CME Interest Rate Portfolio Margining
Unparalleled Capital Efficiencies for Interest Rate Futures & Cleared Swap Portfolios

February 2020
Strong Growth in US Dollar Swap Clearing at CME

USD Swap Product Volumes Grew +22% in 2019

$89B ADV across USD products in 2019

45% increase in interdealer IRS volumes at CME from 2018

20% share of global client clearing in fixed/float swaps

CME Cleared USD IRS Avg. Daily Volume ($B)

Why Clients Are Choosing CME...

- Industry-leading Portfolio Margining solution with our IR Futures franchise, generating record $6 billion in margin savings in 2019
- Over 96% margin savings for Convexity Bias Strategies and 80% savings on invoice spread strategies cleared at CME
- 40 liquidity providers supporting and 580 buyside clients leveraging our service to date
- SOFR Swaps, discounted using SOFR, supported out to 30 years
Portfolio Margining IRS and CME Group Futures

Unparalleled Margin Efficiencies for a Capital Constrained World

Portfolio Margining Eligible Products

- 24 IRS Currencies
- Cleared Swaptions
- Eurodollar Futures
- Treasury Futures
- Fed Funds Futures
- MAC Swap Futures

CME Group Portfolio Margining Program

- PM Savings
- 2016: $2.5bn
- 2017: $2.1bn
- 2018: $2.2bn
- 2019: $6.0bn
- 896 Accounts utilizing PM offering at CME

- $6.0 Billion in margin savings reached in 2019
- Accounts leveraging offering realize 55% peak average savings on IM
- Over 890 accounts utilizing PM offering at CME

Enhancements to the Offering – Now Live

- Spread Model
- S-HVAR Methodology
- Next Gen Optimizer & API
Invoice Swaps and Convexity Bias Strategies

**Invoice Spreads are trades between Swaps and Treasury Futures, that proxies the swap spread**

✓ Invoice spreads are packaged trades involving a CBOT Treasury future and a matching interest rate swap
✓ Terms of the swap are designed to match the attributes of the future, including a duration-neutral notional value, effective date matching the last delivery date of the future, and maturity date matching the cheapest-to-deliver security
✓ This is a highly active market, daily volume exceeded 114,000 contracts ($16 billion notional) in 2019.

<table>
<thead>
<tr>
<th>Receive</th>
<th>Pay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed (Long)</td>
<td>Fixed</td>
</tr>
<tr>
<td>Sept 2018 5-Year CBOT Treasury Future</td>
<td>5-Year Invoice Swap, effective 3-Oct-2019, maturity 30-April-2024</td>
</tr>
</tbody>
</table>

**Convexity Bias are trades between FRAs and Eurodollar Futures, that proxies the convex payoff between STIR Futures and equivalent FRA swap**

✓ Convexity bias appears in STIR instruments because of the payoff differences in the futures market versus the OTC FRA market.
✓ As underlying rates move up and down, a position in STIR futures will have the same payoff but that of the FRA will change.
✓ Fixed income traders have to be aware of the convexity because of the effects on larger OTC transactions, like FRAs, that are further out on the yield curve (i.e. 5-year FRA).

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>Fixed (Long)</td>
<td>Fixed</td>
</tr>
<tr>
<td>1,000 ED Sept 2020 Futures</td>
<td>$100M 3-Month FRA effective 16-Sept-2020</td>
</tr>
</tbody>
</table>
Increased Rates Relative-Value EFR Activity

RV Trading Strategies using Invoice Swap Spread, Eurodollar Convexity Bias, and Fed Fund EFR trading averaged 134K contracts in 2019, a 21% increase from 2018.

- **Invoice Spreads**: 114K ADV in 2019, following rule clarification in Oct ’16 and enhanced electronic entry
- **Eurodollar Convexity Bias Strategies**: 16K ADV in 2019, showing substantial growth compared to 6K in 2015 as volatility returned to the short end of the curve.
- **Portfolio Margining** utilization delivers $6B in daily margin savings in 2019, across over 890 accounts.

**Yearly Comparison of Relative Value Package Strategies using Futures**

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>STIR EFR Package ADV</td>
<td>6k</td>
<td>10k</td>
<td>11k</td>
<td>21k</td>
<td>20k</td>
</tr>
<tr>
<td>Invoice Swap Spread ADV</td>
<td>49k</td>
<td>50k</td>
<td>68k</td>
<td>89k</td>
<td>114k</td>
</tr>
</tbody>
</table>
### Eurodollar Convexity Bias Trading Analysis

Portfolio margining IRS with CME Eurodollars results in indicative margin savings of 83% to 96%.

Examples of Eurodollar Convexity Bias strategies with $1K DV01 in each strategy.

<table>
<thead>
<tr>
<th>FRA vs ED</th>
<th>Swap Margin w/o PM</th>
<th>Swap Margin w/ PM</th>
<th>Margin Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>2nd Quarterly Contract Spread</td>
<td>14.9</td>
<td>4.6</td>
<td>83.3%</td>
</tr>
<tr>
<td>3rd Quarterly Contract Spread</td>
<td>20.0</td>
<td>2.5</td>
<td>92.4%</td>
</tr>
<tr>
<td>5th Quarterly Contract Spread</td>
<td>35.1</td>
<td>1.8</td>
<td>96.4%</td>
</tr>
<tr>
<td>6th Quarterly Contract Spread</td>
<td>37.8</td>
<td>3.2</td>
<td>93.9%</td>
</tr>
<tr>
<td>7th Quarterly Contract Spread</td>
<td>35.2</td>
<td>8.7</td>
<td>83.1%</td>
</tr>
<tr>
<td>8th Quarterly Contract Spread</td>
<td>42.9</td>
<td>6.4</td>
<td>89.2%</td>
</tr>
<tr>
<td>1Y USD Swap + White Pack</td>
<td>14.8</td>
<td>0.9</td>
<td>96.8%</td>
</tr>
<tr>
<td>1Y x 1Y USD Swap + Red Pack</td>
<td>35.3</td>
<td>3.6</td>
<td>93.0%</td>
</tr>
<tr>
<td>2Y x 1Y USD Swap + Green Pack</td>
<td>35.5</td>
<td>3.8</td>
<td>92.8%</td>
</tr>
<tr>
<td>3Y x 1Y USD Swap + Blue Pack</td>
<td>40.2</td>
<td>5.8</td>
<td>90.0%</td>
</tr>
<tr>
<td>4Y x 1Y USD Swap + Gold Pack</td>
<td>33.0</td>
<td>7.1</td>
<td>85.9%</td>
</tr>
</tbody>
</table>

Examples of Eurodollar Convexity Bias strategies with $1K DV01 in each strategy.

<table>
<thead>
<tr>
<th>Swap vs ED Strip</th>
<th>1Y x 1Y Convexity Bias Package</th>
<th>Indicative Margin (bps of DV01)</th>
<th>93% Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>2nd Quarterly Contract Spread</td>
<td>14.8</td>
<td>96% Savings</td>
<td>0.9</td>
</tr>
<tr>
<td>3rd Quarterly Contract Spread</td>
<td>35.3</td>
<td>93% Savings</td>
<td>3.6</td>
</tr>
</tbody>
</table>
# Invoice Swap Spread Efficiencies

**CBOT Treasury Futures vs. Interest Rate Swap**

## Volumes Increasing to 114k ADV in 2019

Portfolio Margining Unlocks Significant Efficiencies for Invoice Swap Spreads

Margin requirements for futures and swaps can create significant cost implications for capital consumption and total cost of trading.

Clearing both legs of invoice spread trades together can generate incremental margin savings as high as 81% - further optimizing capital and cost of trading.

<table>
<thead>
<tr>
<th>Invoice Spread Strategy</th>
<th>Margin if Cleared Separately</th>
<th>CME Portfolio Margin</th>
<th>Margin Savings</th>
<th>Savings Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2YR (TU) Treasury vs IRS</td>
<td>47.9</td>
<td>13.8</td>
<td>34.1</td>
<td>71%</td>
</tr>
<tr>
<td>5YR (FV) Treasury vs IRS</td>
<td>44.7</td>
<td>8.3</td>
<td>36.4</td>
<td>81%</td>
</tr>
<tr>
<td>10YR (TY) Treasury vs IRS</td>
<td>46.6</td>
<td>10.4</td>
<td>36.2</td>
<td>78%</td>
</tr>
<tr>
<td>Ultra 10YR (UXY) Treasury vs IRS</td>
<td>44.5</td>
<td>10.3</td>
<td>34.2</td>
<td>77%</td>
</tr>
<tr>
<td>Treasury Bond (US) vs IRS</td>
<td>48.8</td>
<td>13.8</td>
<td>35.0</td>
<td>72%</td>
</tr>
<tr>
<td>Ultra Treasury (WN) vs IRS</td>
<td>47.5</td>
<td>15.5</td>
<td>32.0</td>
<td>67%</td>
</tr>
<tr>
<td>30 Day Fed Funds (FF) vs OIS</td>
<td>47.8</td>
<td>13.3</td>
<td>34.5</td>
<td>72%</td>
</tr>
</tbody>
</table>
Portfolio Margining – Operational Highlights

CME Margin Optimizer

- Ultimate objective of CME optimization is to minimize the portfolio risk and optimize margins for participants by suggesting transfer of F&O position from Base waterfall to IRS cross-margining program.
- Specifies the ideal allocation of eligible Interest Rate products to move from a Futures segregated account to a sequestered OTC cleared account.
- Clearing Members use the Optimizer to facilitate portfolio margining for both clients and house accounts.
- The tool automates the selection of futures to move and creates a transfer message which is sent to CME to update CME books and records.

**Current Account Set-up**
- Futures Segregated Account
- OTC Customer Cleared Swaps Account

**Portfolio Margining Account Set-up**
- Futures Segregated Account
- Selected Eurodollar, Treasury, Fed Fund, and MAC Swap Futures
- Futures Selected for Portfolio Margining
- OTC IRS
- OTC Customer Cleared Swaps Account

Optimization requires the Futures and OTC positions to be with the same clearing member firm.
Portfolio Margining Tools

Additional Features

**CME CORE**

- **CME CORE: Clearing Online Risk Engine**
- Ideal business user solution for Portfolio Margin analysis
- Allows firms to calculate margin for their portfolios
  - Portfolios can be added manually, via csv upload, or via real-time cleared portfolio access
- CME CORE’s Optimizer tool calculates the portfolio margin savings between OTC IRS and Interest Rate Futures
- Reports breakdown recommended position transfers

- **Enhanced Margin Optimization:**
  Optimize portfolios using IRS trades or Delta Ladders and Futures

- **Streamline Margin Calculations:**
  Upload and margin any combination of IRS trades, IRS Delta Ladder and Futures

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*Margin Optimization Report*

<table>
<thead>
<tr>
<th>Margin Contribution Breakdown</th>
<th>Optimization Breakdown</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Account:</strong></td>
<td><strong>Optimization Breakdown:</strong></td>
</tr>
<tr>
<td>Initial Portfolio Margin IM Requirement:</td>
<td>1,130,427.46</td>
</tr>
<tr>
<td>Initial Futures &amp; Options Residual</td>
<td>1,050,000.00</td>
</tr>
<tr>
<td>Total Margin:</td>
<td>2,180,427.46</td>
</tr>
<tr>
<td>Optimized Portfolio Margin IM</td>
<td>496,172.63</td>
</tr>
<tr>
<td>Optimized Futures &amp; Options Residual</td>
<td>592,200.00</td>
</tr>
<tr>
<td>Optimized Portfolio Total Margin:</td>
<td>1,088,372.63</td>
</tr>
<tr>
<td>Portfolio Margin Savings:</td>
<td>1,092,054.82</td>
</tr>
<tr>
<td>Portfolio Margin Savings Percentage:</td>
<td>50.084%</td>
</tr>
</tbody>
</table>
Clearing Online Risk Engine ("CORE") Risk Tool

CME CORE Capabilities

CME PRODUCTS SUPPORTED

Futures and Options
- Agriculture, Energy, Equity Index, FX, Interest Rates, Metals
Interest Rate Swaps
FX Non-Deliverable Forwards, Cash-Settled Forwards and Options

FUNCTIONALITY

- Optimizer for Portfolio Margining
- Indicative Margin Analysis
- Hypothetical Portfolio/Trade Editing
- Portfolio/Trade History (out to 30 days)
- Incremental Margin
- Estimator/Delta Ladders

- Ideal business user solution for Portfolio Margin Analysis
- Portfolios can be added manually, via csv upload, or via real-time cleared portfolio access
- Margin Matrix feature provides indicative standalone margins for OTC cleared products
- Downloadable reports
- Enhanced Analytics includes:
  - Real-Time Positions – anytime access to CME OTC cleared portfolios, providing a simple way to calculate margin requirements and perform “what if” analysis
  - Real-Time Margin Dashboard – Anticipate overnight funding costs via actively updated margin requirements across accounts

https://www.cmegroup.com/clearing/margin-services.html
Futures trading is not suitable for all investors, and involves the risk of loss. Futures are a leveraged investment, and because only a percentage of a contract's value is required to trade, it is possible to lose more than the amount of money deposited for a futures position. Therefore, traders should only use funds that they can afford to lose without affecting their lifestyles. And only a portion of those funds should be devoted to any one trade because they cannot expect to profit on every trade. All references to options refer to options on futures.

Swaps trading is not suitable for all investors, involves the risk of loss and should only be undertaken by investors who are ECPs within the meaning of section 1(a)12 of the Commodity Exchange Act. Swaps are a leveraged investment, and because only a percentage of a contract's value is required to trade, it is possible to lose more than the amount of money deposited for a swaps position. Therefore, traders should only use funds that they can afford to lose without affecting their lifestyles. And only a portion of those funds should be devoted to any one trade because they cannot expect to profit on every trade.

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