Key

B/N = Bond/Note

BNOC = Basis net of carry

Bond and Note will be used interchangeably unless noted

DC = Deliverable Curve

DS = Deliverable Set

FR = Federal Reserve

GC = General Collateral

HDB/N = High Duration Bond/Note

LDB/N = Low Duration Bond/Note

NSC = Non-Systematic Curve Shift (Non-Parallel Shift)

SCS = Systematic Curve Shift (Parallel Shift)

SSDO = Short's Strategic Delivery Option

Value = Short's Right to CTD

The Short's Strategic Delivery Options

51 If you are long the basis, by definition you are short the futures.

A trader short the futures has the right to choose:

1) what b/n to deliver
2) when to deliver

This *right* is called, *The Short's Strategic Delivery Option (SSDO)*

What to Deliver

1) The trader short the futures wants to deliver a b/n that will cost him the least amount of money to make the delivery.
2) This is known as the "CTD". Or, Cheapest to Deliver.

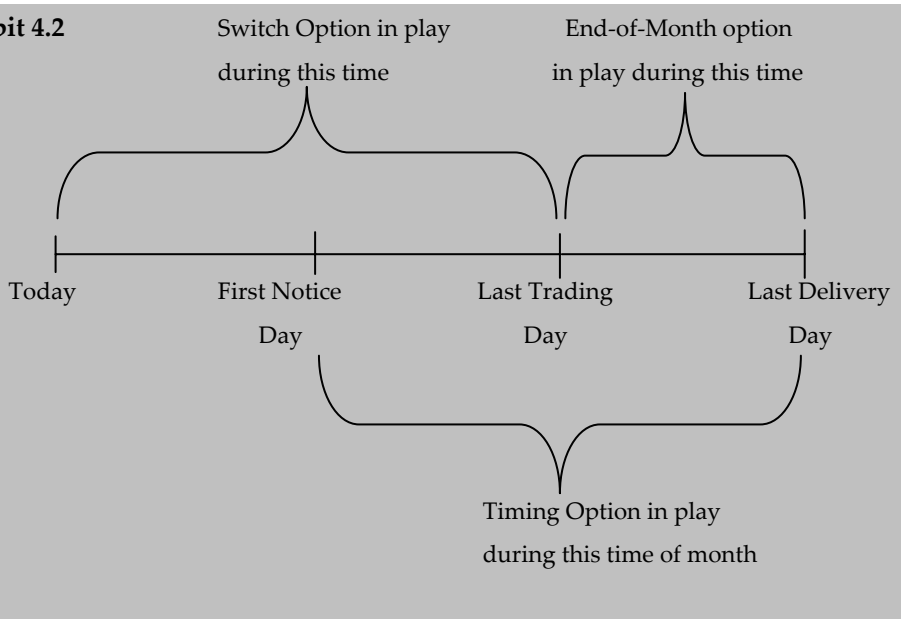
When to Deliver

1) The short may deliver anytime before trading expires in said futures contract month, beginning with Tender Day. So, if we're trading Dec, then, you can delivery beginning Dec 1.
2) Tender Day is designated by the CBOT.

Timing the delivery falls into three categories

1) The Switch Option (most valuable)
2) The End-of-Month Option (2nd most valuable)
3) The Timing Option (least valuable)

77 **Exhibit 4.2**



51 The Switch Option

Value depends on

change in yield levels
change in yield spreads (within deliverable set)
anticipated new issue

54 *Driven by*

changes in CTD
changes in CTD are driven by changes in yield levels
(think volatility between issues)

Parallel Changes in the YC

55 CTD is systematically related to the level of yields

1) If yields are high
    a) HDB/N are CTD
2) If yields are low
    b) LDB/N are CTD
3) If yields are middling
    c) Middling B/N are CTD

When parallel shifts occur

1) HDB/N rise faster in price
2) LDB/N rise slower in price

Parallel Shifts are known as a "Systematic Curve Shift" (SCS)

56 SCS facts (when in a basis position)

1) HDB/N act like calls , rising in value, as yields fall
2) LDB/N act like puts, rising in value
3) Middling B/N act like straddles/strangles

Example: You think yields will fall, then

1) Buy basis of HDB/N (it acts like a call)

As yields fall, being long the basis of HDB/N is more profitable than the basis of a LDB/N.

SCS moves are good for SHORT basis positions.
Meaning, there's less value in the long basis position because there's little chance for a change in the CTD, hence there's less value in being short futures.
Being short the basis is akin to being short volatility.

57 **What makes the switch option so valuable?**

1) a switch in the CTD
2) If there's a switch in the CTD, by definition we are in a volatile environment. Said differently, if you are long basis, you are short futures which gives you the right to choose what and when to deliver. That's worth something. That value literally is the switch option and the markets price this value into the basis market.
3) One way to see how the market values this is to look at the futures in an up trending market. The futures will actually decelerate. Meaning the futures shouldn't out perform their cash underlyers (the CTD). As they write in the book, "this is a direct reflection of the market giving value to the 'short futures' position".
4) Expanding on the concept above, usually in a market that is going up, a short position's losses accelerate. HOWEVER, if there is a chance that there will be a change in the CTD, due to volatility, price level, etc, the futures will actually decelerate. The futures show what is called 'negative convexity'. The negative convexity is reflecting the behavior of the delivery options that are embedded in the short futures position.

57 **BNOC**

Basis Net of Carry (BNOC)

The value of SSDO = BNOC

If BNOC = 2/32, then, the market is valuing the SSDO @ 2 tics.

Consolidating some ideas:

Delivery Curve

Yields fall, DC will steepen

Yields rise, DC will flatten

If DC is moving parallel (systematically) it benefits the short basis position.

If DC is moving in a non-parallel fashion (non-systematically) the long basis position benefits.

If you're long the basis, and the market is going up, yet, the basis isn't rising as fast as you would think it'd move, then check to see if:

1) DC is moving parallel
2) 2/10 curve is moving parallel
3) BNOC is negative.

58 Non-Systematic Shifts in the Deliverable Curve 4

The Deliverable Curve is the basket of deliverables that underly the futures contracts.

We saw an example of this in chapter 2:

CBOT® **5-YEAR U.S. TREASURY NOTE FUTURES CONTRACT**

This table contains conversion factors for all medium-term U.S. Treasury notes eligible for delivery as of March 29, 2006.

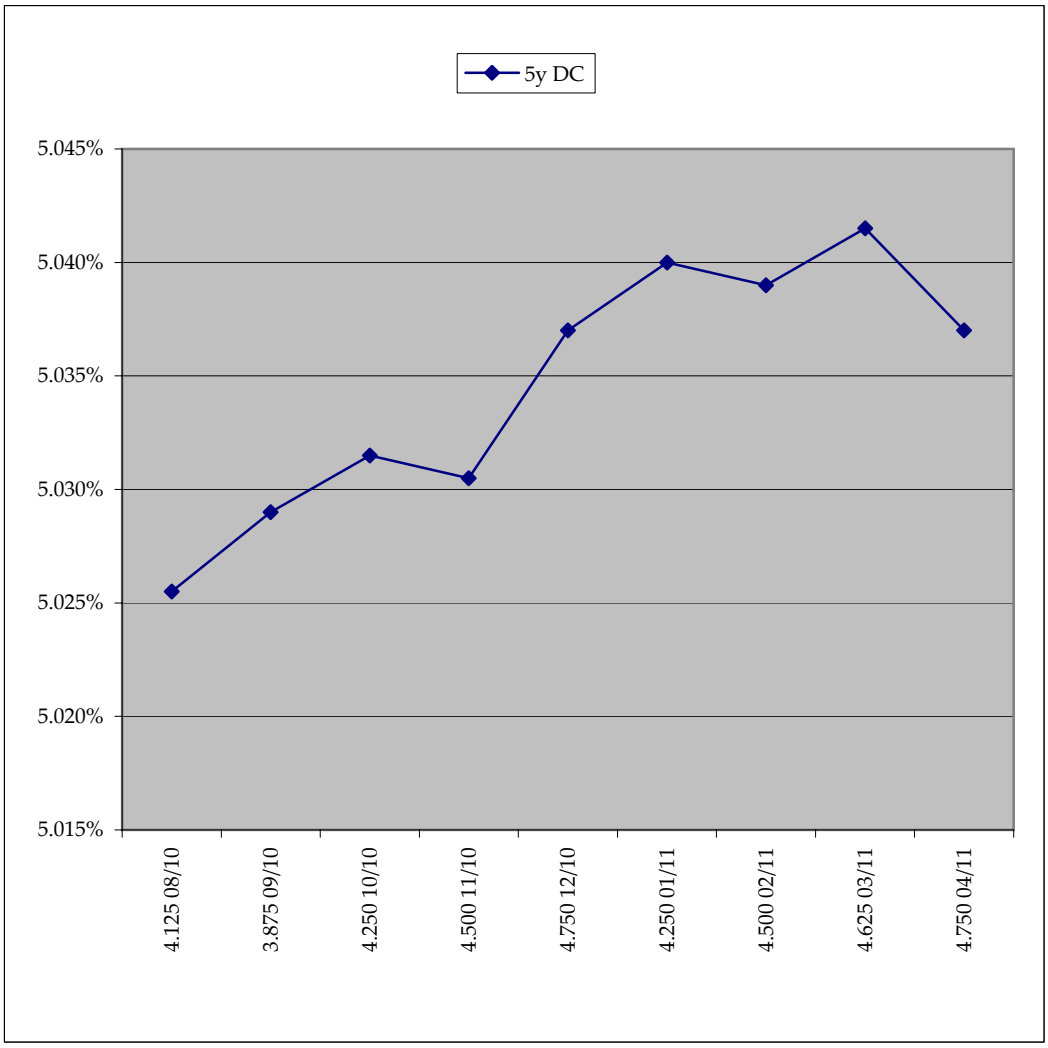
		Coupon	Issue Date	Maturity Date	Cusip Number	Issuance (Billions)	6% Conversion Factors Mar. 2006	6% Conversion Factors Jun. 2006
1.)		3 5/8	06/15/05	06/15/10	912828DX5	$14.0	0.9120	-----
2.)		3 7/8	05/16/05	05/15/10	912828DU1	$15.0	0.9226	-----
3.)		3 7/8	07/15/05	07/15/10	912828DZ0	$13.0	0.9199	-----
4.)		3 7/8	09/15/05	09/15/10	912828EG1	$13.0	0.9173	0.9212
5.)		4 1/8	08/15/05	08/15/10	912828ED8	$13.0	0.9281	0.9317
6.)		4 1/4	10/17/05	10/15/10	912828EJ5	$13.0	0.9307	0.9340
7.)		4 1/4	01/17/06	01/15/11	912828ES5	$13.0	0.9274	0.9307
8.)		4 3/8	12/15/05	12/15/10	912828EQ9	$13.0	0.9336	0.9367
9.)		4 1/2	11/15/05	11/15/10	912828EM8	$13.0	0.9397	0.9425
10.)		4 1/2	02/28/06	02/28/11	912828EX4	$14.0	0.9369	0.9397
11.)	@	4 3/4	03/31/06	03/31/11	912828FA3	$14.0	-----	0.9489
					Number of Eligible Issues:	11	10	8
					Dollar Amount Eligible for Delivery:	$148.0	$0.0	$0.0

The above is the static deliverable curve for the 5-year futures, shown in chapter 2. The numbers within the set are the intrinsic numbers of the underlying notes. The live deliverable curve looks different in one sense. That is, the updating of prices and yields as the notes of the deliverable curve trade in real-time.

Reproduced below is the live deliverable curve as of 05/11/2006, 10 am CDT.

	ZF (Dcml)	103.688	
	Price	**Yield**	
	MID	**MID**	
4.125 08/10	96.578	5.026%	Jun CTD
3.875 09/10	95.543	5.029%	
4.250 10/10	96.930	5.032%	
4.500 11/10	97.887	5.031%	Sep CTD
4.750 12/10	97.313	5.037%	
4.250 01/11	96.740	5.040%	
4.500 02/11	97.717	5.039%	
4.625 03/11	98.746	5.042%	
4.750 04/11	99.293	5.037%	OTR

When I graph the yields of the 5yr deliverable set, I get the 5yr deliverable curve. 5



This is simply a snapshot of all the underlying notes in the 5 year futures basket of deliverables. Note the maturities move from left to right in rank of earliest maturity to farthest maturity. The earliest are considered Low Duration Notes which I've been abbreviating as LDB/N, in these chapter notes. The Highest Duration Note is the OTR furthest to the right.

You can state that this curve is positively sloped because the LDB/N is lower in yield than the HDB/N.

Now that we have a picture of the DC, we can define a few important aspects of the DC and how is affects the basis trade.

58 In a systematic shift (SCS) the value of the short's strategic delivery options goes down in value, i.e., when it's not volatile, a long position in the basis can lose money or not produce as much money as you thought it would in a market that's going up.

60 Non-systematic yield spread volatility

1) An increase in one bond's yield relative to another, in the DS, will make it less expensive to deliver.
2) If the change is big enough, there can be a shift in the CTD.
3) Spreads within the DS are affected by squeezes in the issue
4) The slope of the DC is the most important aspect of the DC.

61 Example of changes in the CTD

When the treasury announced the 30yr buyback in mid-Jan 2000:

1) The CTD was the HDB in the basket. It was the 6 3/8 of 8/27.
2) After the announcement the 08/27 went up faster in price than the other bonds in the DS. Meaning the DS curve flattened. The 08/27 became too expensive to deliver.
3) Eventually the new CTD became the LDB in the DS. The 9.00 of 11/18.
4) Conclusion

   The DS Curve flattened as yields were falling. This is an example of a non-systematic change in the yield spreads.

64 The Short's strategic delivery option (SSDO)

Remember:

Timing the delivery falls into three categories

1) The Switch Option (most valuable)
2) The End-of-Month Option (2nd most valuable)
3) The Timing Option (least valuable)

Let's look at "The End-of-Month Option" (2nd most valuable) 7

When: Expiration to Last Delivery Day (LDD)

What: Futures price is fixed. Therefore, delivery invoice price is fixed. If there's a change in the CTD it makes this option quite valuable.

Driven by: If yields go up a LDB may become CTD, vise versa.

Formula: Net cost = Cash - (Factor * Final Futures price) - Carry

Where 'Net cost' is total cost to deliver the b/n.

(More on End-of-Month Option next page)

70 Now let's look at "The Timing Option"

First some facts:

Decision to deliver at the beginning of the month or end of the month is influenced by the repo rate.

1) If RP Rate is < current yield of bond, then carry is positive and the inclination is to defer delivery.
2) If the RP Rate is > current yield of bond then carry is negative and delivery will take place in beginning of month.
3) If carry is negative and the shorts delivers in the beginning of the month, then the short is giving up all value of the SSDO. However, the short may defer delivery for a little while if carry is only slightly negative so they can see if the value of the SSDO increases with some volatility.
    a) Situation occurs in negatively sloped yield curve environment.

(More on the timing option on pps 70-71 in bond basis book.)

64 More on End-of-Month Option

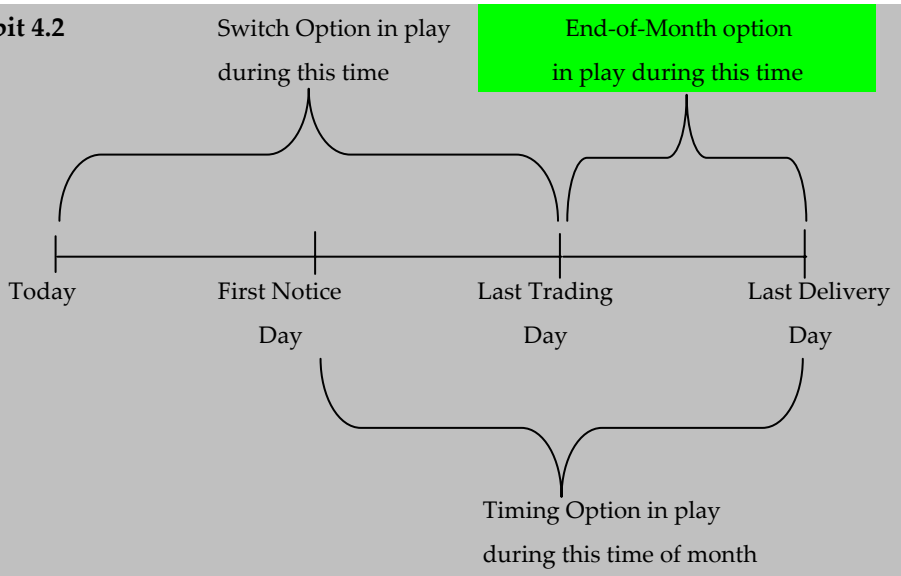
Let's go into a bit more detail concerning the End-of-Month Option (EOMO) since this can have a strong affect on the futures, plus it's a good trade by itself.

64 "The short's right to swap from an expensive bond into a newly cheap bond after the last day of trading is generally known as 'end-of-month' option."

If we are rolling into the September futures contract, we must go through roll-month to get there. September futures become lead month starting the last trading day of May. Therefore, the June contract that was lead month expires in the month of June.

Take a look at Exhibit 4.2 again. Note where the EOMO comes into play.
In our example, June would expire on the Last Trading Day.

77 **Exhibit 4.2**



At 12:00 noon on the last trading day, June expires and the price of that contract is set in stone. It can't change. However, the price of the cash contract can change. This is where the EOMO come into play.
Here's what they have to say in the bond basis book:

64 "The forces that drive the end-of-month option are quite a bit different from those that drive a change in the cheapest to deliver while the futures are still trading. One peculiar result of these differences is that a change in yields that would make a bond cheap to deliver before the expiration of futures trading often will tend to make the bond expensive to deliver once futures trading has expired."

And…

65 "A resolution to this paradox is this. A high-coupon issue will have a high basis point value but will tend to have a low basis duration. On the other hand, a low-coupon issue will have a low basis point value but will tend to have a high duration. Thus, although a rise in interest rates will tend to make high-duration issues cheap to deliver before the close of trading, rising interest rates will tend to make high basis point value issues cheap to deliver. Because the high basis point issues will tend to have low durations, we may well find that a rise in rates will cause a low-duration issue to become cheap to deliver after trading in futures contract has expired and the futures price is fixed."

65 Hedge Ratio's

They trade 1:1 after the expiration of the futures.

See page 65

66 The Key

"The key to understanding the payoff to the end-of-month option is that the invoice price for each deliverable bond is carved in stone once the closing bell has rung and the final settlement price for the expiring futures contract has been established. As this point the net cost to delivering any of the eligible bonds in the futures contract is simply
Net cost = Cash Price - (Factor * Final Futures Settlement Price) - Carry"

68 "What Does the Option Cost?"

1) It all depends on the basis net of carry of the CTD at close of trading for the expiring futures.
2) If BNOC is 1 bp, then that is the value of the EOMO.

Lastly:
When you trade the EOMO, you're buying volatility. You're betting that there'll be a change in the CTD. The 'premium' is the BNOC.