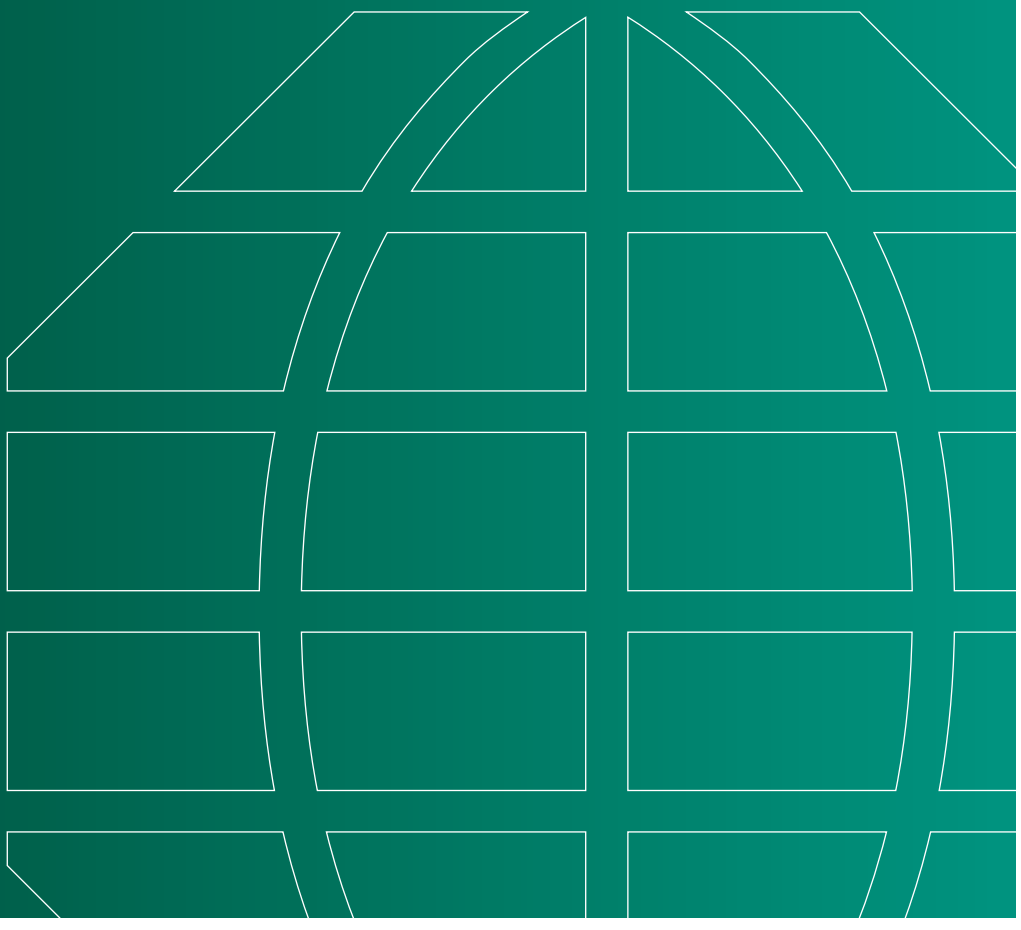
CME Group

A CME/Chicago Board of Trade/NYMEX Company

INTEREST RATE PRODUCTS

3-MONTH OIS FUTURES REFERENCE GUIDE



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INTRODUCTION

3-Month Overnight Index Swap (OIS) futures combine the utility of a futures contract that directly tracks the daily effective federal funds rate, with the convenience of a contract structure that has the familiar look and feel of Eurodollar futures. This blend conveys numerous benefits to users:

- For institutional market participants – bank treasurers, securities dealer financing desks, and fixed-income investment portfolio managers, for example – 3-Month OIS futures are a convenient and transparent means of hedging term exposure to overnight financing costs.

- For those who take strategic views on future U.S. monetary policy actions, such as macro theme hedge funds or institutional proprietary traders, 3-Month OIS futures are an important addition to a tool-kit that already includes the exchange's flagship Eurodollar and 30-Day Federal Funds futures contracts.

- For relative-value traders and arbitrageurs, a potentially rich vein of opportunity lies in the mutual interactions of 3-Month OIS futures, Eurodollar contracts, CME Group 30-Day Federal Funds contracts, and their over-the-counter (OTC) analogues.

- As with all of CME Group's exchange-traded contracts, 3-Month OIS futures permit substantial reductions in administrative costs versus OTC alternatives.

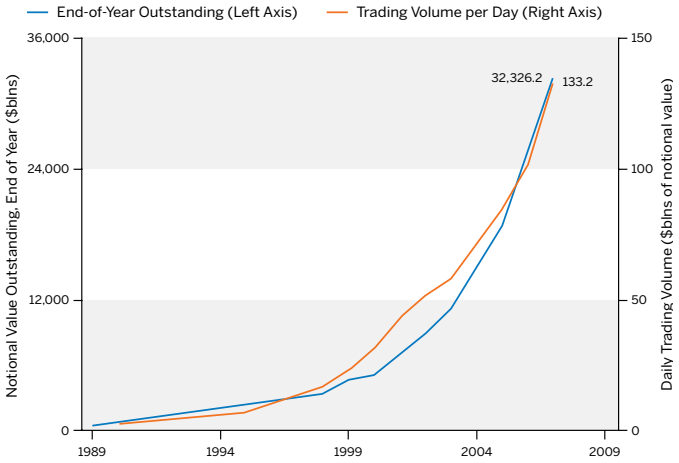
- Because 3-Month OIS futures bear the guarantee of CME Clearing, they virtually eliminate counterparty credit risk, allowing the user to modulate exposure to overnight interest rate risk without tying up credit lines and without assuming credit risk exposure to counterparties of lesser quality.

This reference guide summarizes the salient features of 3-Month OIS futures, explains the mechanics of contract pricing and valuation, and discusses techniques for spreading 3-Month OIS futures against Eurodollar futures and 30-Day Federal Funds futures.

BACKGROUND

In recent years activity has exploded in the OTC market for short-dated U.S. dollar interest rate swaps, including overnight index swaps. Since the late 1990s, outstanding notional volumes and trading activity have both grown nearly 27 percent per annum. See Exhibit 1.

EXHIBIT 1: OUTSTANDING NOTIONAL AMOUNTS AND TRADING VOLUMES IN OTC INTEREST RATE SWAPS WITH TERM TO MATURITY UNDER ONE YEAR

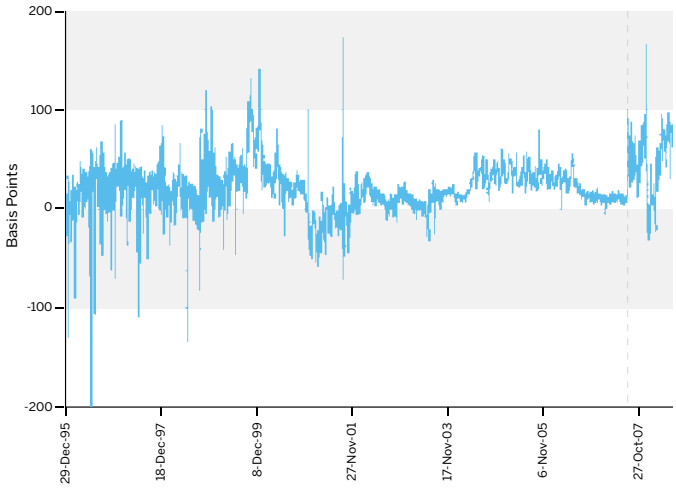


Data Sources: Bank for International Settlements, CME Group

Many factors have fueled growth in OIS traffic. Since mid-2007 these factors prominently include a jump in the volatility of spreads between the overnight federal funds rate and London interbank offered rates. As Exhibit 2 reveals, this volatility upsurge is all the more jarring for having followed a lengthy and unusually placid spell.

EXHIBIT 2: VOLATILITY COMES AND GOES AND COMES AGAIN IN THE FF-LIBOR SPREAD

(3-Month LIBOR minus the Daily Effective Federal Funds Rate, Daily, Jan 1996 through Jul 2008)



Data Sources: Global Insight

For readers with long memories, the lesson in this episode will be obvious. Because term interbank interest rates are distinct from overnight federal funds rates, there can be no guarantee that they are adequate substitutes. To use one as a hedge or as a proxy for the other, the market practitioner must understand and cope with the basis risk between them. 3-Month OIS futures, when employed in conjunction with Eurodollar futures, provide a mechanism ideally suited for this purpose. (For a detailed discussion, see "Trading the OIS-ED Spread" on page 16.)

FEATURES OF THE 3-MONTH OIS FUTURES CONTRACT

In its essence, the price of a 3-Month OIS futures contract is simply the market expectation of the effective federal funds rate, compounded daily, during the 3-month interval that precedes the contract's expiration. Exhibit 3 summarizes the salient features of the contract's terms. The definitive CME Rulebook chapter appears in Appendix 1 on page 22.

EXHIBIT 3: 3-MONTH OIS FUTURES: CONTRACT SPECIFICATIONS

Contract Size	USD 1 million
Reference Quarter	First Day = Third Wednesday of the month that is three whole months before contract's named expiry month Last Day = The day immediately preceding the day that follows First Day by three calendar months
Price Quote	100 minus R R ~ Realized interest rate for Reference Quarter, via daily compounding of daily effective federal funds rate $R = [\ \prod_i\{1+(d_i/360)*(r_i/100)\} - 1\ ] \times (360/D) \times 100$ i ~ Running index spans all FRB business days during Reference Quarter r_i = Effective overnight fed funds rate for i^{th} FRB business day d_i = Number of calendar days to which r_i applies $D = \sum_i d_i$ (i.e., D equals the number of calendar days in Reference Quarter)
Price Increments	Contracts with four months or less to expiry: USD 6.25 per ¼ basis point All other expiries: USD 12.50 per ½ basis point
Expiry Months	First eight months in March-June-September-December quarterly cycle (i.e., White and Red expiry years)
Last Trading Day	Last Day of Reference Quarter Trading in expiring contracts ceases at 4:00 p.m. Central Time (CT) on Last Trading Day
Final Settlement	Expiry by cash settlement on first business day following last day of Reference Quarter Final settlement price is rounded to nearest one tenth (1/10) of one basis point
Trading Hours	Open Outcry: 7:20 a.m. – 2:00 p.m. CT, Monday – Friday CME Globex Electronic Markets: 5:00 p.m. – 4:00 p.m. CT, Sunday – Friday
Ticker Symbol	Open Outcry: OSP CME Globex: OSS

The details of the "three-month interval" as well as other contract critical dates are spelled out in the following section. (See "Contract Critical Dates".) In all other important respects, 3-Month OIS futures resemble CME Group's flagship Eurodollar futures contract.

Price = 100 Minus Rate

The 3-Month OIS futures contract price takes the familiar IMM index form, derived by subtracting the above-mentioned overnight interest rate expectation from 100.

> **Example:** Consider a 3-Month OIS futures contract expiring in December. If market participants expect the daily effective federal funds rate to compound between mid-September and mid-December to an annualized rate of five percent, then the futures contract price will be 95.00, equal to 100.00 minus 5.00.

If interest rates rise – more precisely, if interest rate expectations rise – the 3-Month OIS futures contract price will fall, and vice versa. To profit, a trader who anticipates falling interest rates would buy the contract. To profit from an anticipated rise in interest rates, the trader would sell. If the trader's market view proves to be correct, she would be able to realize a gain by liquidating or offsetting the original position. Conversely, if her market view is incorrect, the transaction could result in a loss.

1 Basis Point = $25

Gains or losses on a contract position are calculated simply by determining the number of basis points (bps) by which the contract price has moved, and then multiplying by the value of one bp.

As with Eurodollar futures, each one bp price move in a 3-Month OIS futures contract is worth $25. This is based directly on the contract's notional underlying reference, a U.S. domestic bank deposit with $1,000,000 principal value:

*$25 = $1,000,000 * 0.0001 percent per year (i.e., 1 bp) * ¼ year (i.e., three months)*

Price Increments = Either ¼ bp or ½ bp

The price of a 3-Month OIS futures contract trades in increments of either ¼ bp or ½ bp, depending upon the proximity of the contract expiry date. For contracts with four months or less until expiry, the minimum price fluctuation is ¼ bp, worth $6.25 per contract. For all other contracts, the minimum price fluctuation is ½ bp, worth $12.50 per contract.

Contract Offerings = Whites and Reds

At any given time the Exchange lists a total of eight quarterly contracts, expiring in mid-March, mid-June, mid-September, or mid-December, and spanning two years – in the parlance of the Eurodollar futures community, four contracts expiring in the nearby "White" year, and four expiring in the deferred "Red" year. Thus, a 3-Month OIS futures contract that is newly listed for trading will have approximately two years until expiry.

CONTRACT CRITICAL DATES

Nowhere is the link between 3-Month OIS futures and Eurodollar futures tighter than in the setting of contract critical dates. These comprise (1) start and end dates for the contract Reference Quarter, the interval over which the daily effective federal funds rate is compounded in determining the final settlement price, (2) contract expiry, (3) last day of trading, and (4) the date on which the contract's minimum price increment cuts over from ½ bp to ¼ bp. Exhibit 4 on page 7 shows examples of these contract critical dates for various contract expiry months.

Reference Quarters

Before defining the 3-Month OIS futures Reference Quarter, an example serves to motivate the concept.

> **Example:** March 2011 Eurodollar futures expire on the Monday before the third Wednesday of the contract's named expiry month, 14 March 2011. The contract's underlying reference is that day's British Bankers' Association (BBA) setting for 3-Month LIBOR. This 3-month interbank interest rate is defined according to BBA LIBOR standards so as to apply to an interbank placement that settles two business days later, on the third Wednesday of the month, 16 March 2011, and that matures three calendar months thereafter, on Thursday, 16 June 2011. In short, March 2011 Eurodollar futures reflect the dynamics of the three-month term interbank interest rate spanning the 92-day interval from 16 March to 16 June 2011.
>
> The June 2011 3-Month OIS futures contract corresponds to March 2011 Eurodollar futures in the sense that the June 2011 3-Month OIS contract references the daily effective federal funds rate compounded over the very same 92-day interval, 16 March to 16 June 2011. That is, the Reference Quarter is defined to start with the daily effective federal funds rate for value on 16 March 2011, and to end with the daily effective federal funds rate for value on 15 June 2011 and maturing on 16 June 2011. (See the highlighted row in Exhibit 4.)

Defined more formally and more generally, a 3-Month OIS futures Reference Quarter comprises the value dates of the sequence of notional overnight bank placements with the same first value date and the same final maturity date as the 3-Month interbank deposit that serves as underlying reference for the Eurodollar futures contract that expires three months before the 3-Month OIS futures contract. The 3-Month OIS futures contract Reference Quarter starts on – and includes – IMM Wednesday (the third Wednesday) of the month preceding the contract's named expiry month by three whole months. The Reference Quarter ends on, and includes, the business day preceding the day that follows the start day by three calendar months.

The link between 3-Month OIS futures and Eurodollar futures is clearly evident in the setting of contract critical dates.

EXHIBIT 4: CONTRACT CRITICAL DATES FOR 3-MONTH OIS FUTURES

(1) Contract Named Expiry Month	(2) IMM Wed of 3rd Whole Month Prior to Column (1)	(3) Contract Expiry: Column (2) plus 3 Calendar Months	(4) Contract Expiry: Day of Week	(5) Last Trading Day: Column (3) Minus 1 Business Day	(6) Reference Quarter Day Count: Column (3) Minus Column (2)
Dec08	17 September 2008	17 December 2008	Wed	16 December 2008	91
Mar09	17 December 2008	17 March 2009	Tue	16 March 2009	90
Jun09	18 March 2009	18 June 2009	Thurs	17 June 2009	92
Sep09	17 June 2009	17 September 2009	Thurs	16 September 2009	92
Dec09	16 September 2009	16 December 2009	Wed	15 December 2009	91
Mar10	16 December 2009	16 March 2010	Tue	15 March 2010	90
Jun10	17 March 2010	17 June 2010	Thurs	16 June 2010	92
Sep10	16 June 2010	16 September 2010	Thurs	15 September 2010	92
Dec10	15 September 2010	15 December 2010	Wed	14 December 2010	91
Mar11	15 December 2010	15 March 2011	Tue	14 March 2011	90
Jun11	16 March 2011	16 June 2011	Thurs	15 June 2011	92
Sep11	15 June 2011	15 September 2011	Thurs	14 September 2011	92
Dec11	21 September 2011	21 December 2011	Wed	20 December 2011	91
Mar12	21 December 2011	21 March 2012	Wed	20 March 2012	91
Jun12	21 March 2012	21 June 2012	Thurs	20 June 2012	92
Sep12	20 June 2012	20 September 2012	Thurs	19 September 2012	92
Dec12	19 September 2012	19 December 2012	Wed	18 December 2012	91

Data Sources: CME Group

Expiration Day

Each 3-Month OIS futures contract expires on the last day of its Reference Quarter, the business day that follows by exactly three calendar months the start day of the Reference Quarter.

Last Day of Trading

An expiring 3-Month OIS contract will cease trading at 4:00 p.m. CT, on the exchange business day that immediately precedes the contract expiration day. (Note that the contract's Last Day of Trading is also the last day of its Reference Quarter.)

Cutover from ½ bp to ¼ bp Price Increments

Each 3-Month OIS futures contract switches from ½ bp minimum price increments to ¼ bp minimum price increments on the same schedule as the Eurodollar futures contract that expires three months earlier. More precisely, each 3-Month OIS futures contract trades in ½ bps until the Monday before the third Wednesday of the month that precedes its named expiry month by four whole months. From then on, until it expires, its price trades in ¼ bps.

Example: The June 2011 3-Month OIS futures contract switches from ½ bp to ¼ bp price increments at the same time as March 2011 Eurodollar futures. Four whole months prior to June 2011 is February 2011, for which the Monday before IMM Wednesday is 14 February 2011. Prior to this trade date, June 2011 3-Month OIS futures trade in ½ bps. On this trade date and thereafter, they trade in ¼ bps.

Contract Critical Dates Are Fixed

Contract critical dates clearly vary from one 3-Month OIS contract expiry to the next. Importantly, however, they do not vary for any given contract. The contract critical dates for each contract are determined when it is first listed for trading (as noted earlier, approximately two years before the contract expires). Once set, these dates remain fixed throughout the contract's life.

As with any other listed futures or options contract, if a critical date for a listed contract is later declared to be an ad hoc market holiday – if, for example, a federal and bank holiday is announced to memorialize the death of a U.S. president – then the contract critical date will automatically roll to the immediately following business day.

PRICING

The final settlement price for an expiring 3-Month OIS futures contract is 100 minus the daily effective federal funds rate, compounded over the contract's Reference Quarter. The following definitions make this more precise.

Final Settlement Price = 100 – R

Where

$R = [\Pi_{i=1...n} \{1 + (d_i/360) * (r_i/100)\} - 1] * (360/D) * 100$

n = the number of Federal Reserve Bank of New York (FRBNY) business days during the contract's Reference Quarter.

$\Pi_{i=1...n}$ denotes the product of the values identified by its running index, i = 1, 2, …, n.

i = is the running index that identifies each FRBNY business day during the Reference Quarter, such that i takes the values i = 1, 2, …, (n-1), n.

r_i = the daily effective federal funds rate applicable to a U.S. domestic interbank overnight deposit for which the i^{th} FRBNY business day is the value date. r_i is expressed in percent terms. For example, if the interest rate applicable to the i^{th} FRBNY business day is five and one quarter percent, then $r_i = 5.25$.

d_i = the number of calendar days to which r_i applies. For any calendar day that is not an FRBNY business day (weekend days or FRBNY holidays) the applicable interest rate value will be the daily effective federal funds rate for the previous FRBNY business day.

Examples: If Day i is a Monday, Tuesday, Wednesday, or Thursday and if the next day is an FRBNY business day, then $d_i = 1$. If Day i is a Friday, and if the following Monday is an FRBNY business day, then $d_i = 3$.

D = the number of calendar days in the Reference Quarter. Note that D is the sum of the d_i, that is, $D = \Sigma_{i=1...n} d_i$. Customarily, D will equal 90, 91 or 92 days.

The exchange will compute an expiring contract's final settlement price on the morning after the contract's last trading day, when the effective federal funds rate for the last day of the contract's Reference Quarter becomes available. The final settlement price is computed so that the value of R is rounded to the nearest 1/1,000th of a percentage point (i.e., the nearest 1/10th of one basis point, or 0.001 percent per annum). In the case of a tie (a rate that ends with 0.0005 in percent per annum terms) the value of R will be rounded up.

For more on determination of contract final settlement price, see "Appendix 1: Chapter 460 – 3-Month OIS Futures" on page 22, especially Section 46003.

Exhibit 5 on page 10 illustrates the computation of the final settlement rate, R, for a hypothetical March 2007 3-Month OIS futures contract. The result appears in the lower right hand corner. In accord with the operating instructions above, this is computed as:

5.283 percent per year = 100 * (360 days per year/90 days) * ((product of all daily interest accumulation factors) minus 1)

EXHIBIT 5: COMPUTING THE CONTRACT FINAL SETTLEMENT RATE FOR HYPOTHETICAL MARCH 2007 3-MONTH OIS FUTURES

Start of Reference Quarter = Wed, 20 December. End of Reference Quarter = Mon, 19 March.

Expiration Day = Tue, 20 March. Daily Interest Accumulation Factor = 1 + (Days/360) * (FF Rate/100)

Date	Daily Effective Fed Funds Rate	Days	Daily Interest Accumulation Factor	Date	Daily Effective Fed Funds Rate	Days	Daily Interest Accumulation Factor
20-Dec	5.26	1	1.000146	5-Feb	5.25	1	1.000146
21-Dec	5.25	1	1.000146	6-Feb	5.24	1	1.000146
22-Dec	5.24	4	1.000582	7-Feb	5.23	1	1.000145
				8-Feb	5.25	1	1.000146
26-Dec	5.29	1	1.000147	9-Feb	5.25	3	1.000438
27-Dec	5.17	1	1.000144				
28-Dec	5.25	1	1.000146	12-Feb	5.28	1	1.000147
29-Dec	5.17	4	1.000574	13-Feb	5.26	1	1.000146
				14-Feb	5.27	1	1.000146
2-Jan	5.30	1	1.000147	15-Feb	5.29	1	1.000147
3-Jan	5.28	1	1.000147	16-Feb	5.24	4	1.000582
4-Jan	5.24	1	1.000146				
5-Jan	5.21	3	1.000434	20-Feb	5.27	1	1.000146
				21-Feb	5.23	1	1.000145
8-Jan	5.23	1	1.000145	22-Feb	5.26	1	1.000146
9-Jan	5.25	1	1.000146	23-Feb	5.24	3	1.000437
10-Jan	5.26	1	1.000146				
11-Jan	5.27	1	1.000146	26-Feb	5.30	1	1.000147
12-Jan	5.22	4	1.000580	27-Feb	5.27	1	1.000146
				28-Feb	5.41	1	1.000150
16-Jan	5.28	1	1.000147	1-Mar	5.31	1	1.000148
17-Jan	5.25	1	1.000146	2-Mar	5.23	3	1.000436
18-Jan	5.23	1	1.000145				
19-Jan	5.25	3	1.000438	5-Mar	5.27	1	1.000146
				6-Mar	5.22	1	1.000145
22-Jan	5.24	1	1.000146	7-Mar	5.24	1	1.000146
23-Jan	5.26	1	1.000146	8-Mar	5.24	1	1.000146
24-Jan	5.27	1	1.000146	9-Mar	5.24	3	1.000437
25-Jan	5.31	1	1.000148				
26-Jan	5.26	3	1.000438	12-Mar	5.25	1	1.000146
				13-Mar	5.25	1	1.000146
29-Jan	5.26	1	1.000146	14-Mar	5.27	1	1.000146
30-Jan	5.23	1	1.000145	15-Mar	5.29	1	1.000147
31-Jan	5.33	1	1.000148	16-Mar	5.25	3	1.000438
1-Feb	5.29	1	1.000147				
2-Feb	5.24	3	1.000437	19-Mar	5.26	1	1.000146
				20-Mar	Expiry		5.283

Data Source: Federal Reserve Bank of New York

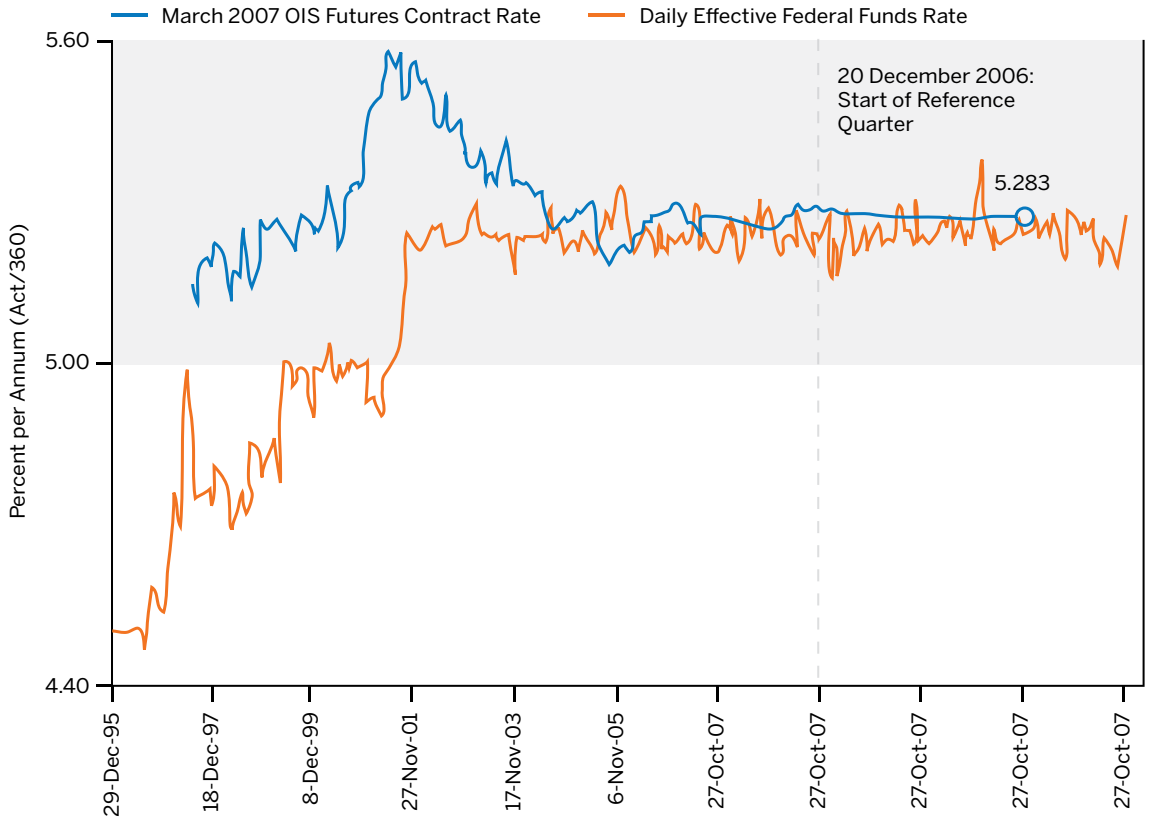
FAIR VALUE AND CONTRACT PRICE DYNAMICS

Prior to the start of a 3-Month OIS futures contract's Reference Quarter, the contract rate – the 'R' portion of the contract price, '100 minus R' – represents the fixed rate of a hypothetical forward-starting 3-month overnight index swap for which the daily effective federal funds rate is the floating rate reference. The notional forward start date is the first day of the contract Reference Quarter, and the notional end date is the futures contract expiration day. (If we ignore term premia, then we might equivalently interpret the 3-Month OIS contract rate as the rate on a hypothetical forward-starting 3-month term federal funds placement.)

By contrast, once the futures contract enters its Reference Quarter, its price represents the confluence of (i) the known values of the daily effective federal funds rate that apply to days from the start of the Reference Quarter up to the present, and (ii) the values of the daily effective fed funds rate that are expected to apply to the days that lie ahead, up to the end of the Reference Quarter.

Exhibit 6 illustrates this with estimated fair-value contract rates for hypothetical March 2007 3-Month OIS futures.

EXHIBIT 6: CONTRACT RATES FOR HYPOTHETICAL MARCH 2007 3-MONTH OIS FUTURES



Data Source: CME Group

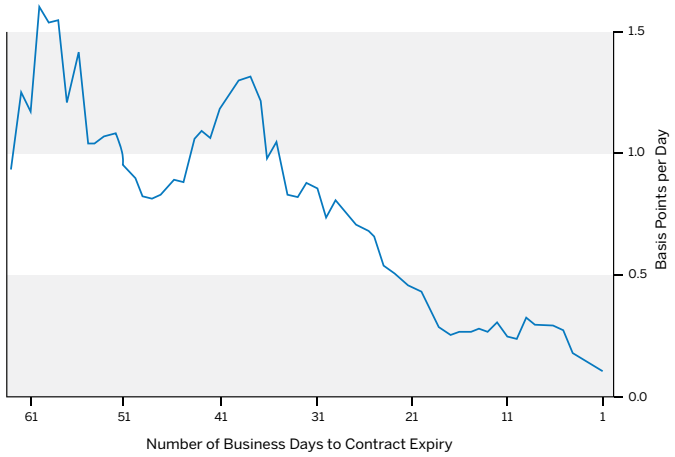
Prior to the start of the Reference Quarter, on 20 December 2006, the 3-Month OIS futures contract rate should mirror the market consensus expectation of the rate on a forward-starting 3-Month OIS for value on 20 December 2006 and maturing on 20 March 2007. After the Reference Quarter begins, the fair value of the contract rate should incorporate actual values of the daily effective federal funds rate, as these are published each day. By the time the contract expires on 20 March 2007, its price will be determined entirely by known values of the daily effective federal funds rate for 20 December 2006 up to (and including) 19 March 2007.

As an expiring contract works its way through its Reference Quarter, the forward-looking expectational component of its price obviously accounts for less and less of its fair value. A direct implication is that in general there should be less and less uncertainty regarding the contract's final settlement rate, and therefore less volatility in the contract price.

Exhibit 7 suggests how the decay in volatility of contract rates might look, on the basis of estimated fair values for mid-2003 through mid-2008. An expiring 3-Month OIS futures would have entered its Reference Quarter with volatility in its contract rate equivalent to an average absolute daily change around 1.5 bps. By the time this representative contract had entered its last week of trading, the volatility in its contract rate would have shrunk to an average absolute daily change around 1/10th of 1 bp per day.

EXHIBIT 7: VOLATILITY OF 3-MONTH OIS FUTURES CONTRACT RATES DURING THE REFERENCE QUARTER

Trailing five-day moving average of absolute daily changes in 3-Month OIS contract rates, computed with hypothetical contract rates for quarterly expiries from September 2003 through June 2008.



Data Source: CME Group

INTERPRETING 3-MONTH OIS FUTURES CONTRACT RATES

For any 3-Month OIS futures contract, valuation depends not just upon the course of the daily effective federal funds rate during the Reference Quarter, but also upon the calendar structure of the Reference Quarter. For the hypothetical March 2007 contract featured in Exhibit 5, the Reference Quarter lasts 90 calendar days, comprising 47 regular business days, nine standard weekends, and four holiday-lengthened three-day weekends.

This means that, to a tolerably good approximation, the March 2007 contract rate (R) can be expressed as a function of the average level of the daily effective federal funds rate during the Reference Quarter (ffr) as follows:

$$1 + (90/360) * R = (1 + (1/360) * ffr)^{47} * (1 + (3/360) * ffr)^{9} * (1 + (4/360) * ffr)^{4}$$

(To lighten notation, we assume that both interest rates are converted from percent terms into decimal terms so that, for example, a rate of 5.5 percent enters as 0.055.)

From the Bottom Up

Those willing to take an informed view of the future course of the daily effective federal funds rate can use the expression above, among other purposes, to decide whether 3-Month OIS futures are mis-valued. Two examples illustrate. In both, we suppose that "today" is Thursday, 30 November 2006. We observe that (purely hypothetical) March 2007 3-Month OIS futures are priced at 94.7475, for a contract rate of 5.2525 percent. (Reminder: Because the March 2007 contract would be within four months of expiry, it would trade in ¼ bp price increments.)

Example: The Federal Open Market Committee (FOMC) has held its target level for the overnight federal funds rate at 5.25 percent since the end of June 2006. We believe the target will stay pinned at this level at least through expiration of the March 2007 contract. We hold a strong hunch, moreover, that the daily effective federal funds rate is unlikely to stray too far, day by day, from the FOMC's target level. Armed with these premises, we plug ffr = 0.0525 into the right-hand side of the expression above. The resultant estimated value of the 3-Month OIS contract rate is 5.284, more than 3 bps above the contract rate reflected in the current futures price (5.2525).

We conclude that March 2007 3-Month OIS futures are over-valued. If we are reasonably confident in this point of view, then we might sell 1,000 March 2007 contracts at their prevailing price of 94.7475. Assuming we hold this position through expiry, the final settlement price of 94.717 (equal to 100 minus 5.283) would translate to a profit of 3.05 bps per contract (equal to 94.7475 minus 94.717). Proceeds from the trade are $76,250 (equal to 3.05 bps per contract, times $25 per bp, times 1,000 contracts).

3-Month OIS futures can be applied in a number of ways to express and benefit from longer-term views of FOMC policy.

Example: Alternatively, we might be convinced – mistakenly, it turns out – that the FOMC will raise its federal funds rate target to 5.50 percent when it meets at the end of January 2007. Specifically, we expect both the FOMC target and the daily effective federal funds rate to stay at 5.25 percent through 31 January 2007, then to rise to 5.5 percent from 1 February onward. Given these assumptions, we would evaluate the right-hand side of the expression above as follows:

$$1 + (90/360) * R$$

$$= (1 + (1/360) * 0.0525)^{22} * (1 + (3/360) * 0.0525)^{3} * (1 + (4/360) * 0.0525)^{3} * (1 + (1/360) * 0.055)^{25} * (1 + (3/360) * 0.055)^{6} * (1 + (4/360) * 0.055)$$

The estimate of the 3-Month OIS contract rate, R, implied by this scenario is 5.416 percent, more than 16 bps above the prevailing contract rate of 5.2525 percent. We conclude that the March 2007 3-Month OIS futures are severely over-valued. As the previous example foreshadows, if we decide to act on this surmise by selling March 2007 3-Month OIS futures, and if (arbitrarily) we hold this position through contract expiry, then we will earn approximately three ticks per contract. Although preferable to a loss, this will not be the 16 or more ticks per contract that we had hoped to achieve.

Traders who are close students of the U.S. money market will have noticed several ways to improve upon these tactics. Obvious examples include applying subjective probability weights to various future FOMC policy scenarios (instead of focusing on one and only one future policy path for the overnight federal funds rate target), and incorporating explicit modeling of the seasonality in the spread between the daily effective federal funds rate and the FOMC target (rather than assuming simply that the daily effective rate always equals the target level).

From the Top Down

With essentially the same framework, practitioners interested in discerning the market consensus viewpoint on future FOMC policy actions can use 3-Month OIS futures contract rates (possibly in conjunction with other CME Group short-term interest rate futures and options) to draw inferences.

Example: Returning to the hypothetical March 2007 3-Month OIS futures contract, assume that it's Tuesday, 26 December 2006, the day after Christmas. The contract's Reference Quarter began three business days earlier, on Wednesday, 20 December. We notice that the current price is 94.7350, for a contract rate of 5.265 percent. What does this imply about market expectations for the future path of the daily effective federal funds rate?

To answer, we start by netting out the information already in hand. We know the daily effective federal funds rate for Wednesday, 20 December, and Thursday, 21 December: 5.26 percent and 5.25 percent, respectively. We also know that the daily effective rate for Friday, 22 December, is 5.24 percent and that this applies not just to Friday but also to three additional days: Saturday, Sunday and Christmas on Monday.

The next step is to find the implied 84-day term rate – call it R^e – for the interval that remains until contract expiry. Plugging the facts in hand into the left- and right-hand sides of the general expression above, we get:

$$1+ (90/360) * 0.05265$$

$$= (1+ (1/360) * 0.0526) * (1+ (1/360) * 0.0525) * (1+ (4/360) * 0.0524) * (1+ (84/360) * R^e)$$

Solving for R^e, we conclude that the implied value of the 84-day term rate is 5.262 percent. For a term federal funds trader, or for the term repo team on a securities dealership's funding desk, or for an overnight index swap dealer, this intermediate result is both interesting and useful in its own right.

The last step is to extract from this term rate the implied level of the expected overnight federal funds rate for the remaining 84 days before contract expiry. This means finding the value of ffr that solves the following polynomial:

$$1 + (84/360) * 0.05262$$

$$= (1 + (1/360) * ffr)^{45} * (1 + (3/360) * ffr)^{9} * (1 + (4/360) * ffr)^{3}$$

Alternatively, we can use a rule of thumb, which tells us that if we compound a daily interest rate in the neighborhood of 5.25 percent per annum, over the course of 84 days, the value of the compound interest (over and above the average level of the interest rate itself) is worth around 3.2 bps per annum. Netting this from R^e, our intermediate result, we get:

$$5.230 \text{ percent} = 5.262 \text{ minus } 0.032$$

In the event, how accurate was this expectation? With the benefit of perfect hindsight, we know that the arithmetic average level of the daily effective federal funds rate was 5.249 percent for the 84 days from 26 December 2006 through 19 March 2007. Thus, the computed expectation fell shy of its mark by 1.9 bps.

For more about the rule of thumb that we invoked in achieving this solution, please see Appendix 2 – Compounded Rates versus Average Rates on page 25.

TRADING THE OIS-ED SPREAD

3-Month OIS futures are tailor-made for spreading against Eurodollar futures (ED). This enables quick and easy manufacture of synthetic exposure to the interest rate spread between a 3-month term money market asset and the effective overnight cost of financing the asset over the same 3-month interval.

Spread Ratio = One-to-One

Because both contracts are similarly scaled – with notional value of $1 million and with dollar value of a one bp price change fixed at $25 – the appropriate spread ratio is one-to-one.

To establish long exposure to the OIS-ED spread, i.e., to benefit from a widening in the spread between three months of compounded overnight financing on one hand and three-month term interbank interest on the other, one would buy a 3-Month OIS futures contract and sell the ED contract that expires one quarter sooner.

Conversely, to sell the OIS-ED spread, i.e., to benefit from a narrowing in the spread between the compounded overnight financing rate and the corresponding three-month term interbank interest rate, one would sell a 3-Month OIS futures contract and buy the ED contract that expires one quarter sooner.

One Quarter for the ED Futures Leg. Next Quarter for the 3-Month OIS Futures Leg.

To achieve the desired synthetic interest rate spread, the crucial detail to remember is that the contract spread must be constructed with staggered contract expiry dates:

- December ED vs. March 3-Month OIS
- March ED vs. June 3-Month OIS
- June ED vs. September 3-Month OIS
- September ED vs. December 3-Month OIS

In terms of their underlying interest rate exposures, both ED and 3-Month OIS futures contracts reference exactly the same three-month interval, namely the span enshrined as the 3-Month OIS contract's Reference Quarter. The difference between them is that they expire at different ends of the Reference Quarter:

The ED futures expiration process is forward-looking. The contract expires two days before the Reference Quarter starts, and its final settlement price is determined by the rate on a term interbank deposit, with a value date two days later (on the third Wednesday of the ED contract expiry month, the start of the Reference Quarter) and a maturity date three calendar months thereafter (the end of the Reference Quarter).

The 3-Month OIS futures expiration process is backward looking. Its final settlement price is determined by overnight interest rate exposure that accumulates over the exact same Reference Quarter. Clearly, the outcome of this accumulation process – and therefore the contract's expiry value – is not known until the Reference Quarter concludes.

A hypothetical illustration of the timing of these events appears on page 18 in Panel A of Exhibit 9, with the spread between December 2006 ED futures and hypothetical March 2007 3-Month OIS futures serving as the example.

3-Month OIS futures are tailor-made for spreading against Eurodollar futures.

Theory vs. Practice

As Panel A of Exhibit 9 on page 18 dramatizes, the structure of the OIS-ED spread is such that the holder cannot simply ride the position to a single coordinated cash settlement on one expiration day. In theory, for the trader to realize the synthetic interest rate spread embodied in the OIS-ED spread, the 3-Month OIS futures leg must be held to expiry, three months beyond expiration of the ED futures leg. As a practical matter, however, many market practitioners will be reluctant to carry one leg of the contract spread in isolation.

Thus, any consideration of position risk management will require careful thought with regard to tactics for trade exit as well as trade initiation. For example, would it be more opportune to leg out of the position prior to ED contract expiry? Or, for a sufficiently large position, to unwind the trade through bilaterally negotiated block transactions? Or to permit the ED futures leg to expire and then to trade out of the 3-Month OIS futures leg on an outright basis?

OIS-ED Spread Dynamics

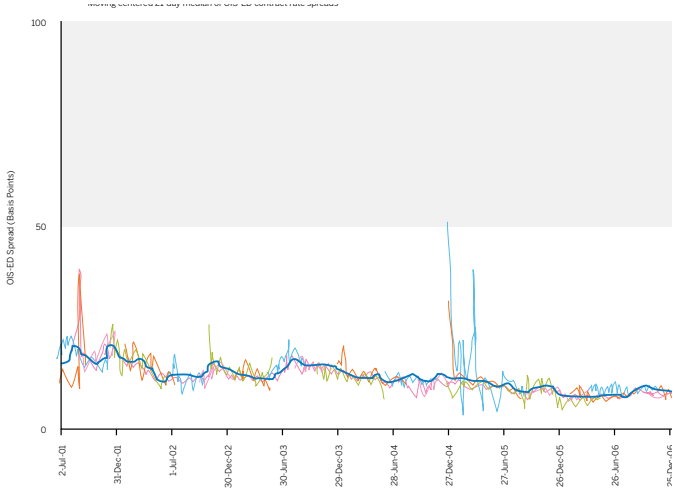
As Exhibit 8 illustrates, between mid-2001 and mid-2007, the OIS-ED spread exhibited only modest volatility. Within any arbitrarily chosen short-run stretch, it would have fluctuated narrowly around a local mean level somewhere between 8 and 20 bps, with only occasional short-lived divergences from the norm.

Since summer 2007, however, with the advent of significant counterparty credit concerns among major financial center banks, and with the attendant disruption in U.S. dollar LIBOR, the OIS-ED spread would have grown considerably wider and more volatile.

EXHIBIT 8: THE OIS-ED SPREAD: SOME HYPOTHETICAL HISTORY

ED futures contract rates (expiries from Jun01 to Jun08, inclusive) minus hypothetical 3-Month OIS futures contract rates (expiries from Sep01 to Sep08, inclusive).

OIS-ED Spreads are color-coded according to the expiry month for the ED futures leg:



Data Source: CME Group

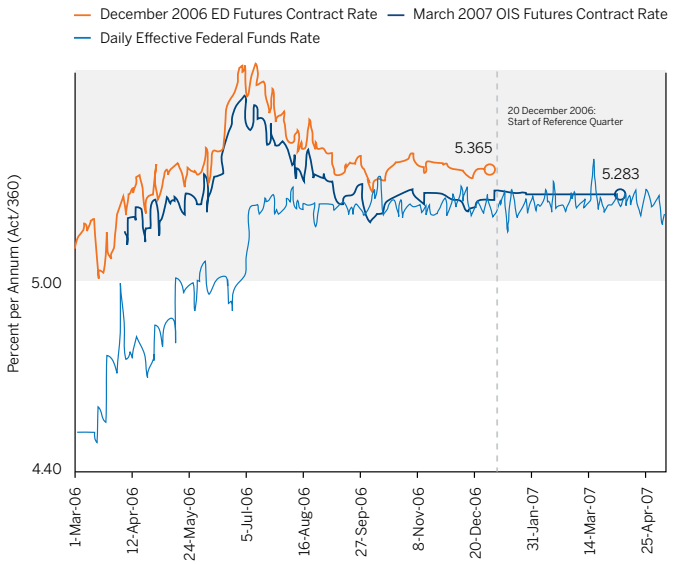
Example: Dec06 ED vs (Hypothetical) Mar07 3-Month OIS Futures

Important to note is that even in earlier and more placid times, the OIS-ED spread would have furnished decent opportunities for attentive relative value traders. Consider for example the spread between (purely fictional) March 2007 3-Month OIS futures and December 2006 ED futures. The pertinent market environment is depicted in Exhibit 9 (where Panel A reproduces Exhibit 6, with the addition of Dec06 ED contract rates).

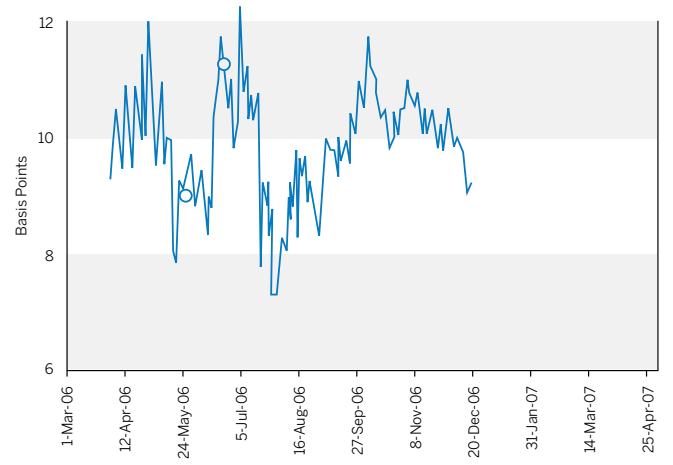
Suppose we are reasonably convinced that the OIS-ED spread is fairly valued between 10 and 12 bps, and that any departures from this neighborhood should be transient. We take note when, in late May 2006, the spread shrinks to around 8 bps. On 26 May we decide to purchase the OIS-ED spread 1,000 times at 9 bps. Specifically, we buy 1,000 Mar07 3-Month OIS futures at 94.75 (for a contract rate of 5.25 percent), and we sell 1,000 Dec06 ED futures at 94.66 (for a contract rate of 5.34 percent).

Four weeks later market events have borne out our conjecture. On 23 June, we sell our OIS-ED spread position at 11.5 bps. That is, we sell 1,000 Mar07 3-Month OIS futures at 94.420 (for a contract rate of 5.580 percent), and we buy back 1,000 Dec06 ED futures at 94.305 (for a contract rate of 5.695 percent). We've lost 33 bps per contract on the 3-Month OIS leg, while earning 35.5 bps on the ED leg. Our net gain is 2.5 bps per contract spread, making a profit of $62,500 (equal to 2.5 bps per contract, times $25 per bp, times 1,000 contracts).

EXHIBIT 9:
PANEL A: CONTRACT RATES FOR DEC06 ED FUTURES AND HYPOTHETICAL MAR07 3-MONTH OIS FUTURES



PANEL B: THE OIS-ED SPREAD (DEC06 ED FUTURES CONTRACT RATE MINUS MAR07 3-MONTH OIS FUTURES CONTRACT RATE)



Data Source: CME Group

TRADING THE FF-OIS SPREAD

Natural spreading opportunities of a different sort abound in the interaction between 3-Month OIS futures and 30-Day Federal Funds (FF) futures.

Spread Ratio = Three-to-Five

At first blush, the FF-OIS spread looks trivial. Both contracts reference the daily effective federal funds rate. Moreover, there would appear to be no art, ingenuity or judgment involved in determining the appropriate spread ratio, which is invariably three FF futures contracts for every five 3-Month OIS futures contracts.

To see this, suppose we are interested in spreading FF futures against 1,000 3-Month OIS futures contracts. The dollar value of a one bp price change (DV01) for a 3-Month OIS futures contract is set at $25, and the DV01 for any FF contract is defined to be $41.67. Thus, for a one bp interest rate move in both legs of the spread to have equal and offsetting financial impact on the spread's profit/loss, the following equality must hold:

(Number of FF) * ($41.67/FF contract)
= (1,000 3-Month OIS) * ($25/3-Month OIS contract)

Solving for the correct number of FF futures gives us an invariant result of 600 FF contracts for every 1,000 3-Month OIS futures contracts, or three-to-five.

The Grit in the Spread

First appearances are deceiving, however. There are several sources of nontrivial mismatch between the two contracts. For one, the reference for 3-Month OIS futures is not simply the daily effective federal funds rate, but the compounded daily rate over the contract Reference Quarter. By contrast, each FF futures contract prices with reference to the arithmetic average of the daily effective federal funds rate over the contract's expiry month.

More significantly, there is no clean match between contract reference intervals. The 3-Month OIS futures Reference Quarter overlaps, in whole or in part, the reference intervals for four distinct FF contracts.

Example: Mar07 3-Month OIS futures are based upon the daily effective federal funds rate compounded over the 90-day Reference Quarter beginning Wednesday, 20 December 2006, and ending Monday 19 March 2007. The corresponding FF futures strip involves:

- Jan07 FF and Feb07 FF, which are based on arithmetic averages of the daily effective federal funds rates for January and February, respectively. In each case, the entire one-month interval of interest rate exposure (31 and 28 days, respectively) is contained within the Mar07 3-Month OIS contract Reference Quarter.

- Dec06 FF, which is based on the average daily effective federal funds rate during December. Importantly, the price dynamics of the Dec06 FF contract depend not only upon what happens in the final 12 days of December, which overlap with the Mar07 3-Month OIS Reference Quarter, but also upon events during the first 19 days of December.

- Mar07 FF, which is based on the average daily effective federal funds rate during March. Like the Dec06 FF contract, the Mar07 FF contract has only partial overlap with the Mar07 3-Month OIS futures Reference Quarter, limited to the first 19 days of March. Thus, as with Dec06 FF, the Mar07 FF futures contract contains interest rate risk exposure that is extraneous to the FF-OIS spread, insofar as its price dynamics also rely upon the course of the daily effective federal funds rate during the last 12 days of March.

Thus, it is not enough to know that one wishes to spread 600 FF futures against 1,000 3-Month OIS futures. Constructing the spread position requires a careful decision as to *which* 600 FF futures. Exhibit 10 indicates one possible approach, based on the reference period overlaps detailed above.

EXHIBIT 10: CALENDAR-BASED SPREAD RATIOS – FF FUTURES STRIP VS. HYPOTHETICAL MAR07 3-MONTH OIS FUTURES

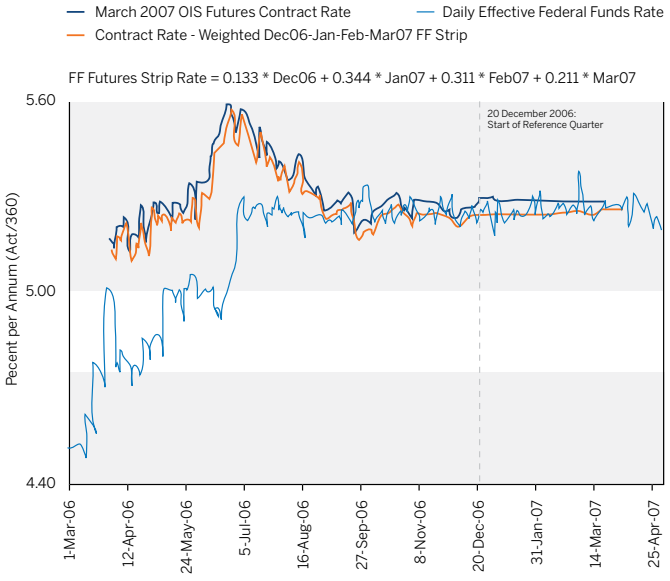
	(1)	(2)	(3)
FF Contract Expiry Month	Length of Overlap, FF Expiry Month vs Mar07 3-Month OIS Reference Quarter (Days)	Fraction of Mar07 3-Month OIS Reference Quarter = Column (1) / 90	Number of FF Contracts = Column (2) * 600
Dec06	12	0.133	80
Jan07	31	0.344	207
Feb07	28	0.311	187
Mar07	19	0.211	126
Totals	90		600

Exhibit 11 displays the contract rate for the FF futures strip defined in Exhibit 10, juxtaposed with estimated contract rates for hypothetical Mar07 3-Month OIS futures. The spread between the two fluctuates narrowly between 3.25 bps and 3.75 bps. This should come as no surprise. Given that the daily effective federal funds rate resides around 5.25 percent, the 3-Month OIS futures contract rate should incorporate a systematic premium of 3.4 bps or so due to daily compounding. (Recall the discussion on page 13 and in Appendix 2 – Compounded Rates versus Average Rates on page 25.)

Exhibit 11 nicely exemplifies two general principles. First, excursions from fair value in the FF-OIS spread tend to be both small and short-lived. This is reassuring for those who might wish to use one as a risk layoff for the other. Second, by the same token, departures from the norm in the FF-OIS spread should signify a sensible and, from the standpoint of position risk control, a reasonably manageable source of opportunity for market participants, such as algorithmic traders, who are poised to respond quickly.

EXHIBIT 11: CONTRACT RATES FOR THE FF FUTURES STRIP AND HYPOTHETICAL MAR07 3-MONTH OIS FUTURES

FF Futures Strip Rate = 0.133 * Dec06 + 0.344 * Jan07 + 0.311 Feb07 + 0.211 * Mar07



Data Source: CME Group

BLOOMBERG ANALYTICS

Bloomberg users who wish to monitor the underlying cash market that corresponds most closely to 3-Month OIS futures can keep tabs on forward-starting overnight index swap rates at:

SWPM-OIS <Go>

Likewise, those who trade the OIS-ED futures spread can keep track of the cash market counterpart, spot LIBOR versus spot overnight index swaps, at:

USSOC <Index> US003M <Index> HS <Go>

APPENDIX 1: CBOT RULEBOOK CHAPTER 460 3-MONTH OIS FUTURES

46000. SCOPE OF CHAPTER

This chapter is limited in application to trading in 3-Month OIS futures. The procedures for trading, clearing, delivery, settlement and any other matters not specifically covered herein shall be governed by the rules of the Exchange.

46001. COMMODITY SPECIFICATIONS

Each futures contract shall be for an interbank deposit having a principal value of $1,000,000 and paying interest at a rate equal to the compounded daily effective federal funds rate during the contract's Reference Quarter (46003.A.1.).

46002. FUTURES CALL

46002.A. Trading Schedule

Futures contracts shall be scheduled for trading during such hours, and for expiration in such months, as may be determined by the Exchange.

46002.B. Trading Unit

The Trading Unit shall be a U.S. domestic interbank deposit in the amount of $1,000,000 that pays interest at a rate equal to the compounded daily effective federal funds rate during the contract's Reference Quarter (46003.A.1.). The daily effective federal funds rate shall be as computed by the Federal Reserve Bank of New York (hereafter, "FRBNY").

46002.C. Price Increments

Bids and offers shall be quoted in terms of the IMM Index: 100.0000 minus the compounded daily effective federal funds rate during the contract's Reference Quarter (46003.A.1.), on an annual basis for a 360-day year.

Example: A compounded daily effective federal funds rate equal to 6.5025 percent shall be quoted as 93.4975.

1. Contracts with Four Months or Less until Expiry

For contracts with four months or less until expiry, minimum fluctuations of the IMM Index shall be in multiples of 0.0025 ($6.25). For each 0.0025 increase in the Index, the Clearing House shall credit $6.25 per contract to those clearing members holding open long positions, and shall debit $6.25 per contract from those clearing members holding open short positions. For each 0.0025 decrease in the Index, the Clearing House shall debit $6.25 per contract from those clearing members holding open long positions, and shall credit $6.25 per contract to those clearing members holding open short positions.

For any given contract, the applicable four-month interval shall be defined so as to begin on, and to include, the Monday before the third Wednesday of the month that precedes the contract's named month of expiry by four months. If this is not an Exchange business day, then the applicable four-month interval shall begin on the following Exchange business day.

2. Contracts with More than Four Months until Expiry

For contracts with more than four months until expiry, minimum fluctuations of the IMM Index shall be in multiples of 0.005 ($12.50). For each 0.005 increase in the Index, the Clearing House shall credit $12.50 per contract to those clearing members holding open long positions, and shall debit $12.50 per contract from those clearing members holding open short positions. For each 0.005 decrease in the Index, the Clearing House shall debit $12.50 per contract from those clearing members holding open long positions, and shall credit $12.50 per contract to those clearing members holding open short positions.

For any given contract, the applicable four-month interval shall be as defined in 46002.C.1.

46002.D. Position Accountability

A person owning or controlling more than 10,000 contracts net long or net short in all contract months combined shall provide, in a timely fashion, upon request by the Exchange, information regarding the nature of the position, trading strategy, and hedging information, if applicable.

In addition, the Exchange may require, at its discretion, that such position not be further increased.

46002.E. Accumulation of Positions

For the purposes of this rule, the positions of all accounts directly or indirectly owned or controlled by a person or persons, and the positions of all accounts of a person or persons acting pursuant to an expressed or implied agreement or understanding, and the positions of all accounts in which a person or persons have a proprietary or beneficial interest, shall be cumulated.

46002.F. [Reserved]

46002.G. Termination of Trading

The Last Day of Trading in an expiring contract shall be the Last Day of the contract's Reference Quarter (46003.A.1.) or, if this is not an Exchange business day, the Exchange business day immediately preceding the Last Day of the contract's Reference Quarter. Trading in an expiring contract shall terminate at 4:00 p.m. Central Time on the Last Day of Trading.

46002.H. Contract Modification

Specifications shall be fixed as of the first day of trading in a contract, except that all deliveries on a contract must conform to government regulations in force at the time of delivery. If any U.S. government agency or body issues an order, ruling, directive, or law that conflicts with the requirements of these rules, then such order, ruling, directive, or law shall be construed to take precedence and shall become part of these rules, and all open and new contracts shall be subject to such government orders.

46002.I. Price Limits and/or Trading Hours

There shall be no trading of 3-Month OIS futures contracts during Electronic Trading Hours (ETH) at a price more than 2.0000 IMM Index points above or below the Reference RTH price.

46003. SETTLEMENT PROCEDURES

Delivery on 3-Month OIS futures contracts shall be made by cash settlement.

46003.A. Final Settlement Price

1. Definition of Reference Quarter

For any given contract, the Reference Quarter shall be the interval for which the First Day is the third Wednesday of the calendar month that precedes the contract's named expiration month by three whole months, and for which the Last Day is the day immediately preceding the day that follows the First Day by three calendar months. The Reference Quarter shall comprise both its First Day and its Last Day.

Example: For a hypothetical 3-Month OIS futures contract expiring in June 2011, the First Day of the contract's Reference Quarter is the third Wednesday of March 2011, or 16 March 2011. Accordingly, the Last Day of the contract's Reference Quarter is the day immediately preceding 16 June 2011, or Wednesday, 15 June 2011.

2. Definition of Final Settlement Price

For any given contract, the Final Settlement Price shall equal 100 minus the compounded daily effective federal funds rate during the contract's Reference Quarter:

Final Settlement Price = 100 – R

Where

$R = [\Pi_{i=1...n} \{1+(d_i/360) * (r_i /100)\} - 1] \times (360/D) \times 100$

n = the number of FRBNY business days during the Reference Quarter.

i = is the running index that identifies each FRBNY business day during the Reference Quarter, such that i takes the values i = 1, 2, …, (n-1), n.

$\Pi_{i=1...n}$ denotes the product of the values identified by the running index, i = 1, 2, …, n.

r_i = the effective federal funds rate applicable to a U.S domestic interbank overnight deposit for which the i^{th} FRBNY business day is the value date. r_i is expressed in percent terms.

Example: If the interest rate applicable to the i^{th} FRBNY business day is five and one quarter percent, then $r_i = 5.25$.

d_i = the number of calendar days to which r_i applies. For any calendar day that is not a FRBNY business day (e.g., weekend days, FRBNY holidays), the applicable value shall be the effective federal funds rate for the previous FRBNY business day.

Example: If Day i is a Monday, a Tuesday, a Wednesday, or a Thursday, and if the next calendar day is a FRBNY business day, then $d_i = 1$. If Day i is a Friday, and if the following Monday is a FRBNY business day, then $d_i = 3$.

D = the number of calendar days in the Reference Quarter. D is also the sum of the d_i. That is, $D = \Sigma_{i=1...n} d_i$.

3. Computational Conventions

The value of R shall be rounded to the nearest 1/1,000th of a percentage point, i.e. the nearest 1/10th of one basis point (0.001). In the case of a tie, i.e. a decimal fraction ending with 0.0005, the value of R shall be rounded up.

For any expiring contract, the Final Settlement Price shall be calculated when the effective federal funds rate that is applicable to the Last Day of the contract's Reference Quarter has been published. (Customarily, this will occur on the FRBNY business day immediately following the Last Day of the contract's Reference Quarter.)

46003.B. Final Settlement

Clearing members holding open positions in expiring contracts at the termination of trading shall make payment to, or shall receive payment from, the Clearing House in accordance with normal variation performance bond procedures based on a settlement price equal to the Final Settlement Price.

46003.C. – I. [Reserved]

46004. – .05. [RESERVED]

46006. ACTS OF GOVERNMENT, ACTS OF GOD, AND OTHER EMERGENCIES

(Refer to Rule 701. ACTS OF GOVERNMENT, ACTS OF GOD, AND OTHER EMERGENCIES)

APPENDIX 2: COMPOUNDED RATES VS. AVERAGE RATES

One of many obvious applications for 3-Month OIS futures will be as a gauge of market expectations regarding future FOMC policy actions. This requires unraveling the 3-Month OIS contract rate to obtain the implied daily effective federal funds rate. One can do so, to a very good approximation, by solving a high-order polynomial such as the one on page 14. This is not a tall order for any trader or trading desk analyst who is willing to keep track of the relevant calendar day-counts, holidays, and business day-counts.

Those who prefer to do their reckoning on the fly, however, can easily create tabular rules of thumb on the basis of archetypal 3-Month OIS futures Reference Quarters. For example, a stereotypical Reference Quarter for a 3-Month OIS futures contract expiring in March might be defined arbitrarily so as to last 91 days, and to comprise 46 business days, 11 regular weekends, two holiday-extended three-day weekends (Martin Luther King Day and Presidents' Day), and two stand-alone holidays (Christmas and New Year's Day). Then the polynomial relationship linking the 3-Month OIS contract (R) to the implied daily effective federal funds rate (ffr) for the Reference Quarter, so defined, would be:

$$1 + (91/360) * R$$

$$= (1 + (1/360) * ffr)^{46} * (1 + (3/360) * ffr)^{11} * (1 + (4/360) * ffr)^{2} * (1 + (2/360) * ffr)^{2}$$

One can evaluate the right-hand side at various levels of the daily effective federal funds to get the implied 3-Month OIS futures contract rate. The "91-day" column in Exhibit A1 indicates how the resultant array of evaluated spreads between the two rates might appear. Thus, for example, if the average daily effective federal funds rate during the Reference Quarter is expected to be nine percent per year, the fair value of the 3-Month OIS futures contract rate should be around 10.1 bps higher, or 9.101 percent.

EXHIBIT A1: 3-MONTH OIS FUTURES CONTRACT RATE PREMIUM DUE TO DAILY COMPOUNDING FOR THE ARCHETYPAL MARCH REFERENCE QUARTER

(Evaluated 3-Month OIS Futures Contract Rate minus Average Daily Effective Funds Rate, Basis Points)

AVERAGE DAILY EFFECTIVE FEDERAL FUNDS RATE (PERCENT PER ANNUM)	NUMBER OF DAYS REMAINING IN 3-MONTH OIS FUTURES CONTRACT REFERENCE QUARTER				
	91	70	50	30	10
10	12.5	9.5	6.7	3.9	1.2
9	10.1	7.7	5.4	3.2	0.9
8	**8.0**	**6.1**	**4.3**	**2.5**	**0.7**
7	6.1	4.6	3.3	1.9	0.6
6	4.5	3.4	2.4	1.4	0.4
5	3.1	2.4	1.7	1.0	0.3
4	2.0	1.5	1.1	0.6	0.2
3	1.1	0.9	0.6	0.4	0.1
2	0.5	0.4	0.3	0.2	0.0
1	0.1	0.1	0.1	0.0	0.0

Other columns in Exhibit A1 indicate how the compounding premium decays as the Reference Quarter draws toward its end. Thus, consider 3-Month OIS futures within 30 days or so of expiring. If the arithmetic average of the daily effective federal funds rate over those 30 days is four percent per year, then the implied rate that signifies the forward-looking expectational portion of the 3-Month OIS futures contract rate should be fairly valued around 4.006 percent, i.e., it should incorporate a compounding premium around 0.6 bps.

One can replicate this exercise for archetypal Reference Quarters that end in June, September, or December. The results differ only slightly from those above. Differences do, however, become more and more conspicuous as the average daily effective federal funds rate rises, or as the time remaining in the Reference Quarter lengthens.

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