

Trading CBOT U.S. Treasury Futures: The Long & Short of It.

Presentation at the Chicago Mercantile Exchange
by
Joseph F Benning, Ph.D.
Senior Economist
The Chicago Board of Trade®

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Treasuries & Eurodollars: Similarities, Differences & Possibilities

- Same Macro Economic Drivers
 - Inflation
 - Business Cycle
- Different Contract Structures
 - CBOT Treasury Futures
 - Physical Delivery
 - Track Treasury Curve
 - CME Eurodollars
 - Cash Settled
 - Euro-Strips Replicate a Credit Curve



Trading Possibilities

- Direction of Rates
- The Shape of the Yield Curve
 - Flat, Steep, Barbells & Butterflies
- Credit Spreads
 - Widening Trades
 - Tightening Trades
 - At Points along the Curve
 - Across the whole Curve



Contract Specs

- Key Interest Rate Contracts
 - Fed Funds
 - 5MM Avg. 30 Day Fed Funds Rate / Calendar Month
 - DV01 = \$41.67, ½ BP Ticks
 - Cash Settled
 - Eurodollars
 - 1MM 3-month LIBOR, DV01 = 25
 - Cash Settled
 - Two-Year Notes
 - 200M, ¼ Ticks, 1Year 9 months— ≤ 2 Years. (Original Maturity ≤ 5Years)
 - Five-Year Notes
 - 100M, 1/64th + Ticks, 4Yr, 2months-5Yr 3Months (Original Maturity)
 - Ten-Year Notes
 - 100M, 1/64th + Ticks, 6.5 – 10 Years
 - Bonds
 - 100M 1/32nd Ticks, 15 Years +

Treasuries / Eurodollars

- **Treasury Notes / Bonds**
 - Coupon Stream
 - Return of Principal
 - Price is Present Value of Coupons & Principal
- **Eurodollars / Strips**
 - Usually 3 month deposits
 - Strips are Sequential 3 month deposits
 - Aggregate to a Eurodollar Curve



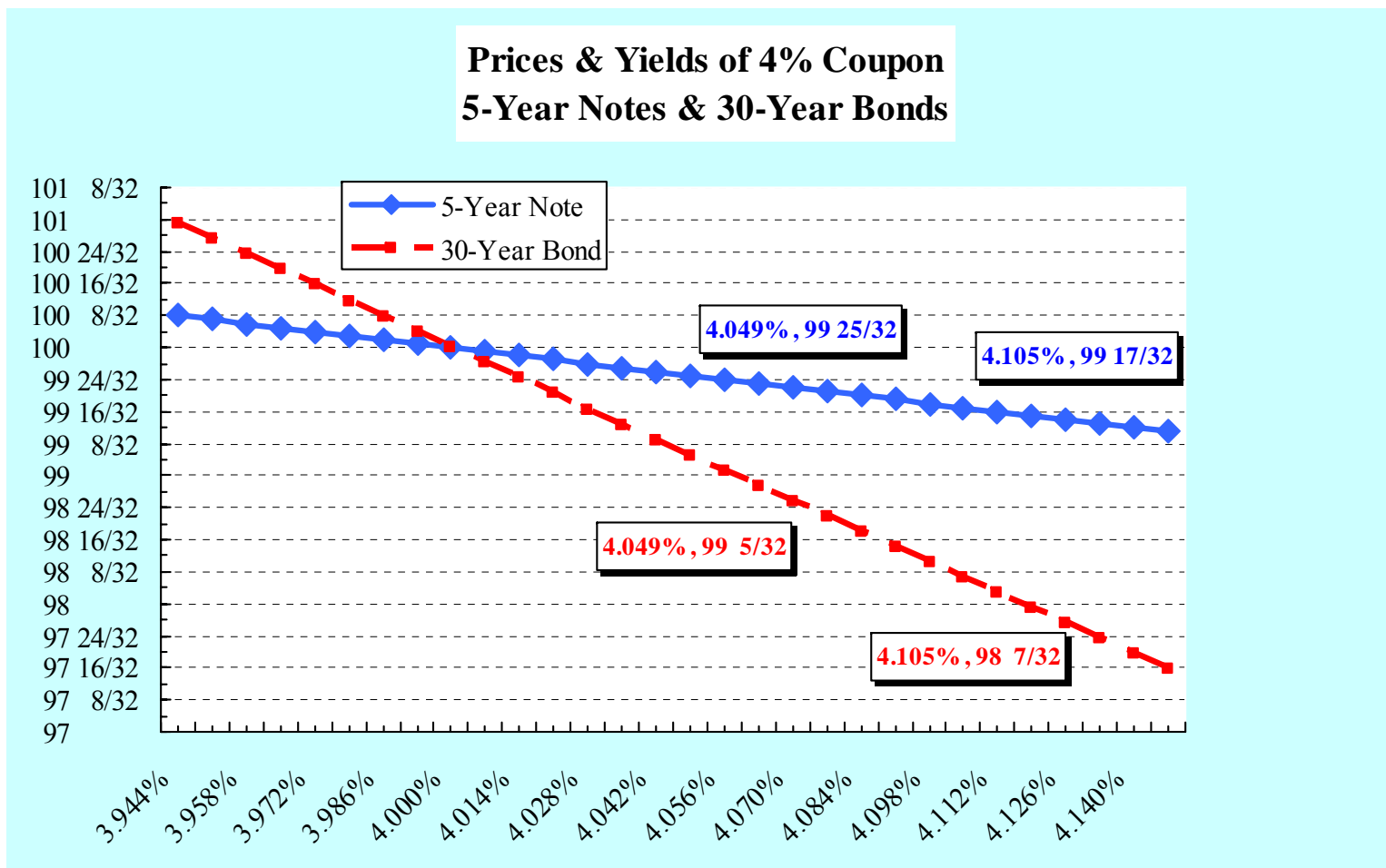
Bond Price = PV Expected Cash Flows

ex: 5 Yr TSY 4% Coupon Priced to Yield 4.10% (Compounded Semi-Annually)

	<u>Coupon</u>	<u>Coupon PMT</u>	<u>PV</u>	<u>FV</u>
	1	-20000	\$19,598.24	\$20,000.00
	2	-20000	\$19,204.54	\$20,000.00
	3	-20000	\$18,818.76	\$20,000.00
	4	-20000	\$18,440.72	\$20,000.00
Coupons	5	-20000	\$18,070.28	\$20,000.00
	6	-20000	\$17,707.28	\$20,000.00
	7	-20000	\$17,351.58	\$20,000.00
	8	-20000	\$17,003.01	\$20,000.00
	9	-20000	\$16,661.45	\$20,000.00
	10	-20000	\$16,326.76	\$20,000.00
	Sum of Coupons		\$179,182.63	\$200,000.00
	Principal	-1000000	\$816,337.81	\$1,000,000.00
		Grand Total	\$995,520.43	99.55 = Bond Price



Bond Prices & Yields



The Importance of Delivery

- Creates Tight Cash / Futures Linkage
 - Arbitrage / Basis Trading
- Basis Trading Makes Futures Sensitive to RP
 - & therefore Fed Policy
- Treasury Futures Replicate Gov't Yield Curve
 - Reflect Inflation Expectations



The Cash-Futures Link: Basis Trading

The Basis is the difference between the current market price of a delivery-eligible cash Treasury security and the delivery price implied by the price of the futures contract.



Basis Calculations

- Determine the Delivery Price (D)
- Delivery: Futures Price (F) * Conversion Factor (C)
- Gross Basis = Cash TSY Price (T) minus the Futures Delivery Price (D)

$$D_{ij} = F_{ij} * C_{ij}$$

$$B^G_{ij} = T_{ij} - D_{ij}$$

- Net Basis* = Gross Basis Minus Carry

$$B^N_{ij} = T_{ij} - D_{ij} - c_{ij}$$



September 2005 Bond Basis Example

- Treasury 7.875% Feb 15 2021
- Cash Market Price = 138 08/32
- Sept Bond Futures = 116 13/32
- Conversion Factor = 1.1855
- Delivery = $1.1855 * 116 \frac{13}{32} = 138$
- Basis = $138 \frac{08}{32} - 138 = \frac{8}{32}$



Bloomberg Ranking by Cheapest-to-Deliver (CTD)

GRAB
Hit {NUMBER} <GO> to view Historical Basis/Repo
Cheapest to Deliver
US LONG BOND(CBT) Sep05 **USU5 116-13**

Comdty **DLV**
Trade **8/16/05** Dlv **9/30/05** p.1 / 2
Set **8/17/05** Cheapest IRP= **4.09**

Order	DR	re-sort?	(Mid) Price	Source	Conv. Yield	C.Factor	(32NDS) Gross Basis	44 Days Act/360 Implied Repo%	Actual Repo%	(32NDS) Net Basis		
MASTER:												
1)	T	7	7/8	02/15/21	138-08	BGN	4.435	1.1855	8.0	4.09	3.47	-3.4
2)	T	8	1/8	05/15/21	141-13	BGN	4.441	1.2125	8.4	4.04	3.47	-3.2
3)	T	8	1/8	08/15/21	141-23	BGN	4.451	1.2144	11.4	3.56	3.47	-.5
4)	T	8	11/15/21		140-20+	BGN	4.457	1.2039	16.0	2.62	3.47	4.7
5)	T	7	1/4	08/15/22	132-26	BGN	4.473	1.1308	37.8	-1.93	3.47	28.0
6)	T	7	5/8	11/15/22	137-20+	BGN	4.470	1.1717	39.9	-1.97	3.47	29.7
7)	T	7	1/8	02/15/23	131-28+	BGN	4.477	1.1197	49.6	-4.33	3.47	40.2
8)	T	6	1/4	08/15/23	121-19+	BGN	4.487	1.0270	65.9	-8.83	3.47	58.5
9)	T	7	1/2	11/15/24	138-18+	BGN	4.485	1.1687	81.1	-9.54	3.47	71.4
10)	T	7	5/8	02/15/25	140-16	BGN	4.486	1.1839	86.0	-10.33	3.47	75.9
11)	T	6	7/8	08/15/25	131-08	BGN	4.490	1.1003	101.4	-14.62	3.47	92.9
12)	T	6	3/4	08/15/26	130-19	BGN	4.485	1.0882	125.5	-19.50	3.47	117.3
13)	T	6		02/15/26	120-05	BGN	4.486	.9999	120.4	-20.72	3.47	113.7
14)	T	6	1/2	11/15/26	127-13	BGN	4.485	1.0593	131.1	-21.05	3.47	123.7
15)	T	6	5/8	02/15/27	129-11	BGN	4.484	1.0744	136.9	-22.04	3.47	129.1
16)	T	6	3/8	08/15/27	126-09+	BGN	4.482	1.0451	148.5	-25.12	3.47	141.2

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 6212 1000 U.S. 1 212 318 2000 Copyright 2005 Bloomberg L.P.
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Bloomberg September Term RP Cost of Carry Calculations

TSY 7.875 Feb 2021

GRAB Govt **COC**

COST OF CARRY ANALYSIS

US TREASURY N/B T 7 7/8 02/15/21 138-05+ /138-07+ (4.44 /44) BGN @13:30

SETTLEMENT DATE	8/17/05	FIX (PRICE or 2=YIELD)	2	COMPOUNDING METHOD	2
PRICE	138-7+	ACCRUED INTEREST	0.0428	[1= CD COMPOUND	
YIELD	4.436565			2= PROCEEDS	
WORKOUT DATE	2/15/21	-VALUE	100.000	3= SCIENTIFIC]	
	CHOOSE:	BUSINESS OR	CALENDAR DAYS	C	

COST OF CARRY

REPO RATE	3.6	1 = REPO or 2 = REVERSE	1	BASIS-ACT/360	
	REPO	B. P.	PRICE	NET P & L FOR	BREAKEVEN
TERMINATION DATE	EQUIV	SPREAD	PICK UP	1000 (M)FACE	PRICE /YIELD
NEXT DAY (8/18/05)	4.293	69.3	0.0027	26.62	138-7 ¹ / ₄ / 4.43676
44 DAYS (9/30/05)	4.304	70.4	0.1190	1189.74	137-28 ⁷ / ₈ / 4.44526

BOND BORROW

		1 = REGULAR or 2 = FED.	1		
	B. P.	PRICE	NET P & L FOR	BREAKEVEN	
TERMINATION DATE	SPREAD	PICK UP	1000 (M)FACE	PRICE /YIELD	
NEXT DAY (8/18/05)	150.0	-0.0058	-57.62	138-7+	/ 4.43615
6 DAYS (8/23/05)	150.0	-0.0346	-345.69	138-7 ⁵ / ₈	/ 4.43406

**** CALENDAR DAYS USED ****

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 6212 1000 U.S. 1 212 318 2000 Copyright 2005 Bloomberg L.P.
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Treasury Futures Converge to the CTD

Futures * Factor = Cash Delivery Price

*Solve for Futures Convergence Price by
Rearranging Terms:*

Futures = Cash Delivery Price ÷ Factor



Dollar Value of 1 Basis Point (DV01)

Per \$1 Million Par Value

- **DV01 Estimates Based on CTD**
- **Use DV01 Estimates to Structure Trades**
 - Cash Treasury Yield Curve Trades
 - Treasury Futures Implied Curve Trades
 - Butterflies
 - BarBells
 - TED Spreads



Calculating Cash DV01s*

(Differences due to Rounding)

Settle	Coupon	Maturity	Price	Yield
8/23/2005	3.625%	6/30/2007	99 9 3/4 32	4.012%
8/23/2005	3.500%	11/15/2009	97 28/32	4.051%
8/23/2005	4.375%	8/15/2012	101 26/32	4.074%
8/23/2005	7.875%	2/15/2021	138 5/32	4.440%

Settle	Coupon	Maturity	Price	Yield	DV01
8/23/2005	3.625%	6/30/2007	99 9 1/4 32	4.022%	\$176.19
8/23/2005	3.500%	11/15/2009	97 27/32	4.061%	\$380.26
8/23/2005	4.375%	8/15/2012	101 24/32	4.084%	\$608.29
8/23/2005	7.875%	2/15/2021	138 1/32	4.450%	\$1,375.81

*For Illustrative Purposes. Subject to Change



Cash / Cash Hedge Ratios*

	2-Year	5-Year	10-Year	Bonds
2-Year	1.00	0.46	0.29	0.13
5-Year	2.16	1.00	0.63	0.28
10-Year	3.45	1.60	1.00	0.44
Bonds	7.81	3.62	2.26	1.00

*For Illustrative Purposes. Subject to Change



Convert Cash DV01s to Futures Equivalents

Contract /Maturity	Cash DV01	Factor	Futures DV01
TUU5 /2 YR	\$176.19	.961	\$183.34
FVU5 / 5 YR	\$380.26	.909	\$418.33
TYU5/ 10YR	\$608.29	.9108	\$667.86
USU5 / Bonds	\$1,375.81	1.18551	\$1,160.53

Convert Cash DV01s to Futures DV01s using the Conversion Factor (Cash DV01 ÷ Factor = Futures DV01)

Futures / Futures Hedge Ratios*

Futures Hedge Matrix

	2-Year	5-Year	10-Year	Bonds
2-Year	1.00	0.44	0.27	0.16
5-Year	2.28	1.00	0.63	0.36
10-Year	3.64	1.60	1.00	0.58
Bonds	6.33	2.77	1.74	1.00

*For Illustrative Purposes. Subject to Change; Based on CTD



Selling the Curve: Short Cash Fives / Long Cash Tens

Yield Weighting: \$5M Short vs. \$3.1 Million Long

Coupon	Maturity	Yield	Price	Change	P&L	Net
3.500%	11/15/2009	4.05%	97.87792			
3.500%	11/15/2009	4.10%	97.68795	-0.18997	\$9,498.305	Short 5M
4.375%	8/15/2012	4.08%	101.775			
4.375%	8/15/2012	4.12%	101.532	-0.24295	(\$7,531.59)	Long 3.1M
					\$1,966.72	Net P&L

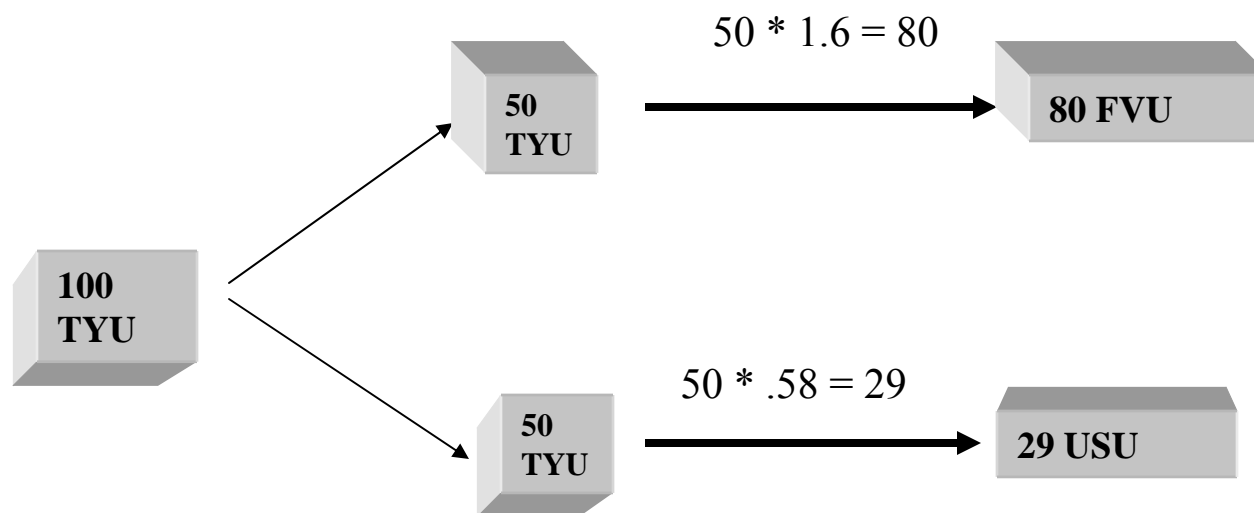


Selling the Curve with Futures: Short FVU5 / Long TYU5 (DV01 Weighted)

Coupon	# Contracts	Cash Yield	Futures Price	Price Change	P&L
FVU5	50	4.05%	107.21		
FVU5	50	4.10%	107.14+	-0.6+	\$10,156.25
TYU5	31	4.08%	111.20		
TYU5	31	4.12%	111.11+	-0.08+	(\$8,234,38)
					\$1,921.88 Net P&L



Sample Butterfly: Hedge 100 Tens with Fives & Bonds*



*Weights Derived from Calculated DV01s



Butterfly P&L

(25 Basis Point Parallel Curve Shift)

Settle	Coupon	Maturity	Price	Yield	Cash	Futures
8/23/2005	3.625%	6/30/2007	98 28/32	4.262%	- 14/32	- 15/32
8/23/2005	3.500%	11/15/2009	96 30/32	4.301%	- 30/32	-1 1/32
8/23/2005	4.375%	8/15/2012	100 10/32	4.324%	-1 16/32	-1 21/32
8/23/2005	7.875%	2/15/2021	134 25/32	4.690%	-3 12/32	-2 27/32

Position	Contract	Q	P+L
Short	Fives	80	\$83,213.16
Long	Tens	100	-\$165,572.75
Short	Bonds	29	\$82,821.93

\$462.35



Basic Term TED

- Long
 - 2-Year Treasury Futures
 - 144 TUU5
 - 144 Sept 2 Year Futures = \$30MM Cash Equivalents
 - CTD = 3 5/8 June 2007 (Factor = .9610)
 - $144 / .9610 * 2 \approx \30MM Par Value
 - Cash DV01 \approx \$176
- Short
 - Eurodollars
 - DV01 = \$25
 - 7 Eurodollars = $7 * 25 = \$175$ DV01
 - \$30MM TSY $\approx 7 * 30 = 210$ Eurodollars
- Trade Rationale
 - Expect Widening Quality Spreads



Treasury P&L:

Assume 20 Basis Point Market Change
on \$30MM 2-Year Cash Equivalents

Settle	Coupon	Maturity	Redeem	Price	Yield	Factor	Futures	Del	Basis
8/17/2005	3.625%	6/30/2007	100	99.29	4.02%	0.961	103.25	99.22	0.07
8/17/2005	3.625%	6/30/2007	100	98.94	4.22%	0.961	102.88	98.87	0.07

Cash	30000	0.35	\$106,349
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Futures	144	0.37	\$105,750
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P&L From Eurodollar Hedge (Parallel Curve Shift)

Exp	# Contracts	DV01	BP	P&L
Dec-05	30	25	20	\$15,000
Mar-06	30	25	20	\$15,000
Jun-06	30	25	20	\$15,000
Sep-06	30	25	20	\$15,000
Dec-06	30	25	20	\$15,000
Mar-07	30	25	20	\$15,000
Jun-07	30	25	20	\$15,000
	210			\$105,000

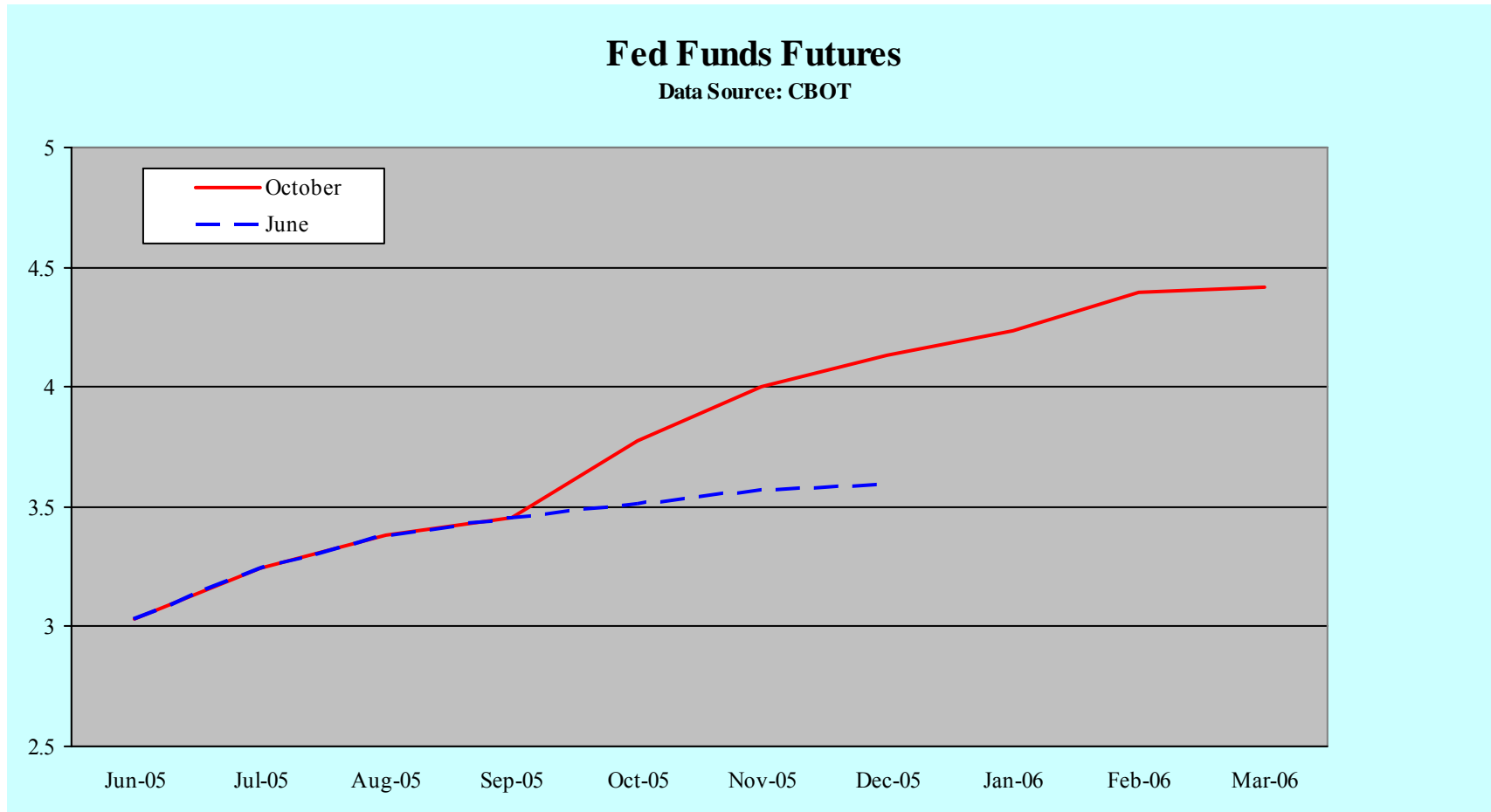


Important Considerations

- Treasury Rates are Free of Default Risk
 - The Ted Spread is a Quality / Credit Spread
- The Curve Can be Extremely Volatile
 - Some Changes are Slow
 - Some are Rapid
- Watch Forward Fed Funds Rates
- Pay Attention to Fed Minutes



The Expected Fed Funds Rate
Based on Closing CBOT Fed Funds Futures
June 1, 2005 & Oct 19, 2005



Fast Changing Yield Curve: FOMC Statement August 12, 2003

The Committee perceives that the upside and downside risks to the attainment of sustainable growth for the next few quarters are roughly equal.

In contrast, the probability, though minor, of an unwelcome fall in inflation exceeds that of a rise in inflation from its already low level.

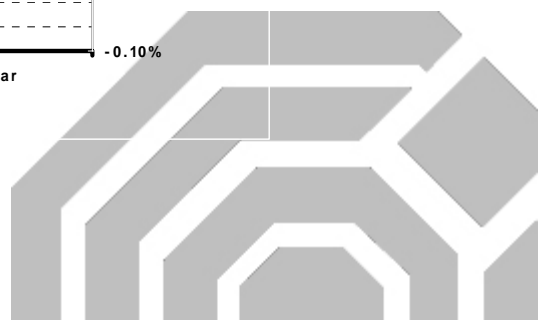
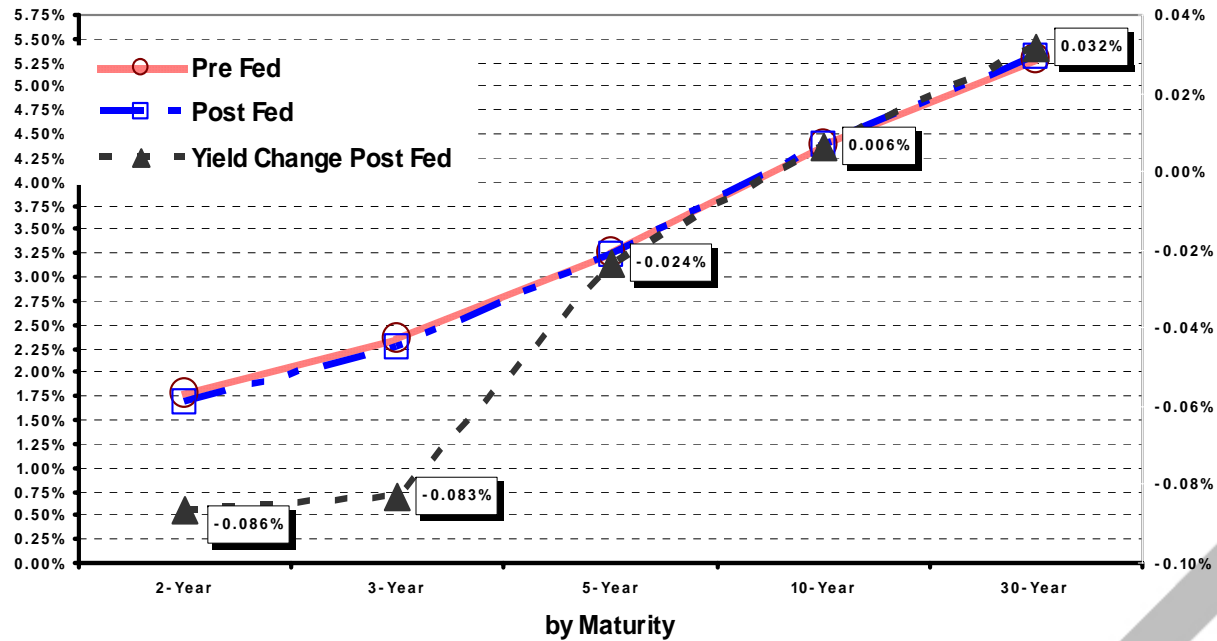
The Committee judges that, on balance, the risk of inflation becoming undesirably low is likely to be the predominant concern for the foreseeable future.

In these circumstances, the Committee believes that policy accommodation can be maintained for a considerable period.

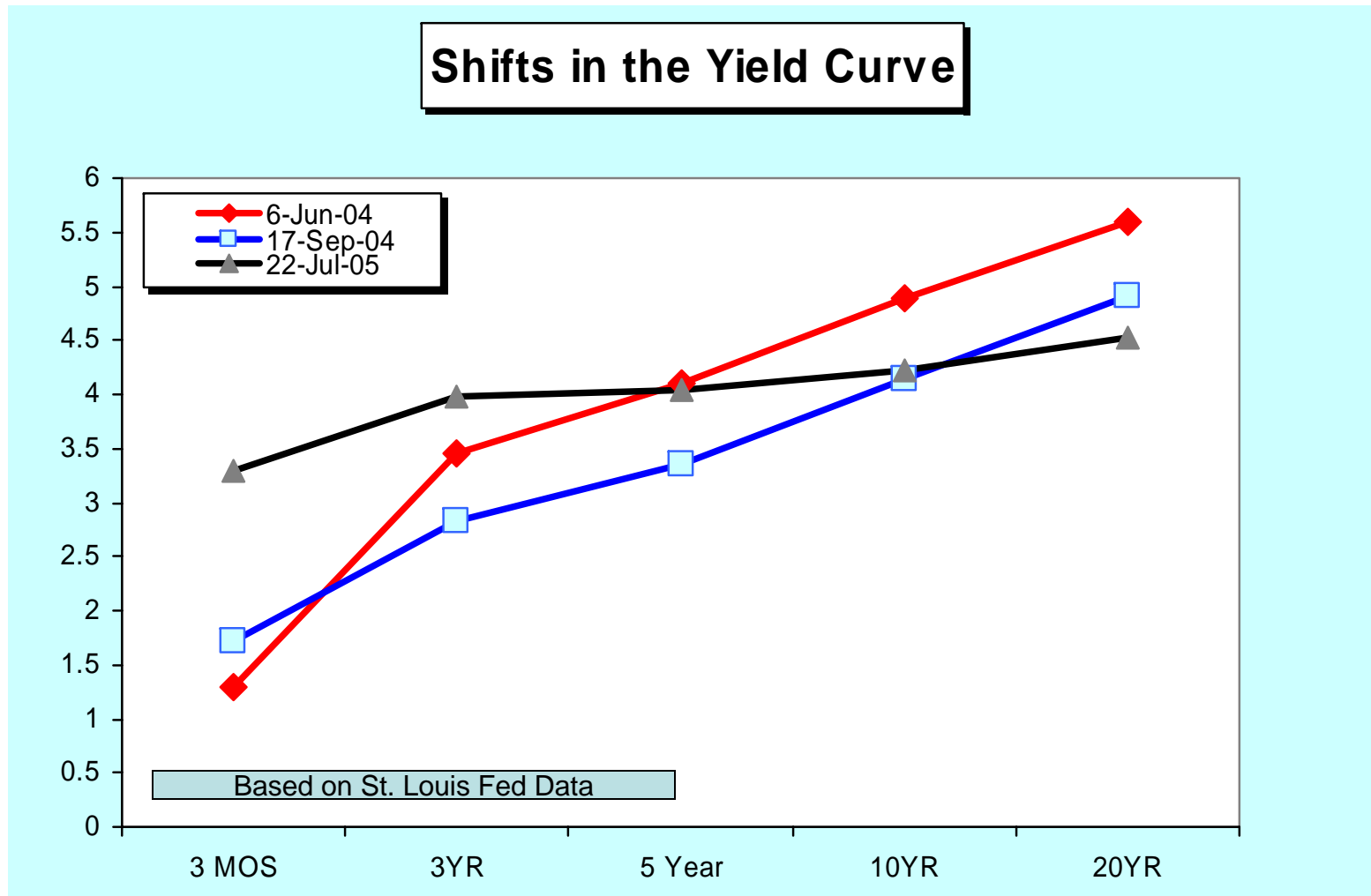


Instantaneous Curve Shift

Post-Fed Yield Curve Shift



Gradual Curve Shifts

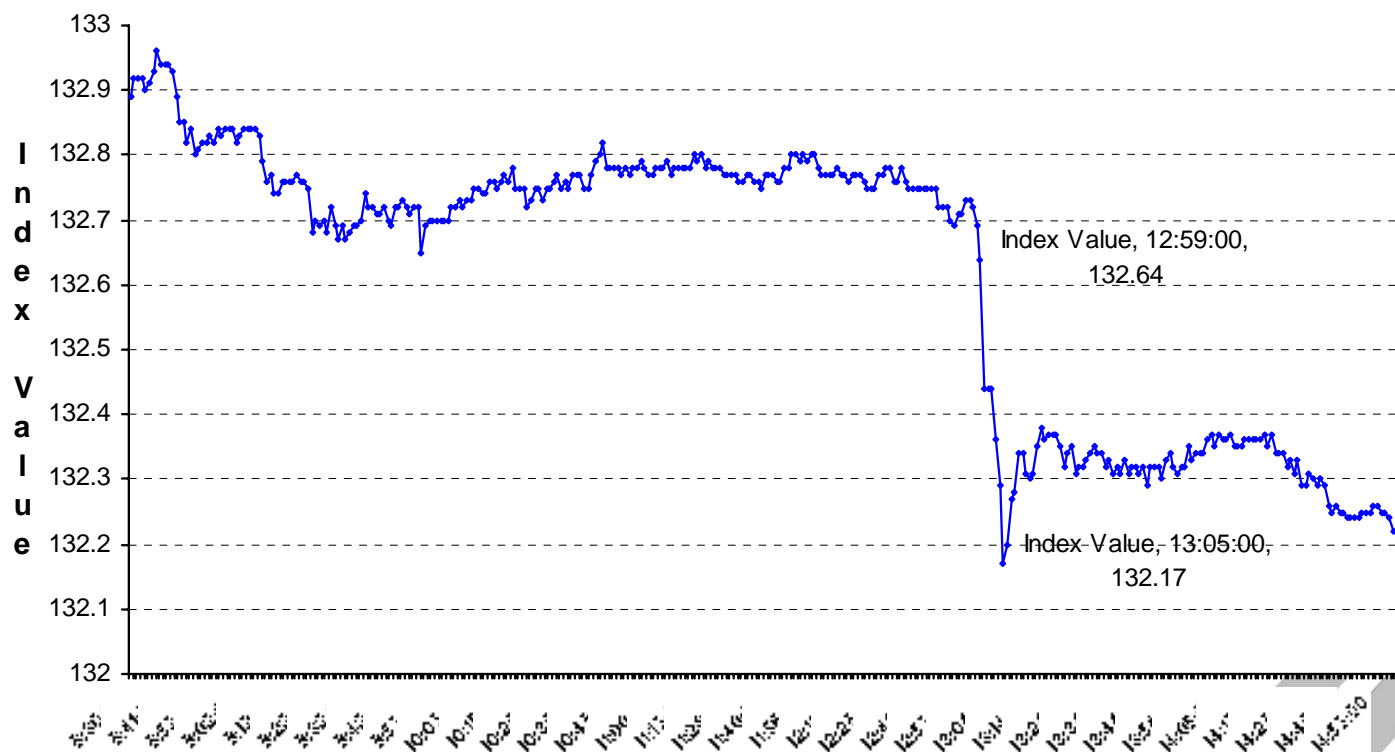


Rapid Shifts in Expectations = Market Turbulence

DJ CBOT Treasury Index™

Minute-by-Minute Changes

January 4, 2005 (FOMC Minutes Released)



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