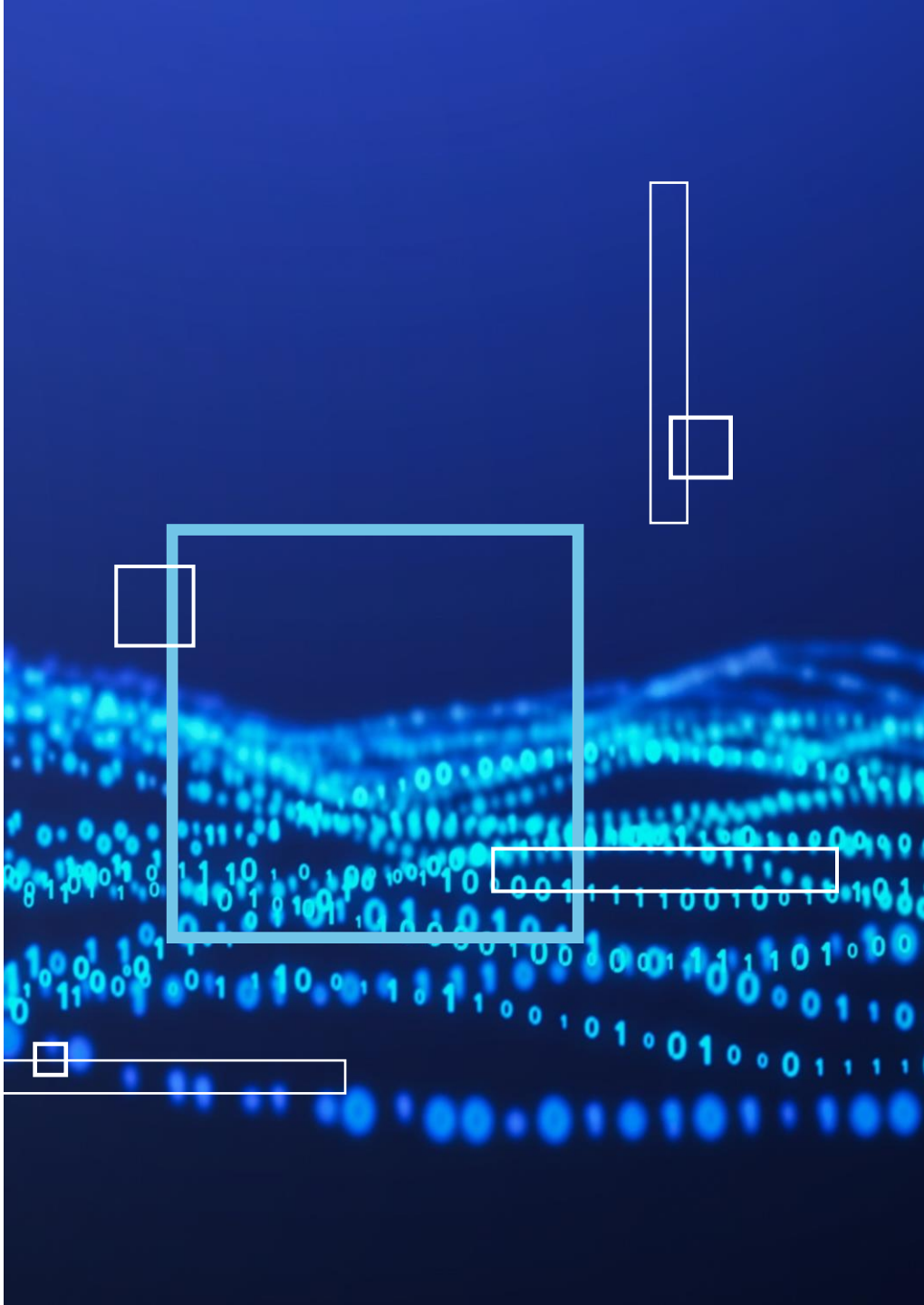
ICE Clear Credit Client Clearing

August 2022



Clearing Activity

ICE CDS Highlights and Volume Growth

ICE clears over 93% of global CDS volume[1]

Mar 2009 — ICE Clear Credit (ICC) is the first credit default swap central counterparty (CCP) offering dealer-to-dealer CDS index clearing

Jul 2009 — ICE Clear Europe (ICEU) launches CDS clearing

Dec 2009 — ICE is first to clear Single Name CDS and first to launch client clearing services

Jul 2012 — ICC designated Systemically Important Financial Market Utility

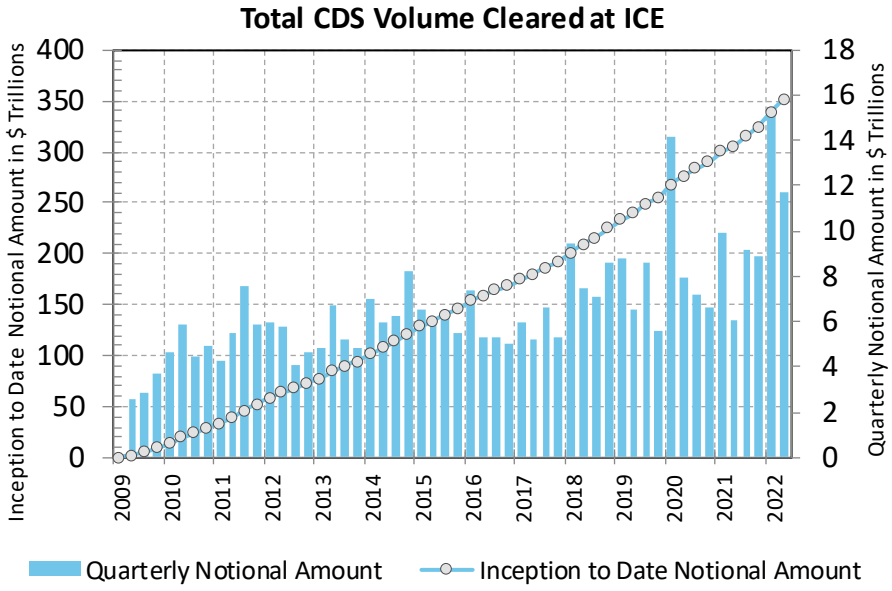
Mar 2014 — $100 trillion notional cleared at ICE[2]

Mar 2018 — $200 trillion notional cleared at ICE

Nov 2020 — ICC launches Index Option clearing

Mar 2021 — $300 trillion notional cleared at ICE

Jun 2022 — $350 trillion notional cleared at ICE



[1] Based on 1H 2022 cleared notional amounts (Source: Public website information)

[2] Total notional amount cleared includes both sides of a cleared transaction between two counterparties. Note that this is double the notional amount reported on the ICE public website.

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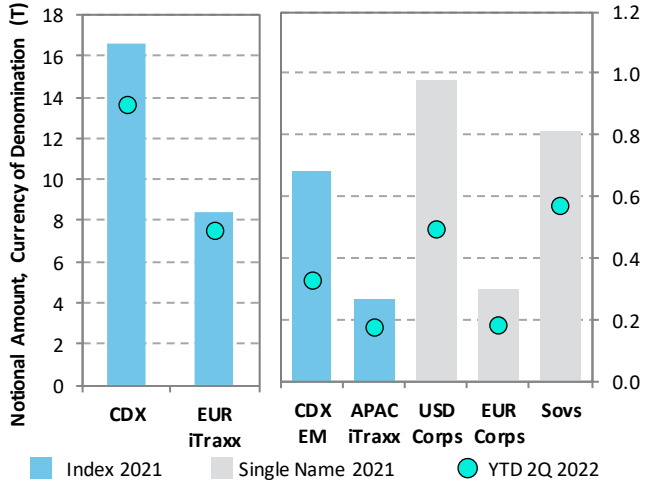
ICE CDS Volumes YTD 2Q vs. full year 2021

ICE Clear Credit

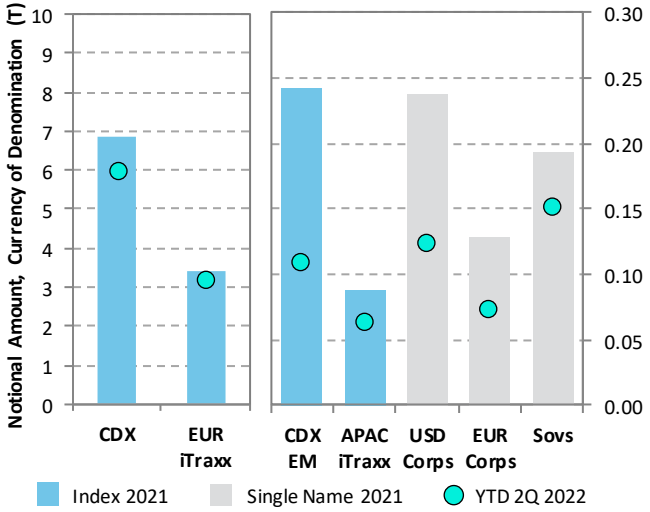
Combined Client/Dealer

(C) ICE Clear Credit Combined Client/Dealer CDS Volume: YTD 2Q 2022 vs. Full Year 2021



Client

(D) ICE Clear Credit Client CDS Volume: YTD 2Q 2022 vs Ful Year 2021



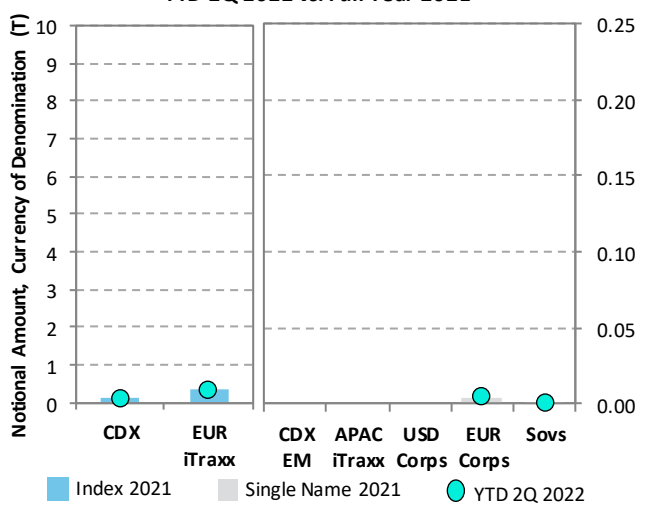
ICE Clear Europe

Combined Client/Dealer

(E) ICE Clear Europe Combined Client/Dealer CDS Volume: YTD 2Q 2022 vs Full Year 2021

Client

(F) ICE Clear Europe Client CDS Volume: YTD 2Q 2022 vs. Full Year 2021



Clearing Activity

ICE CDS Volumes and Market Share by Product

ICE Clear Credit provides the greatest liquidity across the broadest global product set to both European and North American clients

OVERALL DEALER AND CLIENT CLEARING 1H 2022

ICE Notional Amount

ICE Market Share

ICE Clear Credit Notional Amount

Total Cleared

$27.2T — *ICE Notional*

93.9% — *ICE Share*

- Record half-year notional
- ICE Clear Credit **$23.6T**

CDX.NA

$14.0T — *ICE Notional*

99.6% — *ICE Share*

- Record half-year notional
- ICE Clear Credit **$13.6T**

iTraxx

€10.3T — *ICE Notional*

87.9% — *ICE Share*

- Record half-year notional
- ICE Clear Credit **€7.6T**

Sovereign Single Names

$598B — *ICE Notional*

100% — *ICE Share*

- ICE Clear Credit **$569B**

NA Corp. Single Names

$487B — *ICE Notional*

99.7% — *ICE Share*

- ICE Clear Credit **$487B**

EU Corp. Single Names

€329B — *ICE Notional*

69.5% — *ICE Share*

- ICE Clear Credit **€178B**

CLIENT CLEARING 1H 2022

CDX.NA

$6.0T — *ICE Notional*

99.6% — *ICE Share*

- Record half-year notional
- ICE Clear Credit **$5.9T**

iTraxx

€3.4T — *ICE Notional*

95.9% — *ICE Share*

- Record half-year notional
- ICE Clear Credit **€3.1T**

NA Corp. Single Names

$124B — *ICE Notional*

100% — *ICE Share*

- ICE Clear Credit **€124B**

EU Corp. Single Names

€78B — *ICE Notional*

87.6% — *ICE Share*

- Record half-year notional
- ICE Clear Credit **€73B**

Cleared Instruments

ICE CDS Clearing Eligible Instruments

- **Broadest coverage of all CDS Clearinghouses**
- **Index and Single Name CDS covering major global markets**
  - U.S., Europe, Asia-Pacific
- **Single Names on over 570 reference entities**
- **Index Options referencing the most liquid CDX and iTraxx indices**
  - Short-dated European style options with physical delivery
- **Instruments introduced for clearing meet market depth and trading activity criteria**
- **High coverage of index constituents from names meeting eligibility criteria**
  - CDX.IG 98% on-the-run coverage
  - CDX.HY 83% on-the-run coverage
- **Frequent evaluation of index constituents and actively traded Single Names and indices**

Index		Series	Options (OTR Series)
CDX	IG	18-38	Yes
	HY	28-38	Yes
	EM	27-37	
	EM (Restricted)	27-36	
iTraxx	Europe	17-37	Yes
	Crossover	27-37	Yes
	Snr Fins	27-37	
	Sub Fins	27-37	
	Asia Ex-Japan	27-37	
	Australia	27-37	

Single Name Category		Reference Entities
Corporates	North American	272
	European	237
	Australian	10
	Asian and EM	19
Sovereigns		39

CDS Client Clearing Model Overview

CDS Product	■ Standard coupons, adherence to ISDA DC on credit and succession events ■ Upfront fees netted with margin movements ■ Ability to retain individual trades or benefit from operational netting
Customer Protections	■ Segregation of gross margin at the clearing house through Cleared OTC Derivatives Account Class (4d(f)) ■ Indices and Single Names held in the 4d(f) account to allow for portfolio margining ■ Pre and Post default portability of positions and collateral supported ■ "LSOC" customer segregation model
Risk Management	■ Specifically designed for CDS ■ Guaranty Fund covers simultaneous default of 2 largest Clearing Participants ■ EOD settlement process based on price submissions subject to execution ensuring fidelity of quotes
Margin Methodology	■ Capital efficient portfolio approach via Copula-based Monte Carlo simulations and index decomposition ■ Margin Calculator provides transparency and detailed analysis of requirements
Infrastructure	■ Open Access: supporting multiple SEF execution and middleware providers ■ Trades cleared intra-day, on a near real-time basis ■ Allows users to leverage existing infrastructure – no costly technology build ■ Supports all trade life cycle events: backloading, netting, portability, credit events
Customer Documentation	■ Client relationship to FCM/BD governed by a bilateral futures/securities agreement ■ No additional ICE Clear Credit documentation for Client and FCM/BD to bilaterally execute ■ ICE Clear Credit rules govern CDS clearing

Risk Management Approach

Waterfall for Managing Systemic Risk

- Ensure Clearing Participant (CP) has operational capabilities, risk management expertise and financial resources
- Daily Mark-To-Market based on robust end-of-day price discovery process
- Daily margin calls based on dynamic self-adapting risk management approach with anti-procyclical behavior
- Intraday monitoring of position changes and market fluctuations and their impact on collateralization levels with the ability to call for additional funds
- Financial resources to mutualize losses under extreme market scenarios
- Cover-2 financial resources derived from multi-name default scenarios
- Ability to call for additional default funds to cure default(s)

Risk Management Approach

Initial Margin Components

		Related Exposure	Modelling Approach
Market Dynamics	Credit Spread Level Changes Recovery Rate Changes	▪ Credit spread term structure changes ▪ Recovery Rate changes	**Integrated Spread Response Risk Measures** ▪ Statistical modeling of credit spread and recovery rate fluctuations via Monte Carlo Framework ▪ 99.5% VaR measures in accordance with EMIR[1] ▪ Margin Period of Risk (MPOR) at least 5 days[3] ▪ Full portfolio valuation at every simulated scenario ▪ Compliant with EMIR portfolio benefit limitations[1] ▪ Incorporates EMIR required anti-procyclicality features[2]
Market Dynamics	Interest Rate Sensitivity	▪ Interest rate term structure changes	▪ Stress loss in response to discount curve scenarios
Market Dynamics	Basis Risk	▪ Trading behavior differences between Indices and constituents	▪ Statistical modeling of index-Single-Name basis fluctuations
Default Risk	Jump to Default	▪ Losses due to potential credit events	▪ Stress Loss-Given-Default in response to credit events related to Single Names with common majority ownership
Default Risk	Wrong Way Risk	▪ Losses due to highly (and positively) correlated potential credit events	▪ Stress Loss-Given-Default in response to credit events related to Single Names highly and positively correlated to the Clearing Participant
Liquidation Risk	Bid / Offer Charge	▪ Estimated transaction costs associated with positions/portfolio liquidation	▪ Instrument liquidation cost at specific bid-offer widths ▪ Portfolio level costs for hedged and directional positions
Liquidation Risk	Concentration Charge	▪ Transaction costs associated with liquidation of large positions	▪ Exponentially increasing liquidation cost with increasing position size and directionality

[1] In accordance with Article 27 of Commission Delegated Regulation (EU) No. 153/2013 of EMIR RTS
[2] In accordance with Article 28 of Commission Delegated Regulation (EU) No. 153/2013 of EMIR RTS
[3] Increased MPOR (up to 6 days) is applied to instruments/sub-portfolios that trade during market hours different from the clearinghouse's hours of operations

Initial Margin Components – Spread Response Risk

- **Integrated Spread Response I**
  - Capital efficient portfolio approach to market dynamics via Copula-based Monte Carlo simulations[1,2]
  - 99.5% VaR measures reflecting joint Credit Spread and Recovery Rate Profit/Loss moves
  - Margin Period of Risk (MPOR): at least 5 days
    - increased MPOR (up to 6 days) is applied to instruments/sub-portfolios that trade during market hours different from the clearinghouse's hours of operations

- **Integrated Spread Response (iSR) measures:**
  - $iSR^{(RF)}$: Associated with positions in instruments related to the same Risk Factor
  - iSR_{sP}: Associated with positions in instruments related to Risk Factors with common risk characteristics
    - NA Corporate sub-portfolio, European Corporate sub-portfolio, Western-European Sovereign sub-portfolio, Asia-Pacific sub-portfolio, etc.
    - Multi-currency benefits between NA and European corporate sub-portfolios are recognized
  - iSR_P: Associated with all portfolio positions introducing limits on portfolio benefits[3]
  - iSR_{IM} : Associated with all portfolio positions introducing anti-procyclical Initial Margin (IM) features[4]

(1) Stanislav Ivanov, "Initial Margin Estimations for Credit Default Swap Portfolios", Journal of Financial Market Infrastructures, Volume 5, Number 4, June 2017
(2) Andrew Patton, "A Review of Copula Model for Economic Time Series", Journal of Multivariate Analysis, Volume 110, April 2012
(3) In accordance with the Article 24 of the Commission Delegated Regulation (EU) No. 153/2013 of European Market Infrastructure Regulation (EMIR) Regulatory Technical Standards (RTS)
(4) In accordance with the Article 27 and (5) in accordance with the Article 28 of the Commission Delegated Regulation (EU) No. 153/2013 of EMIR RTS

Initial Margin Components – Spread Response Risk continued

- **Integrated Spread Response II**
  - Portfolio level $\boldsymbol{iSR_P}$ measure (offset benefits & limits) is computed as

$$iSR_P = 80\% \times \sum_{sP \in P} iSR_{sP} + 20\% \times \sum_{RF \in P} iSR^{(RF)}$$

Full Cross-RF portfolio benefits are provided

No Cross-RF portfolio benefits are provided

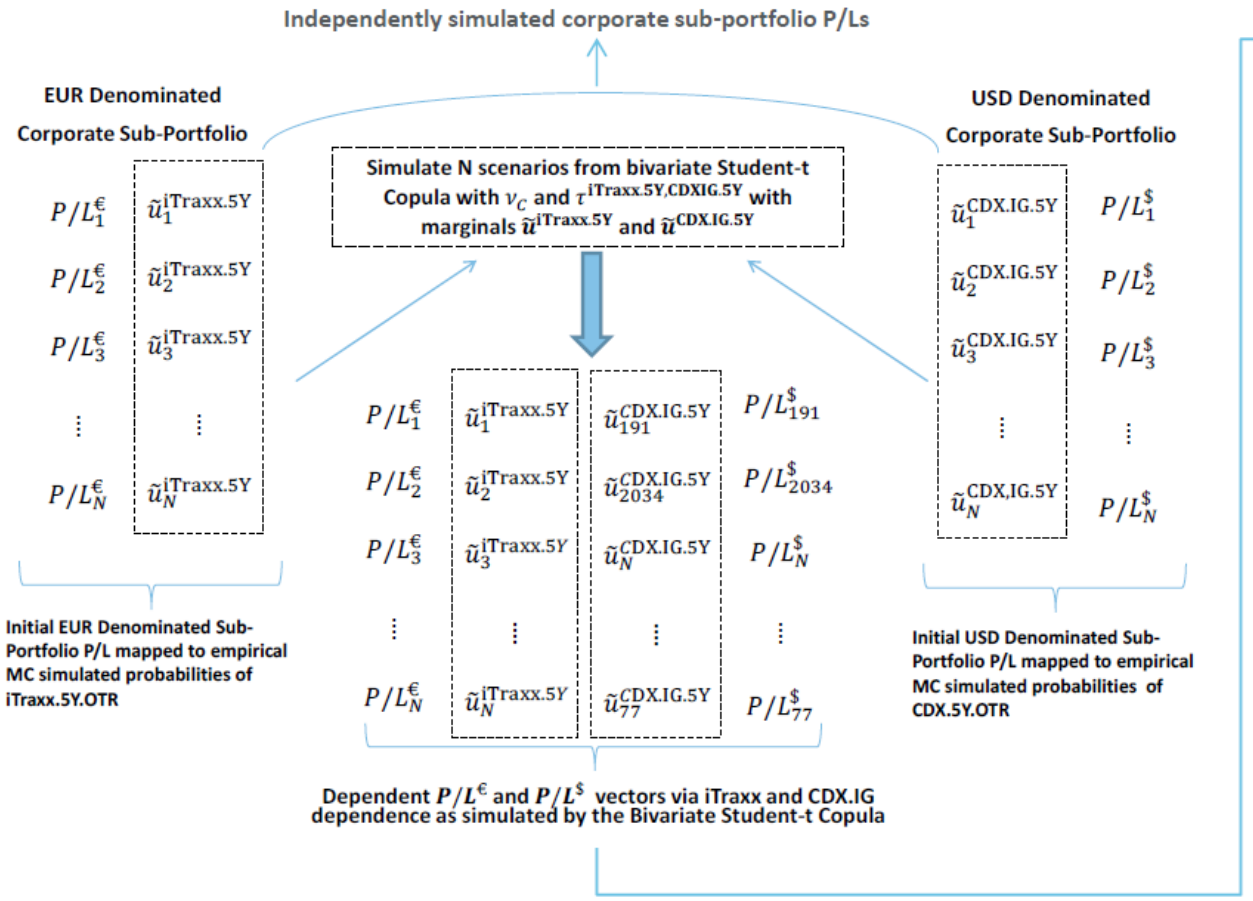
  - Final Initial Margin iSR_{IM} measure (anti-procyclical) is computed as

$$iSR_{IM} = 0.75 \times \boldsymbol{iSR_P} + 0.25 \times \min\left(\boldsymbol{iSR_P}, SRP_{\text{Stress Events}}\right)$$

Portfolio responses to stress market events, e.g. LB default period

Initial Margin Components – Multicurrency Portfolio Benefits

- Multi-currency Spread Response Risk portfolio benefits among risk factor Profit / Loss vectors with applied FX conversion



Guaranty Fund and Cover-2 Financial Resources

Guaranty Fund Approach

- **Guaranty Fund is designed to provide financial resources to cover the greatest hypothetical losses associated with specific extreme market scenarios**
- **The greatest two-affiliate-group cumulative uncollateralized loss under extreme scenarios determines the Guaranty Fund size**
- **Guaranty Fund size is monitored everyday based on all cleared portfolios**
- **Robust reverse stress testing is used to assess the levels of protection achieved by the available financial resources**

Extreme Market Scenarios Used to Size the Guaranty Fund

- Simultaneous defaults of two CPs and their affiliates (two affiliate groups)
- Simultaneous defaults of three non-CP Single Name (SN) Risk Factor Groups
  - Each SN Risk Factor Group may contain multiple reference entities
  - Stress level Recovery Rates are assumed for Loss-Given Default estimations
- Adverse spread widening and tightening scenarios are applied to non-defaulting SN Risk Factor Groups and index instruments
- Adverse widening of the Index-SN basis
- Adverse changes in the default-free discount interest rate term structures

Portfolio Margining – Quantifying the Benefits

- **The ICE index decomposition initial margin methodology provides benefits to long/short Index, Single Name and Index Option positions**
- **Capital efficiencies are achieved by allowing market participants to clear Index, Single Name and Index Option CDS in a single segregated CFTC customer account while maintaining strong risk management protections**
- **Voluntarily clearing Single Names and Options allows you to achieve these margin benefits against mandatorily cleared indices**

Illustrative Example of "Index Arb" Portfolio Benefits

	Margin Requirement	Portfolio Size	Total Requirement
125 SN Positions (Sold Protection on 125 names of $1MM each 5Y tenor)	3.10%	$125MM	$3.9MM
Index Position IG Series 32 5Y (Bought Protection on $125MM)	1.40%	$125MM	$1.7MM
Index Arb (Bought SN/Sold Index)	**0.95%**	**$250MM**	**$2.4MM**

Initial Margin Requirements

If margined on a separate basis	Margined on a portfolio basis
$5.6MM	**$2.4MM**

End-Of-Day Price Discovery

ICE End-Of-Day CDS Prices

- **ICE establish reliable End-Of-Day (EOD) prices based on "tradeable" submissions from its Clearing Participants (CPs)**
- **EOD prices are used to determine mark-to-market cashflows and for risk management purposes**
- **ICE makes EOD prices available to buy-side firms**
  - For Index and Single Name instruments in which they have cleared open-interest
  - For all Option instruments
- **Markit can provide daily a full set of EOD Index and Single Name prices**

ICE End-Of-Day Price Discovery Process

Quote Submission	ICE requires CPs to submit quotes for 9 benchmark tenors and all standard coupons cleared by ICE for any Single Name in which the CP has a cleared interest ICE required CPs to submit quotes for each Index instrument for which the CP has cleared interest
End Of Day Valuation	Using the submitted quotes, ICE performs an end-of-day valuation for every cleared instrument using a multi-stage crossing/matching algorithm EOD prices for non-benchmark tenors are interpolated from prices established for benchmark tenors
Firm Trade Obligation	To encourage the best possible submissions, ICE requires Clearing Participants to enter into real trades if submitted quotes are crossed/locked
Controls to Limit Impact on Risk	Controls ensure that Firm Trades do not have adverse market impact "Default" bid offer width (default spread width) Controlled notional size per trade Limits on daily notional amount traded at CP affiliate group level

Connectivity and Trade Workflow

Trade Ecosystem Touchpoints

Execution Venues

ICE SWAP TRADE
creditex
Bloomberg
bgc
Dealerweb
GFI
ICAP
MarketAxess
Tradeweb
Tradition
tullett prebon

Clearing Members

Bank of America Merrill Lynch
BARCLAYS
BNP PARIBAS
citi
CREDIT SUISSE
Deutsche Bank
Goldman Sachs
HSBC
J.P.Morgan
Morgan Stanley
NOMURA
SOCIETE GENERALE
Scotiabank
UBS
WELLS FARGO

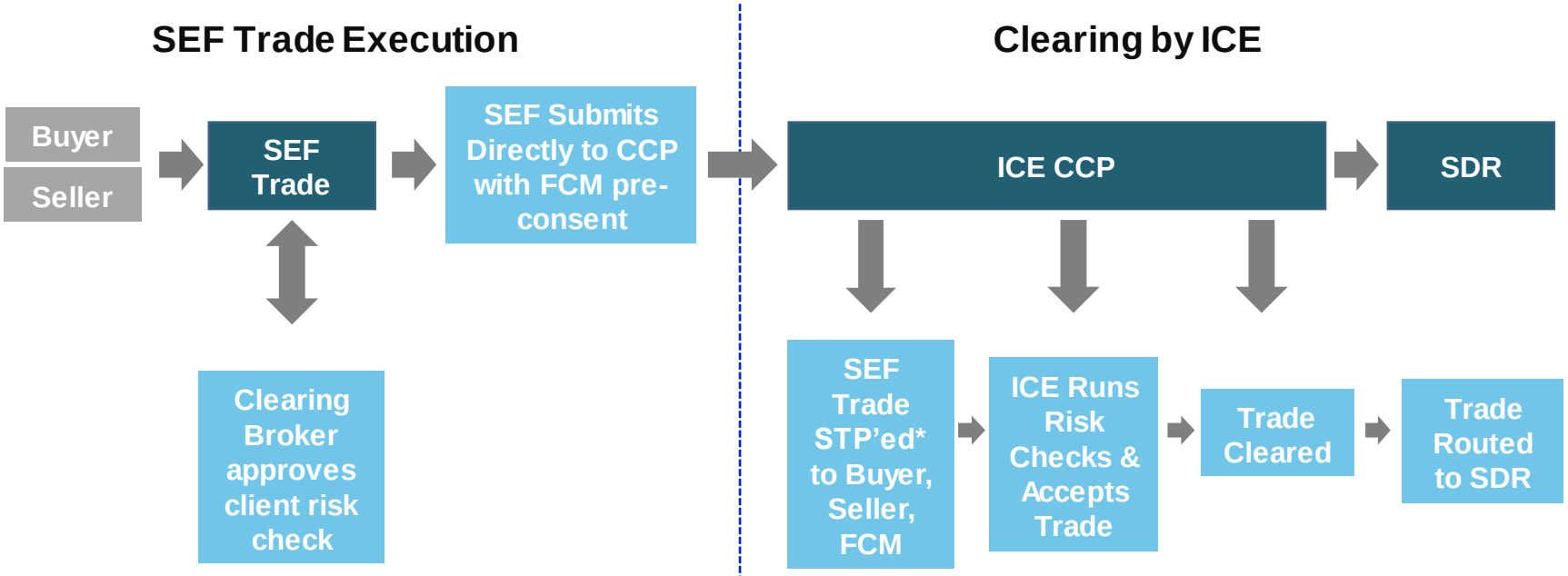
Middleware Platforms

ICE LINK®
markitSERV
Bloomberg

Data Repositories

ICE TRADE VAULT®
DTCC GTR
DTCC Deriv/SERV
TIW & EVENT PROCESSING

SEF Direct Trade Workflow

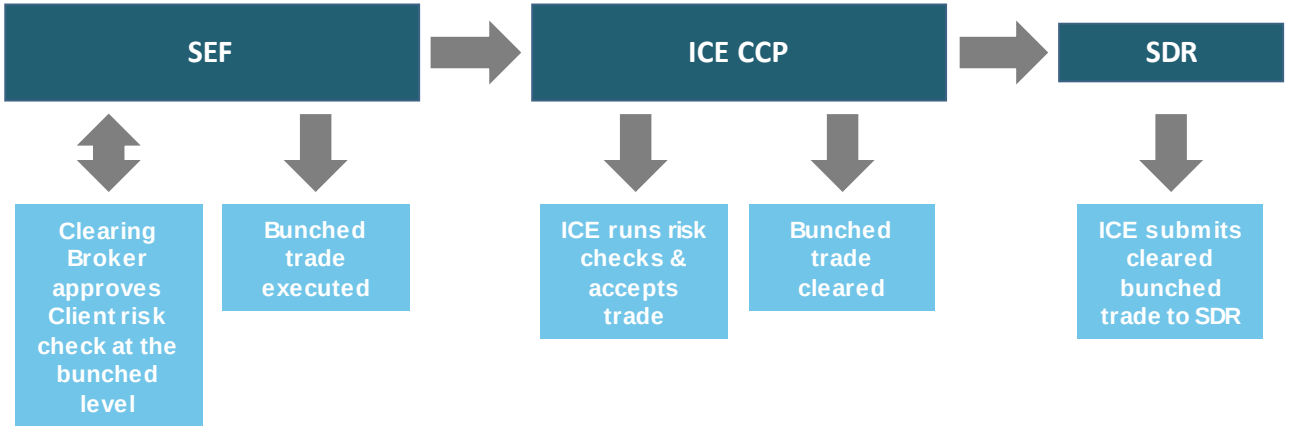


** ICE Link optionally STP's SEF Trade submission and optionally SDR reports the RT/PET message for SEF*

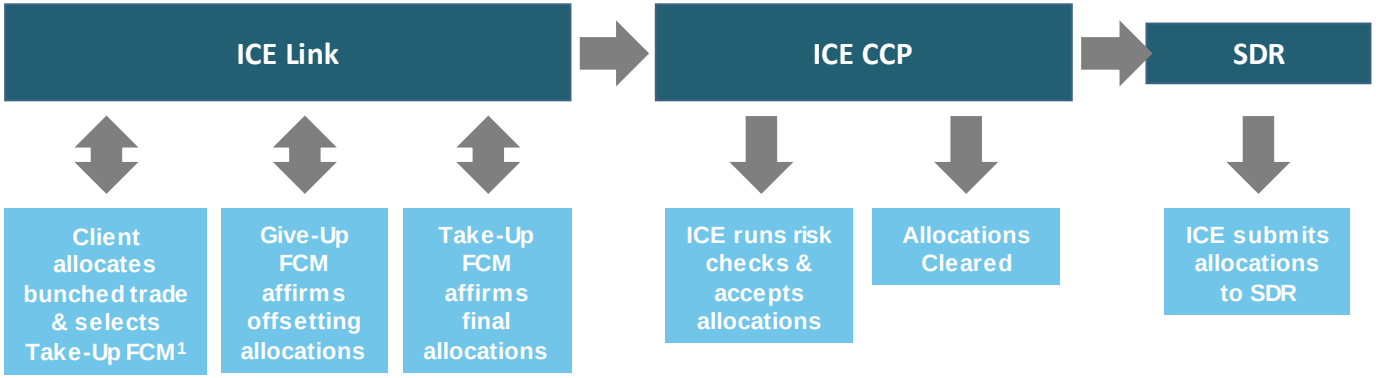
SEF Bunched Trade Workflow

- Clients can Execute at the Bunched Level and Allocate Post Clearing

Step 1. Bunched trade SEF executed & cleared by ICE via the SEF Direct workflow

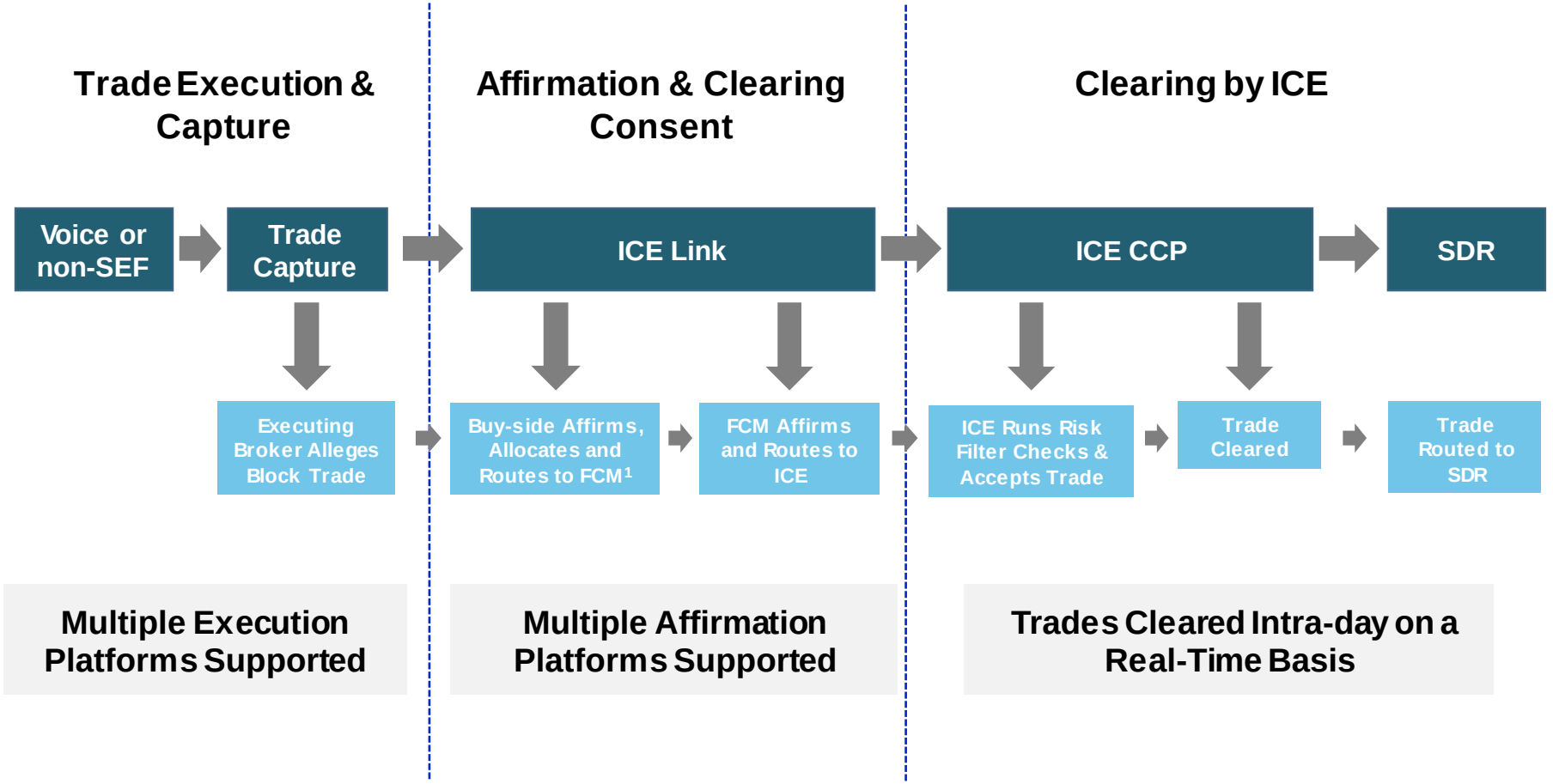


Step 2. Allocations provided by client & cleared by ICE



[1] *Client may allocate via ICE Link (GUI, API or Auto Affirm) or via authorized Middleware Platform or SEF*

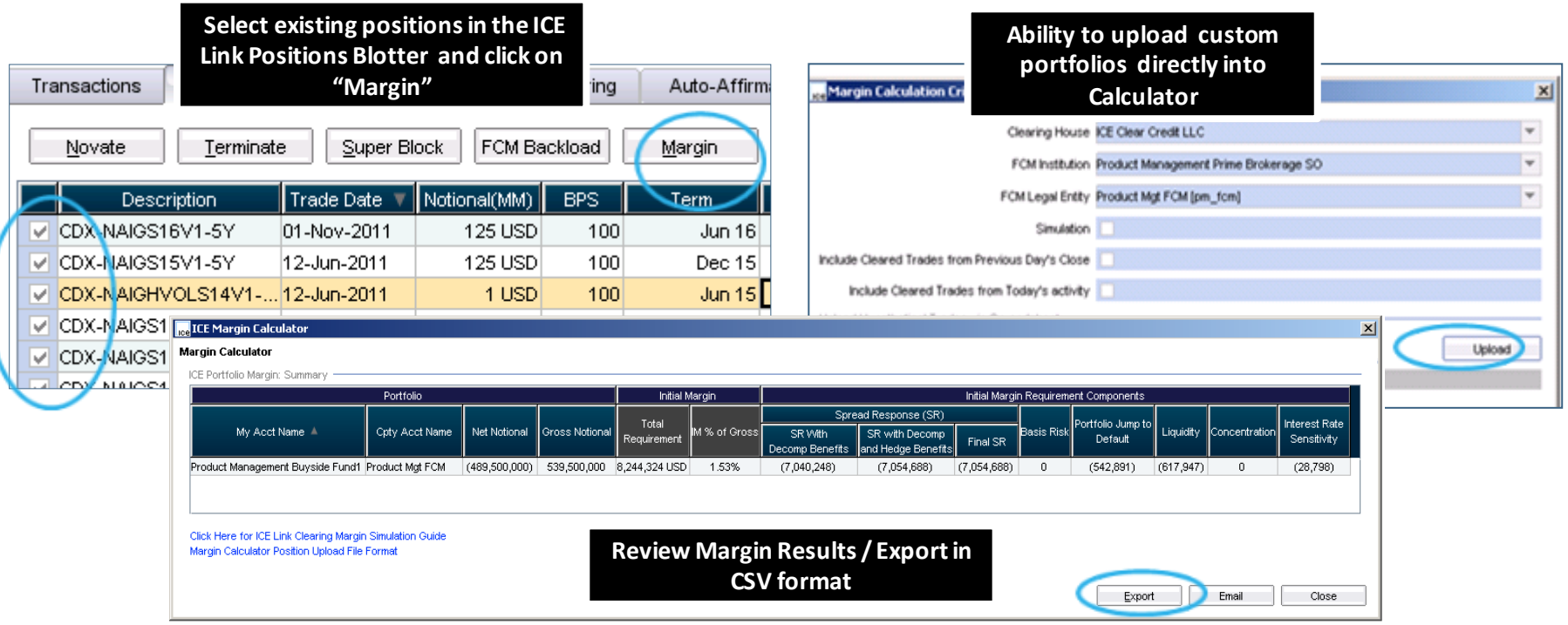
CDS Off-Facility Trade Workflow



[1] *Client may allocate via ICE Link (GUI, API or Auto Affirm) or via authorized Middleware Platform or SEF*

Portfolio Margin Analysis via ICE Link GUI

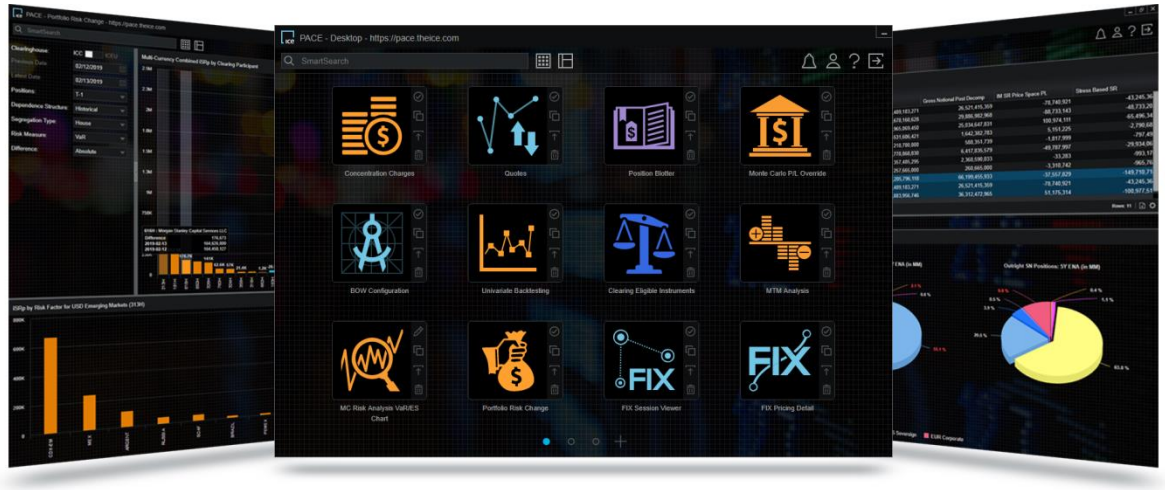
- **Provides full transparency into the Initial Margin methodology**
- **Available to all clients through the ICE Link GUI**
  - Embedded in workflow to assess Initial Margin impact of new trades
  - Ability to run what-if scenarios on existing and/or uploaded hypothetical positions



Training materials available on ICE Link Web GUI (Help Documents) or at www.theice.com/clearcredit
Contact ICE for a demonstration: icelinkhelp@theice.com or call +1 770 738 2101 / +44 (0)20 7488 5100

Client Clearing Tools

PACE – Portfolio Approach to Capital Efficiency



TRADE

Blotters that show the details and clearing status of trades at each ICE Clearinghouse.

POSITION MANAGEMENT

Customize portfolios for pre- and post-trade analytics. Monitor cleared activity while initiating post-trade management functions.

PRICING ANALYSIS

RISK ANALYSIS

On-Demand Mark-to-Market and Initial Margin analyses. Additional transparency into key risk parameters and measures established by the Clearinghouse.

REFERENCE DATA

Reference data on clearable instruments so users can sync up CDS reference data with the Clearinghouse.

Portfolio Margin Analysis via PACE

- **Provide instrument requirements**
- **Visualize, analyze and verify instrument requirement changes in response to market fluctuations and credit events**
- **View cleared portfolios**
- **Construct hypothetical portfolios combining cleared and user-specified positions**
- **Estimate portfolio risk**
  - Support both stress-based approach and copula-based Monte Carlo techniques
  - Include various risk measures such as Value-at-Risk and Expected Shortfall, at different quantiles
  - Perform Initial Margin analysis at portfolio, region-specific sub-portfolio, and Risk Factor levels
  - Understand portfolio-level risk measures

Example PACE Screen Shots

Instrument Requirements Tool

Portfolio Risk Analytics Tool

Client Clearing Tools

Reports and Data Files

- **All reports available in production and test environments**
- **EOD pricing file published 5pm**
- **All other reports published 9pm**
- **Multiple distribution channels**
  - ICE Link GUI
  - Electronically via SFTP using MFT
  - PACE
  - Fund Administrators (if applicable)

All times are Eastern (NY)

Key Reports / Data Files

Report	Description	Format	Available*
Clearing Eligible Instruments	A full list of indices and Single Names eligible for clearing	CSV	Daily
Clearing Activity	Provided at allocated trade level; includes new trades cleared on a specific day	CSV and PDF	Daily
Cleared Positions	Provided at allocated trade level; includes all open cleared positions from current day in a per trade format	CSV and PDF	Daily
Gross Margin	Provides the portfolio level margin requirements (initial margin and mark-to-market)	CSV and PDF	Daily
Early EOD Pricing file	Provides end-of-day closing clearing house prices.	CSV	Daily
Mark-to-Market Margin Interest Report	Provides the daily interest earned on margin collateral using the MTM balances	CSV and PDF	Daily
Netting	Provides netting results for accounts set to net; includes terminations and new net trades	CSV	Daily / Ad hoc

Next Steps

To begin clearing CDS, Clients need to:

- Establish relationships with one or more ICE CDS Clearing Participants and execute legal documentation
- Establish connectivity
- Test clearing workflows and review clearing reports

For more information, please contact us:

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Visit theice.com /clear-credit for further information on clearing eligible products, EOD prices, eligible collateral, margin methodology and clearing workflows