CME Group
A CME/Chicago Board of Trade Company

Implied Liquidity From Redundant Futures Markets

John Curran, MD, Products and Services, CME Group
October 15, 2007

Overview of futures contracts

Futures are standardized contracts to buy or sell a commodity or financial instrument at a pre-determined price in the future.

Key features of futures contracts:

- They are standardized in size, quality and settlement measure
- Traded on a regulated commodity futures exchange
- Guaranteed against default by an exchange's clearinghouse
- Futures contracts cover a wide range of delivery dates. For example, CME's Eurodollar futures has listings for forty quarters and four nearest serial months, effectively allowing market participants to hedge or speculate this benchmark interest rate for up to ten years in the future.

Concentration of Liquidity and Positions in Futures

Many futures markets concentrate activity in the nearest to expiration contract month

- Individual contract months are highly correlated
  - Market shocks impact all contract months similarly
  - Mismatch costs are relatively small
- Instantaneous liquidity tends to be cheaper order flow can concentrate

	% of Volume in Lead Month	% of Open Position in Lead Month
S&P 500 Futures	**99%**	**96%**
US 10-Yr T-Note Futures	**99%**	**98%**

*** For July 2007**

CME Group
A CME/Chicago Board of Trade Company

Concentration of Liquidity and Positions in Futures

Other futures markets distribute activity across different contract month

- Different contract months, while correlated around systemic shocks, still have strong delivery month variation that end-users want to hedge or speculate against

	% of Volume in Lead Month	% of Open Position in Lead Month
3-month Eurodollar Futures	16%	18%
Corn Futures	56%	44%

*** For July 2007**

CME Group
A CME/Chicago Board of Trade Company

Designing electronic markets to optimize liquidity and trading efficiencies

Factors driving futures electronic market design choices:

- Trading interest
  - Order flow arrival rates
  - Day trading? Long-dated position trading? Both?
- Traded contract months
  - Lead contract or distributed contract month trading
- Price volatility
  - High, low, digital?
- Overall market and underlying product complexity

Futures electronic market design choices such as:

- Matching model
  - Single or multiple market matching
- Execution priority
  - First-in first out, pro-rata methodology, preferencing, …
- Designating market-makers

CME Group
A CME/Chicago Board of Trade Company

The Eurodollar contract

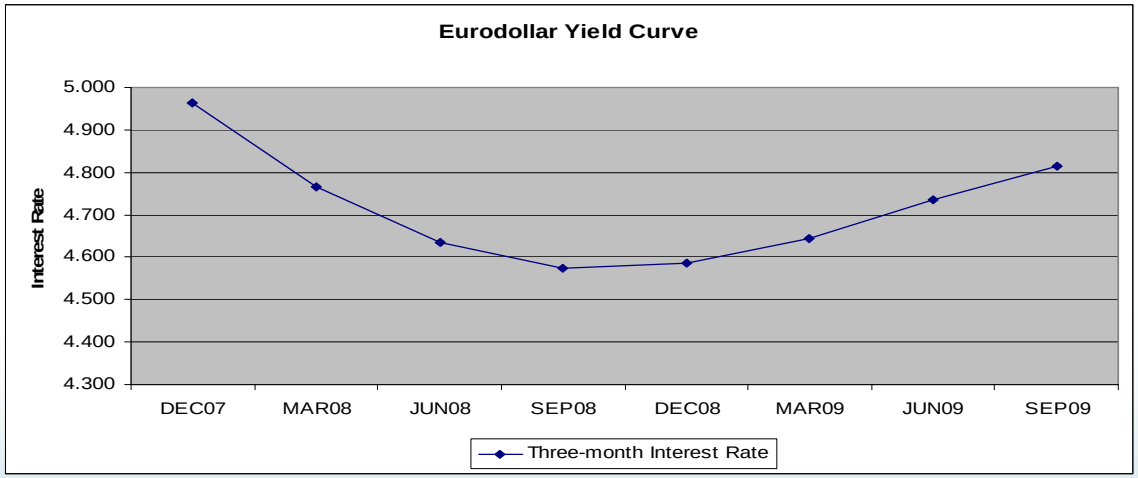
What it is

Eurodollar time deposit having a principal value of $1,000,000 with a three-month maturity.

Users and Usages

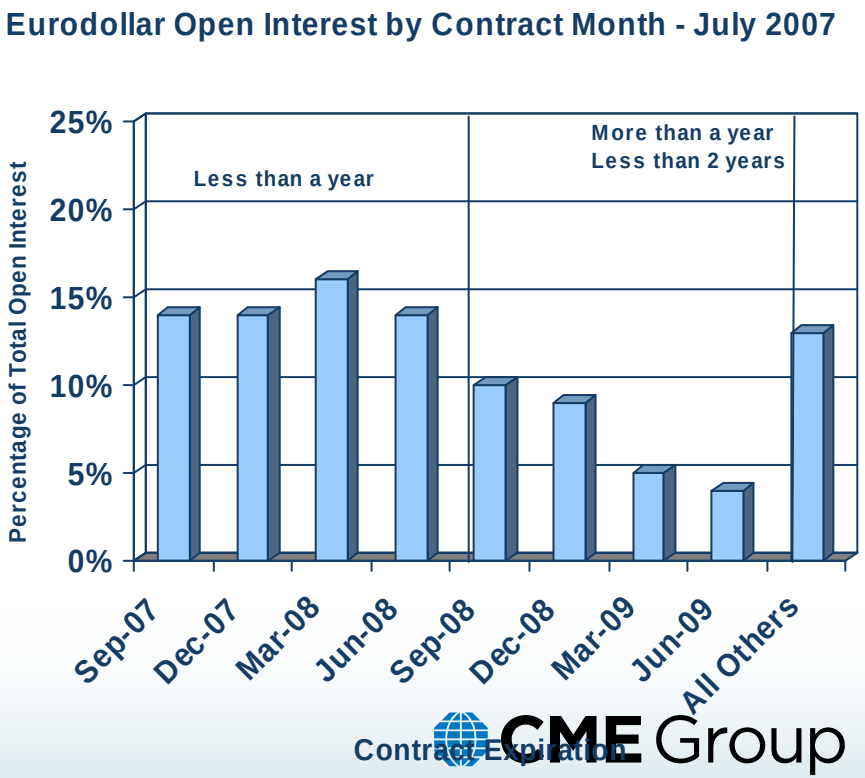
CME Eurodollar is the most actively traded futures contract in the world. Banks and other lenders hedge their interest rate risks with Eurodollar futures.

Graphic showing the Eurodollar yield curve



CME Group
A CME/Chicago Board of Trade Company

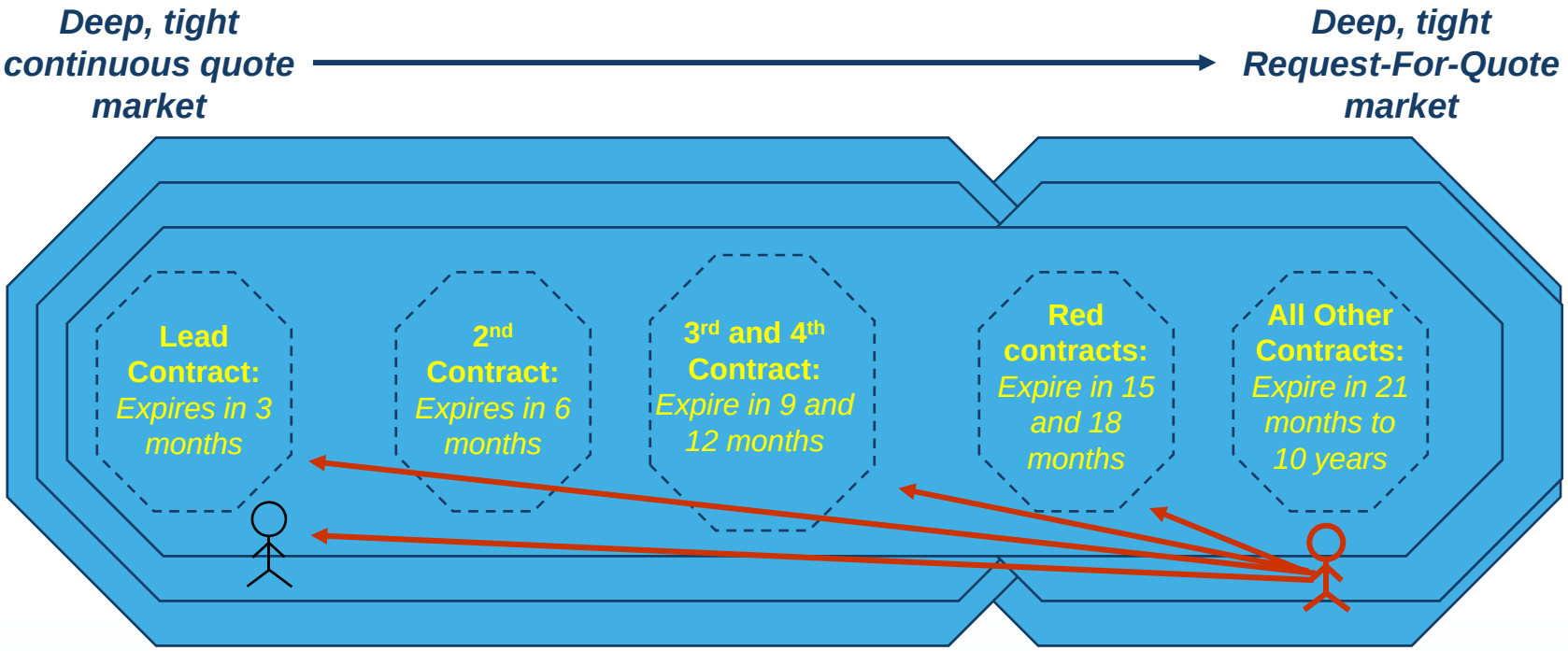
Eurodollars - A multi-month futures market



CME Group
A CME/Chicago Board of Trade Company

The Eurodollar Open Outcry Market in 1997

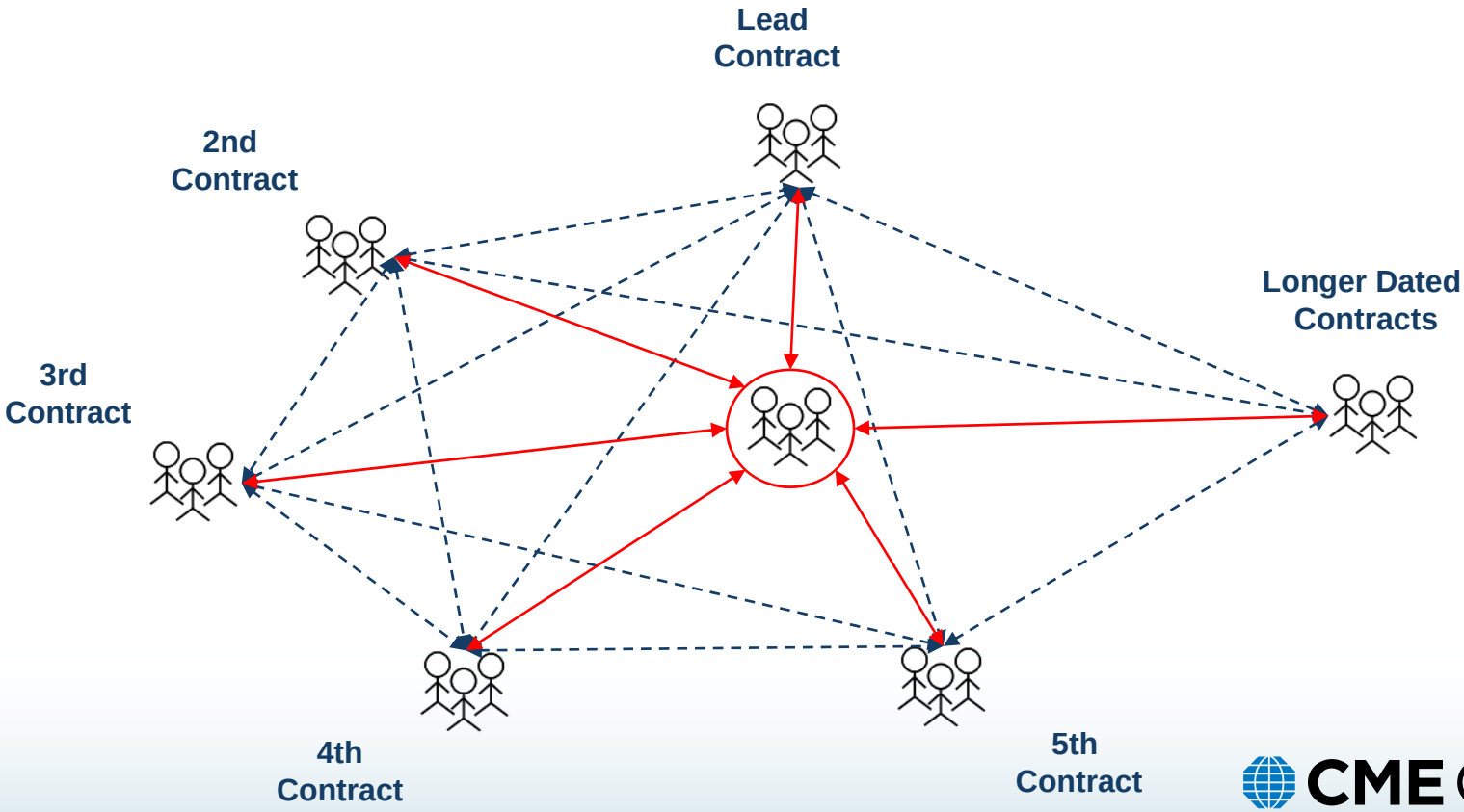
Thousands of brokers, traders and clerks organically trading 44 contracts together



CME Group
A CME/Chicago Board of Trade Company

Leaning on liquidity in other markets

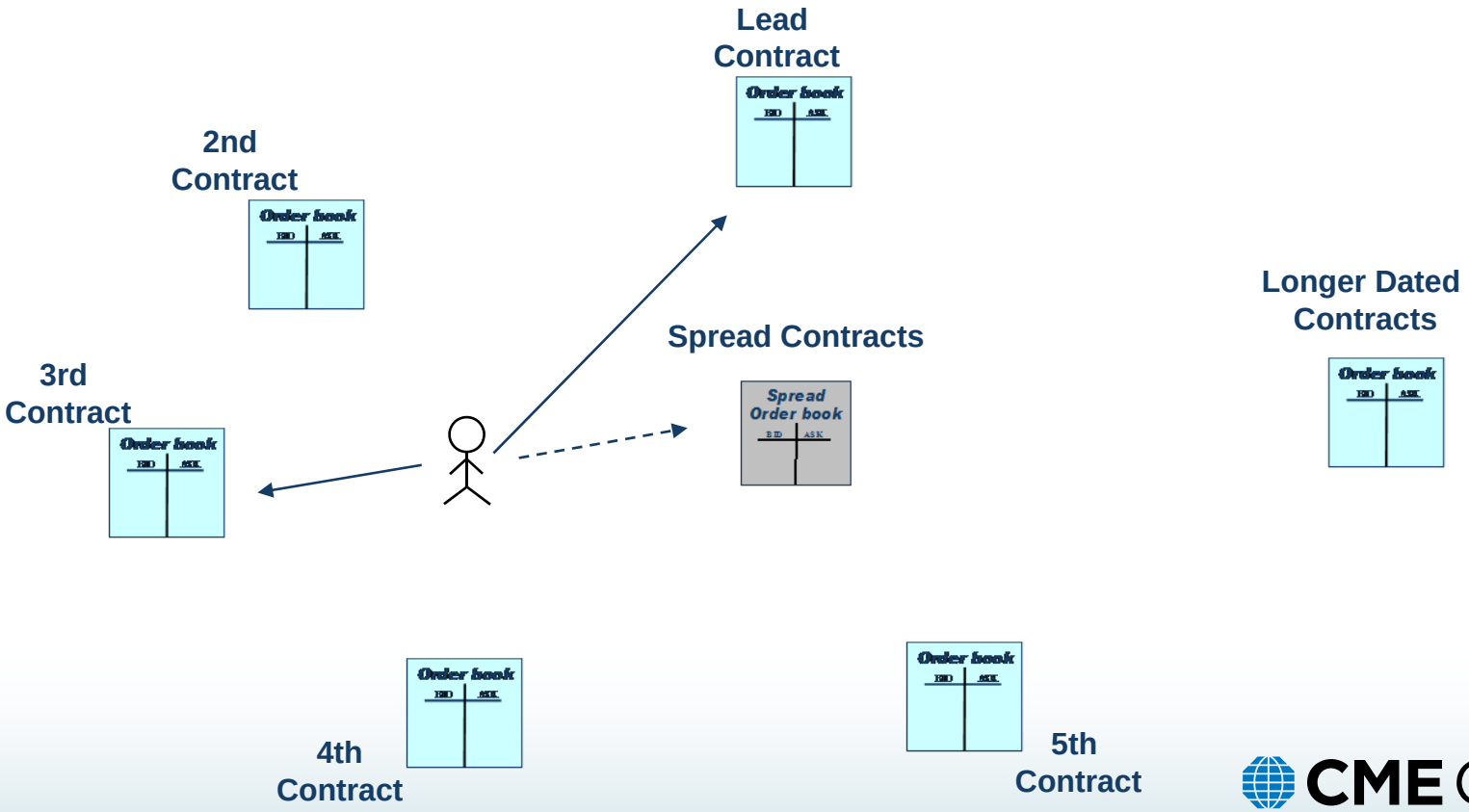
Open outcry market participants created a web of liquidity through the creation of spread markets by some particpants, being able to observe all markets simultaneously and being able to trade in multiple markets quickly and at low risk



CME Group
A CME/Chicago Board of Trade Company

Original Electronic Model for Eurodollar Futures

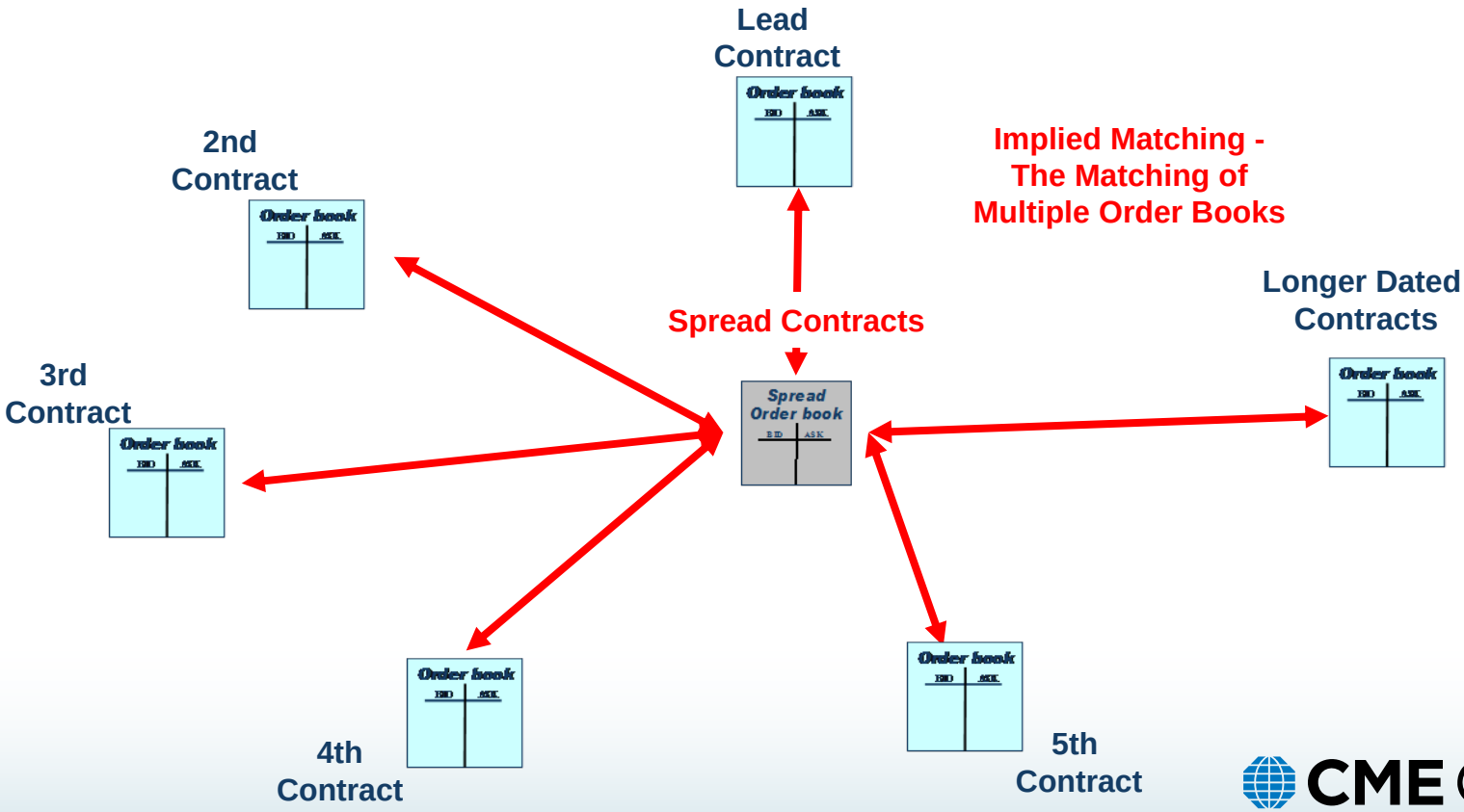
Independent markets with participants responsible for linking liquidity across different markets



CME Group
A CME/Chicago Board of Trade Company

Bridging liquidity:

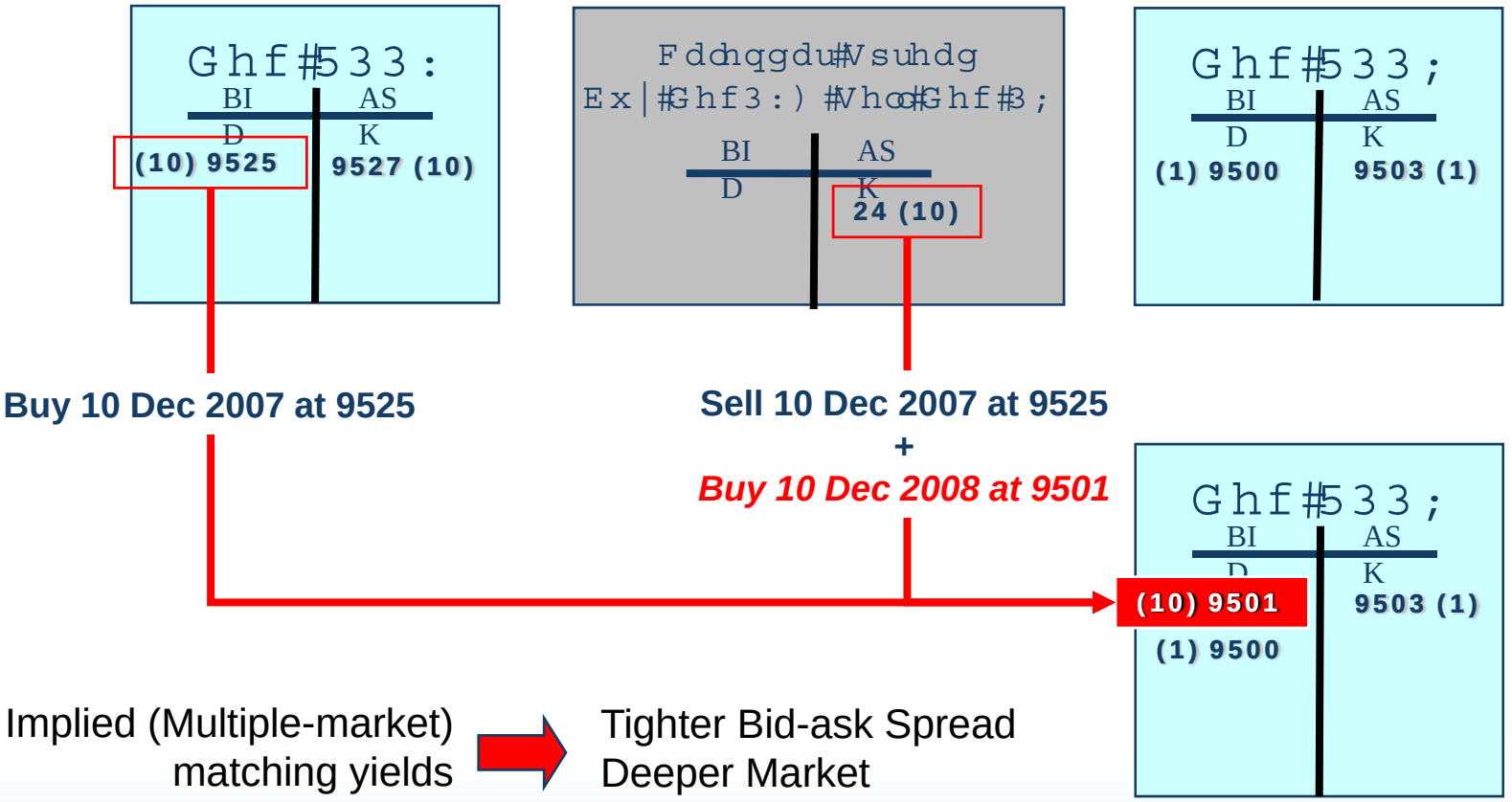
The CME Globex matching engine executes orders from outright and spread markets in combination simultaneously



CME Group
A CME/Chicago Board of Trade Company

Implied Orders and multiple order book matching:

A calendar spread example



Implied (Multiple-market) matching yields → Tighter Bid-ask Spread Deeper Market

CME Group
A CME/Chicago Board of Trade Company

Implied Orders and multiple order book matching:
Globex implies orders/construct matches from a large set of spreads

Combinations of

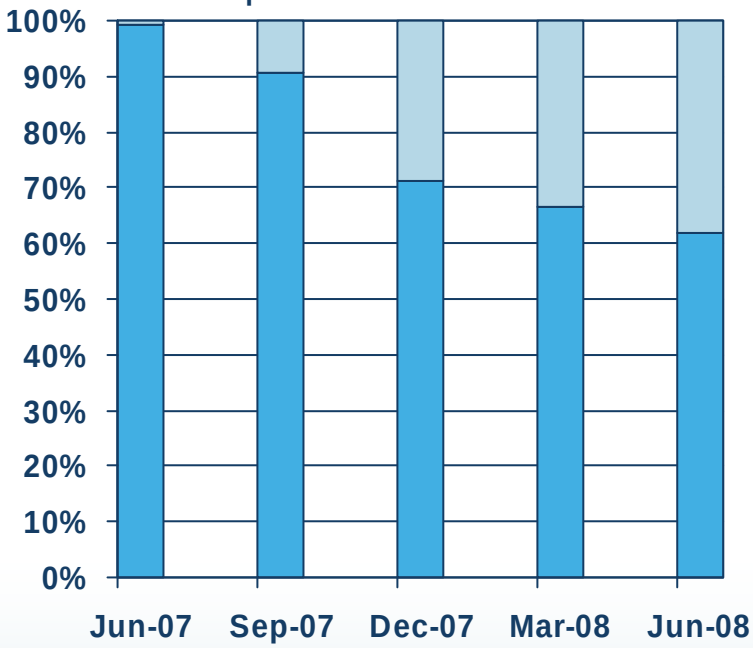
- Individual leg markets
- Calendar spreads (buy 1 month sell a later contract month)
  - Calendar spreads vary with the steepness of the eurodollar curve
- Butterfly spreads (buy 1 month, sell 2 later months and buy 1 even later month)
  - Butterfly spreads vary with changes in the curavature of the eurodollar curve
  - Butterfly spreads are linked to both individual leg markets as well as calendar spread markets

Contribution of implied markets to liquidity

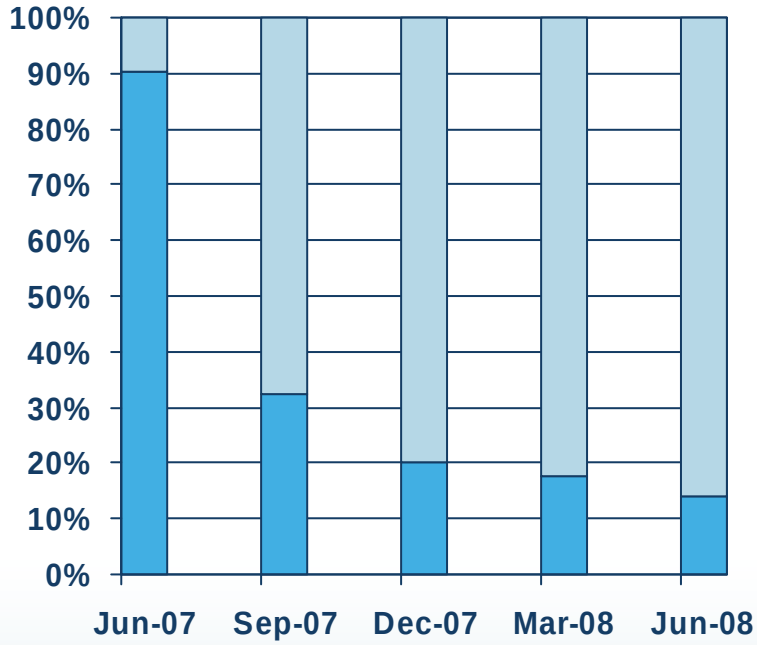
Implied matching bridges liquidity from the more liquid to the less liquid contract months

- Spreads with low volatility is crucial to maximizing the bridge

Top of the Order Book

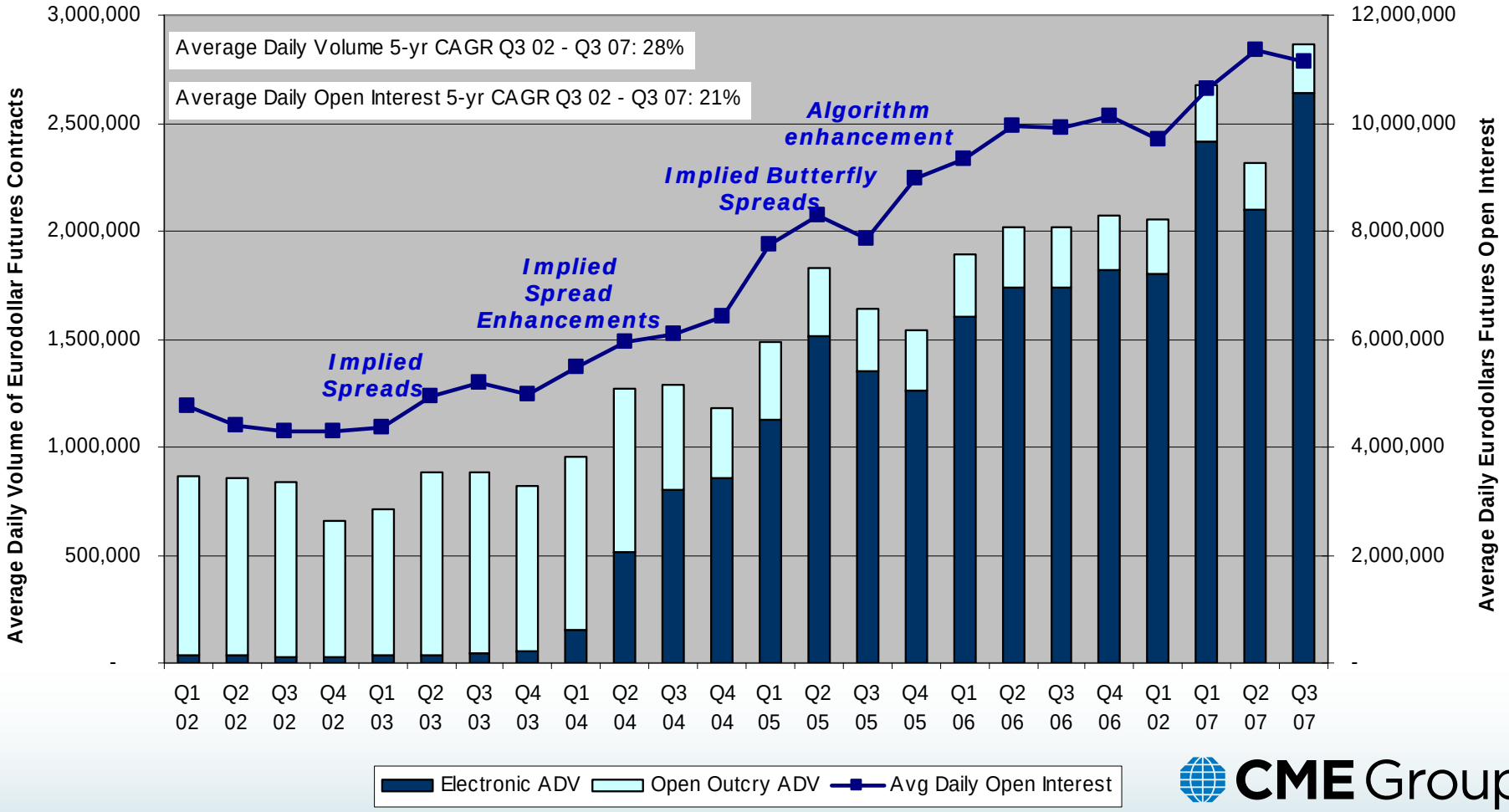


Second level of the Order Book



CME Group
A CME/Chicago Board of Trade Company

Growth in electronic trading of Eurodollars



CME Group
A CME/Chicago Board of Trade Company

Future Enhancements

Two directions

- **Adding more spreads**
  - To generate liquidity in less liquid markets through spreads
  - To generate liquidity in spreads themselves
    - Inter-commodity spreads
- **Chaining more markets together for simultaneous execution**
  - First generation implied :
    - Creating an implied quote from resting orders
  - Second generation:
    - Creating a new implied quote from resting orders and a first generation implied quote
  - Identifying all combinations of eligible legs and spreads that could generate a match

Implied Matching Implications

Implied Matching and Order Execution Priority

- Pro Rata Matching
- Hybrid Matching

Automated Trading Systems in implied markets

- Speed and market complexity

Applicability to other markets

- Front-month futures markets
- Option Markets

Concluding Thoughts