Chapter 3

The Yield Curve, a Treasury Pack and Fitted Curve Analysis

This chapter is an excerpt from *A Morgan Stanley Guide to Fixed Income Analysis* by Andrew R. Young, ©2003 Morgan Stanley & Co. Incorporated.

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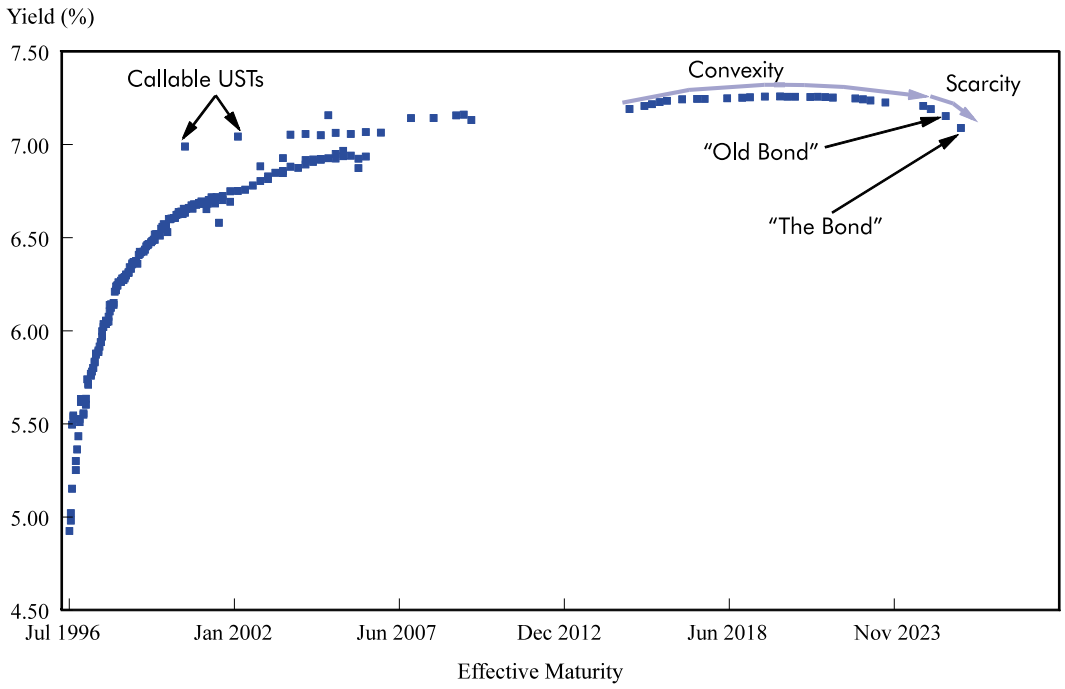
In This Chapter, You Will Learn...

- The Relationship Between STRIPS and Coupon Bonds
- How to Use a Treasury Pack
- How to Hedge Using Duration
- Butterfly Hedging
- How to Construct and Use a Fitted Curve

Yield vs Maturity

U.S. Treasury Coupon Bond Yields from Tuesday, June 25, 1996 Pack



Note: Callable Treasuries at a premium are plotted to the call date.

The most liquid, fundamental type of security is a U.S. Treasury coupon bond

These securities are regularly issued by the Treasury to finance the U.S. government

The yields of these securities can be plotted against maturity to create a *yield curve;* this particular yield curve is *upward sloping*

Yield can also be plotted against duration to adjust better for different coupon rates

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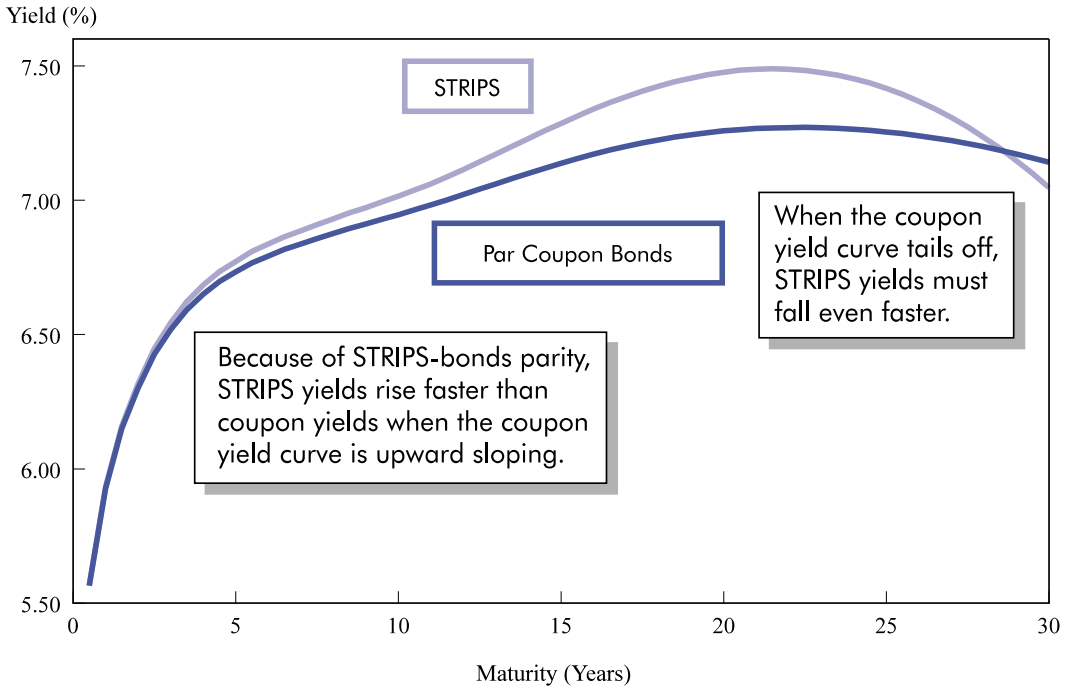
The STRIPS Curve and the Coupon Bond Curve

Benchmark Treasury Yields from Tuesday, June 25, 1996 Pack

There is a yield curve for both coupon bonds and STRIPS (zero-coupon bonds)

The coupon bond curve shown here is for fairly-priced hypothetical par bonds (priced at 100%)

Two bonds with the same maturity but different coupons (and, therefore, prices and durations) will usually have different yields



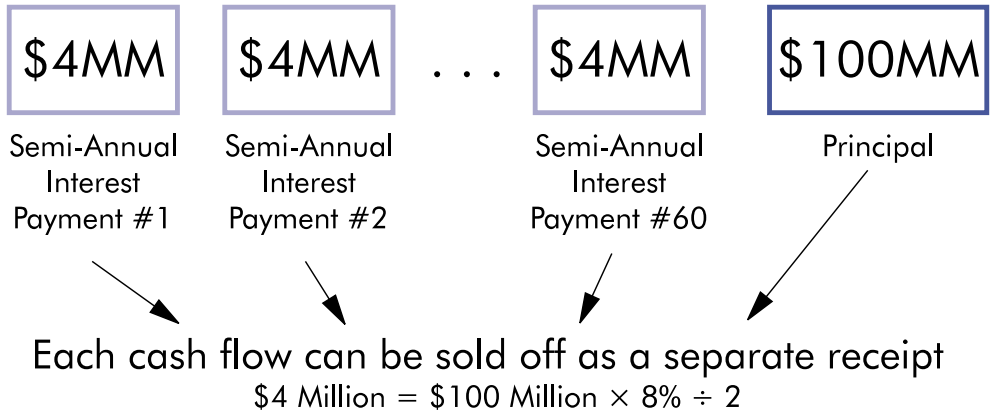
The coupon curve is usually upward sloping (positive), although there have been times when it has been flat or inverted. Theories for why the yield curve should be positive include:

- "rational expectations," where investors generally believe inflation will rise in the future,
- "term premiums," where investors need to earn a higher expected rate of return to compensate them for the risks of owning longer-term securities, and
- "investor segmentation," where different sets of investors are restricted to or have preference for different parts of the yield curve, so there are actually different supply and demand equilibria. For example, money-market funds have a greater demand for short-term securities than for long-term securities.

Stripped Treasury Securities

$100 Million of an 8% 30-year Treasury Bond

Suppose the above security is purchased to create stripped zero-coupon Treasury securities. The cash flow from this bond is 60 semi-annual payments of $4 million each plus the repayment of $100 million principal at maturity:



Most "strippable" securities (10-years and 30-years original-issue only) mature on February, May, August or November 15, so only the STRIPS that mature on these dates have significant liquidity. In 1996, the Treasury began issuing strippable securities maturing in July and October, so there is potential for STRIPS maturing on these cycles as well. Coupon STRIPS are separated coupon payments, and principal STRIPS are separated principal payments. While it is impossible to determine which issue was the source of a coupon STRIPS, principal STRIPS correspond directly to the specific bond from which they were created. A bond can be reconstituted from the correct amount of each of its component STRIPS. Principal STRIPS are always priced so that the value of all of a bond's STRIPS added together is very close to the value of the bond itself. This is sometimes called *STRIPS-bonds parity.* If all bonds were priced consistently, a coupon and a principal STRIPS with the same maturity would have identical prices, because they are both U.S. Treasury obligations.

The process of selling individual coupon and principal payments separately is called *coupon stripping*

This process creates STRIPS, which are separately traded zero-coupon securities

STRIPS are bought, sold, and held the same way as the underlying Treasuries, except they are most often quoted on a yield basis

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Understanding the STRIPS Curve

The Bootstrap Method

By doing some simple calculations, we can understand how the shape of the coupon curve affects the shape of the STRIPS curve

This is called the *bootstrap* method because we start with what we know and then "pull up" our knowledge one step at a time

The present value of a UST coupon bond is very close to the total value of its cash flows, each discounted at the relevant STRIPS yield

Therefore, the coupon bond's yield is some kind of average of the STRIPS yields

Example 1

Term	Coupon Rate	Coupon Bond Yield	STRIPS Yield
6-Month	6.000%	6.000%	?
1-Year	6.500%	6.500%	?

Hints: What is the present value of each bond?

What is the value of the first coupon payment of the 1-year security (assuming UST cash flows are priced consistently, regardless of their source)?

Example 2

Term	Coupon Rate	Coupon Bond Yield	STRIPS Yield
20-Year	8.000%	8.000%	8.500%
20½ -Year	8.000%	7.950%	?

Hints: What is the present value of each bond?

What is the value of the first 40 coupon payments on the 20-year?

What is the value of the first 40 coupon payments on the 20½-year (assuming UST cash flows are priced consistently, regardless of their source)?

Understanding the STRIPS Curve (Continued)

The Bootstrap Method

Given:

Term	Coupon Rate	Coupon Bond Yield	Coupon Bond Price	STRIPS Yield
6-Month	6.000%	6.000%	100%	?
1-Year	6.500%	6.500%	100%	?

Our task is to calculate the 1-year STRIPS' yield.

The 1-year bond comprises two cash flows; the value of the bond is the sum of the values of the individual flows:

$$PV_{1\text{-}Year\ Bond} = PV_{6\text{-}Month\ Cash\ Flow} + PV_{1\text{-}Year\ Cash\ Flow} = 100\%$$

$$= \frac{6.500\%}{2} \times PV_{6\text{-}Month\ STRIPS} + \left(100\% + \frac{6.500\%}{2}\right) \times PV_{1\text{-}Year\ STRIPS}$$

Assuming consistent pricing, the yield of the 6-month STRIPS is the same as the yield of the 6-month bond since both securities have a single cash flow on the same date. The present value of the 6-month STRIPS is then:

$$PV_{6\text{-}Month\ STRIPS} = \frac{100\%}{\left(1 + \frac{6.000\%}{2}\right)} = 97.087379\%$$

The yield of the 1-year STRIPS is then derived from the following two equations:

$$PV_{1\text{-}Year\ STRIPS} = \frac{100\% - \frac{6.500\%}{2} \times PV_{6\text{-}Month\ STRIPS}}{\left(100\% + \frac{6.500\%}{2}\right)} = 93.796281\%$$

$$y_{1\text{-}Year\ STRIPS} = 2 \times \left(\sqrt{\frac{100\%}{PV_{1\text{-}Year\ STRIPS}}} - 1\right) = 6.508\%$$

Determining the yield of the 1-year STRIPS using the bootstrap method depends critically on the assumption that the 6-month coupon from the 1-year bond is priced the same as the coupon and principal from the 6-month bond

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Understanding the STRIPS Curve (Continued)

The Bootstrap Method

The effect of a change in coupon bond yields on STRIPS yields can be understood by estimating how much STRIPS yields would have to change to produce a given change in the value of the whole bond

The principal payment contributes less and less to the present value of a bond as maturity increases; the yield of that principal must, therefore, change by more to affect the yield of the security

Example 1

Term	Coupon Rate	Coupon Bond Yield	STRIPS Yield
6-Month	6.000%	6.000%	6.000%
1-Year	6.500%	6.500%	**6.508%**

Because the majority of the value of the 1-year bond is in the final payment, the steepness of the coupon bond curve does not imply a significantly steeper STRIPS yield curve.

Example 2

Term	Coupon Rate	Coupon Bond Yield	STRIPS Yield
20-Year	8.000%	8.000%	8.500%
20½ -Year	8.000%	7.950%	**8.355%**

Because the majority of the value of the 20-year bond is in its coupons, the yield of the final cash flow has to fall dramatically to affect the overall yield of the bond.

Using the bootstrap method, if an n-period bond with coupon c pays f times per year and has present value PV_{Bond}, and given prices of the STRIPS with shorter maturities $PV_{i\text{-}Period\ STRIPS}$, where $i<n$, then the present value of the n-period STRIPS is

$$PV_{n\text{-}Period\ STRIPS} = \frac{PV_{Bond} - \frac{c}{f} \times \sum_{i=1}^{n-1} PV_{i\text{-}Period\ STRIPS}}{100\% + \frac{c}{f}}$$

and the yield follows from the present value.

STRIPS Quote Sheets in a Treasury Pack

U.S. Treasury Prices from Tuesday, June 25, 1996 Pack

At the end of this chapter, there is a representative Treasury pack for trade on June 25, 1996 (settling on June 26, 1996). The prices are as of the close on June 24, 1996.

A Treasury pack provides a large quantity of information that is useful on a daily basis

The first page of the pack contains a STRIPS quote sheet for both coupon and principal STRIPS. STRIPS have fewer differentiating features and so are often presented in a compressed form.

A pack for a given trade date usually contains closing prices for the prior business day for settlement on the business day after the trade date

- The top section of the sheet shows contemporaneous price and yield closes for the Treasury benchmark issues. This shows the context of the STRIPS yields.
  - There is a listing of the benchmarks. Between each successive pair of benchmarks is the yield spread between those benchmarks.
  - Under each benchmark is its closing bond-equivalent yield and its closing price. For the 1-year bill, the "price" is the discount (quoted) yield (covered later).

At the end of this chapter, there is a representative pack for June 25, 1996 (trade date)

- The main section of the report lists coupon STRIPS in maturity order, followed by principal STRIPS in maturity order.
  - The first column of this section shows the STRIPS maturity. These STRIPS mature on either February 15, May 15, August 15, or November 15.
  - The second column lists the bid yield for each STRIPS, i.e., the yield at which the provider of the quote sheet is willing to buy the STRIPS. The firm would usually offer to sell the STRIPS at a lower yield (translating to a higher price) in order to create the potential for a profit.

The first page in the Treasury pack contains yields for STRIPS

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Coupon Quote Sheet in a Treasury Pack

U.S. Treasury Prices from Tuesday, June 25, 1996 Pack

The rest of the pack contains prices, yields, and other information for Treasury coupon notes and bonds and Treasury bills

There is substantially more useful detail about coupon securities than that contained on the compressed page. The next set of pages shows information about Treasury coupon notes and bonds. Some of the information, notably duration and CUSIP, would also be useful for the STRIPS; similar pages could be constructed for the STRIPS, but are not shown here to save (a little) space. Each security takes at least two rows.

The second page in the pack provides information regarding the benchmark Treasury coupon notes and bonds and bills. The most recently auctioned Treasury issue for each maturity is referred to as the *current* or *on-the-run* issue and is so indicated in the first column. The Treasury currently issues 3- and 6-month bills, 1-year bills, 2-, 3-, 5- and 10-year notes, and 30-year bonds.

Term	When Issued	Issuance Cycle
3-Month Bill	1929–Current	Issued every Thursday; mature 13 weeks later
6-Month Bill	1958–Current	Issued every Thursday; mature 26 weeks later
1-Year Bill	1967–Current	Issued every fourth Thursday; mature 52 weeks later
2-Year Note	1974–Current	Usually issued on last day of every month or on the next following business day
3-Year Note	1978–Current	Usually issued on 15th of February, May, August, and November
5-Year Note	1991–Current	Usually issued on last day of every month or on the next following business day; prior to 1991, there were similar maturities
10-Year Note	1978–Current	Traditionally issued on 15th of February, May, August, and November; in 1996, extended to include July and October 15 issues
30-Year Bond	1978–Current	Usually issued February, May, August, and November 15; May and November issuance was cut in 1993, but November was reinstated in 1996

Coupon Quote Sheet in a Treasury Pack (Continued)

U.S. Treasury Prices from Tuesday, June 25, 1996 Pack

The same information about a complete list of Treasury notes and bonds follows on the next pages, broken down into the following sectors: 0- to 3-, 3- to 5-, 5- to 15-, and 15- to 30-year securities. Each sector lists all the benchmark bonds, even those not in the sector.

- The first column on each Treasury sheet flags various characteristics of the Treasury security.
  - The term of the issue, if it is a current benchmark.
  - "B" indicates a "bad" end date. The security matures on a weekend or holiday, and the money will not be available until the next business day. The bond pays the same amount regardless of the actual payment date. For example, the 6¼% of August 31, 1996 yields 5.545%, 39 basis points more than a bond just 15 days shorter. However, August 31, 1996 is a Saturday. The yield of the bond to a September 3, 1996 (remember Labor Day!) receipt date is much more fair: 5.304%.
  - "O" signifies an *odd first coupon*. An odd first coupon means that the bond began accruing interest from a date that does not lie on the coupon cycle, so the first coupon's size is irregular. The first coupon may be either *long* (greater than normal) or *short* (less than normal). The size of the first coupon has no consequence after it has been paid.
  - "F" represents a "phantom," or old (but recent) on-the-run, issue. These securities tend to have better-than-average liquidity.

Coupon Quote Sheet in a Treasury Pack (Continued)

U.S. Treasury Prices from Tuesday, June 25, 1996 Pack

  - "WI" indicates that the issue is trading on a *when-issued* basis and has an original settlement date that is later than the next business day. No investor actually owns the issue. If the security has not yet been auctioned, the coupon is not known, and trades are done on a yield basis; actual prices are computed after the auction sets the coupon. In the auction for 2- and 5-year notes, every winning bidder buys at the same price; this is called a *Dutch auction*. In all the other auctions, the highest bidders win and buy at the (different) prices bid in the auction. During the auction process, the Treasury sets the coupon to be the average fill level (average of winning yields), rounded down to the nearest eighth; most winners will buy at a discount.

- The second column identifies the coupon (or "BILL" if the security is a Treasury bill benchmark), and the third column identifies the maturity. If the bond is callable, there is a third row with the call year. Note that all existing callable Treasuries are callable at par five years prior to maturity.

- The fourth column shows the previous day's closing bid price, as well as the bid *yield-to-maturity*. If the Treasury is callable, there is a third row that contains the bid *yield-to-call.* The firm providing the quote sheet would generally stand ready to sell at a higher price (lower yield).

  - Treasury coupon securities usually trade on price in units of $\frac{1}{8}$ of a 32nd of a percent of par. Usually, par is assumed to be $100, so that a price of 99% and a price of 99 mean the same thing. For example, the quote of 99-03 for the current five-year note refers to a price of 99 and $\frac{3}{32}$ percent of par.

Coupon Quote Sheet in a Treasury Pack (Continued)

U.S. Treasury Prices from Tuesday, June 25, 1996 Pack

– A plus sign ("+") following the number of 32nds means that a 64th, or ½ of a 32nd, is added to the price. For example, the price of the current 30-year bond is 86-18+, which refers to a price of 86 and $^{37}/_{64}$ percent of par.

– A number (1–7) following the number of 32nds indicates how many 8ths of a 32nd are added to the price. For example, the price of the current 3-year note is 99-222, which indicates a price of

$$99+\frac{22\frac{2}{8}}{32} \text{ or } 99 \text{ and } {}^{178}/_{256} \text{ percent of par.}$$

This is read "99-22 and a quarter" ($\frac{2}{8}$ is simplified to ¼). Another example is the 6% of August 31, 1997 with a price of 99-303, which indicates a price of 99 and $^{243}/_{256}$ percent of par. This would be read "99-30 and three-eighths."

– Treasury coupon securities are also quoted on a yield-to-maturity basis. The yield-to-maturity is the discount rate that equates the present value of the cash flows (interest and principal) to the market price plus accrued interest. If the yield-to-maturity is given, then the present value of the bond is the present value of all the cash flows using that yield, and the price is the present value less accrued interest. Treasury securities with less than six months until maturity follow a slightly different simple-interest convention.

Treasury securities are quoted on both a yield and a price basis; since they are mathematically related, one can always be converted to the other

Coupon Quote Sheet in a Treasury Pack (Continued)

U.S. Treasury Prices from Tuesday, June 25, 1996 Pack

Any callable security, given a market price, can be quoted on a YTM or YTC basis; the yields are different, but both will produce the actual price of the bond in the market

  - Some Treasury securities are callable and are also quoted using a yield-to-call. The yield-to-call is the interest rate that will make the present value of the cash flows of the bond, if called at the first possible opportunity, equal to the actual present value of the bond. The price of the bond is determined in the market and does not change regardless of how investors analyze or quote yield. If the bond is currently trading at a premium, we usually quote the yield assuming that the bond will be called, and so it "trades to call." If the bond is currently trading at a discount, then we assume that it will not be called, so it "trades to maturity." The lower of yield-to-maturity and yield-to-call is called the *yield-to-worst* and is another measure of potential return. The yield-to-worst is identified for each price in the quote sheet by an "r" preceding it; since most callable bonds have high coupons, the yields-to-call are identified with the "r." For example, the yield-to-maturity of the 11¾% due November 15, 2014 is 7.71%, but the yield-to-call is 7.13%. Therefore, the bond trades to call; the bond's yield-to-call is applied to the call date to calculate the market price.

- In the fifth column, the first row contains the yield value of a 32nd increase in dollar price (*YV32*). The value of a 32nd, also known as the value of a tick, measures the change in yield of a security if its dollar price increases by one 32nd of a percent. For example, if the 2-year note's price rises by one 32nd to 99-15+, its yield will fall to 6.302% – 0.0175% = 6.284%. The second row contains the CUSIP, a unique nine-digit security identifier in wide use for identifying and settling domestic securities.

Coupon Quote Sheet in a Treasury Pack (Continued)

U.S. Treasury Prices from Tuesday, June 25, 1996 Pack

- The sixth column contains the amount outstanding, in millions, and the Macaulay duration. If the bond is callable, the third row contains the Macaulay duration-to-call. In order to use the quote-sheet duration correctly, it must be converted using the formula

$$Duration_{Modified} = \frac{Duration_{Macaulay}}{\left(1 + \frac{y}{f}\right)}$$

  For example, the listed duration of the long bond is 12.82. The modified duration is 12.38.

- Columns seven through 11 show the yield for various incremental changes in price. This information is useful for quickly determining the yield given a price quote.

  For example, the closing price of the 5-year was 99-03. In the "Tic–1" column, its price is "31." This means 98-31, a different *handle* (the most significant part of price, i.e., "99" or "98"). Always know your handle! If the bond is callable, the third row shows the yield-to-call for that scenario.

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Coupon Quote Sheet in a Treasury Pack (Continued)

Other Useful Concepts

- *Current yield*, which is defined as coupon divided by price
- Modified duration (present value or price)
- Convexity (or gain from convexity)
- Dollar value of a basis point (*DV01* or *PV01*). *DV01* is the change in price for a one-basis-point change in yield, i.e., *0.01%* × $Duration_{Dollar}$. It is directly related to *YV32*. Based on the definition of dollar duration:

$$Duration_{Dollar} \cong -\frac{\Delta P}{\Delta y} = \frac{DV01}{0.01\%} = \frac{1/32}{YV32}$$

Thus,
$$DV01 = \frac{1/32 \times 0.01\%}{YV32}$$

Treasury Bills in a Treasury Pack

U.S. Treasury Prices from Tuesday, June 25, 1996 Pack

A Treasury pack also contains information about Treasury bills

The final two pages in the representative Treasury pack are the bill pages. Treasury bills are *discount* securities and pay no coupon.

- The first column indicates which bills are the most recently issued benchmarks and which bills are trading on a when-issued basis. It also has the name of the security, "BILL."

- The second column displays the maturity of the bill.

- The third column shows the closing bid discount yield and bond-equivalent yield. Treasury bills are usually quoted on a discount-yield basis; that is how the Treasury auctions them.

  – For the purpose of discussing these yields, define d to be the actual number of days between settlement and maturity.

  – Discount yield and price are related by the following formulas:

$$Yield_{Discount} = \left(\frac{Par - Price}{Par}\right) \times \left(\frac{360}{d}\right)$$

$$Price = Par - Yield_{Discount} \times Par \times \frac{d}{360}$$

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Treasury Bills in a Treasury Pack (Continued)

U.S. Treasury Prices from Tuesday, June 25, 1996 Pack

Bond-equivalent yield usually allows us to compare yields of securities with different quoting conventions on an equal footing

However, the "bond-equivalent yield" for a Treasury bill is calculated according to unique conventions that only approximate putting it on an equal footing

– For three reasons, the discount yield is not a meaningful measure of the return from holding a Treasury bill. First, the measure is based on the face value, rather than the market value, of the investment. Second, the yield is annualized according to a 360-day year instead of a 365-day (or 366-day) year, making it difficult to compare Treasury bill yields with those of Treasury notes and bonds, which pay interest on an actual/actual basis. And third, discount yield does not compound.

– For Treasury bills, bond-equivalent yield is only an estimate of the actual/actual semi-annual yield that discounts the future cash flows to their market value. Nevertheless, the only bond-equivalent yield that is ever used for a Treasury bill is this estimate:

$$d \le 182 \Rightarrow y_{BEY} \equiv \frac{Par - Price}{Price} \times \frac{365}{d}$$

$$d > 182 \Rightarrow y_{BEY} \equiv 2 \times \left[\left(1 + \frac{Par - Price}{Price} \right)^{\frac{182.5}{d}} - 1 \right]$$

Unfortunately, this convention produces a different bond-equivalent yield for T-bills than STRIPS with the same maturity and price, so the BEY for bills is not on "equal footing."

- The fourth column shows the CUSIP of the Treasury bill.
- The fifth through ninth columns contain the bond-equivalent yields corresponding to discount yield up and down two basis points, in one-basis-point increments.

U.S. Treasury Prices from Tuesday, June 25, 1996 Pack

Dollar duration quantifies a bond's or portfolio's sensitivity to a parallel change in interest rates. A first-order hedge would be to offset a risk position with a hedge security with the same dollar duration. Recall that dollar duration and present value of a basis point (*PV01*) measure the same thing: the change in value for a small change in yield. For this reason, the hedge can also be described as matching the *PV01*.

A bond is a hedge if its dollar-duration exposure offsets that of another bond or portfolio

Deviation of the value of the hedge from the value of the hedged asset is called *basis risk;* the quality of a hedge is often measured by its basis risk

Use the following table to hedge a long position (owning) the 5.125% of November 30, 1998 by shorting (selling) the 6% of May 31, 1998:

	Par	Coupon (%)	Maturity	Price (%)	Accrued (%)	PV (%)	Modified PV Duration	Dollar Duration (%)
Long								
	100.000	5.125	11/30/98	97-037				
Short								
		6.000	5/31/98	99-14+				

Hedging (Continued)

U.S. Treasury Prices from Tuesday, June 25, 1996 Pack

A single-bond hedge is exposed to the yield relationship of the two securities

If the yield curve has a non-parallel shift, any difference in the durations of the securities may cause a change in the yield relationship

Hedges often age differently than the underlying position and require rebalancing (for example, the durations of two bonds decline at different rates as time passes)

	Par	Coupon (%)	Maturity	Price (%)	Accrued (%)	PV (%)	Modified PV Duration	Dollar Duration (%)
Long								
	100.000	5.125	11/30/98	97-037	0.364	97.485	2.233	217.710
Short								
	121.998	6.000	5/31/98	99-14+	0.426	99.879	1.787	217.710

The hedge security has a duration almost half a year shorter than the underlying position. Therefore, hedging a long position in the 5⅛% bond would require selling a greater par amount of the 6% bond. If the yield curve steepens, the hedge security should "rally" more. Since this strategy is short the hedge security, the hedge would lose money against the underlying position.

The hedge is also affected by the passage of time. If yields remain unchanged, the dollar duration of the underlying position would be 211.058 in one month. The dollar duration of the hedge would be 209.088. The hedge's "efficiency" with respect to a parallel shift in interest rates would decline from 100% to 99%.

More Complex Hedges

U.S. Treasury Prices from Tuesday, June 25, 1996 Pack

Suppose you own the 5.125% of November 30, 1998. You want to hedge using the current 2-year and 3-year, such that the trade is proceeds-neutral. The duration (and dollar duration) of the long and short positions will cancel out. The long—single-security—position is called a *bullet* (because its cash flows are more concentrated), while the short—combination—position is called a *barbell* (because its cash flows are more dispersed).

A *butterfly* is a proceeds- and duration-neutral three-bond trade where a bond is hedged with both a longer-duration and a shorter-duration bond

A butterfly has much less basis risk than a hedge with only one bond

Butterfly analysis can also provide a good methodology for intra-day Treasury repricing

Weight the trade:

Par	Coupon (%)	Maturity	Price (%)	PV (%)	Modified PV Duration
Long					
100.000	5.125	11/30/98	97-037		
Short					
	6.000	5/31/98	99-14+		
	6.375	5/15/99	99-222		

Q1: Which side of the trade has higher convexity?

Q2: A common measure (discussed in Chapter 5) for estimating the internal rate of return for a portfolio is dollar-duration-weighted yield. In an upward-sloping yield curve, which side of this trade has a higher dollar-duration-weighted yield?

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More Complex Hedges (Continued)

U.S. Treasury Prices from Tuesday, June 25, 1996 Pack

A barbell always has higher convexity than a bullet because it has more dispersion of cash flows (Example: a 5-year zero vs. cash and a 10-year zero)

In an upward-sloping yield curve, a barbell usually has higher dollar-duration-weighted yield because the higher yield of the long leg gets more weight

The barbell portfolio is constructed so that it has the same proceeds and dollar duration as the bullet security:

Proceeds	Dollar Duration
$Par_{Barbell\text{-}Short} \times PV_{Barbell\text{-}Short}$	$Par_{Barbell\text{-}Short} \times PV_{Barbell\text{-}Short} \times D_{Barbell\text{-}Short}$
$+ Par_{Barbell\text{-}Long} \times PV_{Barbell\text{-}Long}$	$+ Par_{Barbell\text{-}Long} \times PV_{Barbell\text{-}Long} \times D_{Barbell\text{-}Long}$
$= Par_{Bullet} \times PV_{Bullet}$	$= Par_{Bullet} \times PV_{Bullet} \times D_{Bullet}$

Solving for the par amounts:

$$Par_{Barbell\text{-}Short} = \frac{Par_{Bullet} \times PV_{Bullet} \times \left(D_{Barbell\text{-}Long} - D_{Bullet}\right)}{PV_{Barbell\text{-}Short} \times \left(D_{Barbell\text{-}Long} - D_{Barbell\text{-}Short}\right)}$$

$$Par_{Barbell\text{-}Long} = \frac{Par_{Bullet} \times PV_{Bullet} \times \left(D_{Bullet} - D_{Barbell\text{-}Short}\right)}{PV_{Barbell\text{-}Long} \times \left(D_{Barbell\text{-}Long} - D_{Barbell\text{-}Short}\right)}$$

Par	Coupon (%)	Maturity	Price (%)	PV (%)	Modified PV Duration
Long					
100.000	5.125	11/30/98	97-037	97.485	2.233
Short					
42.621	6.000	5/31/98	99-14+	99.879	1.787
54.685	6.375	5/15/99	99-222	100.423	2.579

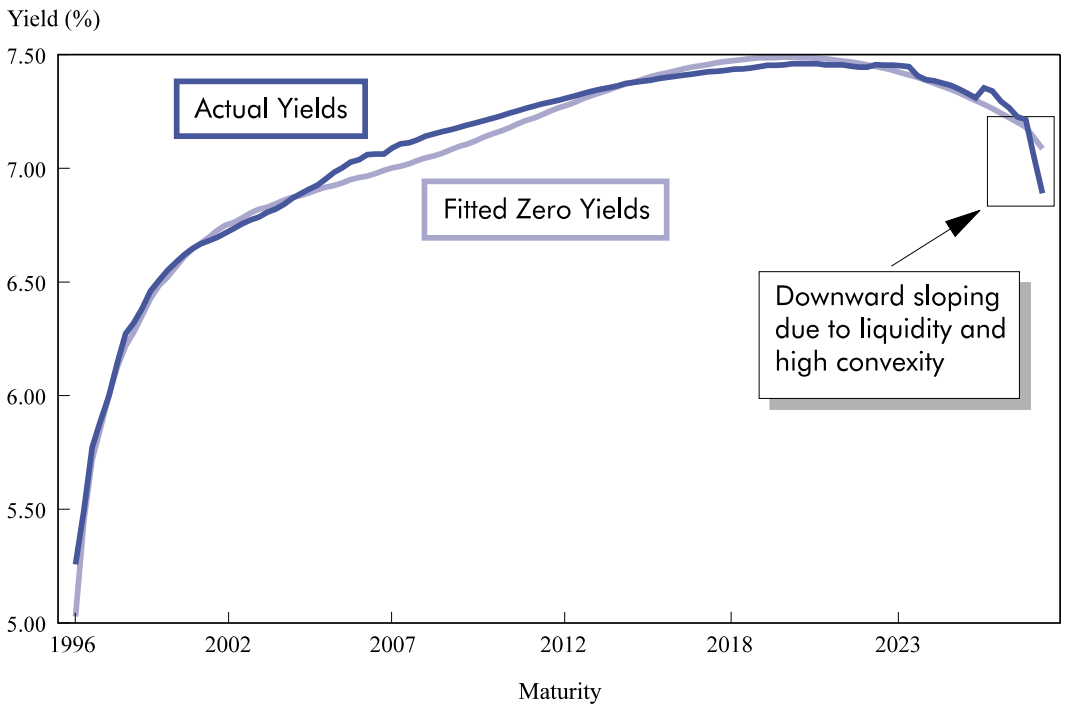
This trade will roughly break even if the yield change on the long position equals the dollar-duration-weighted yield change on the short position. Because the barbell is approximately replicating the bullet, the change in value of the barbell should approximate the change in value of the bullet. This suggests a useful algorithm for estimating intra-day off-the-run Treasury prices when the market has not shifted too dramatically.

The Fitted Curve

U.S. Treasury Prices from Tuesday, June 25, 1996 Pack

The fitted yield curve is a smoothed discount (zero-coupon) curve for the entire Treasury market; the curve can be used to price coupon bond cash flows, thus producing a fitted yield and a fitted price for coupon bonds.

Some relative-value trading strategies compare actual market yields to the fitted curve.



The fitted yield curve is an internally consistent curve that, in aggregate, does the "best" job of pricing individual Treasury securities

Actual bond prices can be compared to their fitted prices to determine if the bonds are richer or cheaper than "average"

Morgan Stanley

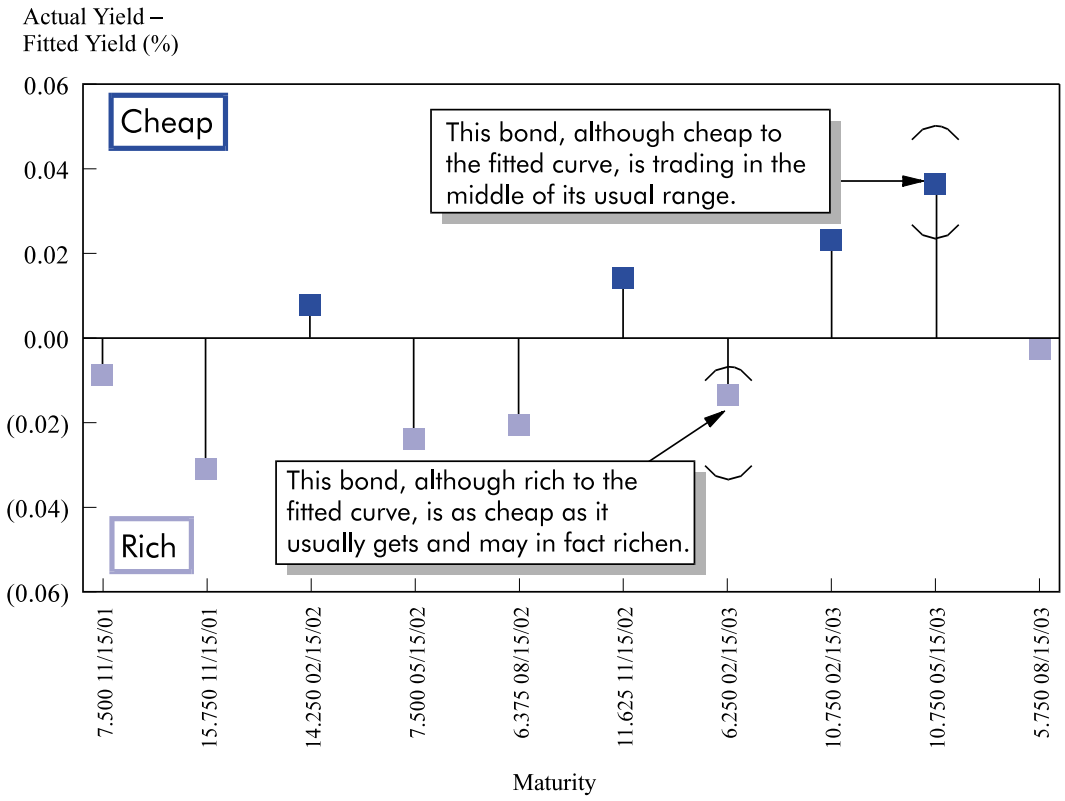
Valuing Treasuries on the Fitted Curve

U.S. Treasury Prices from Tuesday, June 25, 1996 Pack

A fitted-curve analysis can identify bonds with cheaper or richer cash flows for investment purposes

However, a fitted-curve analysis provides limited insight into short-term trading phenomena: cheap bonds can cheapen, and rich bonds can richen

Another phase of the analysis would be a comparison of richness or cheapness to historical levels



This graph depicts what happens when we subtract fitted yield from actual yield.

If actual yield is higher than fitted, we have a "cheap" security. If actual yield is lower than fitted, we have a "rich" one.

Before deciding whether to buy or sell, we must also look at the historical trading ranges.

Constructing a Fitted Zero Curve

Advanced

The objective of the curve-fitting is to find a function for zero-coupon yields (or, equivalently, prices) for pricing individual cash flows. Pricing each cash flow of a bond independently and summing them provides the bond's fitted present value. A reasonable measure to gauge the success of the fit is the total of the squared pricing errors of the bonds (the difference between the bond's actual and fitted price, multiplied by the amount outstanding).

A fitted zero curve contains all the information necessary to build a fitted par curve, but is more efficient to compute

One method for constructing a fitted zero curve is to estimate a curve that minimizes the total squared difference between each Treasury bond's value in the market and its value according to the curve

Define the function *f(t)* to be the fitted present value of a zero-coupon bond of term *t*. Then the problem would be to choose *f(t)* to minimize the total squared error *E*:

$$E = \sum_{i=1}^{Number\ of\ Bonds} \left[Outstanding_i \times \left(PV_i - \sum_{j=1}^{(Number\ of\ Cash\ Flows)_i} Cash\ Flows_{ij} \times f\left(Term_{ij}\right) \right) \right]^2$$

The following two pages define a methodology for fitting *f(t)* as the exponential of a *cubic spline.* The Treasury fitted curve in the prior pages was built using this technique on a five-segment spline with knot points at ¾, three, six, and 12 years. The spline has seven independent parameters, which must be chosen using a finicky general optimizer, such as the *variable metric method.*[1] Experts agree that when you need a general optimizer, call an expert.

The same technique can be used to fit corporate, mortgage, and other types of curves.

[1] William Press et al., *Numerical Recipes in C,* 2nd ed. New York: Cambridge University Press, 1995.

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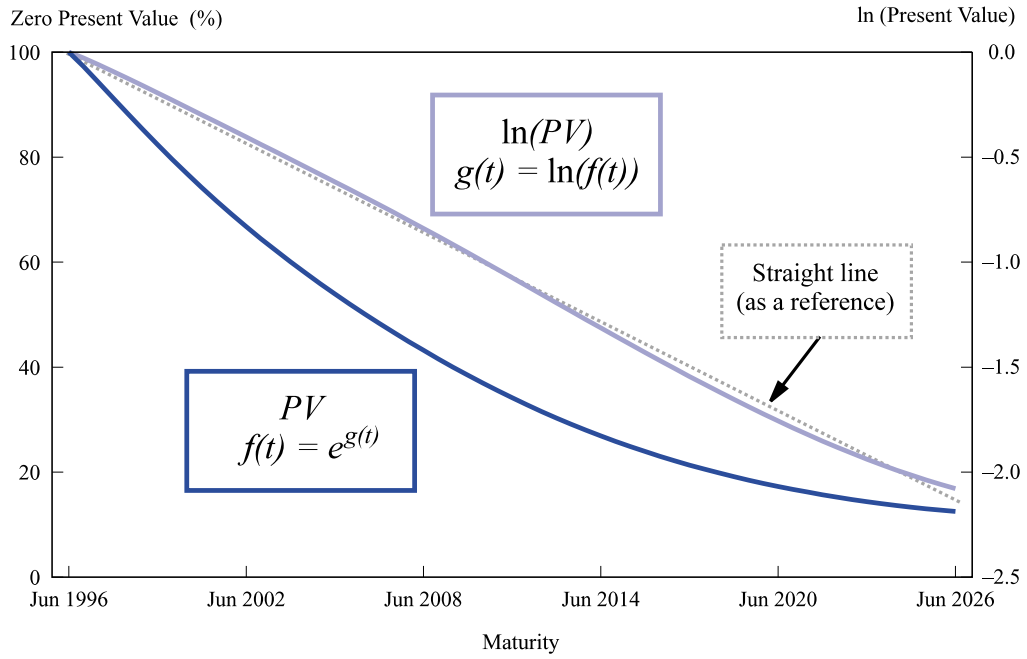
Constructing a Fitted Zero Curve (Continued)

Advanced

By taking the log of the fitted price function, we get a nearly linear relationship that is easier to fit

Most curve-fitting methodologies do better the closer the actual function is to a straight line. For zero-coupon bonds, price is much more linear than yield, and log of price more linear still. Consequently, this approach constructs a concise model for the log of price. Note that if a function cannot be linearized, it helps to look for an estimating function shaped like the data.



A cubic spline is a common fitting function. It has different segments, and each segment has its own cubic (third degree) polynomial. The polynomials are constrained so that, at each intersection of two segments (a *knot* point), both functions have the same value, slope, and curvature (the resulting function is continuous and twice differentiable everywhere). The cubic spline has reasonable flexibility and appears smooth.

Constructing a Fitted Zero Curve (Continued)

Advanced

Mathematically, define the function for segment k for time $t_k \le t \le t_{k+1}$ to be $g_k(t)=a_k+b_kt+c_kt^2+d_kt^3$. As an end condition, $t_0=0$. Then if the unconstrained variables are defined to be b_0, c_0 and d_k (with $a_0 \equiv 0$ so that $f(0)=e^{g(0)}=e^0=100\%$), then a_k, b_k, and c_k are defined as follows for $k > 0$:

$$g_k''(t_k) = g_{k-1}''(t_k) \Rightarrow c_k + 3d_kt_k = c_{k-1} + 3d_{k-1}t_k \Rightarrow c_k = c_{k-1} + 3t_k(d_{k-1} - d_k)$$

$$g_k'(t_k) = g_{k-1}'(t_k) \Rightarrow b_k + 2c_kt_k + 3d_kt_k^2 = b_{k-1} + 2c_{k-1}t_k + 3d_{k-1}t_k^2 \Rightarrow b_k = b_{k-1} - 3t_k^2(d_{k-1} - d_k)$$

$$g_k(t_k) = g_{k-1}(t_k) \Rightarrow a_k + b_kt_k + c_kt_k^2 + d_kt_k^3 = a_{k-1} + b_{k-1}t_k + c_{k-1}t_k^2 + d_{k-1}t_k^3 \Rightarrow a_k = a_{k-1} + t_k^3(d_{k-1} - d_k)$$

The function for $g_k(t)$ and the fitted-price curve $f_k(t)$ are, therefore, defined piece-wise in terms of the unconstrained variables for $t_k \le t \le t_{k+1}$ as

$$g_k(t) = \sum_{m=1}^{k} t_m^3 \times (d_{m-1} - d_m) + \left[b_0 - 3\sum_{m=1}^{k} t_m^2 \times (d_{m-1} - d_m) \right] \times t + \left[c_0 + 3\sum_{m=1}^{k} t_m \times (d_{m-1} - d_m) \right] \times t^2 + d_k \times t^3$$

or, alternatively,

$$g_k(t) = b_0 \times t + c_0 \times t^2 + \sum_{m=1}^{k} \left(t_m^3 - 3t_m^2 t + 3t_m t^2 \right) \times (d_{m-1} - d_m) + d_k \times t^3$$

Now that we have $g_k(t)$, we can substitute it in $f_k(t)=e^{g_k(t)}$ to obtain our fitted discount function.

A common function for fitting a curve is the cubic spline, a "smooth" set of cubic polynomials

Choosing the spline parameters to minimize error requires a general optimizer (more complicated than ordinary least squares)

Morgan Stanley

Constructing a Fitted Par Curve

U.S. Treasury Prices from Tuesday, June 25, 1996 Pack

A fitted par curve is equivalent to a fitted zero curve

The fitted par curve tells what coupon would equal the yield-to-maturity (and thus price the bond at par) at each maturity along the curve

Recall that the present value of a bond with regular coupons can be expressed as:

$$Price+Accrued = \sum_{i=0}^{n} \frac{\frac{c}{f}}{\left(1+\frac{y_{i+1-x}}{f}\right)^{i+1-x}} + \frac{100\%}{\left(1+\frac{y_{n+1-x}}{f}\right)^{n+1-x}}$$

where x is the length of the accrual period ($0 \le x < 1$) and y_t is the yield for a t-period zero-coupon bond.

After substituting $Accrued = x \times \frac{c}{f}$ and $Price = 100\%$, this can be solved for c:

$$c = f \times \left(\frac{100\% - \frac{100\%}{\left(1+\frac{y_{n+1-x}}{f}\right)^{n+1-x}}}{\sum_{i=0}^{n} \frac{1}{\left(1+\frac{y_{i+1-x}}{f}\right)^{i+1-x}} - x} \right)$$

The U.S. Treasury par-coupon curve provides a good benchmark for relative-value analysis of corporate or mortgage new issues. For example, there have been no 7-year bonds issued recently, and all bonds in the 12- to 25-year range are very old. A par-coupon curve provides a consistent benchmark for pricing issues in these regions.

Chapter 3 Exercises

U.S. Treasury Prices from Tuesday, June 25, 1996 Pack

1. Under what conditions will the STRIPS curve lie above the coupon curve on a plot of maturity vs. yield (maturity on the x-axis)? When will it lie below the coupon curve?

2. Estimate the closing price and accrued interest for the UST 6.875% of July 31, 1999 if its yield-to-maturity falls 10 bp (from 6.548%).

3. Two separate Treasury issues mature on August 15, 1997. Why do their durations differ?

4. Given the quote sheet price for the UST 6.875% of July 31, 1999 (100-285), calculate the bond's yield, modified duration, price duration, Macaulay duration, accrued interest, and the value of an 01 and a 32nd.

5. Is the price of a 2-year fixed-rate bond more or less sensitive to movements in interest rates than the price of a 2-year floating-rate bond? Why?

6. If the 11¾% of November 15, 2014 falls in price to 135-00, what is its yield-to-call for settlement on June 26, 1996?

7. A trader has given you the 5¾% of August 15, 2003 as a benchmark for a corporate bond. On your Telerate screen, the 5-year is now trading at 100, the 10-year is now trading at 101, and the trader looks very busy. How would you estimate the current price of your benchmark?

8. You sell the 5¾% of August 15, 2003 (at the closing price) and hedge with the 5-year and the 10-year. The Fed tightens, and the curve flattens. Do you hang your head in shame or do a victory lap?

U.S. Treasury Benchmarks

Settlement Date: 6/26/96 **Trade Date: 6/25/96**

1yr	+47	2yr	+19	3 yr	+19	5yr	+22	10yr	+15		-6	30yr
5.827		6.302		6.489		6.717		6.935		7.150		7.089
5.505		99-14+		99-222		99-03		99-18		96-20+		86-18+

Coupons

8/96	5.112	2/04	6.975	2/12	7.364	2/20	7.469	11/96	5.532	2/06	7.016
11/96	5.522	5/04	7.005	5/12	7.369	5/20	7.469			5/06	6.990
		8/04	7.025	8/12	7.374	8/20	7.449	5/97	5.882		
2/97	5.762	11/04	7.045	11/12	7.379	11/20	7.434	8/97	6.002	11/09	7.360
5/97	5.872							11/97	6.162	2/15	7.404
8/97	5.987	2/05	7.060	2/13	7.394	2/21	7.439			8/15	7.419
11/97	6.157	5/05	7.080	5/13	7.399	5/21	7.434	2/98	6.297	11/15	7.429
		8/05	7.085	8/13	7.404	8/21	7.429	5/98	6.327		
2/98	6.272	11/05	7.085	11/13	7.409	11/21	7.414	11/98	6.472	2/16	7.444
5/98	6.327									5/16	7.414
8/98	6.397	2/06	7.110	2/14	7.414	2/22	7.409	2/99	6.514	11/16	7.434
11/98	6.467	5/06	7.130	5/14	7.419	5/22	7.404	5/99	6.579		
		8/06	7.140	8/14	7.424	8/22	7.399	8/99	6.629	8/17	7.464
2/99	6.524	11/06	7.150	11/14	7.429	11/22	7.384	11/99	6.659	5/18	7.464
5/99	6.564									11/18	7.464
8/99	6.594	2/07	7.160	2/15	7.434	2/23	7.364	2/00	6.687		
11/99	6.634	5/07	7.170	5/15	7.439	5/23	7.349	5/00	6.697	2/19	7.464
		8/07	7.180	8/15	7.444	8/23	7.334	8/00	6.732	8/19	7.454
2/00	6.662	11/07	7.190	11/15	7.449	11/23	7.314	11/00	6.742		
5/00	6.682									2/20	7.459
11/00	6.717	2/08	7.205	2/16	7.454	2/24	7.294	2/01	6.757	5/20	7.459
		5/08	7.215	5/16	7.459	5/24	7.284	5/01	6.772	8/20	7.459
2/01	6.722	8/08	7.225	8/16	7.459	8/24	7.274	8/01	6.797		
5/01	6.742	11/08	7.235	11/16	7.464	11/24	7.264	11/01	6.817	2/21	7.429
8/01	6.762									5/21	7.429
11/01	6.782	2/09	7.245	2/17	7.469	2/25	7.224	5/02	6.836	8/21	7.424
		5/09	7.255	5/17	7.474	8/25	7.104	8/02	6.851	11/21	7.414
2/02	6.805	8/09	7.265	8/17	7.474			2/03	6.891		
5/02	6.825	11/09	7.275	11/17	7.474	2/26	6.964	8/03	6.931	8/22	7.384
8/02	6.845									11/22	7.374
11/02	6.865	2/10	7.289	2/18	7.474			2/04	6.961	2/23	7.344
		5/10	7.299	5/18	7.474			5/04	7.001	8/23	7.299
2/03	6.885	8/10	7.309	11/18	7.474			8/04	7.011		
5/03	6.905	11/10	7.319					11/04	7.060	11/24	7.249
8/03	6.920			2/19	7.474						
11/03	6.940	2/11	7.329	5/19	7.474			2/05	7.026	2/25	7.184
		5/11	7.339	8/19	7.469			5/05	7.096	8/25	7.064
		8/11	7.344	11/19	7.469			8/05	7.106	2/26	6.899
		11/11	7.354					11/05	7.015		

Principals

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U.S. Treasury Benchmarks

Settlement Date: 6/26/96 **Trade Date: 6/25/96**

		Maturity	Ds/Yld	Cusip	Tic–2	Tic–1	Ds/Yld	Tic+1	Tic+2
			5.095		5.075	5.085	5.095	5.105	5.115
90DY	BILL	09/26/96	5.234	9127943H5	5.213	5.224	5.234	5.244	5.255
WI			5.225		5.205	5.215	5.225	5.235	5.245
180DY	BILL	12/26/96	5.441	9127943T9	5.420	5.431	5.441	5.452	5.463
			5.505		5.485	5.495	5.505	5.515	5.525
WI	BILL	06/26/97	5.827	9127942R4	5.804	5.815	5.827	5.838	5.849

	Coupon	Maturity	Pr/Yld	32nd/Cusip	Size/Dur	Tic–2	Tic–1	Pr/Yld	Tic+1	Tic+2
FB			99-14+	(0.0175)		10+	12+	99-14+	16+	18+
2YR	6.000	05/31/98	6.302	912827X98	1.85	6.372	6.337	6.302	6.267	6.232
FB			99-222	(0.0121)	19011	14+	18+	99-22+	26+	30+
3YR	6.375	05/15/99	6.489	912827X72	2.67	6.583	6.534	6.486	6.438	6.390
B			96-082	(0.0096)	9761	0+	4+	96-08+	12+	16+
	5.500	04/15/00	6.626	912827K43	3.44	6.701	6.662	6.624	6.585	6.547
F			99-03	(0.0076)		27	31	99-03	7	11
5YR	6.500	05/31/01	6.717	912827Y22	4.28	6.778	6.748	6.717	6.687	6.657
F			99-18	(0.0044)		10	14	99-18	22	26
10YR	6.875	05/15/06	6.935	912827X80	7.27	6.971	6.953	6.935	6.918	6.900
FB			86-18+	(0.0028)		10+	14+	86-18+	22+	26+
30YR	6.000	02/15/26	7.089	912810EW4	12.82	7.112	7.100	7.089	7.077	7.066

FED FUNDS 5.250

U.S. Treasury Notes and Bonds (0–3 Years)

Settlement Date: 6/26/96 **Trade Date: 6/25/96**

	Coupon	Maturity	Pr/Yld	32nd/Cusip	Size/Dur	Tic–2	Tic–1	Pr/Yld	Tic+1	Tic+2
B			100-01	(2.7381)	9250	100	0+	100-01	1+	2
	7.875	06/30/96	4.843	912827B43	0.01	7.583	6.213	4.843	3.474	2.105
			100-045	(0.5788)	7250	3+	4	100-04+	5	5+
	7.875	07/15/96	4.925	912827XT4	0.05	5.577	5.287	4.998	4.708	4.419
			100-082	(0.3156)	9250	7+	8	100-08+	9	9+
	7.875	07/31/96	5.021	912827B76	0.10	5.258	5.100	4.942	4.784	4.627
			100-031	(0.3183)	17304	2	2+	100-03	3+	4
	6.125	07/31/96	4.981	912827Q54	0.10	5.340	5.180	5.021	4.862	4.703
			99-282	(0.2257)	15782	27+	28	99-28+	29	29+
	4.375	08/15/96	5.152	912827L75	0.14	5.322	5.209	5.096	4.983	4.870
B			100-033	(0.1723)	17257	2+	3	100-03+	4	4+
	6.250	08/31/96	5.545	912827Q96	0.18	5.696	5.610	5.523	5.437	5.351
B			100-09	(0.1715)	9250	8	8+	100-09	9+	10
	7.250	08/31/96	5.538	912827C34	0.18	5.709	5.623	5.538	5.452	5.366
			100-136	(0.1183)	9250	13	13+	100-14	14+	15
	7.000	09/30/96	5.252	912827C59	0.27	5.341	5.281	5.222	5.163	5.104
			100-092	(0.1186)	17267	8+	9	100-09+	10	10+
	6.500	09/30/96	5.301	912827R38	0.27	5.390	5.330	5.271	5.212	5.153
			100-243	(0.1023)	7500	23+	24	100-24+	25	25+
	8.000	10/15/96	5.363	912827YB2	0.31	5.453	5.402	5.350	5.299	5.248
			100-15	(0.0908)	17271	14	14+	100-15	15+	16
	6.875	10/31/96	5.433	912827C83	0.35	5.524	5.479	5.433	5.388	5.343
			100-20+	(0.0815)	20258	19+	20	100-20+	21	21+
	7.250	11/15/96	5.509	912827UF7	0.39	5.590	5.550	5.509	5.468	5.427
			99-176	(0.0826)	17008	17	17+	99-18	18+	19
	4.375	11/15/96	5.526	912827M74	0.39	5.588	5.547	5.505	5.464	5.423
B			100-112	(0.0740)	9000	10+	11	100-11+	12	12+
	6.500	11/30/96	5.635	912827D41	0.43	5.690	5.653	5.616	5.579	5.542
B			100-21+	(0.0737)	17316	20+	21	100-21+	22	22+
	7.250	11/30/96	5.617	912827R95	0.43	5.691	5.654	5.617	5.580	5.543
			100-307	(0.0622)	17300	29	30	100-31	101	1
	7.500	12/31/96	5.557	912827S37	0.50	5.673	5.611	5.549	5.487	5.424
			100-091	(0.0627)	9000	7	8	100-09	10	11
	6.125	12/31/96	5.549	912827D66	0.50	5.683	5.620	5.557	5.495	5.432

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U.S. Treasury Notes and Bonds (0–3 Years) (Continued)

Settlement Date: 6/26/96 **Trade Date: 6/25/96**

	Coupon	Maturity	Pr/Yld	32nd/Cusip	Size/Dur	Tic–2	Tic–1	Ds/Yld	Tic+1	Tic+2
			101-085	(0.0575)	7500	6+	7+	101-08+	9+	10+
	8.000	01/15/97	5.623	912827YK2	0.54	5.745	5.688	5.630	5.573	5.516
			100-116	(0.0537)	9250	10	11	100-12	13	14
	6.250	01/31/97	5.604	912827D90	0.58	5.698	5.644	5.590	5.536	5.483
			101-022	(0.0534)	17257	0+	1+	101-02+	3+	4+
	7.500	01/31/97	5.635	912827S52	0.58	5.729	5.675	5.622	5.568	5.515
B			99-122	(0.0508)	17008	10+	11+	99-12+	13+	14+
	4.750	02/15/97	5.739	912827N73	0.63	5.828	5.777	5.726	5.676	5.625
			100-213	(0.0471)	9750	19+	20+	100-21+	22+	23+
	6.750	02/28/97	5.717	912827E57	0.67	5.805	5.758	5.711	5.664	5.617
			100-241	(0.0471)	17251	22	23	100-24	25	26
	6.875	02/28/97	5.711	912827S94	0.67	5.811	5.764	5.717	5.670	5.623
			100-196	(0.0421)	17251	18	19	100-20	21	22
	6.625	03/31/97	5.770	912827T36	0.75	5.844	5.801	5.759	5.717	5.675
			100-257	(0.0421)	10250	24	25	100-26	27	28
	6.875	03/31/97	5.759	912827E73	0.75	5.838	5.796	5.754	5.712	5.670
			102-027	(0.0396)	7500	1	2	102-03	4	5
	8.500	04/15/97	5.781	912827YT3	0.79	5.856	5.816	5.776	5.737	5.697
			100-275	(0.0381)	10250	25+	26+	100-27+	28+	29+
	6.875	04/30/97	5.801	912827F23	0.83	5.882	5.843	5.805	5.767	5.729
			100-177	(0.0382)	17751	16	17	100-18	19	20
	6.500	04/30/97	5.801	912827T51	0.83	5.873	5.834	5.796	5.758	5.720
			102-083	(0.0360)	9921	6+	7+	102-08+	9+	10+
	8.500	05/15/97	5.831	912827UW0	0.87	5.898	5.862	5.826	5.790	5.754
			100-177	(0.0365)	17000	16	17	100-18	19	20
	6.500	05/15/97	5.834	912827P71	0.87	5.903	5.866	5.830	5.793	5.757
B			100-247	(0.0348)	10300	23	24	100-25	26	27
	6.750	05/31/97	5.871	912827F64	0.92	5.937	5.902	5.867	5.832	5.797
B			100-067	(0.0350)	17750	5	6	100-07	8	9
	6.125	05/31/97	5.878	912827T93	0.92	5.944	5.909	5.874	5.839	5.804
			99-235	(0.0323)	17753	19+	21+	99-23+	25+	27+
	5.625	06/30/97	5.895	912827U34	0.97	6.028	5.963	5.899	5.834	5.769
			100-151	(0.0322)	10517	11	13	100-15	17	19
	6.375	06/30/97	5.886	912827F80	0.97	6.018	5.954	5.890	5.825	5.761

U.S. Treasury Notes and Bonds (0–3 Years) (Continued)

Settlement Date: 6/26/96 **Trade Date: 6/25/96**

	Coupon	Maturity	Pr/Yld	32nd/Cusip	Size/Dur	Tic–2	Tic–1	Pr/Yld	Tic+1	Tic+2
			102-19	(0.0304)	8000	15	17	102-19	21	23
	8.500	07/15/97	5.915	912827ZB1	1.00	6.037	5.976	5.915	5.854	5.794
			99-295	(0.0298)	17754	25+	27+	99-29+	31+	1+
	5.875	07/31/97	5.940	912827U59	1.06	6.063	6.003	5.943	5.884	5.824
			99-171	(0.0299)	10506	13	15	99-17	19	21
	5.500	07/31/97	5.938	912827G30	1.06	6.062	6.002	5.942	5.882	5.822
			102-276	(0.0282)	9358	24	26	102-28	30	103
	8.625	08/15/97	5.968	912827VE9	1.08	6.074	6.018	5.961	5.905	5.849
			100-171	(0.0287)	17010	13	15	100-17	19	21
	6.500	08/15/97	5.997	912827Q70	1.09	6.116	6.058	6.001	5.944	5.886
B			99-17+	(0.0279)	10588	13+	15+	99-17+	19+	21+
	5.625	08/31/97	6.020	912827G71	1.14	6.132	6.076	6.020	5.964	5.909
B			99-303	(0.0278)	17794	26+	28+	99-30+	0+	2+
	6.000	08/31/97	6.036	912827U91	1.14	6.144	6.088	6.033	5.977	5.921
			99-111	(0.0262)	10514	7	9	99-11	13	15
	5.500	09/30/97	6.036	912827G97	1.23	6.144	6.092	6.039	5.987	5.935
			99-20	(0.0261)	17752	16	18	99-20	22	24
	5.750	09/30/97	6.054	912827V33	1.22	6.159	6.106	6.054	6.002	5.950
			103-103	(0.0247)	8503	6+	8+	103-10+	12+	14+
	8.750	10/15/97	6.047	912827ZK1	1.25	6.142	6.093	6.044	5.994	5.945
			99-19+	(0.0246)	10753	15+	17+	99-19+	21+	23+
	5.750	10/31/97	6.050	912827H47	1.31	6.148	6.099	6.050	6.000	5.951
			99-133	(0.0246)		9+	11+	99-13+	15+	17+
	5.625	10/31/97	6.075	912827V58	1.31	6.171	6.121	6.072	6.023	5.974
B			101-19+	(0.0236)	17158	15+	17+	101-19+	21+	23+
	7.375	11/15/97	6.138	912827R79	1.34	6.233	6.186	6.138	6.091	6.044
B			103-196	(0.0232)	9800	16	18	103-20	22	24
	8.875	11/15/97	6.104	912827VN9	1.33	6.192	6.145	6.099	6.052	6.006
B			99-26+	(0.0232)	10750	22+	24+	99-26+	28+	30+
	6.000	11/30/97	6.123	912827H88	1.39	6.216	6.170	6.123	6.077	6.031
B			98-306	(0.0233)	18250	27	29	98-31	1	3
	5.375	11/30/97	6.142	912827V90	1.39	6.230	6.183	6.136	6.089	6.043
F O			98-23	(0.0222)	18254	19	21	98-23	25	27
	5.250	12/31/97	6.150	912827W32	1.44	6.239	6.195	6.150	6.106	6.062

Morgan Stanley

U.S. Treasury Notes and Bonds (0–3 Years) (Continued)

Settlement Date: 6/26/96 **Trade Date: 6/25/96**

	Coupon	Maturity	Pr/Yld	32nd/Cusip	Size/Dur	Tic–2	Tic–1	Pr/Yld	Tic+1	Tic+2
			99-255	(0.0220)	10540	21+	23+	99-25+	27+	29+
	6.000	12/31/97	6.139	912827J29	1.43	6.230	6.186	6.142	6.098	6.054
			102-13+	(0.0211)	9126	9+	11+	102-13+	15+	17+
	7.875	01/15/98	6.210	912827ZT2	1.45	6.295	6.253	6.210	6.168	6.126
FB			98-04+	(0.0211)	19086	0+	2+	98-04+	6+	8+
	5.000	01/31/98	6.238	912827W57	1.53	6.322	6.280	6.238	6.196	6.154
B			99-033	(0.0210)	11507	31+	1+	99-03+	5+	7+
	5.625	01/31/98	6.218	912827J45	1.52	6.299	6.257	6.215	6.173	6.131
B			101-17	(0.0201)	17123	13	15	101-17	19	21
	7.250	02/15/98	6.244	912827S78	1.54	6.325	6.285	6.244	6.204	6.164
B			102-28	(0.0200)	9151	24	26	102-28	30	103
	8.125	02/15/98	6.242	912827VW9	1.53	6.322	6.282	6.242	6.203	6.163
B			98-065	(0.0201)	11686	2+	4+	98-06+	8+	10+
	5.125	02/28/98	6.261	912827J94	1.61	6.344	6.303	6.263	6.223	6.183
			98-03+	(0.0192)	11008	31+	1+	98-03+	5+	7+
	5.125	03/31/98	6.269	912827K35	1.69	6.346	6.307	6.269	6.230	6.192
F O			99-24+	(0.0190)	18250	20+	22+	99-24+	26+	28+
	6.125	03/31/98	6.262	912827X31	1.68	6.338	6.300	6.262	6.224	6.186
			102-212	(0.0183)	8530	17+	19+	102-21+	23+	25+
	7.875	04/15/98	6.281	912827A44	1.70	6.349	6.313	6.276	6.240	6.203
			98-006	(0.0184)	11024	29	31	98-01	3	5
	5.125	04/30/98	6.271	912827K68	1.77	6.340	6.303	6.267	6.230	6.193
F			99-092	(0.0183)	18777	5+	7+	99-09+	11+	13+
	5.875	04/30/98	6.283	912827X56	1.76	6.352	6.315	6.279	6.242	6.206
			99-22+	(0.0178)		18+	20+	99-22+	24+	26+
	6.125	05/15/98	6.290	912827T77	1.80	6.361	6.325	6.290	6.254	6.218
			104-241	(0.0173)	8750	20	22	104-24	26	28
	9.000	05/15/98	6.281	912827WE8	1.77	6.352	6.317	6.283	6.248	6.214
FB			99-14+	(0.0175)		10+	12+	99-14+	16+	18+
2YR	6.000	05/31/98	6.302	912827X98	1.85	6.372	6.337	6.302	6.267	6.232
B			98-11	(0.0176)	11034	7	9	98-11	13	15
	5.375	05/31/98	6.297	912827L26	1.85	6.368	6.333	6.297	6.262	6.227
			97-251	(0.0170)	11007	21	23	97-25	27	29
	5.125	06/30/98	6.315	912827L42	1.89	6.385	6.351	6.317	6.283	6.249

U.S. Treasury Notes and Bonds (0–3 Years) (Continued)

Settlement Date: 6/26/96 **Trade Date: 6/25/96**

	Coupon	Maturity	Pr/Yld	32nd/Cusip	Size/Dur	Tic–2	Tic–1	Pr/Yld	Tic+1	Tic+2
WI F O			99-28+	(0.0169)		24+	26+	99-28+	30+	0+
2YRWI	6.250	06/30/98	6.310	912827Y30	1.91	6.377	6.343	6.309	6.275	6.242
			103-195	(0.0161)	9000	15+	17+	103-19+	21+	23+
	8.250	07/15/98	6.341	912827B50	1.87	6.408	6.376	6.343	6.311	6.279
			97-286	(0.0164)	11023	25	27	97-29	31	1
	5.250	07/31/98	6.333	912827L67	1.97	6.394	6.362	6.329	6.296	6.264
B			99-01	(0.0160)	18003	29	31	99-01	3	5
	5.875	08/15/98	6.362	912827U75	2.00	6.426	6.394	6.362	6.330	6.298
B			105-217	(0.0153)	11326	18	20	105-22	24	26
	9.250	08/15/98	6.357	912827WN8	1.94	6.416	6.385	6.355	6.324	6.294
			96-236	(0.0159)	11000	20	22	96-24	26	28
	4.750	08/31/98	6.370	912827M25	2.07	6.430	6.398	6.366	6.335	6.303
			96-196	(0.0154)	11015	16	18	96-20	22	24
	4.750	09/30/98	6.375	912827M41	2.15	6.433	6.402	6.371	6.340	6.310
			101-192	(0.0146)	9280	15+	17+	101-19+	21+	23+
	7.125	10/15/98	6.360	912827C67	2.14	6.415	6.386	6.357	6.327	6.298
B			96-14	(0.0149)	11013	10	12	96-14	16	18
	4.750	10/31/98	6.407	912827M66	2.23	6.466	6.436	6.407	6.377	6.347
B			97-312	(0.0145)		27+	29+	97-31+	1+	3+
	5.500	11/15/98	6.425	912827V74	2.26	6.479	6.450	6.421	6.392	6.363
B			105-113	(0.0139)	B 9893	7+	9+	105-11+	13+	15+
	8.875	11/15/98	6.413	912827WW8	2.19	6.467	6.439	6.411	6.383	6.356
			97-037	(0.0144)	11023	97	2	97-04	6	8
	5.125	11/30/98	6.422	912827N24	2.31	6.477	6.449	6.420	6.391	6.363
			97-007	(0.0139)	11042	29	31	97-01	3	5
	5.125	12/31/98	6.425	912827N40	2.33	6.479	6.452	6.424	6.396	6.368
			99-273	(0.0135)	9507	23+	25+	99-27+	29+	31+
	6.375	01/15/99	6.435	912827D74	2.33	6.488	6.461	6.434	6.407	6.380
B			96-182	(0.0135)	12029	14+	16+	96-18+	20+	22+
	5.000	01/31/99	6.453	912827N65	2.42	6.504	6.477	6.450	6.423	6.396
F			96-16	(0.0134)		8	12	96-16	20	24
	5.000	02/15/99	6.461	912827W73	2.46	6.568	6.515	6.461	6.408	6.355
			105-242	(0.0126)	9702	20+	22+	105-24+	26+	28+
	8.875	02/15/99	6.460	912827XE7	2.35	6.507	6.482	6.457	6.431	6.406

Morgan Stanley

U.S. Treasury Notes and Bonds (0–3 Years) (Continued)

Settlement Date: 6/26/96 **Trade Date: 6/25/96**

	Coupon	Maturity	Pr/Yld	32nd/Cusip	Size/Dur	Tic–2	Tic–1	Pr/Yld	Tic+1	Tic+2
B			97-206	(0.0131)	11021	17	19	97-21	23	25
	5.500	02/28/99	6.466	912827P22	2.49	6.515	6.489	6.463	6.436	6.410
			98-156	(0.0126)	11003	12	14	98-16	18	20
	5.875	03/31/99	6.475	912827P48	2.56	6.523	6.497	6.472	6.447	6.422
			101-093	(0.0123)	9750	1+	5+	101-09+	13+	17+
	7.000	04/15/99	6.483	912827E81	2.57	6.580	6.530	6.481	6.432	6.383
			100-00+	(0.0122)	11004	24+	28+	100-00+	4+	8+
	6.500	04/30/99	6.490	912827P63	2.62	6.587	6.538	6.490	6.441	6.392
B			106-24	(0.0116)	10030	16	20	106-24	28	107
	9.125	05/15/99	6.516	912827XN7	2.59	6.609	6.563	6.516	6.470	6.424
FB			99-222	(0.0121)	19011	14+	18+	99-22+	26+	30+
3YR	6.375	05/15/99	6.489	912827X72	2.67	6.583	6.534	6.486	6.438	6.390
			100-192	(0.0118)	11000	11+	15+	100-19+	23+	27+
	6.750	05/31/99	6.519	912827Q21	2.70	6.610	6.563	6.516	6.468	6.421
			100-196	(0.0116)	11000	12	16	100-20	24	28
	6.750	06/30/99	6.520	912827Q47	2.69	6.610	6.564	6.518	6.471	6.425
			99-20	(0.0115)	9750	12	16	99-20	24	28
	6.375	07/15/99	6.511	912827F98	2.75	6.603	6.557	6.511	6.465	6.419
B			100-285	(0.0112)	11014	20+	24+	100-28+	0+	4+
	6.875	07/31/99	6.548	912827Q62	2.77	6.640	6.594	6.549	6.504	6.460

U.S. Treasury Notes and Bonds (3–5 Years)

Settlement Date: 6/26/96 **Trade Date: 6/25/96**

	Coupon	Maturity	Pr/Yld	32nd/Cusip	Size/Dur	Tic–2	Tic–1	Pr/Yld	Tic+1	Tic+2
F			99-092	(0.0183)	18777	5+	7+	99-09+	11+	13+
2YR	5.875	04/30/98	6.283	912827X56	1.76	6.352	6.315	6.279	6.242	6.206
FB			99-222	(0.0121)	19011	14+	18+	99-22+	26+	30+
3YR	6.375	05/15/99	6.489	912827X72	2.67	6.583	6.534	6.486	6.438	6.390
F			96-16	(0.0134)		8	12	96-16	20	24
	5.000	02/15/99	6.461	912827W73	2.46	6.568	6.515	6.461	6.408	6.355
			101-093	(0.0123)	9750	1+	5+	101-09+	13+	17+
	7.000	04/15/99	6.483	912827E81	2.57	6.580	6.530	6.481	6.432	6.383
			100-00+	(0.0122)	11004	24+	28+	100-00+	4+	8+
	6.500	04/30/99	6.490	912827P63	2.62	6.587	6.538	6.490	6.441	6.392
B			106-24	(0.0116)	10030	16	20	106-24	28	107
	9.125	05/15/99	6.516	912827XN7	2.59	6.609	6.563	6.516	6.470	6.424
			100-192	(0.0118)	11000	11+	15+	100-19+	23+	27+
	6.750	05/31/99	6.519	912827Q21	2.70	6.610	6.563	6.516	6.468	6.421
			100-196	(0.0116)	11000	12	16	100-20	24	28
	6.750	06/30/99	6.520	912827Q47	2.69	6.610	6.564	6.518	6.471	6.425
			99-20	(0.0115)	9750	12	16	99-20	24	28
	6.375	07/15/99	6.511	912827F98	2.75	6.603	6.557	6.511	6.465	6.419
B			100-285	(0.0112)	11014	20+	24+	100-28+	0+	4+
	6.875	07/31/99	6.548	912827Q62	2.77	6.640	6.594	6.549	6.504	6.460
B			104-00+	(0.0109)	10163	24+	28+	104-00+	4+	8+
	8.000	08/15/99	6.558	912827XW7	2.77	6.646	6.602	6.558	6.515	6.471
			100-27	(0.0110)	11012	19	23	100-27	31	3
	6.875	08/31/99	6.572	912827R20	2.85	6.660	6.616	6.572	6.528	6.484
			101-196	(0.0107)	11009	12	16	101-20	24	28
	7.125	09/30/99	6.561	912827R46	2.93	6.644	6.601	6.559	6.516	6.473
			98-14	(0.0108)	9754	6	10	98-14	18	22
	6.000	10/15/99	6.530	912827H21	3.01	6.616	6.573	6.530	6.487	6.444
B			102-206	(0.0104)	11019	13	17	102-21	25	29
	7.500	10/31/99	6.600	912827R61	3.00	6.681	6.639	6.598	6.556	6.515
			103-256	(0.0102)	10771	18	22	103-26	30	2
	7.875	11/15/99	6.599	912827YE6	3.02	6.678	6.637	6.596	6.556	6.515
			103-146	(0.0101)	11000	7	11	103-15	19	23
	7.750	11/30/99	6.603	912827S29	3.07	6.682	6.641	6.601	6.560	6.520

Morgan Stanley

U.S. Treasury Notes and Bonds (3–5 Years) (Continued)

Settlement Date: 6/26/96 **Trade Date: 6/25/96**

	Coupon	Maturity	Pr/Yld	32nd/Cusip	Size/Dur	Tic–2	Tic–1	Pr/Yld	Tic+1	Tic+2
			103-17	(0.0099)	11000	9	13	103-17	21	25
	7.750	12/31/99	6.606	912827S45	3.04	6.686	6.646	6.606	6.567	6.527
B			99-086	(0.0101)	9752	1	5	99-09	13	17
	6.375	01/15/00	6.606	912827J37	3.15	6.684	6.644	6.604	6.564	6.523
			103-17+	(0.0097)	11000	9+	13+	103-17+	21+	25+
	7.750	01/31/00	6.622	912827S60	3.12	6.700	6.661	6.622	6.584	6.545
			105-306	(0.0095)	10012	23	27	105-31	3	7
	8.500	02/15/00	6.625	912827YN6	3.13	6.698	6.660	6.622	6.584	6.547
			101-176	(0.0096)	11001	10	14	101-18	22	26
	7.125	02/29/00	6.638	912827T28	3.24	6.712	6.674	6.635	6.597	6.558
			100-242	(0.0095)	11000	16+	20+	100-24+	28+	0+
	6.875	03/31/00	6.640	912827T44	3.33	6.713	6.675	6.637	6.600	6.562
B			96-082	(0.0096)	9761	0+	4+	96-08+	12+	16+
	5.500	04/15/00	6.626	912827K43	3.44	6.701	6.662	6.624	6.585	6.547
B			100-096	(0.0093)	11500	2	6	100-10	14	18
	6.750	04/30/00	6.655	912827T69	3.42	6.728	6.690	6.653	6.616	6.579
			107-176	(0.0088)	10503	10	14	107-18	22	26
	8.875	05/15/00	6.634	912827YW6	3.37	6.703	6.667	6.632	6.596	6.561
			98-196	(0.0092)	11502	12	16	98-20	24	28
	6.250	05/31/00	6.654	912827U26	3.53	6.726	6.689	6.652	6.615	6.578
			97-086	(0.0092)	11505	1	5	97-09	13	17
	5.875	06/30/00	6.661	912827U42	3.52	6.732	6.695	6.658	6.622	6.585
			98-016	(0.0089)	11501	26	30	98-02	6	10
	6.125	07/31/00	6.673	912827U67	3.59	6.743	6.707	6.671	6.635	6.600
			107-14+	(0.0084)	10503	6+	10+	107-14+	18+	22+
	8.750	08/15/00	6.656	912827ZE5	3.49	6.723	6.689	6.656	6.622	6.589
			98-142	(0.0088)	11922	6+	10+	98-14+	18+	22+
	6.250	08/31/00	6.679	912827V25	3.67	6.747	6.712	6.677	6.642	6.607
B			97-31	(0.0086)	11500	23	27	97-31	3	7
	6.125	09/30/00	6.677	912827V41	3.76	6.746	6.712	6.677	6.642	6.608
			96-162	(0.0086)	12081	8+	12+	96-16+	20+	24+
	5.750	10/31/00	6.687	912827V66	3.87	6.753	6.719	6.685	6.650	6.616
			106-256	(0.0080)	11000	18	22	106-26	30	2
	8.500	11/15/00	6.681	912827ZN5	3.75	6.743	6.711	6.679	6.647	6.615

U.S. Treasury Notes and Bonds (3–5 Years) (Continued)

Settlement Date: 6/26/96 **Trade Date: 6/25/96**

	Coupon	Maturity	Pr/Yld	32nd/Cusip	Size/Dur	Tic–2	Tic–1	Pr/Yld	Tic+1	Tic+2
			95-30+	(0.0085)	12000	22+	26+	95-30+	2+	6+
	5.625	11/30/00	6.694	912827W24	3.96	6.762	6.728	6.694	6.661	6.627
FBO			95-14	(0.0084)	12821	6	10	95-14	18	22
	5.500	12/31/00	6.688	912827W40	3.94	6.755	6.722	6.688	6.655	6.621
F			94-16+	(0.0083)		8+	12+	94-16+	20	24
	5.250	01/31/01	6.653	912827W65	4.04	6.719	6.686	6.653	6.620	6.587
			104-04+	(0.0078)	11000	28+	0+	104-04+	8+	12+
	7.750	02/15/01	6.693	912827ZX3	3.90	6.756	6.724	6.693	6.662	6.631
F			95-23	(0.0081)		15	19	95-23	27	31
	5.625	02/28/01	6.703	912827X23	4.09	6.768	6.736	6.703	6.671	6.639
FBO			98-196	(0.0078)	12006	12	16	98-20	24	28
	6.375	03/31/01	6.717	912827X49	4.13	6.777	6.746	6.715	6.683	6.652
F			98-03	(0.0077)	15	27	31	7	11	15
	6.250	04/30/01	6.715	912827X64	4.21	6.777	6.746	6.715	6.684	6.653
F			99-03	(0.0076)	15	27	31	7	11	15
5YR	6.500	05/31/01	6.717	912827Y22	4.28	6.778	6.748	6.717	6.687	6.657
WI FBO			100-06	(0.0075)	18	30	2	10	14	18
WI	6.750	06/30/01	6.705	912827Y48	4.32	6.765	6.735	6.705	6.675	6.646
			92-233	(0.0048)	13500	15+	19+	92-23+	27+	31+
	5.875	11/15/05	6.941	912827V82	7.21	6.979	6.959	6.940	6.921	6.902
FB			86-18+	(0.0028)		10+	14+	86-18+	22+	26+
30YR	6.000	02/15/26	7.089	912810EW4	12.82	7.112	7.100	7.089	7.077	7.066

Morgan Stanley

U.S. Treasury Notes and Bonds (5–15 Years)

Settlement Date: 6/26/96 **Trade Date: 6/25/96**

	Coupon	Maturity	Pr/Yld	32nd/Cusip	Size/Dur	Tic–2	Tic–1	Pr/Yld	Tic+1	Tic+2
FB			99-14+	(0.0175)		10+	12+	99-14+	16+	18+
2YR	6.000	05/31/98	6.302	912827X98	1.85	6.372	6.337	6.302	6.267	6.232
FB			99-222	(0.0121)	19011	14+	18+	99-22+	26+	30+
3YR	6.375	05/15/99	6.489	912827X72	2.67	6.583	6.534	6.486	6.438	6.390
			100-27	(0.0110)	11012	19	23	100-27	31	3
	6.875	08/31/99	6.572	912827R20	2.85	6.660	6.616	6.572	6.528	6.484
			101-196	(0.0107)	11009	12	16	101-20	24	28
	7.125	09/30/99	6.561	912827R46	2.93	6.644	6.601	6.559	6.516	6.473
B			102-206	(0.0104)	11019	13	17	102-21	25	29
	7.500	10/31/99	6.600	912827R61	3.00	6.681	6.639	6.598	6.556	6.515
			103-146	(0.0101)	11000	7	11	103-15	19	23
	7.750	11/30/99	6.603	912827S29	3.07	6.682	6.641	6.601	6.560	6.520
B			99-086	(0.0101)	9752	1	5	99-09	13	17
	6.375	01/15/00	6.606	912827J37	3.15	6.684	6.644	6.604	6.564	6.523
			103-17+	(0.0097)	11000	9+	13+	103-17+	21+	25+
	7.750	01/31/00	6.622	912827S60	3.12	6.700	6.661	6.622	6.584	6.545
			105-306	(0.0095)	10012	23	27	105-31	3	7
	8.500	02/15/00	6.625	912827YN6	3.13	6.698	6.660	6.622	6.584	6.547
			101-176	(0.0096)	11001	10	14	101-18	22	26
	7.125	02/29/00	6.638	912827T28	3.24	6.712	6.674	6.635	6.597	6.558
			100-242	(0.0095)	11000	16+	20+	100-24+	28+	0+
	6.875	03/31/00	6.640	912827T44	3.33	6.713	6.675	6.637	6.600	6.562
B			96-082	(0.0096)	9761	0+	4+	96-08+	12+	16+
	5.500	04/15/00	6.626	912827K43	3.44	6.701	6.662	6.624	6.585	6.547
B			100-096	(0.0093)	11500	2	6	100-10	14	18
	6.750	04/30/00	6.655	912827T69	3.42	6.728	6.690	6.653	6.616	6.579
			107-176	(0.0088)	10503	10	14	107-18	22	26
	8.875	05/15/00	6.634	912827YW6	3.37	6.703	6.667	6.632	6.596	6.561
			98-196	(0.0092)	11502	12	16	98-20	24	28
	6.250	05/31/00	6.654	912827U26	3.53	6.726	6.689	6.652	6.615	6.578
			97-086	(0.0092)	11505	1	5	97-09	13	17
	5.875	06/30/00	6.661	912827U42	3.52	6.732	6.695	6.658	6.622	6.585
			98-016	(0.0089)	11501	26	30	98-02	6	10
	6.125	07/31/00	6.673	912827U67	3.59	6.743	6.707	6.671	6.635	6.600

U.S. Treasury Notes and Bonds (5–15 Years) (Continued)

Settlement Date: 6/26/96 **Trade Date: 6/25/96**

	Coupon	Maturity	Pr/Yld	32nd/Cusip	Size/Dur	Tic–2	Tic–1	Pr/Yld	Tic+1	Tic+2
B			97-31	(0.0086)	11500	23	27	97-31	3	7
	6.125	09/30/00	6.677	912827V41	3.76	6.746	6.712	6.677	6.642	6.608
			106-256	(0.0080)	11000	18	22	106-26	30	2
	8.500	11/15/00	6.681	912827ZN5	3.75	6.743	6.711	6.679	6.647	6.615
			95-30+	(0.0085)	12000	22+	26+	95-30+	2+	6+
	5.625	11/30/00	6.694	912827W24	3.96	6.762	6.728	6.694	6.661	6.627
F			94-16+	(0.0083)		8+	12+	94-16+	20+	24+
	5.250	01/31/01	6.653	912827W65	4.04	6.719	6.686	6.653	6.620	6.587
			119-29	(0.0071)	1500	21	25	119-29	1	5
	11.750	02/15/01	6.682	912810CT3	3.67	6.739	6.711	6.682	6.654	6.626
			104-04+	(0.0078)	11000	28+	0+	104-04+	8+	12+
	7.750	02/15/01	6.693	912827ZX3	3.90	6.756	6.724	6.693	6.662	6.631
F			95-23	(0.0081)		15	19	95-23	27	31
	5.625	02/28/01	6.703	912827X23	4.09	6.768	6.736	6.703	6.671	6.639
FBO			98-196	(0.0078)	12006	12	16	98-20	24	28
	6.375	03/31/01	6.717	912827X49	4.13	6.777	6.746	6.715	6.683	6.652
F			98-03	(0.0077)		27	31	98-03	7	11
	6.250	04/30/01	6.715	912827X64	4.21	6.777	6.746	6.715	6.684	6.653
			126-145	(0.0066)	1800	6+	10+	126-14+	18+	22+
	13.125	05/15/01	6.684	912810CU0	3.86	6.737	6.711	6.685	6.659	6.632
			105-096	(0.0074)	11750	2	6	105-10	14	18
	8.000	05/15/01	6.706	912827A85	4.13	6.763	6.734	6.704	6.675	6.645
F			99-03	(0.0076)		27	31	99-03	7	11
5YR	6.500	05/31/01	6.717	912827Y22	4.28	6.778	6.748	6.717	6.687	6.657
			128-185	(0.0062)	1800	10+	14+	128-18+	22+	26+
	13.375	08/15/01	6.702	912810CW6	3.90	6.752	6.728	6.703	6.678	6.653
			104-293	(0.0071)	12000	21+	25+	104-29+	1+	5+
	7.875	08/15/01	6.724	912827B92	4.24	6.780	6.751	6.723	6.695	6.667
			103-105	(0.0069)	23000	2+	6+	103-10	14+	18+
	7.500	11/15/01	6.749	912827D25	4.51	6.805	6.778	6.750	6.723	6.695
			140-12	(0.0056)	1800	4	8	140-12	16	20
	15.750	11/15/01	6.693	912810CX4	4.04	6.738	6.715	6.693	6.670	6.648
			134-21	(0.0056)	1800	13	17	134-21	25	29
	14.250	02/15/02	6.751	912810CZ9	4.14	6.796	6.774	6.751	6.729	6.707

Morgan Stanley

U.S. Treasury Notes and Bonds (5–15 Years) (Continued)

Settlement Date: 6/26/96 **Trade Date: 6/25/96**

	Coupon	Maturity	Pr/Yld	32nd/Cusip	Size/Dur	Tic–2	Tic–1	Pr/Yld	Tic+1	Tic+2
			103-17+	(0.0064)	11500	9+	13+	103-17+	21+	25+
	7.500	05/15/02	6.757	912827F49	4.85	6.808	6.783	6.757	6.732	6.706
			97-31+	(0.0064)	22337	23+	27+	97-31+	3+	7+
	6.375	08/15/02	6.780	912827G55	5.05	6.831	6.805	6.780	6.754	6.729
			124-196	(0.0053)	2800	12	16	124-20	24	28
	11.625	11/15/02	6.804	912810DA3	4.83	6.846	6.824	6.803	6.782	6.761
B			120-202	(0.0053)	3000	12+	16+	120-20+	24+	28+
	10.750	02/15/03	6.829	912810DC9	4.93	6.869	6.848	6.827	6.806	6.785
B			97-00+	(0.0060)	21519	24+	28+	97-00+	4+	8+
	6.250	02/15/03	6.814	912827J78	5.39	6.863	6.839	6.814	6.790	6.766
			121-037	(0.0051)	3250	28	121	121-04	8	12
	10.750	05/15/03	6.849	912810DD7	5.18	6.889	6.868	6.848	6.828	6.807
			123-24	(0.0049)	3500	16	20	123-24	28	124
	11.125	08/15/03	6.858	912810DE5	5.17	6.897	6.877	6.858	6.838	6.819
			93-282	(0.0058)	23099	20+	24+	93-28+	0+	4+
	5.750	08/15/03	6.846	912827L83	5.78	6.891	6.868	6.845	6.821	6.798
B			128-166	(0.0046)	3500	9	13	128-17	21	25
	11.875	11/15/03	6.881	912810DG0	5.36	6.917	6.899	6.880	6.861	6.843
B			94-04	(0.0055)	12001	28	94	94-04	8	12
	5.875	02/15/04	6.875	912827N81	6.08	6.919	6.897	6.875	6.853	6.831
B			102-042	(0.0051)	12009	28+	0+	102-04+	8+	12+
	7.250	05/15/04	6.893	912827P89	6.12	6.933	6.912	6.892	6.871	6.851
B			132-233	(0.0043)	3750	15+	19+	132-23+	27+	31+
	12.375	05/15/04	6.917	912810DH8	5.57	6.951	6.934	6.917	6.899	6.882
B			141-301	(0.0040)	4000	22	26	141-30	2	6
	13.750	08/15/04	6.919	912810DK1	5.46	6.952	6.936	6.920	6.904	6.887
B			102-031	(0.0050)	12073	27	31	102-03	7	11
	7.250	08/15/04	6.907	912827Q88	6.16	6.948	6.927	6.907	6.887	6.867
			105-317	(0.0048)	12051	24	28	106-00	4	8
	7.875	11/15/04	6.919	912827R87	6.31	6.957	6.937	6.918	6.899	6.880
			129-165	(0.0042)	8301	8+	12+	129-16+	20+	24+
	11.625	11/15/04	6.923	912810DM7	5.89	6.957	6.940	6.924	6.907	6.890
			103-213	(0.0048)	12045	13+	17+	103-21+	25+	29+
	7.500	02/15/05	6.927	912827S86	6.39	6.964	6.945	6.926	6.907	6.888

U.S. Treasury Notes and Bonds (5–15 Years) (Continued)

Settlement Date: 6/26/96 **Trade Date: 6/25/96**

	Coupon	Maturity	Pr/Yld	32nd/Cusip	Size/Dur	Tic–2	Tic–1	Pr/Yld	Tic+1	Tic+2
B			97-06+	(0.0049)		30+	2+	97-06+	10+	14+
	6.500	05/15/05	6.925	912827T85	6.81	6.964	6.945	6.925	6.906	6.886
B			104-067	(0.0048)	4200	31	3	104-07	11	15
	8.250	05/15/05	7.587	912810BU1	6.47	7.625	7.606	7.587	7.568	7.549
	YTC in 00		r6.99		3.39	r7.061	r7.024	r6.988	r6.952	r6.915
B			133-015	(0.0040)	4260	25+	29+	133-01+	5+	9+
	12.000	05/15/05	6.950	912810DQ8	6.09	6.982	6.966	6.950	6.934	6.919
			125-075	(0.0040)	9269	31+	3+	125-07+	11+	15+
	10.750	08/15/05	6.967	912810DR6	6.21	7.000	6.984	6.968	6.951	6.935
			97-021	(0.0048)	13010	26	30	97-02	6	10
	6.500	08/15/05	6.937	912827U83	6.83	6.976	6.957	6.938	6.919	6.900
			92-233	(0.0048)	13500	15+	19+	92-23+	27+	31+
	5.875	11/15/05	6.941	912827V82	7.21	6.979	6.959	6.940	6.921	6.902
F			91-09+	(0.0047)		1+	5+	91-09+	13+	17+
	5.625	02/15/06	6.873	912827W81	7.30	6.912	6.892	6.873	6.854	6.836
F			99-18	(0.0044)		10	14	99-18	22	26
10YR	6.875	05/15/06	6.935	912827X80	7.27	6.971	6.953	6.935	6.918	6.900
			117-00+	(0.0041)	4755	24+	28+	117-00+	4+	8+
20YR	9.375	02/15/06	6.924	912810DU9	6.62	6.956	6.940	6.924	6.908	6.891
FB			86-18+	(0.0028)		10+	14+	86-18+	22+	26+
30YR	6.000	02/15/26	7.089	912810EW4	12.82	7.112	7.100	7.089	7.077	7.066

Morgan Stanley

U.S. Treasury Notes and Bonds (Long)

Settlement Date: 6/26/96 **Trade Date: 6/25/96**

	Coupon	Maturity	Pr/Yld	32nd/Cusip	Size/Dur	Tic–2	Tic–1	Pr/Yld	Tic+1	Tic+2
FB			99-14+	(0.0175)		10+	12+	99-14+	16+	18+
2YR	6.000	05/31/98	6.302	912827X98	1.85	6.372	6.337	6.302	6.267	6.232
F			99-03	(0.0076)		27	31	99-03	7	11
5YR	6.500	05/31/01	6.717	912827Y22	4.28	6.778	6.748	6.717	6.687	6.657
B			102-031	(0.0050)	12073	27	31	102-03	7	11
	7.250	08/15/04	6.907	912827Q88	6.16	6.948	6.927	6.907	6.887	6.867
			105-317	(0.0048)	12051	24	28	106-00	4	8
	7.875	11/15/04	6.919	912827R87	6.31	6.957	6.937	6.918	6.899	6.880
			129-165	(0.0042)	8301	8+	12+	129-16+	20+	24+
	11.625	11/15/04	6.923	912810DM7	5.89	6.957	6.940	6.924	6.907	6.890
			103-213	(0.0048)	12045	13+	17+	103-21+	25+	29+
	7.500	02/15/05	6.927	912827S86	6.39	6.964	6.945	6.926	6.907	6.888
B			104-067	(0.0048)	4200	31	3	104-07	11	15
	8.250	05/15/05	7.587	912810BU1	6.47	7.625	7.606	7.587	7.568	7.549
	YTC in 00		r6.99		3.39	r7.061	r7.024	r6.988	r6.952	r6.915
B			133-015	(0.0040)	4260	25+	29+	133-01+	5+	9+
	12.000	05/15/05	6.950	912810DQ8	6.09	6.982	6.966	6.950	6.934	6.919
			125-075	(0.0040)	9269	31+	3+	125-07+	11+	15+
	10.750	08/15/05	6.967	912810DR6	6.21	7.000	6.984	6.968	6.951	6.935
B			97-06+	(0.0049)		30+	2+	97-06+	10+	14+
	6.500	05/15/05	6.925	912827T85	6.81	6.964	6.945	6.925	6.906	6.886
			97-021	(0.0048)	13010	26	30	97-02	6	10
	6.500	08/15/05	6.937	912827U83	6.83	6.976	6.957	6.938	6.919	6.900
			92-233	(0.0048)	13500	15+	19+	92-23+	27+	31+
	5.875	11/15/05	6.941	912827V82	7.21	6.979	6.959	6.940	6.921	6.902
F			99-18	(0.0044)		10	14	99-18	22	26
10YR	6.875	05/15/06	6.935	912827X80	7.27	6.971	6.953	6.935	6.918	6.900
			102-21	(0.0042)	4200	13	17	102-21	25	29
	7.625	02/15/07	7.260	912810BX5	7.33	7.294	7.277	7.260	7.244	7.227
	*YTC in 02		r7.04		4.58	r7.097	r7.070	r7.043	r7.016	r6.990
			105-01+	(0.0039)	1500	25+	29+	105-01+	5+	9+
	7.875	11/15/07	7.216	912810BZ0	7.76	7.247	7.232	7.216	7.200	7.184
	*YTC in 02		r6.88		5.14	r6.930	r6.907	r6.883	r6.812	r6.835

U.S. Treasury Notes and Bonds (Long) (Continued)

Settlement Date: 6/26/96 **Trade Date: 6/25/96**

	Coupon	Maturity	Pr/Yld	32nd/Cusip	Size/Dur	Tic–2	Tic–1	Pr/Yld	Tic+1	Tic+2
			108-01	(0.0037)	2100	25	29	108-01	5	9
	8.375	08/15/08	7.361	912810CC0	7.81	7.391	7.376	7.361	7.346	7.331
	*YTC in 03		r6.93		5.44	r6.970	r6.949	r6.927	r6.906	r6.884
B			109-20	(0.0037)	5200	12	16	109-20	24	28
	8.750	11/15/08	7.539	912810CE6	7.95	7.569	7.554	7.539	7.524	7.510
	*YTC in 03		r7.05		5.64	r7.095	r7.074	r7.053	r7.033	r6.912
			112-10+	(0.0035)	4600	2+	6+	112-10+	14+	18+
	9.125	05/15/09	7.606	912810CG1	8.06	7.634	7.620	7.606	7.591	7.577
	*YTC in 04		r7.06		5.87	r7.096	r7.077	r7.057	r7.038	r7.019
B			120-24+	(0.0033)	4200	16+	20+	120-24+	28+	0+
	10.375	11/15/09	7.840	912810CK2	7.98	7.867	7.853	7.840	7.827	7.813
	*YTC in 04		r7.05		6.00	r7.086	r7.068	r7.050	r7.033	r6.915
			129-06	(0.0032)	5900	30	2	129-06	10	14
	11.750	02/15/10	8.160	912810CM8	7.63	8.186	8.173	8.160	8.148	8.135
	*YTC in 05		r7.16		5.85	r7.191	r7.174	r7.158	r7.141	r7.125
B			119-04	(0.0033)	3000	28	119	119-04	8	12
	10.000	05/15/10	7.728	912810CP1	8.23	7.754	7.741	7.728	7.715	7.702
	*YTC in 05		r7.06		6.29	r7.087	r7.080	r7.063	r7.046	r7.029
			138-18+	(0.0029)	4700	10+	14+	138-18+	22+	26+
	12.750	11/15/10	8.146	912810CS5	7.92	8.169	8.158	8.146	8.134	8.122
	YTC in 05		r7.06		6.24	r7.087	r7.072	r7.067	r7.042	r7.027
B			147-26+	(0.0028)	4600	18+	22+	147-26+	30+	2+
	13.875	05/15/11	8.238	912810CV8	7.92	8.260	8.249	8.238	8.227	8.216
	*YTC in 06		r7.07		6.36	r7.094	r7.081	r7.067	r7.053	r7.040
			150-13+	(0.0027)	4500	5+	9+	150-13+	17+	21+
	14.000	11/15/11	8.178	912810CY2	8.06	8.199	8.189	8.178	8.168	8.157
	*YTC in 06		r7.06		6.56	r7.090	r7.077	r7.064	r7.051	r7.038
			124-28+	(0.0029)	11200	20+	24+	124-28+	0+	4+
	10.375	11/15/12	7.678	912810DB1	8.95	7.701	7.689	7.678	7.666	7.655
	*YTC in 07		r7.14		7.36	r7.170	r7.156	r7.142	r7.128	r7.114
			138-31	(0.0026)	15300	23	27	138-31	3	7
	12.000	08/15/13	7.829	912810DF2	8.68	7.850	7.839	7.829	7.818	7.808
	*YTC in 08		r7.14		7.29	r7.168	r7.156	r7.143	r7.130	r7.118

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U.S. Treasury Notes and Bonds (Long) (Continued)

Settlement Date: 6/26/96 **Trade Date: 6/25/96**

	Coupon	Maturity	Pr/Yld	32nd/Cusip	Size/Dur	Tic–2	Tic–1	Pr/Yld	Tic+1	Tic+2
			150-23	(0.0024)	4750	15	19	150-23	27	31
	13.250	05/15/14	7.903	912810DJ4	8.88	7.922	7.913	7.903	7.894	7.884
	*YTC in 09		r7.16		7.58	r7.179	r7.168	r7.156	r7.145	r7.134
			144-30+	(0.0024)	4750	22+	26+	144-30+	2+	6+
	12.500	08/15/14	7.819	912810DL9	8.87	7.838	7.828	7.819	7.809	7.799
	*YTC in 09		r7.16		7.59	r7.184	r7.172	r7.161	r7.149	r7.138
B			139-12+	(0.0025)	6006	4+	8+	139-12+	16+	20+
	11.750	11/15/14	7.706	912810DN5	9.26	7.726	7.716	7.706	7.696	7.686
	*YTC in 09		r7.13		7.94	r7.155	r7.144	r7.132	r7.120	r7.109
B			141-09+	(0.0024)	12667	1+	5+	141-09+	13+	17+
	11.250	02/15/15	7.191	912810DP0	9.41	7.210	7.200	7.191	7.182	7.172
B			135-05+	(0.0024)	7149	29+	1+	135-05+	9+	13+
	10.625	08/15/15	7.207	912810DS	9.63	7.226	7.217	7.207	7.197	7.188
B			127-16	(0.0025)	6899	8	12	127-16	20	24
	9.875	11/15/15	7.217	912810DS	10.01	7.237	7.227	7.217	7.207	7.197
			121-00+	(0.0026)	7266	24+	28+	121-00+	4+	8+
	9.250	02/15/16	7.228	912810DV7	10.00	7.249	7.239	7.228	7.218	7.208
B			100-04+	(0.0030)	18823	28+	0+	100-04+	8+	12+
	7.250	05/15/16	7.235	912810DW5	10.75	7.259	7.247	7.235	7.224	7.212
			102-22+	(0.0029)	18864	14+	18+	102-22+	26+	30+
	7.500	11/15/16	7.243	912810DX3	10.79	7.266	7.255	7.243	7.232	7.220
			116-02	(0.0026)	18117	26	30	116-02	6	10
	8.750	05/15/17	7.245	912810DY1	10.58	7.266	7.255	7.245	7.234	7.224
			117-15+	(0.0026)	14000	7+	11+	117-15+	19+	23+
	8.875	08/15/17	7.245	912810DZ8	10.42	7.266	7.255	7.245	7.235	7.224
			120-13+	(0.0025)	8500	5+	9+	120-13+	17+	21+
	9.125	05/15/18	7.249	912810EA2	10.72	7.269	7.259	7.249	7.239	7.229
			119-06+	(0.0025)	9000	30+	2+	119-06+	10+	14+
	9.000	11/15/18	7.252	912810EB0	10.85	7.271	7.261	7.252	7.242	7.232
			117-28	(0.0025)	19000	20	24	117-28	118	4
	8.875	02/15/19	7.254	912810EC8	10.73	7.274	7.264	7.254	7.244	7.234
			109-20+	(0.0026)	19750	12+	16+	109-20+	24+	28+
	8.125	08/15/19	7.258	912810ED6	11.00	7.279	7.268	7.258	7.247	7.237

U.S. Treasury Notes and Bonds (Long) (Continued)

Settlement Date: 6/26/96 **Trade Date: 6/25/96**

	Coupon	Maturity	Pr/Yld	32nd/Cusip	Size/Dur	Tic–2	Tic–1	Pr/Yld	Tic+1	Tic+2
B			113-29+	(0.0025)	10000	21+	25+	113-29+	1+	5+
	8.500	02/15/20	7.258	912810EE4	11.00	7.278	7.268	7.258	7.248	7.238
			116-26	(0.0025)	10000	18	22	116-26	30	2
	8.750	05/15/20	7.257	912810EF1	11.20	7.277	7.267	7.257	7.247	7.237
B			116-28	(0.0024)	21000	20	24	116-28	117	4
	8.750	08/15/20	7.257	912810EG9	11.04	7.277	7.267	7.257	7.247	7.238
			107-01+	(0.0026)	11000	25+	29+	107-01+	5+	9+
	7.875	02/15/21	7.256	912810EH7	11.34	7.277	7.266	7.256	7.245	7.235
B			109-29+	(0.0025)	11750	21+	25+	109-29+	1+	5+
	8.125	05/15/21	7.257	912810EJ3	11.53	7.277	7.267	7.257	7.247	7.237
B			109-31+	(0.0025)	12000	23+	27+	109-31+	3+	7+
	8.125	08/15/21	7.254	912810EK0	11.36	7.275	7.265	7.254	7.244	7.234
			108-19+	(0.0025)	32000	11+	15+	108-19+	23+	27+
	8.000	11/15/21	7.252	912810EL8	11.65	7.272	7.262	7.252	7.242	7.232
			100-00+	(0.0027)	10000	24+	28+	100-00+	4+	8+
	7.250	08/15/22	7.248	912810EM6	11.77	7.269	7.258	7.248	7.237	7.226
			104-14+	(0.0026)	10298	6+	10+	104-14+	18+	22+
	7.625	11/15/22	7.243	912810EN4	11.91	7.264	7.254	7.243	7.233	7.223
			98-21+	(0.0027)	17590	13+	17+	98-21+	25+	29+
	7.125	02/15/23	7.237	912810EP9	11.89	7.259	7.248	7.237	7.226	7.216
			88-14+	(0.0029)	22053	6+	10+	88-14+	18+	22+
	6.250	08/15/23	7.226	912810EQ7	12.27	7.249	7.237	7.226	7.214	7.202
			103-16	(0.0025)	11000	8	12	103-16	20	24
	7.500	11/15/24	7.208	912810ES3	12.27	7.228	7.218	7.208	7.198	7.188
B			105-07+	(0.0025)	11017	31+	3+	105-07+	11+	15+
	7.625	02/15/25	7.190	912810ET1	12.07	7.210	7.200	7.190	7.180	7.170
			96-19+	(0.0026)	11500	11+	15+	96-19+	23+	27+
	6.875	08/15/25	7.152	912810EV6	12.38	7.174	7.163	7.152	7.142	7.131
FB			86-18+	(0.0028)		10+	14+	86-18+	22+	26+
30YR	6.000	02/15/26	7.089	912810EW4	12.82	7.112	7.100	7.089	7.077	7.066

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U.S. Treasury Bills

Settlement Date: 6/26/96 **Trade Date: 6/25/96**

		Maturity	Ds/Yld	Cusip	Tic–2	Tic–1	Ds/Yld	Tic+1	Tic+2
			4.870		4.850	4.860	4.870	4.880	4.890
	BILL	06/27/96	4.952	912794Z56	4.931	4.942	4.952	4.962	4.972
			4.690		4.670	4.680	4.690	4.700	4.710
	BILL	07/05/96	4.774	9127942Y9	4.753	4.764	4.774	4.784	4.794
			4.710		4.690	4.700	4.710	4.720	4.730
	BILL	07/11/96	4.798	9127942Z6	4.778	4.788	4.798	4.808	4.818
			4.550		4.530	4.540	4.550	4.560	4.570
	BILL	07/18/96	4.639	9127943A0	4.618	4.629	4.639	4.649	4.659
			4.810		4.790	4.800	4.810	4.820	4.830
	BILL	07/25/96	4.909	912794Z64	4.889	4.899	4.909	4.919	4.930
			4.870		4.850	4.860	4.870	4.880	4.890
	BILL	08/01/96	4.975	9127943B8	4.955	4.965	4.975	4.986	4.996
			4.980		4.960	4.970	4.980	4.990	5.000
	BILL	08/08/96	5.093	9127943C6	5.073	5.083	5.093	5.104	5.114
			4.985		4.965	4.975	4.985	4.995	5.005
	BILL	08/15/96	5.103	9127943D4	5.083	5.093	5.103	5.114	5.124
			5.030		5.010	5.020	5.030	5.040	5.050
	BILL	08/22/96	5.155	912794Z72	5.134	5.145	5.155	5.165	5.176
			5.040		5.020	5.030	5.040	5.050	5.060
	BILL	08/29/96	5.156	9127943E2	5.136	5.146	5.156	5.167	5.177
			5.105		5.085	5.095	5.105	5.115	5.125
	BILL	09/05/96	5.229	9127943F9	5.208	5.218	5.229	5.239	5.249
			5.115		5.095	5.105	5.115	5.125	5.135
	BILL	09/12/96	5.244	9127943G7	5.223	5.234	5.244	5.255	5.265
			5.130		5.110	5.120	5.130	5.140	5.150
	BILL	09/19/96	5.265	912794Z80	5.244	5.255	5.265	5.275	5.286
			5.095		5.075	5.085	5.095	5.105	5.115
90DY	BILL	09/26/96	5.234	9127943H5	5.213	5.224	5.234	5.244	5.255
			5.135		5.115	5.125	5.135	5.145	5.155
	BILL	10/03/96	5.281	9127943J1	5.260	5.270	5.281	5.291	5.302
			5.150		5.130	5.140	5.150	5.160	5.170
	BILL	10/10/96	5.302	9127943K8	5.281	5.291	5.302	5.312	5.323
			5.160		5.140	5.150	5.160	5.170	5.180
	BILL	10/17/96	5.318	912794Z98	5.297	5.307	5.318	5.328	5.339
			5.150		5.130	5.140	5.150	5.160	5.170
	BILL	10/24/96	5.313	9127943L6	5.292	5.302	5.313	5.323	5.334

U.S. Treasury Bills (Continued)

Settlement Date: 6/26/96 **Trade Date: 6/25/96**

		Maturity	DS/Yld	Cusip	Tic-2	Tic-1	Ds/Yld	Tic+1	Tic+2
			5.160		5.140	5.150	5.160	5.170	5.170
	BILL	10/31/96	5.329	9127943M4	5.308	5.318	5.329	5.339	5.350
			5.175		5.156	5.165	5.175	5.185	5.195
	BILL	11/07/96	5.350	9127943N2	5.329	5.339	5.350	5.360	5.371
			5.215		5.195	5.205	5.215	5.225	5.235
	BILL	11/14/96	5.398	9127942A1	5.377	5.387	5.398	5.408	5.419
			5.205		5.185	5.195	5.205	5.215	5.225
	BILL	11/21/96	5.393	9127943P7	5.372	5.382	5.393	5.403	5.414
			5.215		5.195	5.205	5.215	5.225	5.235
	BILL	11/29/96	5.410	9127943Q5	5.388	5.399	5.410	5.420	5.431
			5.250		5.230	5.240	5.250	5.260	5.270
	BILL	12/05/96	5.452	9127943R3	5.430	5.441	5.452	5.462	5.473
			5.260		5.240	5.250	5.260	5.270	5.280
	BILL	12/12/96	5.468	9127942B9	5.447	5.457	5.468	5.479	5.489
			5.260		5.240	5.250	5.260	5.270	5.280
	BILL	12/19/96	5.474	9127943S1	5.452	5.463	5.474	5.484	5.495
WI			5.225		5.205	5.215	5.225	5.235	5.245
180DY	BILL	12/26/96	5.441	9127943T9	5.420	5.431	5.441	5.452	5.463
			5.280		5.260	5.270	5.280	5.290	5.300
	BILL	1/09/97	5.501	9127942K9	5.480	5.491	5.501	5.512	5.523
			5.315		5.295	5.305	5.315	5.325	5.335
	BILL	2/06/97	5.545	9127942L7	5.523	5.534	5.545	5.556	5.566
			5.365		5.345	5.355	5.365	5.375	5.385
	BILL	3/06/97	5.609	9127942N5	5.587	5.598	5.609	5.620	5.630
			5.410		5.390	5.400	5.410	5.420	5.430
	BILL	4/03/97	5.671	9127942N3	5.649	5.660	5.671	5.681	5.692
			5.445		5.425	5.435	5.445	5.455	5.465
	BILL	5/01/97	5.724	9127942P8	5.702	5.713	5.724	5.735	5.746
			5.475		5.455	5.465	5.475	5.485	5.495
360DY	BILL	5/29/97	5.774	9127942Q6	5.753	5.764	5.774	5.785	5.796
			5.505		5.485	5.495	5.505	5.515	5.525
WI	BILL	6/26/97	5.827	9127942R4	5.804	5.815	5.827	5.838	5.849

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