

CME Interest Rate Portfolio Margining

Unparalleled Capital Efficiencies for Interest Rate Futures & Cleared Swap Portfolios

Strong Growth in US Dollar Swap Clearing at CME

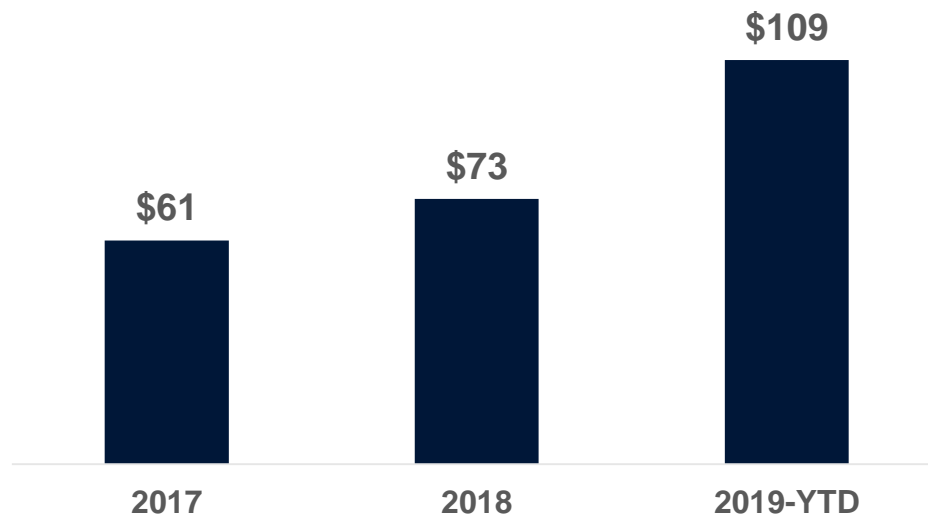
Daily Volume +54% Across All USD Products

\$109B ADV in all USD products in in Sept 2019

65% increase in interdealer volumes at CME from 2018

23% 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 \$5.7 billion in margin savings in September
- ✓ Over 90% margin savings for Convexity Bias Strategies and 80% savings on invoice spread strategies cleared at CME
- ✓ 40 liquidity providers supporting and 580 buy-side 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

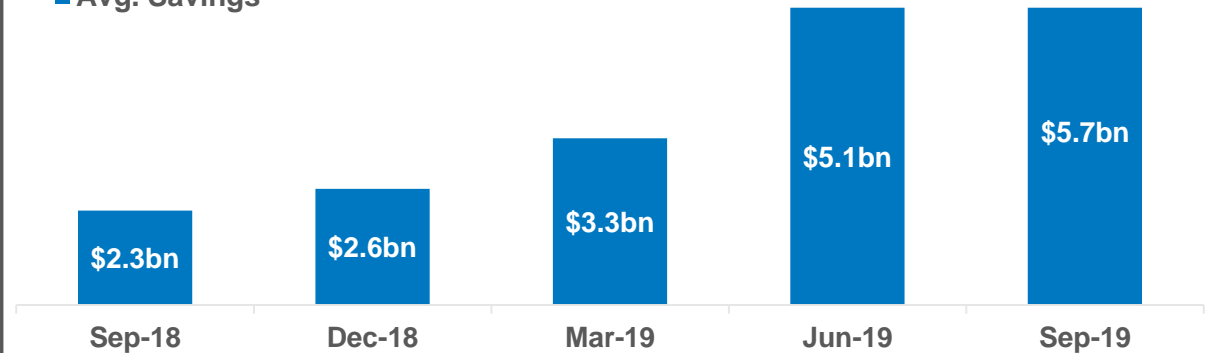
Treasury Futures

Fed Funds Futures

MAC Swap Futures

CME Group Portfolio Margining Savings

■ Avg. Savings



- Record **\$5.7 Billion** in Margin Savings Realized in Sept 2019
- Accounts leveraging offering realize **51% average savings** on IM
- **820+** Client accounts utilizing PM offering at CME

Upcoming Enhancements to the Offering



Production Target Launch: November 2019*

*subject to regulatory approval of margin model enhancements

Pipeline:

Listed Eurodollar Options, SOFR Futures, Eris Swap Futures

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 exceeds \$9.6 billion notional (121,000 futures equivalents)

Receive Fixed (Long)

Sept2018 5-Year CBOT Treasury Future

Pay Fixed

5-Year Invoice Swap, effective 3-Oct-2019, maturity 30-April-2024

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)

Receive Fixed (long)

1,000 ED Sept 2020 Futures

Pay Fixed

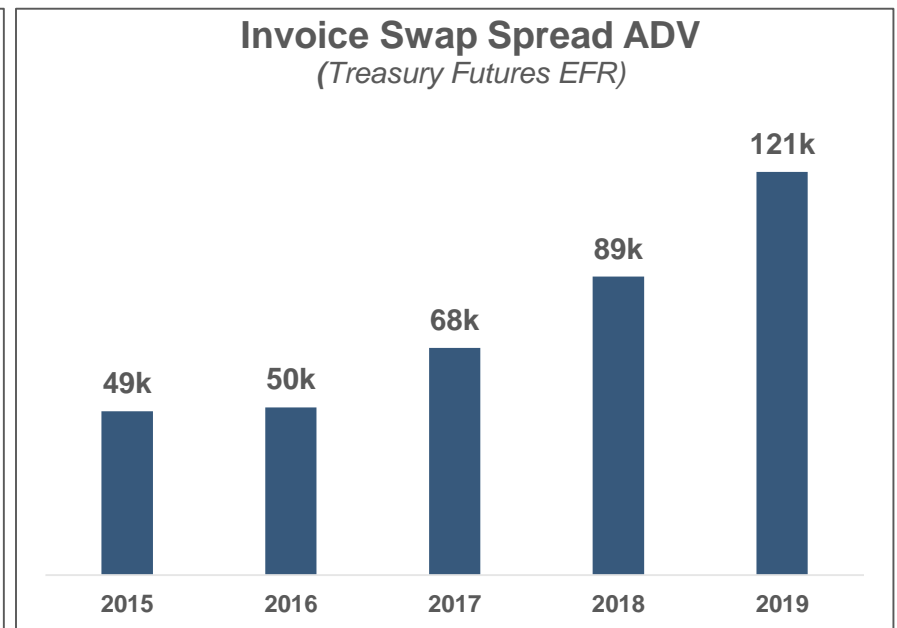
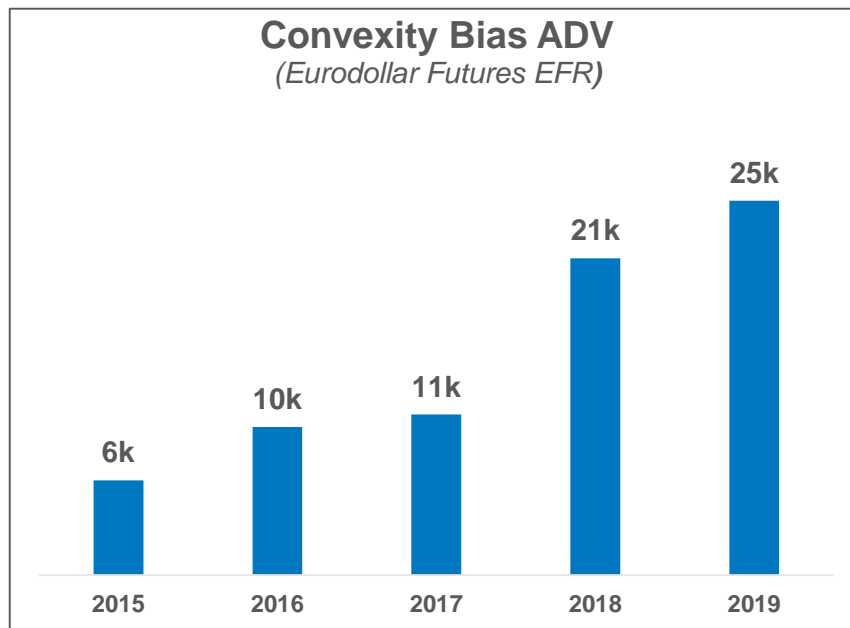
\$100M 3-Month FRA effective 16-Sept-2020

Increased Eurodollar and Treasury EFR Activity

RV Trading Strategies using Invoice swap spread and Eurodollar Convexity Bias trading averaging 145K contracts in 2019- 32% increase from 2018.

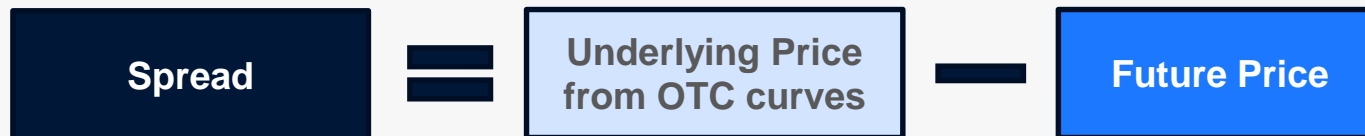
- **Invoice Spreads:** 121K ADV in 2019, following rule clarification in Oct '16 and enhanced electronic entry
- **Eurodollar Convexity Bias Strategies:** 25K ADV in 2019, showing substantial growth compared to 6K in 2015 as volatility has returned to the short end of the curve.
- **Portfolio Margining** utilization delivers \$5.1B in daily margin savings as of June 2019, across over 820 accounts.

Yearly Comparison of Eurodollar Convexity Bias Strategies and Invoice Spreads



Portfolio Margining Enhancements: Spread Model

Introduces the spread between **Eurodollar Futures** and our **3M LIBOR Swap Curve** as a risk factor, rather than considering each risk factor considered individually.



- *Helps reduce the inconsistency in the projected behavior of the common elements*
- *Spread will be implied from the settled future price and underlying OTC swap price*

- Eurodollar futures and the LIBOR 3M interest rate term structure have strong overlap with each other where both of them represent the market expectations of the same risk
- Shocking the risk factors representing the same elements independently can possibly result in scenarios that are not aligned with the moves in history. Synchronizing the common elements across the risk factors will produce better representation of the historical movements
- These spread packages are very popular trading strategies e.g. Invoice swaps, ED strips vs LIBOR Swaps and etc.

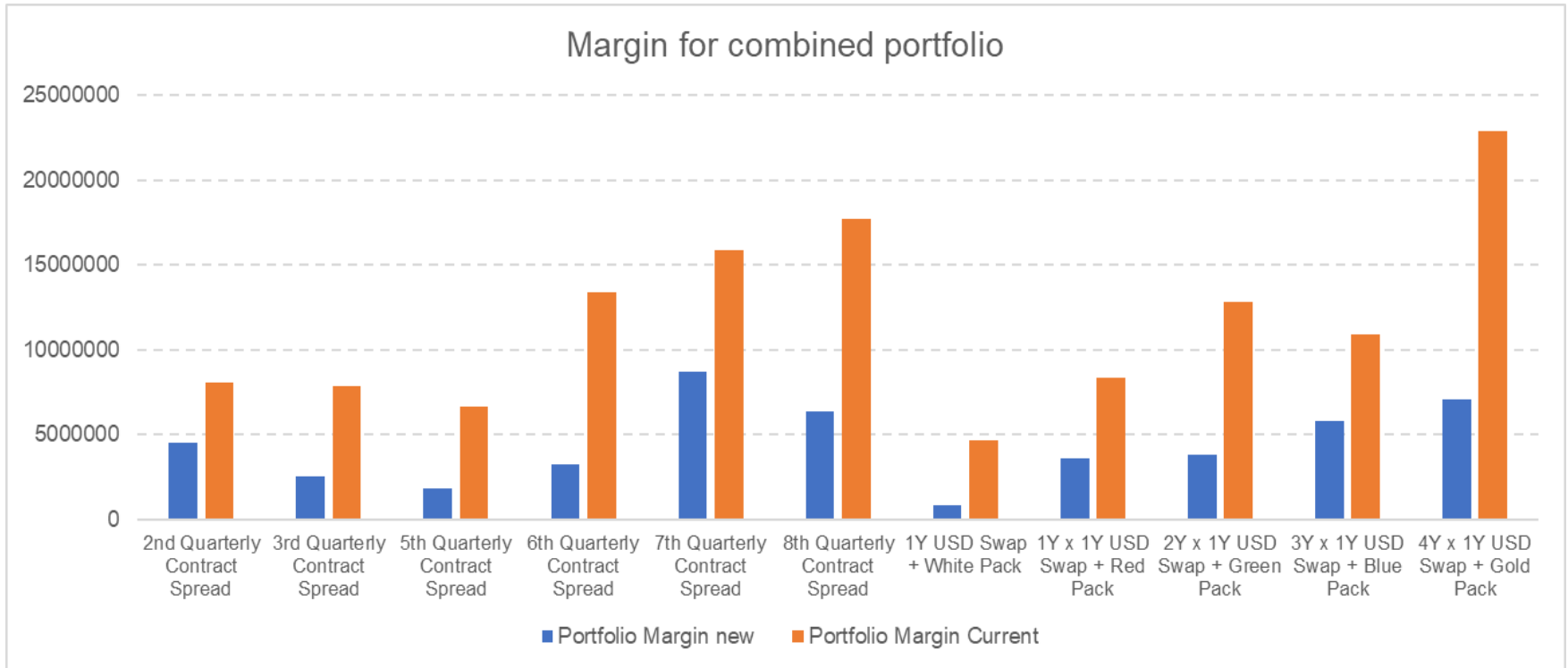
Eurodollar Convexity Bias Trading Analysis

- Eurodollar Convexity Bias Strategies have grown in popularity as volatility has returned to the short end of the curve, and clients can capitalize on CME portfolio margining of IRS and Eurodollars
- *Below are examples of popular Eurodollar Convexity Bias strategies with \$1K DV01 in each strategy.* Portfolio margining IRS with CME Eurodollars results in **indicative margin savings of 70%-91%**.

		Swap Margin w/o PM (Current Model)	Swap Margin w/ PM (Current Model)	Swap Margin w/ PM (New Model)	Margin Savings (New Model w/PM vs Futures & Swaps w/o PM)
FRA vs ED	2nd Quarterly Contract Spread	14.9	8.0	4.6	83.3%
	3rd Quarterly Contract Spread	20.0	7.8	2.5	92.4%
	5th Quarterly Contract Spread	35.1	6.7	1.8	96.4%
	6th Quarterly Contract Spread	37.8	13.4	3.2	93.9%
	7th Quarterly Contract Spread	35.2	15.9	8.7	83.1%
	8th Quarterly Contract Spread	42.9	17.7	6.4	89.2%
Swap vs ED Strip	1Y USD Swap + White Pack	14.8	4.7	0.9	96.8%
	1Y x 1Y USD Swap + Red Pack	35.3	8.4	3.6	93.0%
	2Y x 1Y USD Swap + Green Pack	35.5	12.8	3.8	92.8%
	3Y x 1Y USD Swap + Blue Pack	40.2	10.9	5.8	90.0%
	4Y x 1Y USD Swap + Gold Pack	33.0	22.9	7.1	85.9%

Eurodollar Convexity Bias Trading Analysis

Increased savings potential for Eurodollar Convexity Bias Trading with up to 40% more margin efficiencies than current portfolio margining



Invoice Swap Spread Efficiencies

CBOT Treasury Futures vs. Interest Rate Swap

Volumes Increasing to 121k 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

Invoice Spread Strategy	Margin if Cleared Separately	CME Portfolio Margin	Margin Savings	Savings Percentage
2YR (TU) Treasury vs IRS	\$47,907,679	\$13,754,959	\$34,152,721	71%
5YR (FV) Treasury vs IRS	\$44,741,006	\$8,291,274	\$36,449,732	81%
10YR (TY) Treasury vs IRS	\$46,585,902	\$10,350,656	\$36,235,247	78%
Ultra 10YR (UXY) Treasury vs IRS	\$44,516,194	\$10,347,453	\$44,815,741	77%
Treasury Bond (US) vs IRS	\$48,791,513	\$13,760,083	\$46,755,430	72%
Ultra Treasury (WN) vs IRS	\$47,539,434	\$15,515,974	\$32,023,460	67%
30 Day Fed Funds (FF) vs OIS	\$47,818,460	\$13,278,340	\$46,785,135	72%

Portfolio Margining Enhancements: Optimizer

Optimizer Enhancement Overview

Optimization Enhancements	<ul style="list-style-type: none">• Incorporates IRS model enhancements leading to improved optimization capabilities• Next generation Optimization algorithm optimizes risk based on true margin calculation instead of approximation
Operational Changes	<ul style="list-style-type: none">• Version 13 now available in CME CORE for download• New input files available for download via sFTP<ul style="list-style-type: none">• Target Prod: September 9th*• Updated Configuration File in JSON format• Output File changes <p>*subject to regulatory approval on margin model enhancements</p>
Out of Scope	<ul style="list-style-type: none">• New Products for Optimization• Transfer Messages• Positions File Format

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
- CME Margin Optimizer: 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
- Input market data and portfolio details are required to run the Optimizer
 - CME-produced files are described in the Optimizer User Guide
 - Clearing member produces IR Futures & Options Position File

Current Account Set-up

Futures Segregated Account

OTC Customer Cleared Swaps Account

Optimization requires the Futures and OTC positions to be with the same clearing member firm

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

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

Margin Contribution Breakdown		Optimization Breakdown	
Account:	Account	Initial Portfolio Margin IM Requirement:	1,130,427.46
Initial Base Margin Requirement:	496,172.63	Initial Futures & Options Residual	1,050,000.00
Concentration Margin Requirement:	0.00	Total Margin:	2,180,427.46
Total Portfolio IM Requirement:	496,172.63	Optimized Portfolio Margin IM	496,172.63
Total Number of IRS Trades:	1	Optimized Futures & Options Residual	592,200.00
Total Number of Futures Positions:	3	Optimized Portfolio Total Margin:	1,088,372.63
		Portfolio Margin Savings:	1,092,054.82
		Portfolio Margin Savings Percentage:	50.084%

Margin Optimization Report

TEST
IRS Portfolio Margin Optimization Report
July 10, 2019

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>

Disclaimer

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.

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