100:13	4.68
5.55	7-99	100:14	100:17	4.68
8.65	10-99	103:07	103:10	4.69
6.28	6-01	103:17	103:21	4.76
6.10	9-01	102:14	102:18	5.12
5.70	6-03	103:12	103:18	4.82
6.75	6-07	110:17	110:23	5.19

World Bank Bonds

Rate	Mat.	Bid	Asked	Yld.
8.38	10-99	103:06	103:09	4.45
8.13	3-01	107:21	107:25	4.49
6.38	5-01	103:30	104:02	4.64
6.75	1-02	104:30	105:02	4.99
12.38	10-02	124:08	124:14	5.35
5.25	9-03	102:05	102:11	4.70
6.38	7-05	106:30	107:04	5.10
6.63	8-06	109:08	109:16	5.12
8.25	9-16	125:28	126:04	5.86
8.63	10-16	130:00	130:08	5.87
9.25	7-17	137:27	138:03	5.86
7.63	1-23	124:14	124:22	5.73
8.88	3-26	139:00	139:08	5.95

Financing Corporation

Rate	Mat.	Bid	Asked	Yld.
10.70	10-17	149:30	150:06	6.16
9.80	11-17	145:20	145:28	5.79
9.40	2-18	136:03	136:11	6.15
9.80	4-18	145:13	145:21	5.84
10.00	5-18	147:07	147:15	5.88
10.35	8-18	151:03	151:11	5.91
9.65	11-18	144:07	144:15	5.84
9.90	12-18	146:20	146:28	5.89
9.60	12-18	143:06	143:14	5.89
9.65	3-19	144:05	144:13	5.88
9.70	4-19	144:17	144:25	5.90
9.00	6-19	135:18	135:26	5.95
8.60	9-19	131:11	131:19	5.94

Inter-Amer. Devel. Bank

Rate	Mat.	Bid	Asked	Yld.
7.13	9-99	101:30	102:01	4.66
8.50	5-01	106:28	107:00	5.41
6.13	3-06	105:22	105:28	5.15
6.63	3-07	109:06	109:12	5.22
12.25	12-08	150:09	150:17	5.61
8.88	6-09	125:23	125:31	5.58
8.40	9-09	122:29	123:05	5.52
8.50	3-11	124:18	124:26	5.67
7.13	3-23*	103:06	103:14	6.82
7.00	6-25	113:28	114:04	5.94
6.80	10-25	111:14	111:22	5.93

GNMA Mtge. Issues Nov98

Rate	Mat.	Bid	Asked	Yld.
5.50	30Yr	96:13	96:15	6.00
6.00	30Yr	98:28	98:30	6.22
6.50	30Yr	100:25	100:27	6.41
7.00	30Yr	102:04	102:06	6.57
7.50	30Yr	103:00	103:02	6.58
8.00	30Yr	103:25	103:27	6.36
8.50	30Yr	105:22	105:24	5.89
9.00	30Yr	106:13	106:15	6.20
9.50	30Yr	106:27	106:29	7.04

Tennessee Valley Authority

Rate	Mat.	Bid	Asked	Yld.
8.38	10-99	102:11	102:14	5.44
6.00	11-00*	101:24	101:27	5.00
6.50	8-01	103:16	103:20	5.06
6.38	6-05	105:22	105:28	5.31
3.38	1-07	96:03	96:09	3.91
8.05	7-24*	100:30	101:06	6.17
6.75	11-25	110:16	110:24	5.95
8.63	11-29*	101:31	102:07	8.42
8.25	9-34*	101:29	102:05	5.51
8.25	4-42*	113:08	113:16	6.96
7.25	7-43*	105:24	106:00	6.73
6.88	12-43*	103:14	103:22	6.62

Figure 12.5 Municipal Securities

TAX-EXEMPT BONDS

Representative prices for several active tax-exempt revenue and refunding bonds, based on institutional trades. Changes rounded to the nearest one-eighth. Yield is to maturity. n-New. Source: The Bond Buyer.

ISSUE	COUPON	MAT	PRICE	CHG	BID YLD
Alabama Pub Sch Auth r	4.250	11-01-18	90⅛	...	5.03
Austin TX Sub Lien 98A	4.250	05-15-28	87	...	5.10
Brazis Riv Auth Tx-n	5.050	11-01-18	99⅜	– ¼	5.10
CA Ed Facs Auth Ser 98	4.500	10-01-27	92¼	– ¼	5.01
Cook Co Ill Ser 98A	5.000	11-15-22	98	– ⅛	5.15
Dallas Tx Wtrwrks-n	5.000	10-01-29	97⅝	– ⅛	5.15
Denver Colo Arpt-n	5.000	11-15-25	96⅜	– ¼	5.25
Denver Colo Arpt-n	5.000	11-15-25	97⅝	– ⅜	5.16
Fla St Bd Ed Cap	4.750	06-01-23	95¼	...	5.09
Huston Tx Airport Sys	5.000	07-01-28	97½	– ⅛	5.17
Huston Tx Airport Sys	5.000	07-01-25	96¼	– ⅛	5.26
King Co Wash Ltd	5.000	01-01-30	96¾	– ⅛	5.21
LI Pwr Auth NY	5.125	12-01-22	99⅝	...	5.15
Long Island Pwr Elec	4.750	04-01-18	96½	– ⅛	5.03
Mass Tpk Auth Ser A	5.000	01-01-37	96½	– ⅛	5.21
Matagorda Co Tx-n	5.125	11-01-28	99½	– ⅛	5.16
Metro Washn Arpts Auth	5.000	10-01-28	97⅜	...	5.18
Miami-Dade Co Sch Bd-n	5.000	08-01-25	97¾	– ⅛	5.15
Miami-Dade Fla Avia	5.000	10-01-28	97⅛	– ⅛	5.18
Mo. Hlth & Ed Fac	5.000	05-15-28	96½	...	5.24
Mo. Hlth & Ed Fac	5.000	05-15-38	94⅞	...	5.31
NC Med Care Comm	5.000	06-01-28	97	– ⅛	5.20
NC Med Care Comm Hsp	4.750	12-01-28	92⅜	– ⅛	5.25
NYC Genl Oblig Bds	5.000	08-15-22	97	...	5.22
NYC Genl Oblig Bds	5.000	08-15-28	96⅝	– ⅛	5.22
NYC Muni Wtr Fin Auth	5.000	06-15-27	97⅝	– ⅛	5.16
NYC Muni Wtr&Swr Ath	4.750	06-15-31	94⅜	– ⅛	5.10
PA of NY & NJ cnsldted	4.250	10-01-26	88⅜	– ¼	5.02
Portland Ore Sewer	4.500	06-01-18	93½	...	5.02
PR Elec Pwr Auth	4.750	07-01-21	97	...	4.97
PR Hwy & Trans Auth	5.000	07-01-38	96⅞	– ⅛	5.19
Pub Hwy Auth Colo.	5.000	09-01-26	97⅞	– ⅛	5.14
Sacramento Cty Fin Auth	4.750	05-01-23	96	– ⅛	5.03
So Miami Hlth Hosp Auth	5.000	11-15-28	97¾	– ⅛	5.14
Tampa Bay Wtr Fla	4.750	10-01-27	94⅞	– ⅛	5.09
Triboro BTA NY	4.750	01-01-24	95⅜	– ⅛	5.08
Wash Hlth Care Auth	5.000	11-15-28	96⅜	+ ⅛	5.24
Wash Hlth Care Fac-n	5.000	10-01-28	96⅜	...	5.24
Washn Convntn Center	4.750	10-01-28	92¾	...	5.22
Wayne Chrtr Co MI Airp	5.000	12-01-28	96⅛	– ⅛	5.26

Investment Updates (WSJ 6/24/93)

Puerto Rico Sells Municipal Bonds, Including 'Designer' Securities

By THOMAS T. VOGEL JR.
Staff Reporter of THE WALL STREET JOURNAL

NEW YORK – Puerto Rico sold a new kind of municipal bond yesterday that investors can buy or trade in bits and pieces.

As part of a well-received $961 million offering of general obligation municipal refunding bonds, Puerto Rico sold about $126 million of so-called bond payment obligations, or BPOs. The offering was the largest of a $2 billion slate of new municipal bonds sold yesterday.

Bond payment obligations can be broken down into separate pre-packaged parts at the will of the investor and distributed into different portfolios or even sold to other investors. Each of the parts comes with its own registration number to make trading easier. The BPO bond is the ultimate "designer security," said Gary Gray, a senior vice president at Lehman Brothers, the offering's lead underwriter.

But such flexibility comes at a price. Investors receive yields as much as 0.10 percentage point lower than similarly rated plain-vanilla bonds if they choose not to break the BPOs into separate parts, many of which would be riskier than regular bonds.

The BPOs were sold in maturities of 15, 16 and 17 years with yields ranging from 5.50% to 5.60%. Certain parts of the BPOs, when separated, would have significantly higher or lower yields depending on the direction of short-term interest rates, among other factors. The plain-vanilla fixed-rate bonds sold by Puerto Rico maturing in 14 years, by comparison, yielded 5.55%, 0.05 percentage point more than the 15-year BPO bonds.

Furthermore, some of the bonds could pay much less, or much more, than regular bonds depending on the direction of interest rates.

Indeed, the offering had been postponed in April due to rising interest rates as an inflation scare rushed through the bond market. But with interest rates moving lower again, Lehman and Puerto Rico decided that yesterday was time to come to market.

A handful of large mutual fund companies snapped up the BPOs and many of the plain-vanilla bonds, according to Lehman officials. Part of the reason for such strong demand is that interest payments from Puerto Rico's securities are exempt from federal, state and local taxes. Indeed, demand was so strong that the offering was increased from an anticipated $700 million. The bonds are rated Baa-1 by Moody's Investors Service Inc. and single-A by Standard & Poor's Corp.

It wasn't the first time Lehman has sold BPOs, but it is the largest offering of its type ever. Earlier this year, Lehman sold about $60 million of BPOs for the Puerto Rico Telephone Agency and the Pennsylvania Housing Finance Agency.

All of these offerings are part of a program by Lehman to sell more exotic municipal bonds to sophisticated investors. The program, appropriately called "strips and pieces," is described in a brochure which speaks of "bull floaters" and "bear floaters," among other creatures.

According to Lehman officials, the BPOs were designed for investors looking to boost yields and plug holes in their portfolios left by bonds that were called away as interest rates dropped. They were also designed for investors hoping to hedge against other volatile bonds. Some of the pieces give the investor the right to claim a certain coupon or principal payment at some date in the future. Others are the popular inverse-floaters, called bull floaters in the brochure, which pay more than plain-vanilla bonds when short-term interest rates fall and less when they rise. On the other hand, the bear floaters pay more than plain-vanilla bonds when short-term rates rise and less when they fall. After five years, both bull and bear floaters convert to fixed-rate securities. The bear floaters would then have a fixed rate of 5.5% while the bull floaters would yield 3.5% or 1.5%, depending on which BPO package they are separated from.

The bonds sold yesterday could be purchased in denominations of $5,000, if bought in whole parts, as more than half of them were, according to Mr. Gray. Despite the low denominations, Lehman isn't actively marketing the BPOs to individual investors, Mr. Gray said. But some of the bits and pieces, like inverse floaters, for example, wouldn't be such a bad idea for individuals interested in holding them until maturity, he added.