INTEREST RATE FUTURES

November 2003

The CME/CBOT Common Clearing Link:

BENEFITS FOR FED FUND—EURODOLLAR SPREAD TRADES

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The CME/CBOT Common Clearing Link: Benefits for Fed Fund–Eurodollar Spread Trades

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In April 2003, Chicago Mercantile Exchange (CME) signed a definitive agreement with the Chicago Board of Trade (CBOT®) for CME to provide clearing and related services for all CBOT products. The resulting CME/CBOT Common Clearing Link will provide market participants with significant margin and capital efficiencies. These include an estimated $1.2 billion savings in performance bond collateral requirements (which will be calculated based on a customer's portfolio at both exchanges), and another $200 million in reduced capital requirements due to a combined CME-CBOT financial safeguards package.

The CME/CBOT Common Clearing Link also will deliver valuable operational efficiencies to market participants, include a standardized online interface and simplified business practices.

The Link will begin back-office processing of trades in November 2003. When it becomes fully operational in January 2004, it will clear approximately 85 percent of U.S. futures and futures options volume (based on the two exchanges' combined 2002 volume level of 902 million), making the CME Clearing House the largest derivatives clearing organization in the world.

Given the complementary nature of CBOT and CME contract markets, ***intermarket spread trades across the two exchanges will benefit from potentially significant reductions in performance bond requirements.*** The following illustrates this point for spread trades between CBOT 30-Day Fed Fund futures (FF) and CME Eurodollar futures (ED).

The resultant capital efficiencies are potentially substantial. In the example given below, ***initial performance bond for a standard 3:5 spread comprising 600 FF futures and 1,000 ED futures drops from nearly $1 million to less than $250,000.*** Expressed in terms of the interest rate sensitivity of either leg of the spread, ***the savings from reduction in performance bond are equivalent to an interest rate move of nearly 30 basis points.***

Parts 1 and 2 sketch the basics of FF-ED spread trades. Part 3 presents hypothetical performance bond reductions for such transactions. Part 4 examines the capital efficiencies that should arise when performance bond reductions are applied. Part 5 briefly covers extensions to spread trades between CBOT FF futures and CME LIBOR futures (EM). The Appendix offers a more detailed discussion of the rudiments of FF-ED spreading.

Setting the Ratio for FF-ED Spreads

Assume, for illustration, that you wish to spread FF against 1,000 of the nearby quarterly ED contract. Your aim is to profit from changes in the spread between the effective overnight federal funds rate (the interest rate underlying FF) and the 3-month London interbank offered rate (the interest rate underlying ED).

If you expect this interest rate spread to widen, you'll buy FF against an offsetting short position of 1,000 ED. If you look for this interest rate spread to narrow, you'll sell FF against an offsetting long position of 1,000 ED.

Clearly, you should structure your FF-ED spread so that, as nearly as possible, it changes in value only in response to changes in the interest rate spread. You do not want it to register either profit or loss in response to parallel moves in the overnight fed funds rate and 3-month LIBOR that leave the spread between them unchanged.

You'll achieve this, to a very good approximation, by choosing a number of FF contracts with the same interest rate sensitivity as 1,000 ED contracts:

FF position's interest rate sensitivity = ED position's interest rate sensitivity

Given the DV01—the dollar value of a one basis point change in interest rate levels—for both FF and ED, determining the appropriate spread ratio is straightforward:

By rulebook definition, the DV01 for an ED contract—*any* ED contract—is $25. Thus the DV01 of your 1,000-contract ED position is $25,000 (i.e., 1,000 contracts times $25 per contract).

Similarly, by rulebook definition, the DV01 for an FF contract — with one exception, *any* FF contract—is $41.67.[1]

Thus, for a one basis point move in both the overnight fed funds rate and 3-month LIBOR, the following equality should hold:

(Number of FF) x ($41.67 / FF contract) = (1,000 ED) x ($25 / ED contract)

This yields the desired result of

600 FF = (1,000 ED) x ($25 / ED contract) / ($41.67 / FF contract)

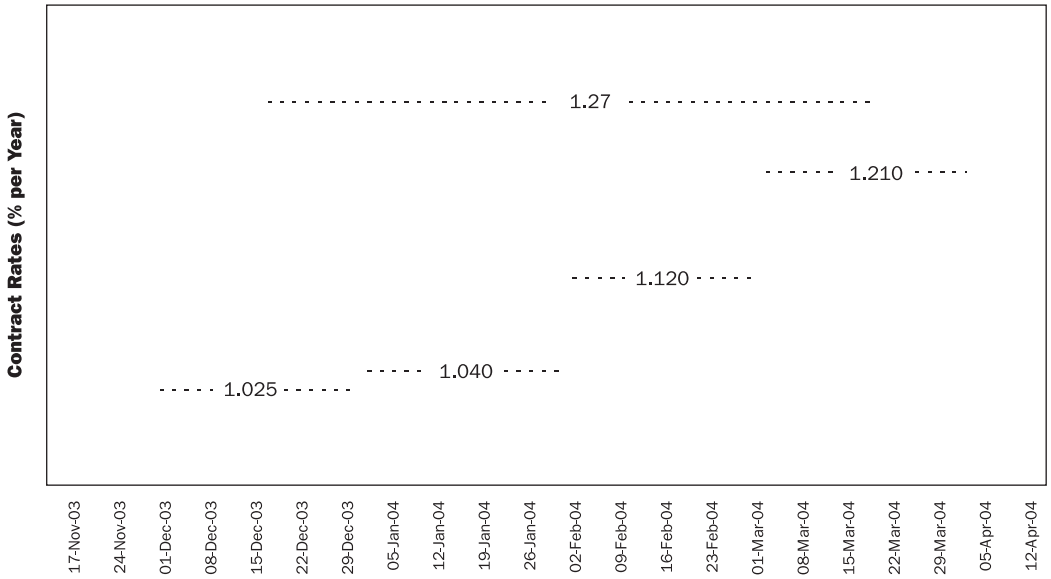
In short, the correct spread ratio is 3:5, or 600 FF for every 1,000 ED.

[1] While the DV01 of FF is $41.67 by product definition, the effective DV01 of FF declines as its time to expiration falls below one calendar month. For simplicity, we suppress this complication in the ensuing calculations. If a particular FF-ED spread employs the spot month FF contract, suitable adjustment should be applied. The Appendix contains a brief discussion on this matter.

How Contract Expiration Calendars Mesh

The interval of interest rate exposure embodied in the nearby quarterly ED contract overlaps, in whole or in part, the exposure intervals for four FF contracts. Exhibit 1 illustrates this with Dec 03 ED and the strip of four FF contracts expiring between Dec 03 and Mar 04.

Exhibit 1
CBOT FF Futures Contract Rates and CME ED Futures Contract Rates
Closing Levels on 3 September 2003



Interval of Interest Rate Exposures
Dec 03 ED vs Dec 03, Jan 04, Feb 04, and Mar 04 FF

Dec 03 ED is based upon the LIBOR that applies to a bank deposit settling on Wednesday, December 17 (the December IMM date, the third Wednesday of the contract expiration month), and that matures three months (in this case, 91 days) later on Wednesday, March 17, 2004.

Dec 03 FF is based upon the average effective overnight fed funds rate for all days in December. As such, it shares only 15 days of interest rate exposure (December 17 through 31) with Dec 03 ED.

Jan 04 FF and Feb 04 FF are based on the average effective overnight fed funds rates for January and February, respectively. In each case, the entire one-month interval of exposure is contained within Dec 03 ED's exposure interval.

At the far end of the strip, Mar 04 FF (like Dec 03 FF) has partial overlap with Dec 03 ED's interval of interest rate exposure, spanning the 16 days from March 1 through March 16.

In what follows, we'll use shorthand—"FF1", "FF2", "FF3", and "FF4," respectively—to refer to any strip of FF contracts that occupies the same generic temporal relationship to the nearby quarterly ED futures contract as we observe above in the temporal relationship between Dec 03 ED and the FF futures strip from Dec 03 to Mar 04.

Note: As used here, this shorthand notation represents a different chronological sequence of contract expirations than it does in the context of various financial analytical platforms, such as Bloomberg or Reuters. For example, during the month of September 2003,

"FF1" as used here represents Dec 03 FF, that is, the fourth expiration in CBOT's listing cycle for 30-Day Fed Fund futures, whereas

"FF1" as used on Bloomberg, for example, references Sep 03 FF, the nearby expiration in the listing cycle.

Note: There is more than one way to construct the FF leg of an FF-ED spread. Among the choices, you can execute a precisely weighted strip of FF contracts involving all four corresponding expirations, or you can stack your FF position using just one of these expirations. A more detailed discussion is found in the Appendix.

Setting Performance Bond Reductions

Exhibit 2 demonstrates that the price dynamics in the nearby quarterly ED exhibit a high positive correlation with price changes in each of the contracts in the associated FF strip.

Exhibit 2
CME Nearby Quarterly Eurodollar Futures versus the Corresponding Strip of CBOT 30-Day Fed Fund Futures [2]
(Correlation of daily price changes, September 1998 to August 2003)

FF1	FF2	FF3	FF4
0.892	0.938	0.940	0.911

For the purpose of illustration, assume the CME/CBOT Common Clearing Link uses this and other statistical evidence to warrant a 75% performance bond reduction for a standard DV01-weighted spread ratio of 3 FF versus 5 ED.

Note: The integrity and security of the common guarantee fund that lies at the core of the CME/CBOT Common Clearing Link is of paramount importance to both CBOT and CME. Thus, as a prudential matter, minimum contract performance bonds and spread-related reductions in those minimum performance bonds will be reviewed regularly by a joint committee of officials from the two exchanges. They are likely to change from time to time in response to fluctuations in market volatility, the degree of correlation between different segments of the fixed-income and money markets, or both.

[2] For more information on construction of the data set underlying these and other statistics in this essay, please see the concluding sections, **For the record…**

Performance Bond Reductions in Action

Exhibit 3 indicates the capital efficiencies you would reap if the hypothetical reduction in minimum performance bond established in Part 3 were applied to the FF-ED spread sketched in Part 1.

Under current circumstances—with CBOT and CME contracts cleared through different clearing houses—the initial performance bond you would post for 600 FF spread against 1,000 ED is $980,000 per $1 billion notional of three-month interest rate exposure (comprising $180,000 on 600 FF and $800,000 on 1,000 ED).

Given common clearing of CBOT and CME contracts through the CME/CBOT Common Clearing Link, and given the hypothetical assumption of a 75% performance bond reduction, ***your savings by way of reduced initial performance bond would be $735,000. Given that the interest rate sensitivity for either leg of the spread is $25,000 per basis point, the amount you save on performance bond reduction is equivalent to 29.4 basis points.***

Exhibit 3
Minimum Performance Bond Postings and Reductions for a FF-ED Spread
(As of September 2, 2003, initial performance bond rates for the purpose of hedging were $300 per contract side for CBOT FF and $800 per contract side for CME ED.)

Number of FF Contracts	600
Number of ED Contracts	1,000
Performance Bond w/out Common Clearing ($)	980,000
Performance Bond with Common Clearing ($)	245,000
Reduction in Performance Bond ($)	735,000

Note: This example assumes you represent an establishment that carries fundamental commercial exposure to short-term money market interest rates, e.g., the treasury operation of a commercial bank treasury or nonfinancial corporation. Accordingly, the initial performance bond rates presented in Exhibit 3 apply to a commercial hedger. If instead you represent a speculative user of financial futures with no commercial exposure to the underlying cash markets, e.g., a managed futures fund or CTA, then the applicable initial performance bond rates would be higher: as of September 2, 2003, $405 per contract side for FF, and $1,080 per contract side for ED. *Under this circumstance, your initial performance bond would be reduced from $1,323,000 to $330,750, for a savings of $992,250—equivalent to nearly 40 basis points of the notional interest rate exposure in either leg of the spread.*

Note: This discussion of performance bond reduction references the minimum performance bond rates at the Clearing House. Your clearing firm may demand a higher level of performance bond.

Extensions

The spread logic sketched above and in the Appendix is not confined to nearby quarterly ED contracts. It extends directly to spreads between FF and deferred ED contracts.

It also applies, with minor modification, to spreads between FF and CME LIBOR futures (EM). EM derives from 1-month LIBOR, unlike ED, which derives from 3-month LIBOR. However, the EM contract is conveniently designed so that, as with ED, the dollar value of a 1-basis-point move in its underlying interest rate is $25. Thus, the appropriate generic DV01-weighted ratio for spreading FF against EM remains 3:5, exactly as for spreading FF against ED.[3]

The chief difference resides in the interval of interest rate exposure. For example:

> Dec 03 EM is based upon 1-month LIBOR on an interbank deposit settling on Wednesday, December 17 (the December IMM date), and maturing on Monday, January 19, 2004, whereas
>
> Dec 03 ED is based upon 3-month LIBOR on an interbank deposit settling on Wednesday, December 17, and maturing on Wednesday, March 17, 2004.

A direct implication is that the strip of FF contracts that would be natural candidates for spreading against Dec 03 EM is limited to Dec 03 FF and Jan 04 FF (in contrast to the four-contract strip spanning Dec 03 FF to Mar 04 FF that would be natural candidates for spreading against Dec 03 ED).

Performance bond reductions applying to FF-ED spreads and FF-EM spreads are apt to be comparable, although they may diverge from time to time depending upon market conditions (notably differences in interest rate volatility at various points on the money market yield curve).

[3] This assertion, too, is subject to the qualification mentioned in Footnote 1. For more details, please see the Appendix.

Putting Down Stakes on the FF Strip

The reasoning in Parts 1 and 2 establishes that a proper standard ratio for spreading FF against nearby quarterly ED is 3:5. It leaves open, however, the question of which FF contract or contracts you should use in constructing the spread. Unsurprisingly, the answer depends upon your objective.

Objective for Hedgers: Precision and Structure

Suppose you are a commercial market participant—a bank treasurer, say—who decides in September to use the FF-ED spread to lock in the interest rate spread on a $1 billion 3-month LIBOR loan (or other forward-starting asset earning 3-month LIBOR)

that is expected to settle on the December 2003 IMM date (making its tenor identical to the interval of interest rate exposure covered by Dec 03 ED futures) and

that will be financed by overnight borrowings in the fed funds market.

The purchase of 1,000 Dec 03 ED will suffice to hedge the 3-month LIBOR loan. The 600 contracts in the FF leg of the futures spread, on the other hand, should be chosen so as to replicate, as closely as the FF strip permits, 91 days of overnight rate exposure. One obvious means of doing so is to apportion the contracts along the FF strip according to the extent to which they overlap with Dec 03 ED's interest rate exposure interval. Exhibit 4 illustrates how you might achieve this goal (in this case, by building on the convention that LIBOR and overnight federal funds rates are both governed by the actual/360 daycount convention).

Exhibit 4
Setting the FF-ED Spread Ratio to Hedge an Overnight/3-Month Money Market Spread

FF Contract [a]	Length of Overlap of FF's Interest Rate Exposure Interval with Dec 03 ED's Interest Rate Exposure Interval (Days) [b]	Fraction of Dec 03 ED Interest Rate Exposure Interval [c] = [b] / 91	Number of FF Contracts [d] = [c] x 600
Dec 03 (FF1)	15	0.165	99
Jan 04 (FF2)	31	0.341	204
Feb 04 (FF3)	29	0.319	191
Mar 04 (FF4)	16	0.176	106
Column Totals	91		600

To summarize, you would sell the FF-ED spread by establishing a short position of 600 FF—comprising 99 Dec 03, 204 Jan 04, 191 Feb 04, and 106 Mar 04, as shown in Exhibit 4—against a long position of 1,000 Dec 03 ED.

A quick, generic, approximate rendition of this would entail selling 100 each of Dec 03 FF and Mar 04 FF and 200 each of Jan 04 FF and Feb 04 FF (for the requisite total of 600 contracts) against a long position of 1,000 Dec 03 ED.

Objective for Speculators: Convenience and Correlation

Suppose instead you are an exchange local who wants to use ED simply as a means of laying off risk in FF (or vice versa). Alternatively, you might be a proprietary trader who wishes to trade the money market yield curve, or segments of it, by spreading the FF contract for particular month against ED.

Either way—for reasons of speed in the case of the local, or for reasons of yield curve pitch, curvature, or misvaluation in the case of the prop trader—the FF-ED spread you employ will frequently take the form of a one-month stack of FF against a stack of ED.

Let's assume for simplicity that you want to spread 1,000 Dec 03 ED against 600 FF chosen from the corresponding four-contract FF strip. Apart from whatever distortion in the spread that you anticipate as a result of seasonal turn-of-year effects, the overall strength of correlation between the two legs of the spread will be a key consideration (probably the leading consideration for the exchange local in search of an effective means of risk lay-off). The 5-year correlations appearing in Exhibit 2 point to the third contract in the strip (i.e., Feb 04 FF) as the most suitable candidate. However, the correlation between Dec 03 ED and the second contract in the strip (here, Jan 04 FF) is only marginally less, making it a close contender.

Two additional factors might incline you to prefer stacking with Jan 04 FF rather than Feb 04 FF. First, in FF futures as in ED futures, a contract's liquidity tends to be better the nearer the contract's expiration.

Second, an examination of short-term correlations may lead to different conclusions than the long-term (5-year) correlations presented in Exhibit 2. If, for example, you compute a series of moving quarterly (63-business-day) correlations using the same 5-year data interval used in computing the statistics in Exhibit 2, then you will find that FF2's local correlation with nearby quarterly ED exceeds local correlations for other members of the FF strip nearly 49% of the time. As Exhibit 5 reveals, this criterion would give FF2 the dominant position more often than FF3 as the stack hedge of choice.

Exhibit 5

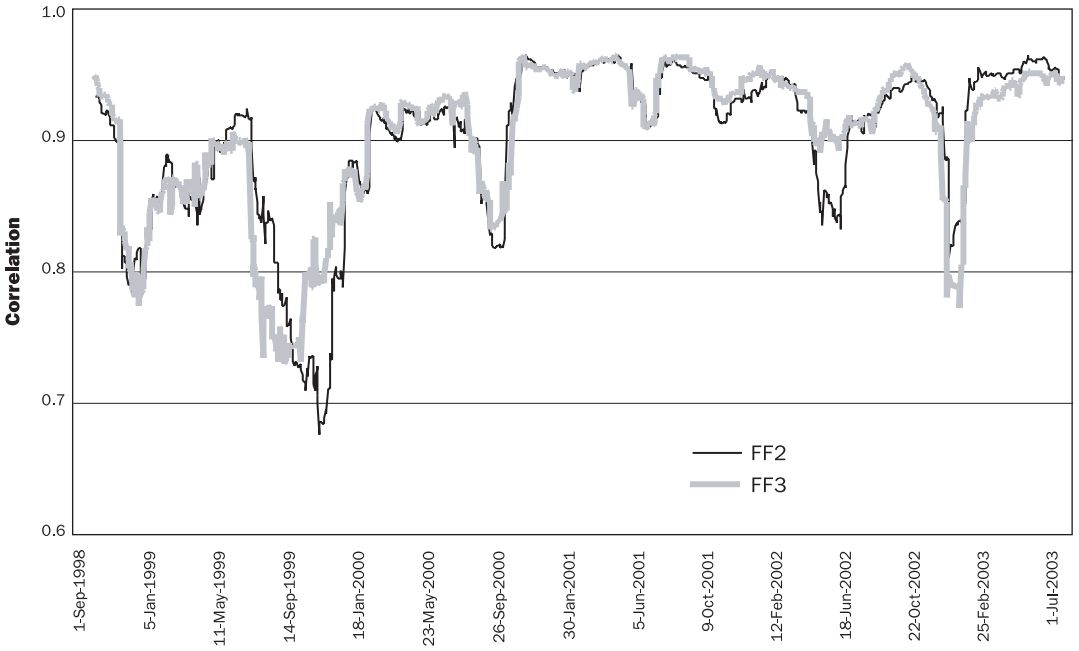
Which Member of the FF Strip Has the Strongest Correlation with the Nearby Quarterly ED?

(Percentage share of days on which an FF contract's local correlation with nearby quarterly ED exceeds local correlation for other members of the corresponding FF strip. Local correlation is defined as the centered moving quarterly (63-business-day) correlation of daily price changes. FF1, FF2, FF3, and FF4 are as defined in Part 2. Data are from September 1998 to August 2003.)

FF1	FF2	FF3	FF4
3.7	48.6	41.0	6.6

To convey some notion of the variability in local correlation over the five-year sample period, Exhibit 6 exhibits the plot of local correlations between price changes in FF2 and FF3 versus price changes in nearby quarterly ED.

Exhibit 6
CME Nearby Quarterly ED versus CBOT FF2 and FF3 Moving Quarterly Correlations
September 1998 to August 2003



Note: Important Exception for Nearby FF

The spread logic spelled out above and in Parts 1 and 2 applies with full force to any FF-ED spread for which the expiration dates for an ED contract and the first contract in the corresponding FF strip (FF1) lie beyond the calendar month in which you are trading the spread.

The rules of the game will change slightly, however, if you trade the spread during the expiration month for ED and FF1—if for example it is early September 2003, and you are trading Sep 03 ED against the corresponding strip consisting of Sep 03, Oct 03, Nov 03, and Dec 03 FF. The reason is that, for a FF contract already in its expiration month (Sep 03 FF in the example above), pricing is governed by an averaging process that takes into account the elapsed days of the expiration month, i.e., days for which the effective overnight federal funds rate is already known. A direct implication is that the impact upon the contract's price of a one-basis-point move in interest rates diminishes as the contract glides toward its month-end expiration day. That is, for practical purposes, a FF contract's DV01 declines from $41.67 per basis point at the beginning of its expiration month to zero at month's end. This in turn affects the ratio for spreading FF1 against ED, either alone or in combination with FF2, FF3, and FF4. (For more information on this, please see **Reference Guide: CBOT Fed Funds Futures**, Chicago Board of Trade, Chicago, 2003, available at www.cbot.com.)

For the record...

In constructing the data set for the analysis above, the convention we use to define nearby quarterly ED assumes that market participants roll out of the nearby contract into the first deferred contract on the last business day of the month preceding the nearby contract's expiration month. For example, throughout August "nearby ED" would be the Sep expiration; on the first day of September "nearby ED" would become the Dec expiration. Contracts in the corresponding FF futures strip are chosen similarly. For example, throughout August FF2 would be the Oct expiration; on the first day of September FF2 would become the following Jan expiration.

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