Key

B/N = Bond/Note
BNOC = Basis net of carry
Bond and Note will be used interchangeably unless noted
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)
SC = Systematic Curve Shift (Parallel Shift)
SSDO = Short's Strategic Delivery Option
Value = Short's Right to CTD

This chapter deals with the Deliverable Set (basket).
Most references to the 'curve' apply to the Deliverable Curve.
I refer to the basket as the Deliverable Set (DS).
Also, it's important to note that we are talking about 6% conversion factors, within the DS.
This point is very important when reading facts about the basis, as you will see.

What Drives the Basis ?

"Form a strict carry standpoint, futures prices usually are too low. Those who buy bonds and sell futures cannot make enough in carry to compensate for the lower futures prices. Those who *sell bonds and buy futures* seem as if they will more that make up for the carry loss. In a nutshell, basis tends to exceed carry and has done so since Treasury futures began trading." [My Emphasis]

The above is from the book, word for word. If you understand that paragraph's meaning, then, you understand 99% more than every other trader.

To make up for the lost carry, those who sell futures (buy basis) get something in return. As stated in the book: "...therefore those who buy futures are giving something up."
Those buyers of the futures (seller's of the basis) make the difference between the basis and the carry.
However, the seller of the basis gives up the right WHEN and WHAT bond/note to deliver.
That *right* is the SHORT position in the futures (long basis).
That right is called, 'The Short's Strategic Delivery Option' (SSDO).
Do not confuse the word 'option' with the tradable options market. SSDO has nothing to do with that.

SSDO

CBOT rules state that whomever is short the bond decides *WHEN* and *WHAT* to deliver.
"**…changes in the values of these rights accounts for changes in the difference between basis and carry.** (Chptrs 3&4 cover the way to value the SSDO).

CTD

28 To understand the SSDO you must first understand the Deliverable Set (DS)
and Cheapest to Deliver (CTD).
Recall the conversion factors from the first chapter.

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

This is the Deliverable Set (DS) for the five-year notes.
All notes meet CBOT eligibility requirements. Therefore, if it's within the delivery month,
and you're short the 5-year note futures, you may deliver any
of the notes in the DS. (Sometimes DS is referred to as 'The Basket'.)
Since the object is to make money on your position, you'll deliver the
cheapest note; the note that will cost you the least and make you the most $.
You will deliver the "Cheapest to Deliver" note.
The CTD for 5y, at that time, was 5.) the 4 1/8s of 08/10.

How do I know that fact? The CTD will always be the b/n with the
highest implied repo rate. Great….what's that?
What's important for now is knowing where to find the information.
because you need to know "what the CTD is."
You can find the CTD on:

Bloomberg, Reuters, or email and ask me. I keep track of the CTD everyday.

You'll want to do the same; keep track of the CTD.

And, most importantly, will there be a change in the CTD because it can make the basis go nuts. We'll get into that later.

So, the lesson from all of this, if you think back, is the SSDO.
The SSDO has the right of WHEN and WHAT to deliver.

They'll always deliver the CTD (99% of the time).

The CTD is in the DS.

When to deliver is a different ballgame, that we'll get into later.

Repos on Special

32 We'll get into Repos (RPs) and Special RPs later. But here's a synopsis:

1 I send out an collection of 7 emails every day concerning the RPs and what's on special. If you trade basis and aren't looking at the RPs, you're doing yourself a disservice.

2 If a repo is on special, it'll show up in one of the emails with an "*" (asterisk) next to it.

Example:

RepoPX GovPX PG 240

Morning Bid Side Overnight Repo Rates

Monday Apr 10, 2006

	Open	8:15	8:30	8:45	9:00	9:30	10:00
GC Rate	4.77	4.77	4.75	4.75	4.76	4.75	
Fed Funds	4 3/4	4 3/4	4 3/4	4 3/4	4 3/4	4 3/4	
GC TBill	4.75	4.75	4.75	4.75	4.76	4.76	
02Y 02/08	4.70	4.70	4.70	4.70	4.80	4.80	
2Y 03/08	4.70	4.70	4.75	4.75	4.75	4.75	
03Y 11/08	4.80	4.85	4.85	4.75	4.70	4.80	
3Y 02/09	4.78	4.75	4.75	4.75	4.75	4.80	
05Y 02/11	4.75	4.75	4.75	4.75	4.80	4.75	
5Y 03/11	4.75	4.70	4.70	4.70	4.70	4.70	
010Y 11/15	4.65	4.65	4.65	4.65	4.65	4.65	
10Y 02/16	4.00*	3.85*	3.85*	3.85*	4.00*	4.00*	
030Y 02/31	4.75	4.75	4.75	4.80	4.80	4.80	
30Y 02/36	4.65	4.65	4.65	4.75	4.80	4.75	

* Denotes issue trading special.

Note the left hand column, 10Y 02/16. There's an asterisk denoting that that issue is on special. Also note that it opened on special.

Here's how you'd use this information:

IF that 10Y returned to GC it would be bad for the trader who's long the basis. Said differently, if the RP on the issue you're trading opens on special and goes off special (no more asterisk) then, it's bearish the basis of the issue you're trading. Vice versa.

You need to watch the RPs if you're trading basis.

Implied Repo Rate 2 (IRR)

34 We mentioned the IRR before:

it's used to identify the CTD

It can also be used to identify when to deliver a b/n. Why is that important to you?
The odds are you'll never make or take delivery? Right? True, but all-the-same
knowing when traders are delivering is very important for determining market direction.
To identify when it's best to delivery, within the delivery month, you can use the IRR
as a tool. However, use it as one tool, not THE tool.
If the IRR of the b/n you are trading is moving higher day after day, within the delivery
month, the odds favor a later delivery. Since IRR is the hypothetical rate of return
for holding a b/n, a trader will hold the b/n longer as long as the IRR is moving
higher.

34 Slope and the IRR

If the curve is positively sloped, a trader will make delivery later in the cycle.
That's because in a positively sloped curve environment a trader's carry
is positive and "everyday that goes by is money in the bank".
"The IRR simply confirms this".

If a trader was to make delivery early in the delivery month, they're giving up
the SSDO. The SSDO could be worth a couple of basis points.

If the curve is negatively sloped, it poses a problem.
Everyday that goes by is a drain to being long the basis because the trader has a position
on that has negative carry. One way to avoid negative carry is to deliver early.
However, you must weigh the choice between the negative carry and the SSDO.
Early delivery doesn't happen often. But it does happen, as it did in the March delivery cycle,
in 2006, with the 2s, 5s and 10s .
Did those early deliveries have an affect on you PnL??

We'll come back to the IRR and the delivery cycle later.

Changes in CTD and the Rules of Thumb

36 Changes in CTD

1) The single biggest risk to the trader who's short the basis.
   You must always be aware if there's a chance there'll be a change in the CTD.
   You can use the IRR as a tool to identify if there's a potential change.
   Remember, the the b/n with the highest IRR is the CTD.
   With this information at hand look to the next b/n in the basket that has the next highest IRR. There could be two or three bunched closely together.

Example:

10:51 10APR06 10YR CHEAPEST TO DELIVER US42963 RTRTSY11

10-YEAR FUTURE 105.85938 DELIVERY DATE 29-Sep-06

COUPON	MATURITY	PRICE	CHG	BASIS BID	BASIS OFFER	CBOT FACTOR	IMPLIED REPO BID	IMPLIED REPO OFFER	CHEAP DELVR
3.625%	15-May-13	92.08-11	+07	6.39	7.89	0.8697	3.40%	3.29%	-
3.875%	15-Feb-13	93.27-30	+08	-1.71	0.79	0.8870	4.21%	4.03%	$
4.000%	15-Feb-14	93.24-27	+07	17.47	18.97	0.8806	3.00%	2.89%	-
4.000%	15-Feb-15	93.01-03	+06	36.13	37.13	0.8683	1.70%	1.63%	-
4.125%	15-May-15	93.26-28	+06	42.34	43.84	0.8737	1.35%	1.24%	-
4.250%	15-Aug-13	95.22-25	+06	9.18	11.68	0.9012	3.76%	3.59%	-
4.250%	15-Nov-13	95.17-20	+07	14.01	16.51	0.8983	3.40%	3.23%	-
4.250%	15-Aug-14	95.04-06	+06	28.79	29.79	0.8901	2.43%	2.36%	-
4.250%	15-Nov-14	95.00-02	+07	34.27	35.27	0.8873	2.02%	1.95%	-
4.250%	15-Aug-15	94.18-20	+06	46.02	47.02	0.8797	1.25%	1.18%	-
4.500%	15-Nov-15	96.11-13	+07	52.54	53.54	0.8946	1.00%	0.93%	-
4.500%	15-Feb-16	96.15-17	+07	63.32	64.82	0.8926	0.30%	0.20%	-
4.750%	15-May-14	98.16-20	+06	24.82	27.32	0.9233	3.07%	2.90%	-

This page will update appx. every 20 minutes between 8:30am - 3:00pm N.Y. Time
***CHEAPEST TO DELIVER FOR 30-YEAR BONDS AVAILABLE ON PAGE <RTRTSY8> ***
***CHEAPEST TO DELIVER FOR 5-YEAR NOTES AVAILABLE ON PAGE <RTRTSY12> ***
*** CHEAPEST TO DELIVER FOR 2-YEAR NOTES AVAILABLE ON PAGE <RTRTSY13> ***

The above is a listing of the Ten-year basket from Reuters.
The CTD is the note with the highest IRR.
The 3.875 of 15-Feb-13, on the second line, is the CTD, with a IRR of 4.21%
To gage the chance that there'll be a change in the CTD, look to the next note with the highest IRR. That would be the 4.25 of 15-Aug-13 with an IRR of 3.76 (Bid). That's the note that would be a threat to the 3.875 of 15-Feb-13.
With a spread of 45bps between the two competing CTDs, unless you were expecting enormous volatility, there's really a very small likely-hood that there'll be a change.
The lesson for now is to identify if there's a b/n within the basket that threatens the current CTD. You'll use the IRR to determine if there's a threat. If there's a threat, it's bad for the trader who's short the basis, good for the trader who's long the basis.

36 **2 Rules of Thumb**

These rules concern a change in the CTD:

1) **Duration**

a) For Bonds/notes trading at the same yield below the 6% Conversion Factor, the b/n with the lowest duration will be CTD.

b) For Bonds/notes trading at the same yield above the 6% Conversion Factor, the b/n with the highest duration will be CTD.

2) **Yield**

a) Bonds/notes with the same duration, the b/n with the highest yield will be CTD. (Read on).

What is Duration?

(We are going to side-track from the book because the concept of duration is important. It'll help explain the rules of thumb.)

If you think you have an idea what duration is, but aren't sure, then please pay attention to this section.

The following is reproduced from a study on Duration, from Salomon Brothers, 1985. It's well known to be the best study of Duration in the industry. I will quote from the paper extensively. Therefore leaving out direct reference, due to time.

Duration was described/invented by Frederick Macaulay in 1938. Hence the name you may see, "Macaulay Duration". Not to be confused with "M Duration" which is Modified Macaulay Duration.

In the bond market, securities are commonly referred to by their maturities. While this is a useful benchmark, it is deficient, because it measures only when the final cash flow is paid and ignores all of the interim flows.

I put the above paragraph in a box for a purpose. That purpose is important. Note the last line that talks about cash flow. That's what duration is---CASH FLOW.

Yes, duration has a time component, but the **cash flow** is the first thing you must recognize about duration.

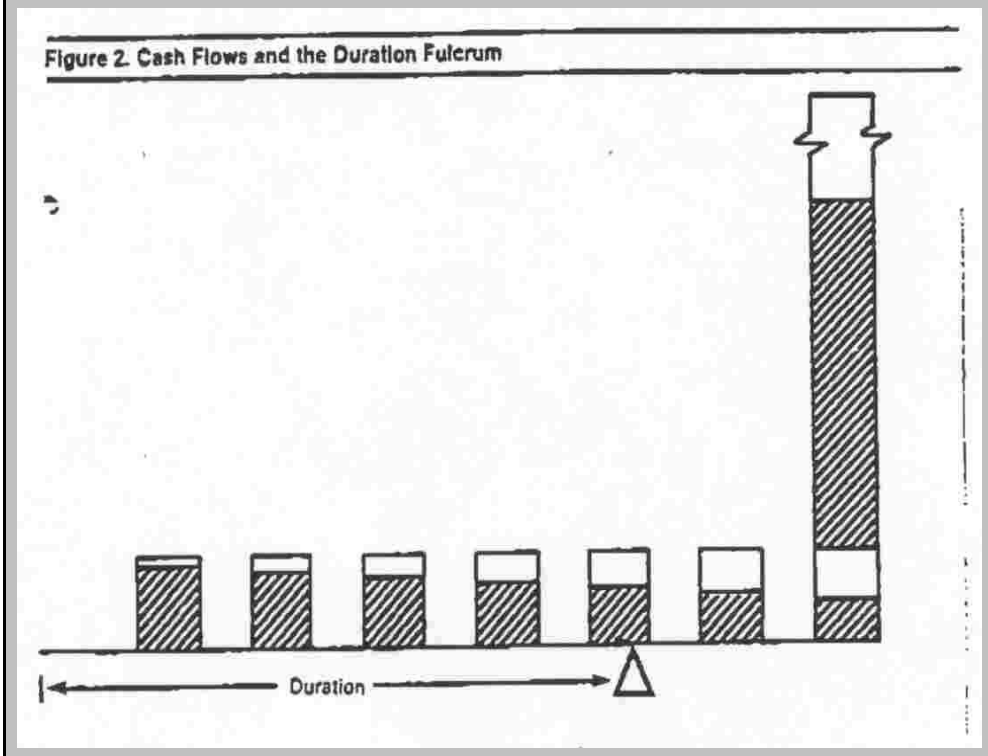
Duration, by definition, is a weighted average of time until cash flow payment.

For you math nuts, you can get the exact equation by looking at page 4 of the study. Email me and I'll send it to you. Or, look it up on the net; it's out there for free downloading.

The name of the paper is:

Salomon Brothers Inc, Understanding Duration and Volatility, September 1985

The picture below is the best illustration of Duration I've ever seen. It explains everything about duration. It's reproduced from the study.



Each box represents 1-year. There are 7 boxes total. This picture represent the cash flow of a 7-year note. Each box has a striped area and white area.

Striped = nominal amount of cash to be received

White = present value of cash flow

Now, look at the triangle under the 5th box. That's the balance point of the cash flow. That triangle is balanced at 5.1 years, of the total 7-year note.

The Duration of the note = 5.1

So, duration is a measure of money over time; the exact balance of the cash flow.

Below is the duration of the current on-the-runs and futures, for today, April 10th, 2006:

	M Duration
30y	15.59
10y	7.78
5y	4.37
3y	2.63
2y	1.86
ZB	9.52
ZN	5.87
ZF	3.90
ZT	1.86

(futures duration =CTD duration / CF)

If you're a 10y basis trader, you're trading 2 very different durations.
Referring to the durations on the prior page, the on-the-run duration = 7.78 years
ZN's duration = 5.87 years.
That's almost a 2-year difference. This is precisely why someone who wants to get long or short the 2/10 curve but thinks it's too expensive to carry the position and decides to put on a 2/10 futures spread will not be rewarded.
The Duration of the 2/10 cash and 2/10 futures are very different, hence they trade very very differently.

Let's go back to the statement I wrote below the duration matrix,
"The futures durations are taken from the CTDs".
Think about it. Why are the CTD's duration and the futures duration the same?
Because to figure out hedge ratio's and duration, you need intrinsic measurements, like, a coupon, maturity, etc. The futures don't have intrinsic measurements. They're based on a 'basket' of bond/notes. So, when you go to Bloomberg or Reuters, etc to figure out hedge ratios for futures, they use the 'proxy issue' for the futures. The proxy issue is simply the CTD.

This means that the futures really are the CTD. They take on the life of that CTD. If the CTD is one of the lowest durations in the basket of deliverables, then you've got a lower duration for the future compared to the on-the-run. You're literally trading a mini-yield curve. That's why I chart the on-the-run minus the CTD, as a spread.

Fact:

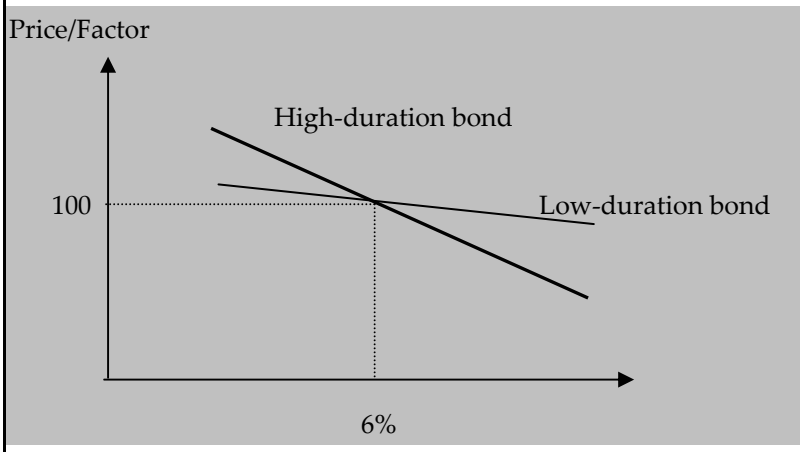
	Duration
Yields up	Down
Yields dwn	Up

Back to the book.

Fact:

36 Duration represents the percentage change in the b/n price for a given change in the b/n yield. "For the same change in yields, then, the prices of high-duration bonds change relatively more than the prices of low-duration bonds".

Explaining further, with an example from the book:

37 

(Reproduced from the book, p37, exhibit 2.5)

This is very important. It explains why the basis trades like it does.

37 "As yields fall from 6%, the prices of both [HDB/N & LDB/N] bonds rise, but the price of the low-duration bond rises relatively less than the price of the high-duration bond. Thus, as yields fall below 6%, the low-duration bond becomes the CTD."

"In contrast, as yields rise above 6%, the price of the high-duration bond falls relatively more than the price of the low-duration bond. As the a result, the high-duration bond becomes the cheapest to deliver as yields rise above 6%. Hence the first rule of thumb." (reproduced below)

36 1) **Duration**

a) Bonds/notes trading at the same yield below the 6% Conversion Factor, the b/n with the lowest duration will be CTD.

Think about this for a minute. Pretend the HDB above is the on-the-run and the LDB is ZN (remember that ZN takes on the life of the CTD).
For a b/n trading under the 6% conversion factor, as yields fall, price goes up.
BUT the HDB will go up faster.
That's why the basis should rally as the market rallies. If the basis is lagging, meaning the cash is NOT rallying as fast as futures, then the market may be telling you something; like it's a false rally.

In contrast, when yield goes up, price goes down, BUT the HDB will NOT go down as fast in price (for the b/n trading below the 6% conversion factor, as we have been trading for the last couple of years).

Conclusion: Taking into account that we are trading under the 6% CF, we can state the following:

1) When we rally, the cash should out-perform the futures and then some.
2) When we break, the cash should out-perform the futures, but, not as much as when the market is rallying.
3) The futures are more volatile in a down market.
4) If we get over 6% in any contract, we better look for a massive change in how the basis trades.

(next page)

The Bond Basis is Like an Option

The harderst aspect of basis is perhaps this concept: Basis can be traded like an option. Meaning, you can bet on volatility with a basis trade. The authors have more to say about this in chapter 7.

What I think is important to learn in chapter 2 is

1) the relationship between the cash and the futures
2) high duration compared to low duration (vice versa)
3) how the CTD can change with volatility
4) exhibits 2.6 through 2.9, beginning on pg 39
   (read on)

First, recall the following:

2 Rules of Thumb

36 These rules concern a change in the CTD:

1) **Duration**

a) If Bonds/notes are trading at the same yield below the 6% nominal CF, then, the b/n with the lowest duration will be CTD.

b) Bonds/notes trading at the same yield above the 6% nominal CF, then, the b/n with the highest duration will be CTD.

2) **Yield**

a) If 2 Bonds/nots have the same duration, then, b/n with the highest yield will be CTD.

38 Using the 2 rules as a foundation, let's move to exactly how trading the basis is like trading options.

3 basic options trades

Call : buy if you think market is going up
Put: buy if you think market is going down
Straddle/Strangle: buy if you think there's going to be volatility

3 basis trades that replicate these strategies

Long basis of a high duration b/n acts like a call
Long basis of a low duration b/n acts like a put
Long basis of a middling b/n acts like a straddle/strangle

(Remember to look at the charts in the book. They are a great visual.)

41 Introduction to how to use 'what if' scenarios with the CTD.
With these tools, you can project the curve in different directions to see if there will be a change in the CTD.

44,45 These 2 pages have a pictures of the 'what if' tools. This tool also helps explain why the two rules of thumb work the way they do. 14

44,45,46 **Facts**

IF yields fall, then, LDB/N becomes CTD
IF yields rise, then, HDB/N becomes CTD
Of course the rise/fall would have to be large.
It's the idea that's important.
In the DS, a LDB/N tend to have higher coupons & lower maturities.
Both attributes contribute to lower durations.

48 **Examples of buying and selling CTD Basis**

When trading the basis, the long basis position is the safer trade.
That's because the long basis position is by definition short the futures. That's of greater value then being long future because of the short's strategic delivery options.
Another way of stating the above is, "A person who is short futures has a lot in common with the person who buys options. Buyers of options want volatility and so do the holders of long basis positions. Remember, if you are long the basis, you are short futures.
Furthermore:
Selling the basis has been a profitable proposition in the treasury markets as of the past 18 months, because volatility has been so LOW.

Said another way, the seller of the basis (long futures) is doing the same thing as selling interest rate volatility.

50 "Apart from carry, the single most important determinant of the PRICE and behavior of B/N futures is the short's strategic delivery options."

End chapter 2