



The TED spread trade: illustration of the analytics using
Bloomberg

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Introduction

Treasury Eurodollar future spread trades are common in the market and carried out regularly by banks and proprietary traders. There are two main reasons why such trades are undertaken. They are:

- when traders need to hedge their Treasury interest-rate risk against a change in yields;
- when speculators anticipate a change in the difference between the Fed rate and the London interbank market.

When TED trading was first practiced, traders simply used long treasury bills and short eurodollar futures. Calculating the P&L was straightforward as the spread was determined by subtracting the Treasury rate from the eurodollar future rate. The simplicity was further pronounced by the fact that the issue date and maturity dates of both securities were the same. As the practice developed, traders started to make TED trades using longer maturity bonds. This led to certain complications when calculating the spreads, as yields on short term eurodollar contracts could not easily be compared to longer term bond yields. Hence it became important to develop a means of equating the terms of the two securities so as to nullify the problem arising from the difference in issue and maturity dates.

In this article we illustrate how the Bloomberg system can be used by banks to compare securities and analyse the effectiveness of any trades undertaken.

Illustration using the Bloomberg

The Bloomberg Euro Future Strip Hedge function allows the user to work out an implied TED spread based on a strip of eurodollar futures contracts. This is on the TED screen. This screen takes in a strip of the contracts, having calculated the number and maturity of contracts equating to the amount and maturity of the selected bond. Using the eurodollar futures, Bloomberg discounts each of the future cash flows of the bond with the rates implied by each of the futures contracts. Once the present values of the cash-flows are calculated, they are summed to produce an implied price. Once the implied price is calculated we work out the corresponding conventional yield and this is subtracted from the yield implied by the market price of the bond. The resulting yield is the *implied yield TED*. The screen also calculates two other values, namely the *spread adjusted TED* and the *implied price TED*. We consider these later in the article.

Setting up the trade on Bloomberg

We explain the methodology of the TED function by considering an example with a two year US Treasury, the 3% Treasury maturing in November 2003. Initially the user types

CT2 <GOVT> TED<GO>.

Once this is done one we arrive at the TED function screen. This screen includes input parameters such as bond price, face amount, settlement date and the different TED spreads as over-rideable fields. One can also specify what type of futures contract one would want to use as well as specifying the rates for the stub contract and the individual eurodollar futures.

Once the different parameters have been set, the screen will match up the cash flows of the Treasury bond and the eurodollar contract. To do this, Bloomberg takes in the date of the first cashflow of the Treasury from the settlement date of the trade and finds the futures contract which this cashflow coincides with. We illustrate this calculation with Figure 1 which is the TED screen, and Figure 2, the CSHF function which shows the cashflows of the Treasury bond.

GRAB						Govt	TED
Euro-Future Strip Hedge							
P 1/2							
US TREASURY N/B T 3 11/30/03 101-19 /101-20 (1.25 /21) BGN @10:00							
Price	101-19	Settlement	12/26/02	Implied Yield TED	19.7		
Yield	1.26747%	Face \$	100000000	Spread Adjusted TED	19.4		
*Implied Yld	1.46444%	Risk	0.93	Implied Price TED	19.7		
(*-Compounded, Freq=2, ACT/ACT)		A Worst / Maturity	(11/30/03) (11/30/03)	Sign Conv	N Curve-Security		
Stub Period:	83 days			Total Hedge:	378 contracts		
Contract to strip	ED	RATES FROM			12/24/02		
1-Day	2-Day	1-Wk	2-Wk	1-Mth	2-Mth	3-Mth	4-Mth
1.3125	1.3125	1.4500	1.4000	1.4200	1.4100	1.4000	1.4000
Price/Rate Quoted?	R	Spread Adjusted Hedge?	N		Bid/Mid/Ask/Last/Best		
	Rate	Cntrcts	Rate	Cntrcts	Rate	Cntrcts	Rate
STUB	1.4025	93					
EDH3	1.3550	102					
EDM3	1.4200	101					
EDU3	1.6200	82					
<small> Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 920410 Hong Kong 852 2977 6000 Japan 81 3 3201 8900 Singapore 65 212 1000 U.S. 1 212 318 2000 Copyright 2002 Bloomberg L.P. 6489-319-2 27-Dec-02 10:52:54 </small>							

Figure 1

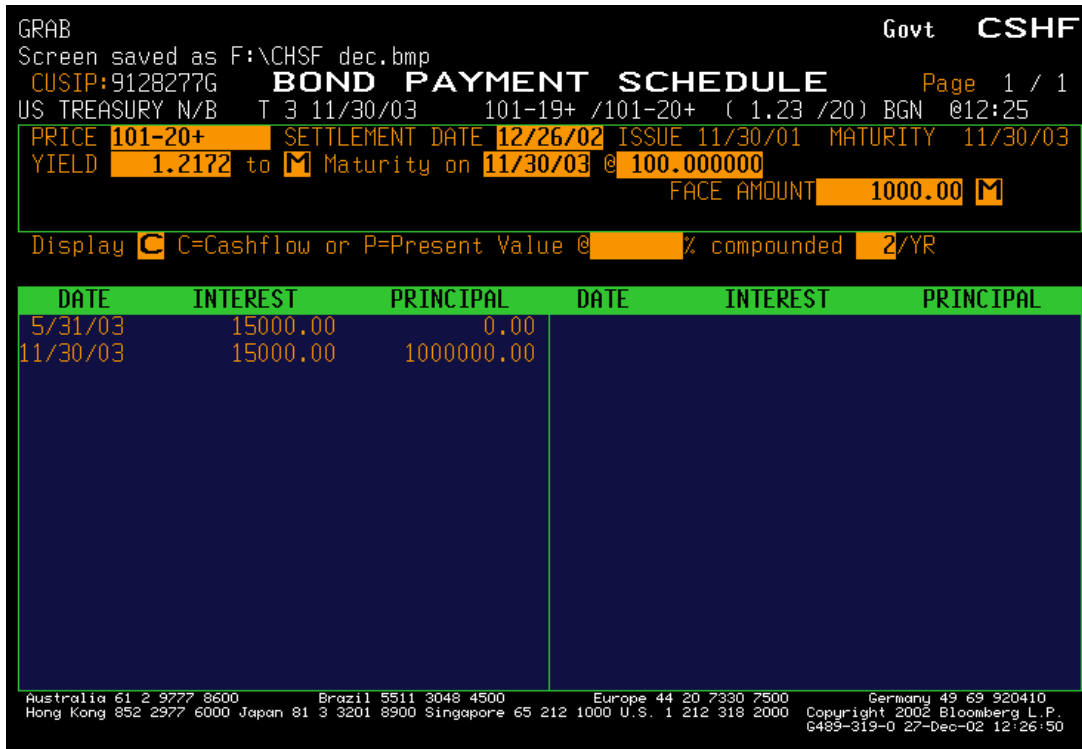


Figure 2

To calculate the TED spread one must match up the cash flows of the Treasury bond with the eurodollar futures contracts whose expiry coincides with the dates of the coupon payments. Figure 2 shows the Bloomberg CSHF screen which displays the future cash-flows of the bond given a settlement date. This shows that the bond settles on 26 December 2002 and at this value date there are two more cashflows remaining. These are the coupon payment on May 31st 2003 and the final coupon and principal payments on 30 November 2003.

To calculate the TED spread we see that we need to use a total of 4 Eurodollar futures contracts. These are the EDZ2 <commodity> to EDU3<Commodity> contracts (we note here the Bloomberg tickers for these contracts). These Eurodollar futures are displayed on the lower half of the TED screen along with their rates or price, which option is selected by the user.

Calculation methodology

The first step in calculating the Implied Yield TED is to calculate the interpolated discount factors derived from the eurodollar futures shown in figure 3.

	LAST PRICE	RATE	FUT_DLV_DT_FIRST	FUT_ROLL_DT	INT_RATE_FUT	FUT_END_DT
STUB(EDZ2 COMDTY)		1.4025	17-Dec-12	17-Dec-12		20-Mar-13
EDH3 COMDTY	98.675	1.325	17-Mar-03	15-Dec-02		18-Jun-03
EDM3 COMDTY	98.635	1.365	16-Jun-03	16-Jun-03		17-Sep-03
EDU3 COMDTY	98.475	1.525	15-Sep-03	15-Sep-03		17-Dec-03

Figure 3

For the 31st May cash-flow we will need to use EDZ2 <comdty> to calculate the March 20th discount factor; and the EDH3 <comdty> to calculate the discount factor for the expiry date 18th June 2003. The stub period, which is the days to the expiry of the first contract, is (from settlement date of 26 December 2002) worked out as 84 days. Hence the discount factor for 20th March 2003 is given by:

$$(1+((1.4025/100)*(83/360)))^{-1} = 0.99677688 \quad [1]$$

To calculate the discount factor from the settlement date to 18 June 2003 we need to create a strip by multiplying [1] with the discount factor associated with the EDH3 <comdty> contract. This is the contract that begins on 17th March and expires on 18th June. A similar process is applied, namely:

$$(1+((1.355/100)*(91/360)))^{-1} = 0.96586553. \quad [2]$$

Multiplying [1] and [2] will give the stripped discount factor for 18th June, which is

$$0.993374435. \quad [3]$$

Taking the log of [3] will give -0.006046418.

Now that we have the discount factors for the boundary dates, we can calculate the interpolated discount factor for 31st May.

Taking the natural logarithm of equation [1] will give a value of

$$-0.003228325.$$

Taking the log of [3] will give us -0.993374435.

Using

$$(-0.003228325) + ((75/91) * (-0.006647611) - (-0.003228325)) \\ = -0.006046418$$

$$\text{and } \exp(-0.006046418) = 0.993971825,$$

we obtain the interpolated discount factor for 31st May. This we label as [4].

A similar procedure is applied to calculate the discount factor for 30th November 2003. Using EDM3 <commodity>, EDU3 <comdy> and the strips calculated in equation [3], we can calculate the discount factors for 17 September 2002 as 0.989821526, which we label as [5].

The corresponding discount factor for 17 December 2002 is 0.985784737. [6]

Using the same interpolation method used above we can calculate an interpolated discount factor for 30th November 2003 as

$$0.986449007. [7]$$

As the bond pays a semiannual coupon equivalent of 1.5%, we then use the equation

Future Value x discount factor = Present Value.

Hence we have the present value of the cash-flow on the 31st May as

$$(0.993971825) * (1.5\%) = 1.490957737 [8]$$

and that for 30th November is

$$(0.986449007) * (101.5\%) = 101.1245742 [9].$$

The implied price of the Treasury bond is given by

$\sum \text{FV} \times \text{DF} - (\text{accrued interest})$

which is equal to:

$$1.490957737 + 101.1245742 - (0.214285714)$$

$$= 101.4012462.$$

This gives the implied street convention yield as 1.474%. [10]

The resulting TED spread is the difference between [10] and the yield associated with the market price of the treasury (given as 1.267%), which is

$$= \boxed{0.223\%}$$

Hedging

The first page on the TED function will show you the Eurodollar futures contracts used in calculating the TED spread, as well as the number of contracts needed to structure an effective hedge. Once the implied yield TED has been calculated, we can calculate how many futures contracts are needed to effect a hedge on the Treasury bond. To do this we use the following formula. The Hedge ratio is calculated as:

$$\frac{\text{Face Value} \times (\text{days in contract}/360) \times \text{discount factor of strip}}{\text{Risk of eurodollar future} \times 10000}$$

The rate used in calculating the above discount factor is the eurodollar future rate - the TED spread. The risk of a eurodollar future is a constant 0.25.

We can view how the TED spread changes with the price of the treasury from the screen, by selecting “page forward”.

Historical TED spread analysis

Market participants sometimes trade on the value of the TED rather than the bond or futures price. Such a trade requires that we consider how this value has varied historically and whether the current value is considered as rich or cheap. High values of TED imply relatively cheap bonds and low values indicate more dear ones. The Bloomberg screen plots the graph of the historical TED spread, whether the implied yield, spread adjusted or Implied price TED.

To illustrate, we select a Treasury bond such as T3 03<Govt>HTED<GO>. We then specify a date range, what type of spread we wish to plot, and which type of futures contract we wish to use. The screen defaults to the eurodollar-futures contract for the currency of the security used. Once the choices have been specified, we type 1<GO> and the generate the report. We then type RPT<GO> select the graph. This is shown in figure 4.

for data tables

HISTORICAL EURO-FUTURE STRIP SPREAD

US TREASURY N/B T 3 11/30/03 101-15+ /101-16+ (1.25 /21) BGN @17:29

1/21/02 - 1/19/03

TED to worst (11/30/03)

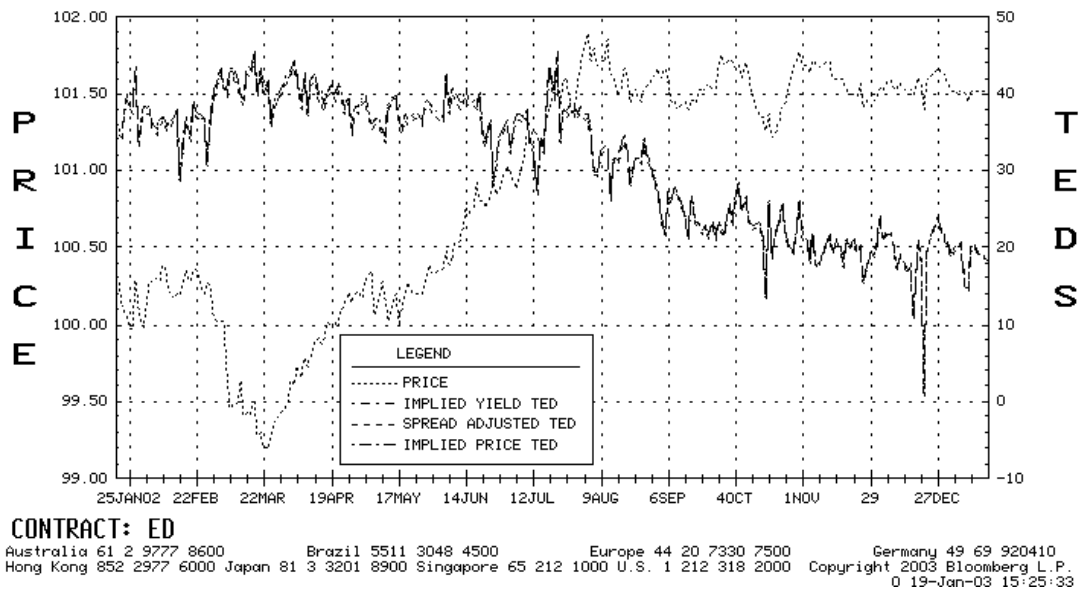


Figure 4

Portfolio TED spread analysis

To apply the analysis for a portfolio of securities, we input the ticker of each security as well as their positions. This is carried out on screen PRTU<GO>, which set up a portfolio from scratch. Fixed income asset managers who wish to hedge their Treasuries with Eurodollar futures may create a portfolio of Treasuries and then type

PTED<GO> 1<GO>

to generate the report. Once the report is completed, PTED will display the total number of each of the eurodollar futures needed to complete a total hedge of the whole portfolio, the number of contracts needed for a specific treasury (as shown in figure 5), and the individual number of eurodollar futures needed to hedge a specific treasury security.

Portfolio TED Report

PAGE 2 / 2

Holder Name: BLOOMBERG/ LONDON OFFICE	Base Currency: US DOLLAR
Port Name: TED	Port: U1199023-6

USD SUMMARY

Security	Price	Implied Yield TED	Implied Price TED	Spread Adj. TED	# of Cntrcts
1T 3 1/4 08/15/07	101.45	41.13	41.24	40.41	171668.189
2T 4 3/8 08/15/12	102.91	60.20	61.03	60.07	308357.759
3T 2 1/8 08/31/04	100.91	20.89	20.85	20.40	64909.090

<Page Fwd> for excluded securities #<GD> to view contracts for security
 Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 920410
 Hong Kong 852 2977 6000 Japan 81 3 3201 8900 Singapore 65 212 1000 U.S. 1 212 318 2000 Copyright 2003 Bloomberg L.P.
 0 19-Jan-03 15:36:07

Figure 5**Conclusion**

Analysing the TED spread between a fixed income instrument and eurodollar futures allows market practitioners to hedge a specific treasury against future changes in interest rates, or to hedge a portfolio. TED analysis can also be used to speculate between the difference in yield changes between the yield on a fixed income instrument and London interbank rates. This becomes an accessible approach to hedging and speculation for TED trades on Treasuries which have longer maturities than 3 months, when the problem of matching cashflows becomes more pronounced.