RATELAB

MERRILL LYNCH US RATES STRATEGY

Value Concepts from the ML Trading Desk

The Return of CBOT Delivery Shift

For most of the past four years, trading in CBOT futures contracts has been a relatively simple venture since the inverted Yield Curve effectively transformed these instruments into fully margined Treasury Forwards. The only security that was deliverable was the shortest duration issue in the "basket" so all that was required to value the contract was a Term Repo to the first delivery date.

However, the reshaping of the Curve has created the possibility that the longer maturity issues may become the "cheapest to deliver". This creates negative convexity in the futures contract that is valued as the delivery switch option. The last time this formation was significantly evident occurred in the Spring of 2003, and I am sure most of you recall how the subsequent bear steepener produced tears for many Rates Traders.

The Simple Logic of Delivery Shift

Reach back to that boring class on Duration and Convexity that you attended at the start of your career. You will recall that all Fixed-coupon bonds (non-callable) exhibit positive convexity. This is manifest as the Dv01 (Dollar value of a basis point) increasing as rates decline and shrinking as rates rise. Pull up any Treasury security on the Bloomberg "YA" screen, alter the rate, and notice the "Risk" number change. It will change by roughly the "Convexity" number quoted on that same page.

There are three inputs into Duration:

1) Coupon
2) Time to Maturity
3) Yield Level

It is this third factor, Yield Level, that creates the Convexity in a Fixed-coupon bond; this must be the case since the Coupon and Maturity cannot be altered.

For further information, please read: "Inside the Yield Book" by Homer and Leibowitz. This 1972 classic is the bond bible.

Futures contracts were created to provide an active and transparent market for Interest Rate trading. To facilitate liquidity, the contract was designed to accept a wide variety of securities for delivery. Since bonds have different Coupons and Maturity dates, a process was created to make them somewhat equivalent. This is done via "Conversion Factors". Each eligible bond delivered to the Exchange will receive the contract price times the Conversion Factor. (This is known as the Invoice Price.) The Conversion Factors are published years in advance and are created via a fixed two-factor matrix of Coupon and Time to Maturity. Below is a sample set of Conversion Factors for the Ten-Year Contract.

	Maturity	Issuance	6% Conversion Factors					
Coupon	Date	(Billions)	Dec. 2007	Mar. 2008	Jun. 2008	Sep. 2008	Dec. 2008	Mar. 2009
4	02/15/15	$23.0	0.8870	0.8902	0.8937	-----	-----	-----
4 1/8	05/15/15	$22.0	0.8910	0.8941	0.8971	0.9003	-----	-----
4 1/4	08/15/14	$23.0	0.9069	-----	-----	-----	-----	-----
4 1/4	11/15/14	$23.0	0.9040	0.9069	-----	-----	-----	-----
4 1/4	08/15/15	$21.0	0.8955	0.8983	0.9012	0.9040	0.9069	-----
4 1/4	11/15/17	$21.0	0.8721	0.8747	0.8771	0.8797	0.8821	0.8848
4 1/2	11/15/15	$21.0	0.9080	0.9105	0.9128	0.9153	0.9177	0.9202
4 1/2	02/15/16	$21.0	0.9058	0.9080	0.9105	0.9128	0.9153	0.9177
4 1/2	05/15/17	$21.0	0.8946	0.8968	0.8990	0.9013	0.9034	0.9058
4 5/8	11/15/16	$21.0	0.9074	0.9095	0.9115	0.9136	0.9157	0.9179
4 5/8	02/15/17	$21.0	0.9054	0.9074	0.9095	0.9115	0.9136	0.9157
4 3/4	08/15/17	$21.0	0.9105	0.9122	0.9140	0.9158	0.9177	0.9195
4 7/8	08/15/16	$21.0	0.9259	0.9275	0.9293	0.9310	0.9328	0.9346
5 1/8	05/15/16	$21.0	0.9436	0.9450	0.9463	0.9478	0.9491	0.9506

Where the Rubber Meets the Road

If your eyes have not glazed over yet, the truth here is self-evident. Fixed-coupon bond Durations are driven by a three-vector model whereas the CBOT delivery function uses only a two-vector matrix. Specifically, the Conversion Factors do NOT change as rates move. This is how the "cheapest-to-deliver" bond can change as rates change. Generally, as rates rise, the longer maturity bonds become deliverable. Similarly, as rates decline, shorter maturity bonds

will be delivered. So the effective duration of the contract shortens in rally and lengthens in a back-up; this is the negative convexity we referred to at the beginning.

Where is the "Switch"

There are a few ways to locate where the "switch" will occur. The easiest is to use the Bloomberg CMS function. The screen below can be accessed via: {TYM8 Commodity CMS <go>} Bloomberg assumes a parallel shift with a fixed issue spread. Below, the "switch" is denoted by the box in the far right column. We found it by changing the *yield shift* box to +76bp (upper right) which created a price of 110-28 (just beneath). This method does NOT account for changes in the Curve or Repo but it does capture the broad notion.

GRAB ComdtyCMS

VIEW B — B-Basis, C-basis Chg; H-Horizon bond price; V-BPV; S-CTD B.P. Spread; P-P&L 32nds

CTD Scenario Analysis

CTD Basis 0. 32nds Stl 1/18/08 Dlv 6/30/08

PARALLEL YIELD SHIFTS (BP)	-100	-50	0	50	76
Price:	122-26+	119-09	115-27+	112-18	110-28
Chng:	+7-17+	+4-00	+ 18+	-2-23	-4-13
Risk:	7.19	6.96	6.72	6.50	7.18

TYM8 115-09

	Issue	Price	Src	Yield	Basis	Basis at Contract Horizon (32nds)				
1)	T 4 02/15/15	103-24 3/8	BBT	3.397	23.5	.0	.0	.0	.0	.2
2)	T 4 1/8 05/15/15	104-09 3/4	BBT	3.454	28.3	10.5	7.2	4.2	1.3	.1
3)	T 4 1/4 08/15/15	105-00 1/4	BBT	3.492	35.7	23.3	16.7	10.5	4.8	2.1
4)	T 4 1/2 11/15/15	106-18 5/8	BBT	3.530	43.2	34.2	24.6	15.7	7.4	3.4
5)	T 5 1/8 05/15/16	110-23 5/8	BBT	3.619	52.7	48.1	33.0	19.1	6.1	.0
6)	T 4 1/2 02/15/16	106-17 1/8	BBT	3.562	50.2	48.7	35.4	23.1	11.6	6.2
7)	T 4 7/8 08/15/16	108-30+	BBT	3.649	58.3	65.2	45.9	28.0	11.5	3.5
8)	T 4 5/8 11/15/16	107-07+	BBT	3.658	69.0	87.4	63.8	41.9	21.6	11.9
9)	T 4 5/8 02/15/17	107-05 7/8	BBT	3.686	74.7	100.2	73.2	48.1	24.8	13.6
10)	T 4 1/2 05/15/17	106-06 7/8	BBT	3.705	82.4	117.1	86.2	57.6	31.1	18.3
11)	T 4 3/4 08/15/17	108-06+	BBT	3.723	90.8	128.6	94.7	63.3	34.3	20.3
12)	T 4 1/4 11/15/17	104-11 1/4	BBT	3.717	103.6	156.4	117.7	82.0	48.9	32.9

Another method is to just subscribe to Merrill Lynch's daily Future report and check your email In Box each morning. Below is a sample page. Our model is more detailed as it includes "yield beta's" and Repo assumptions. Notice how the shift is located a point lower at 109-20 (the third line from the top). However, a fancier model does not necessarily imply a better answer. Since Repo rates tend to be "sticky", and brutal bear markets tend to squeeze Repo rates lower, it is not clear which is the better answer.

TYM8 Scenario Detail/w Beta

Parallel Shift	Futures Price	CTD IRP	OA IRP	Quality Option	CTD Cpn	CTD Mat	CTD Gross Basis	CTD Net Basis	CTD Theo Net Basis	CTD Prob	BPV	Delta BPV	Mod Dur	Convexity
1.000	108-05+	2.46	3.62	0-186	5.125	05/15/16	36.74	26.49	17.74	15.1	71.34	-1.9	6.59	-0.18
0.900	108-286	2.42	3.53	0-18	5.125	05/15/16	37.13	25.78	17.03	15.6	71.11	-2.0	6.53	-0.18
0.800	109-20	2.36	3.43	0-17+	5.125	05/15/16	37.78	25.32	16.57	16.0	70.87	-2.0	6.46	-0.19
0.700	110-12+	2.30	3.18	0-142	4.000	02/15/15	24.31	21.10	12.84	50.4	70.44	-2.2	6.38	-0.20
0.600	111-03+	2.36	3.09	0-12	4.000	02/15/15	23.27	18.93	10.66	54.7	70.15	-2.1	6.31	-0.19
0.500	111-262	2.40	2.99	0-096	4.000	02/15/15	22.47	16.98	8.72	59.1	69.86	-1.8	6.25	-0.16
0.400	112-17	2.42	2.89	0-076	4.000	02/15/15	21.92	15.27	7.01	63.6	69.60	-1.5	6.18	-0.13
0.300	113-076	2.43	2.80	0-062	4.000	02/15/15	21.62	13.78	5.52	68.2	69.37	-1.0	6.13	-0.09
0.200	113-302	2.42	2.70	0-046	4.000	02/15/15	21.55	12.52	4.26	72.7	69.18	-0.5	6.07	-0.05
0.100	114-206	2.39	2.60	0-03+	4.000	02/15/15	21.71	11.46	3.20	77.1	69.05	0.1	6.02	0.00
0.000	115-11	2.35	2.51	0-02+	4.000	02/15/15	22.08	10.60	2.34	81.2	68.98	0.7	5.98	0.06
-0.100	116-012	2.30	2.41	0-016	4.000	02/15/15	22.64	9.92	1.66	85.1	68.97	1.3	5.94	0.11
-0.200	116-23+	2.24	2.31	0-012	4.000	02/15/15	23.38	9.40	1.14	88.5	69.04	1.9	5.91	0.16
-0.300	117-136	2.17	2.22	0-008	4.000	02/15/15	24.27	9.01	0.75	91.5	69.18	2.5	5.89	0.21
-0.400	118-042	2.09	2.12	0-00+	4.000	02/15/15	25.29	8.73	0.47	94.0	69.38	3.1	5.87	0.26
-0.500	118-26+	2.01	2.02	0-002	4.000	02/15/15	26.41	8.54	0.28	96.0	69.66	3.5	5.86	0.30
-0.600	119-17	1.92	1.93	0-002	4.000	02/15/15	27.62	8.42	0.16	97.5	69.99	3.9	5.86	0.33
-0.700	120-07+	1.83	1.83	0-00	4.000	02/15/15	28.89	8.34	0.08	98.6	70.36	4.3	5.85	0.35
-0.800	120-30	1.73	1.73	0-00	4.000	02/15/15	30.22	8.30	0.04	99.2	70.78	4.5	5.85	0.37
-0.900	121-206	1.64	1.64	0-00	4.000	02/15/15	31.58	8.28	0.02	99.6	71.23	4.7	5.86	0.38
-1.000	122-116	1.54	1.54	0-00	4.000	02/15/15	32.98	8.27	0.01	99.8	71.69	4.8	5.86	0.39

Another method is to just do it by hand with your own assumptions about the curve. A recent analysis done by our Basis Desk indicated that a linearly interpolated 15bp 5s::10s steepener could jump the "shift" to a 112-handle.

How Impactful is the Switch

This is an unusually large switch since the CTD shifts by five issues in a single step. This is occurring because the May 16s are a high coupon issue that trades cheap to the surrounding lower priced issues. The Adjusted Duration of the Feb '15s is 6.05 while the Adjusted Duration of the May '16s is 6.80, 12.4% longer. As such, the Switch is similar to being short about 10mm four month 6 point o-t-m puts on the T10yr per 1000 contracts. This is a substantial risk considering that we were near this level just three weeks ago.

Implications

One of the reasons the convention on the CBOT is to quote options on an Implied Price Volatility basis is that the underlying security is uncertain. As such, the Adjusted Duration is unknown. (This is also why MBS options are quoted in Price Volatility since the unknown prepayment rate makes any assumed Duration just a wild guess.)
Let's examine how one might value CBOT options.

……Security……	..Price..	..Yield..	..IPVol..	..IYVol..	..INVol..
T 4.000 Feb 2015	103-28	3.38%	7.25%	36.9%	123.3
T 5.125 May 2016	110-28	3.60%	7.25%	30.7%	109.8
T 5.125 May 2016	110-28	3.60%	8.15%	34.5%	123.3

The Rule: *For two securities with the same Implied Normal Volatility, the ratio of Adjusted Durations will equal the ratio of the Implied Price Volatilities.*

The current IPVolatility on the TYM8 (Jun) for expiry on May 23 is 7.25%
As shown above, that is a 123.3 INVolatility if the Feb 15s is CTD. However, it is a 109.8 INVolatility if the longer May 16s is Delivered. Although the Volatility surface is not flat between those two points, it is certainly not a 13.5 NVol spread.

TYM	Expiry = May 23	K = 115-16	IPVol = 7.25%	Delta = 0.50
TYM	Expiry = May 23	K = 110-00	IPVol = 7.15%	Delta = 0.13

This pricing structure is silly. Not only is a 13% delta "wing option" priced below the a-t-m option, but there is a reasonable potential that if we reach the lower strike the CTD will switch to the longer security.

The Trade

Sell	1000	TYM	K = 115-16	put	1-63/64 7.27%
Buy	2000	TYM	K = 110-00	put	0-20/64 7.20%
Sell	250	TYM	at 115-16		

Initial greeks are flattish Delta, Gamma, Theta and Vega. It is a huge winner in a large bear steepener. As such, this would be a great hedge to MBS.

ML US Rates Strategy
January 17, 2008

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