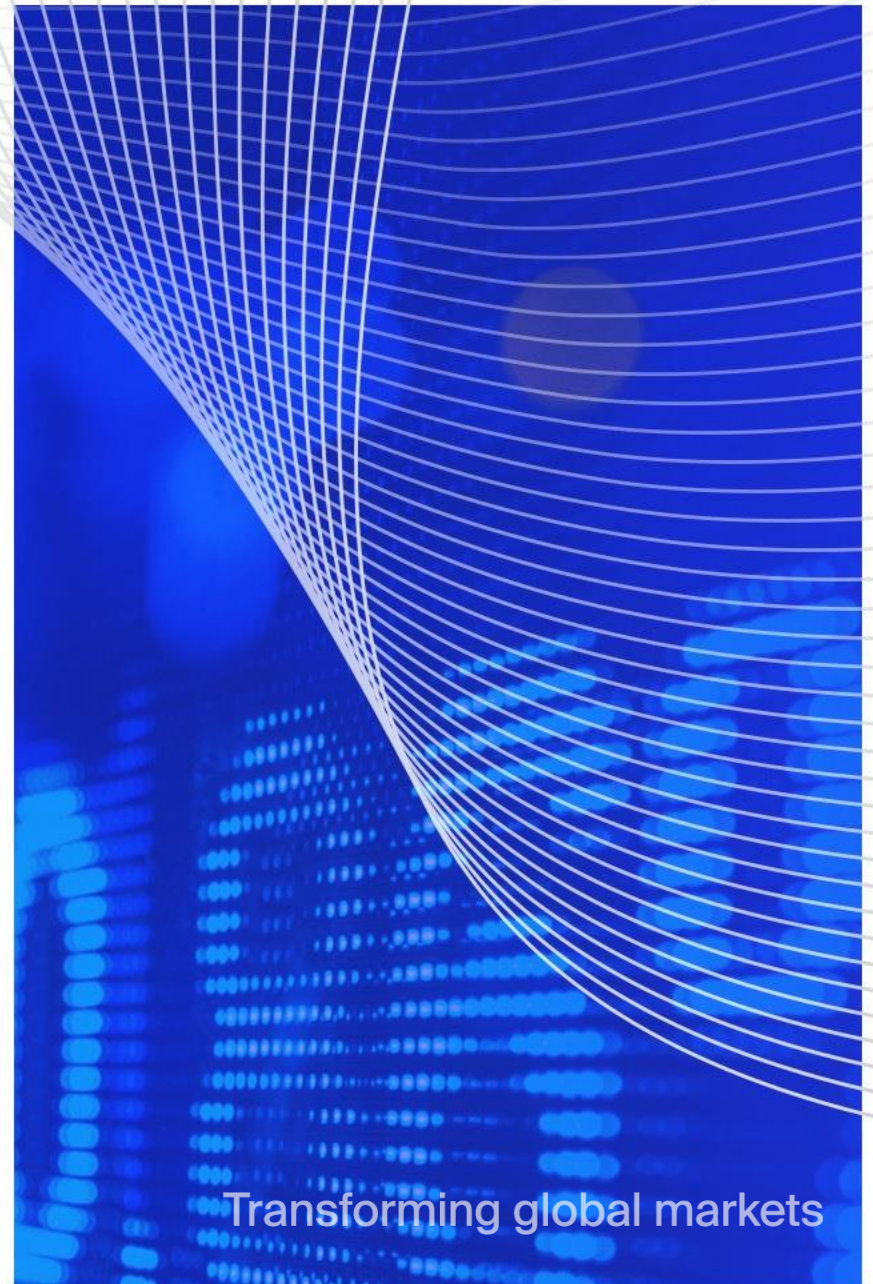




ICE CDS Clearing Margin Calculator

ICE LINK GUI

ICE Credit Derivatives Services



Transforming global markets

ICE CDS MARGIN SIMULATION CALCULATOR

OVERVIEW

- Buy-side institutions and their clearing counterparties may access the ICE Clear Credit LLC and ICE Clear Europe Limited **margin risk tool** to calculate clearing margin requirements in the ICE Link GUI
- Users can simply point and click which positions to calculate margin, whether it be **pre-trade, hypothetical/what-if trades, or historical non-cleared trades**
- Users may also **bulk upload** hypothetical portfolios via spreadsheet upload for simulating different portfolio scenarios
- Margin is always calculated at a **portfolio level** (e.g .fund/legal entity) per Clearing Broker / Futures Commission Merchant (FCM)
- Portfolio benefits provided between Index, Single Name and Options positions as appropriate
- The margin calculator provides users with detailed analysis of the margin details providing **deeper transparency** of the ICE margin methodology

ICE CDS MARGIN SIMULATION CALCULATOR

COMPONENTS – MARGIN RISK MODELLING APPROACH

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

Established Approach

Enhancement for Options

Market Dynamics

Credit Spread Level 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 EMIR¹
- Margin Period of Risk (MPOR) at least 5 days³
- Full portfolio valuation at each simulated scenario
- Compliant with EMIR portfolio benefit limitations¹
- Incorporates EMIR anti-procyclicality features²

- Capital efficient spread response requirement considering index, SN and option positions in one portfolio
- Asymmetric heavy-tailed Implied Distribution describes credit spread log-return fluctuations consistently pricing all strikes for a given expiry
- Extract implied forward price at each expiry using EOD submissions and Put-Call Parity relationship
- Re-price options at each simulated forward-looking scenario by using the calibrated Implied Distribution

Interest Rate Sensitivity

- Stress loss in response to discount curve scenarios

- Use existing approach of applying Interest Rate stress scenarios to estimate Profit/Loss response

Basis Risk

- Statistical modeling of index-SN basis fluctuations

- Not applicable

Default Risk

Jump to Default

- Stress LGD in response to credit events related to SNs with common majority ownership

- Analyze Delta Equivalent Notional Amount (DENA) underlying "pseudo" index positions for Default Risk purposes as part of the existing index portfolio

Wrong Way Risk

- Stress LGD in response to credit events related to SNs highly and positively correlated to CP

Liquidation Risk

Bid / Offer Charge

- Instrument liquidation cost at specific bid-offer widths (BOWs)
- Portfolio-level costs for hedged and directional positions

- Establish option-specific Bid/Offer widths consistent with market observed option and underlying index Bid/Offer widths under stress conditions

Concentration Charge

- Exponentially increasing liquidation cost with increasing position size and directionality

- Establish stand-alone option CC thresholds and requirements
- Analyze option positions, by means of their DENAs, in the presence of underlying index positions to identify an increased directionality

ICE CDS MARGIN SIMULATION CALCULATOR

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 benefits³
 - iSR_{IM} : Associated with all portfolio positions introducing anti-procyclical Initial Margin (IM) features⁴

(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

ICE CDS MARGIN SIMULATION CALCULATOR

MARGIN COMPONENTS – SPREAD RESPONSE RISK - CONTINUED

■ Integrated Spread Response II

- Portfolio level iSR_P measure (offset benefits & limits) is computed as

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

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

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

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

ICE CDS MARGIN SIMULATION CALCULATOR

MARGIN COMPONENTS –MULTICURRENCY PORTFOLIO BENEFITS

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

Independently simulated corporate sub-portfolio P/Ls

EUR Denominated Corporate Sub-Portfolio

| | |
|--------------------|----------------------------------|
| $P/L_1^{\text{€}}$ | $\tilde{u}_1^{\text{iTraxx.5Y}}$ |
| $P/L_2^{\text{€}}$ | $\tilde{u}_2^{\text{iTraxx.5Y}}$ |
| $P/L_3^{\text{€}}$ | $\tilde{u}_3^{\text{iTraxx.5Y}}$ |
| ⋮ | ⋮ |
| $P/L_N^{\text{€}}$ | $\tilde{u}_N^{\text{iTraxx.5Y}}$ |

Initial EUR Denominated Sub-Portfolio P/L mapped to empirical MC simulated probabilities of iTraxx.5Y.OTR

Simulate N scenarios from bivariate Student-t Copula with v_C and $\tau^{\text{iTraxx.5Y,CDX.IG.5Y}}$ with marginals $\tilde{u}^{\text{iTraxx.5Y}}$ and $\tilde{u}^{\text{CDX.IG.5Y}}$

| | | | |
|--------------------|----------------------------------|---------------------------------------|--------------------------|
| $P/L_1^{\text{€}}$ | $\tilde{u}_1^{\text{iTraxx.5Y}}$ | $\tilde{u}_{191}^{\text{CDX.IG.5Y}}$ | $P/L_{191}^{\text{\$}}$ |
| $P/L_2^{\text{€}}$ | $\tilde{u}_2^{\text{iTraxx.5Y}}$ | $\tilde{u}_{2034}^{\text{CDX.IG.5Y}}$ | $P/L_{2034}^{\text{\$}}$ |
| $P/L_3^{\text{€}}$ | $\tilde{u}_3^{\text{iTraxx.5Y}}$ | $\tilde{u}_N^{\text{CDX.IG.5Y}}$ | $P/L_N^{\text{\$}}$ |
| ⋮ | ⋮ | ⋮ | ⋮ |
| $P/L_N^{\text{€}}$ | $\tilde{u}_N^{\text{iTraxx.5Y}}$ | $\tilde{u}_{77}^{\text{CDX.IG.5Y}}$ | $P/L_{77}^{\text{\$}}$ |

Dependent $P/L^{\text{€}}$ and $P/L^{\text{\$}}$ vectors via iTraxx and CDX.IG dependence as simulated by the Bivariate Student-t Copula

USD Denominated Corporate Sub-Portfolio

| | |
|----------------------------------|---------------------|
| $\tilde{u}_1^{\text{CDX.IG.5Y}}$ | $P/L_1^{\text{\$}}$ |
| $\tilde{u}_2^{\text{CDX.IG.5Y}}$ | $P/L_2^{\text{\$}}$ |
| $\tilde{u}_3^{\text{CDX.IG.5Y}}$ | $P/L_3^{\text{\$}}$ |
| ⋮ | ⋮ |
| $\tilde{u}_N^{\text{CDX.IG.5Y}}$ | $P/L_N^{\text{\$}}$ |

Initial USD Denominated Sub-Portfolio P/L mapped to empirical MC simulated probabilities of CDX.5Y.OTR

$$FX_{\text{€} \rightarrow \text{\$}} \times P/L_1^{\text{€}} + P/L_{191}^{\text{\$}}$$

$$FX_{\text{€} \rightarrow \text{\$}} \times P/L_2^{\text{€}} + P/L_{2034}^{\text{\$}}$$

$$FX_{\text{€} \rightarrow \text{\$}} \times P/L_3^{\text{€}} + P/L_N^{\text{\$}}$$

⋮

$$FX_{\text{€} \rightarrow \text{\$}} \times P/L_L^{\text{€}} + P/L_{77}^{\text{\$}}$$

- Convert the EUR denominated P/L vector into USD denominated P/L vector and add the results to $P/L^{\text{\$}}$ vector.
- The resultant P/L vector is further used to estimate the risk measures for the EUR/USD combined portfolio of corporate instruments.
- The currency-specific $P/L^{\text{€}}$ and $P/L^{\text{\$}}$ vectors are used to estimate the risk measures for the currency-specific sub-portfolios of corporate instruments.

ICE CDS MARGIN SIMULATION CALCULATOR

CALCULATE MARGIN PRE-AFFIRMED TRANSACTION

ICE Link Affirm/Allocate screen; View Projected Margin

Affirm/Allocate

CDX-HAIGS16V1-5Y @ 111 bps in 15MM USD (pm_buyside_fund1 v pm_d1)

Block Id:

Paste from Clipboard | Select Funds... | **View Proj. Margin**

| Fund | Amount (MM) | % | FCM-Buyer Deal Id | FCM-Seller Deal Id | Desk ID |
|------------------|-------------|-------------|-------------------|--------------------|------------------|
| pm_buyside_fund1 | 6 | 40% | TESTCLIENT032342 | TESTFCM034032 | pm_buyside_fund1 |
| pm_buyside_fund2 | 5 | 33.33333... | TESTCLIENT032343 | TESTFCM034033 | pm_buyside_fund2 |
| pm_buyside_fund3 | 4 | 26.66666... | TESTCLIENT032344 | TESTFCM050334 | pm_buyside_fund3 |

Total: 15 100%

Remaining: 0 0%

Affirm | Cancel

Allocation Details

1 → View Proj. Margin

| Confirm | Fund | Amount(MM) | % | Buyer Id | Seller Id |
|---------|------------------|------------|-----|------------|-----------|
| | pm_buyside_fund1 | 6 | 60% | CALY943400 | |
| | pm_buyside_fund2 | 4 | 40% | CALY943401 | |

Margin Calculation Criteria

Simulation

Include All Cleared Trades from Previous Days Close

Include Cleared Trades from Today's activity

2

Note - To include all cleared trades from the previous days close AND today's activity in the projected margin calculation (i.e. the net portfolio margin), please check/mark both options. To view the projected margin calculation for the transaction by itself (not the net portfolio margin), do not check/mark any selections

OK | Cancel

Margin Calculator Results Screen

ICE Margin Calculator

Margin Calculation Date/Time: 13-Jun-2012 14:02:57 Margin Parameters Date: 12-Jun-2012

ICE Portfolio Margin: Summary

| Portfolio | | | Initial Margin | | Initial Margin Requirement Components | | | | | | | | |
|-----------------------------------|----------------|--------------|----------------|-------------------|---------------------------------------|-------------------------|-----------------------------------|-----------|------------|---------------------------|-----------|---------------|---------------------------|
| My Acct Name | Cpty Acct Name | Net Notional | Gross Notional | Total Requirement | IM % of Gross | Spread Response (SR) | | | Basis Risk | Portfolio Jump to Default | Liquidity | Concentration | Interest Rate Sensitivity |
| | | | | | | SR With Decomp Benefits | SR with Decomp and Hedge Benefits | Final SR | | | | | |
| Product Management Buyside Fund1 | CSFCM | (15,000,000) | 15,000,000 | 379,215 USD | 2.53% | (243,108) | (243,108) | (243,108) | 0 | (115,627) | (17,775) | 0 | (1,489) |
| Product Management Buyside Fund 2 | CSFCM | 13,000,000 | 37,000,000 | 229,141 USD | 0.62% | (147,357) | (147,357) | (147,357) | 0 | (79,574) | (1,966) | 0 | (209) |

Note -

- Including All Existing Cleared Trades: To include all previous days AND today's cleared trade activity in the hypothetical initial margin calculation, please check BOTH options to include Previous Days and Today's Activity
- Isolated IM Trade Level Calculation: To calculate the hypothetical initial margin for a single trade (and not at the portfolio level), uncheck BOTH options to exclude Previous Days and Today's Activity
- IM Results are a Estimation Only: The initial margin calculator is intended to simulate hypothetical results and not the actual initial margin requirements which are provided in the end-of-day clearing reports
- Eligible Contract Instruments: Please view the Eligible Instruments File in the Clearing Reports tab to view a list of clearing eligible instruments to use with the calculator
- Clearing Houses: The initial margin calculator is only intended for hypothetical analysis for clearing with ICE Clear Credit LLC and ICE Clear Europe

Click Here for ICE Link Clearing Margin Simulation Guide
Margin Calculator Position Upload File Format

Export | Email | Close

Projected Margin Calculator Steps

- Prior to clearing a trade, any party to the transaction can calculate the clearing house projected initial margin by selecting the **View Projected Margin** button after providing FCM and allocation details
- After selecting the **View Projected Margin** button, users may select to view the margin amount weighted against all existing cleared positions from **yesterday's end of day**, only **today's trades, all trades** (selecting both yesterday and today's trades), or view the isolated margin amount (deselecting yesterdays and today's trades) and select **OK** to run the calculations
- The calculator returns the margin results for each fund/portfolio (separate row for each portfolio-FCM combination; users may optionally **email** the calculation results

Note: The 'Simulation' option is for future eligible instruments margin testing or for Self Clearing Participants for ICE Clear Europe

The margin tool may be accessed pre-trade via the 'New Deal-Upload' option in the Menu (or) the Positions Blotter

ICE CDS MARGIN SIMULATION CALCULATOR

CALCULATE MARGIN OPEN/HISTORIC POSITION

- ICE Link Positions Blotter; select positions and run Margin

Users may run hypothetical **Margin** calculations on non-cleared clearing eligible positions in the ICE Link Position Blotter to project the clearing house required minimum margin amounts

To calculate margin from the Position Blotter, users may:

- Filter positions eligible for margin simulation
- Select All (or) Specific Positions
- Click the Margin button and select a potential FCM

Note:

- ICE Link automatically synchronizes all client DTCC warehouse positions in the Position Blotter, simplifying margin calculations
- Additional positions may be manually entered or uploaded via spreadsheet *
- Select 'Include Cleared Trades' to automatically include open cleared trades into the calculation
- The Simulation checkbox is only for ICE Clear Europe calculations for Self Clearing members or for testing with new instruments with ICE Clear Credit

* Note: Buy-side firms have the ability to upload positions for testing clearing house margin requirements by selecting the **Upload** feature in the GUI Menu, see the Help Documents screen for more details



ICE CDS MARGIN SIMULATION CALCULATOR

CALCULATE MARGIN – MARGIN CALCULATION RESULTS

ICE Link Margin Results screen

ICE Margin Calculator

Margin Calculation Date/Time: 30-Aug-2013 11:52:57 Margin Parameters Date: 29-Aug-2013 (Production NA)

ICE Portfolio Margin Summary

| Portfolio | | Initial Margin | | | | Initial Margin Requirement Components | | | | | | | | | | | | | |
|-----------------------------------|------------------------|----------------|----------------|-------------------|---------------|---------------------------------------|-----------------------------------|-----------|---------------------------|------------|---------------------------|-----------|---------------|---------------------------|----------|---------|---------------------------|----------------|--|
| My Acct Name | Cpty Acct Name | Net Notional | Gross Notional | Total Requirement | IM % of Gross | Spread Response (SR) | | | Recovery Rate Sensitivity | Basis Risk | Portfolio Jump to Default | Liquidity | Concentration | Interest Rate Sensitivity | FX | Haircut | Equivalent IM Requirement | Equivalent CCY | |
| | | | | | | SR With Decomp Benefits | SR with Decomp and Hedge Benefits | Final SR | | | | | | | | | | | |
| Product Management Buyside Fund1 | CSFCM | (25,000,000) | 25,000,000 | (456,400) USD | 1.83% | (248,646) | (248,646) | (248,646) | (584) | 0 | (187,810) | (17,203) | 0 | (2,158) | 1.000000 | 0% | (456,400) | USD | |
| Product Management Buyside Fund1 | CSFCM | 0 | 0 | 0 EUR | 0% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.000000 | 0% | | USD | |
| Product Management Buyside Fund 2 | CSFCM | (450,000) | 450,000 | (9,829) EUR | 2.18% | (8,062) | (8,062) | (8,062) | (6) | 0 | (3,289) | (468) | 0 | (8) | 1.324400 | 4.5% | | USD | |
| Product Management Buyside Fund 2 | CSFCM | 0 | 0 | 0 USD | 0% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.000000 | 0% | (13,631) | USD | |
| Product Management Buyside Fund 2 | London Marketing 2 FCM | (14,000,000) | 14,000,000 | (305,797) EUR | 2.16% | (188,603) | (188,603) | (188,603) | (201) | 0 | (102,320) | (14,500) | 0 | (174) | 1.324400 | 4.5% | | USD | |
| Product Management Buyside Fund 2 | London Marketing 2 FCM | 0 | 0 | 0 USD | 0% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.000000 | 0% | (424,082) | USD | |

Click Here for ICE Link Clearing Margin Simulation Guide

Margin Calculator Position Upload File Format

Export Close

- View all portfolios with summary margin information per portfolio
 - 6 key risk components: Spread, Basis, Jump-to-Default/Health, Liquidity, Concentration and Interest Rate Risk
 - FX Rate, Haircut, Equivalent IM Requirement and Equivalent Currency for multi-currency portfolios
- Access Margin Simulation Guides in the results screen
- Export results to spreadsheet/file

ICE CDS MARGIN SIMULATION CALCULATOR

CALCULATE MARGIN – SPREADSHEET UPLOAD FOR MANY “WHAT-IF” TRADES

Investment Advisor

Menu

Transactions Positions Transaction History Clearing Auto-Affirmation Confirmation Netting

Novate Terminate Super Block FCM Backload Margin

Group By Quick Search US Clearing Eligible

Margin Calculation Criteria

Select Margin Calculation Criteria

Clearing House

FCM Institution

FCM Legal Entity

Simulation

Include Cleared Trades from Previous Day's Close

Include Cleared Trades from Today's activity

Upload Hypothetical Trades via Spreadsheet:

File Name:

Upload

Upload errors

Created 11:25:17 Oct 19 2010

Confirm Audit Print

| Buyer Deal Id | Buyer | Seller Deal Id | Seller | Product Type | Scheduled Termination Date | Amount | Fixed Rate | Seniority | Red Id | Entity Id | ISIN | Restructuring | ISDA Definition | Margin Test |
|---|-------|----------------|--------|--------------|----------------------------|--------|------------|-----------|-----------|-----------|--------------|---------------|-----------------|-------------|
| Sample CDS Index Trade (Do Not Include This Row in the upload) | | | | | | | | | | | | | | |
| BUY101-1B | fund1 | bank1 | CIX | | 2015-12-20 | 10 | | | 21666VAU9 | | | | ISDA2014Credit | Y |
| Sample Standard CDS Single Name - (Do Not Include This Row in the upload) | | | | | | | | | | | | | | |
| BUY101-6 | bank1 | BUY101-6 | fund1 | CSN | 2015-09-20 | 10 | 100 | SNR | | 3D233R | US30212PAB13 | N | ISDA2014Credit | Y |

Price: N/A

Index Factor: 100%

Initial Margin: No Margin

Margin Payer:

Position Id: 4789806

Click Here for ICE Link Clearing Margin Simulation Guide Margin Calculator Position Upload File Format

OK Cancel

Need Training? Help Documents

(212)323-6030 E-Mail: ICELinkHelp@theice.com

1. Hypothetical trade positions may be **uploaded directly** to the Margin Calculator **via spreadsheet** (CSV file) for testing; the **upload template** and template instructions are available in the **Help Documents screen**
2. After selecting **the 'Margin' option in the menu**, select 'Upload' in the Margin Calculation criteria screen, select the spreadsheet file (CSV) and the Open button to upload (any upload displayed in the errors window).
3. Select the **Clearing House** the hypothetical portfolio will be cleared to.
4. Select **OK** to run the calculation

Note: ICE Clear Credit and ICE Clear Europe trades must be uploaded separately; calculations can be mixed with existing non-cleared, cleared, and hypothetical trades

- Note: The 'Simulate' option is only applicable for self-clear ICE Clear Europe parties; to include pre-existing cleared trades from yesterday's end of day or for today's activity (or both for all), select the 'Include Cleared Trades' options

ICE CDS MARGIN SIMULATION CALCULATOR

CALCULATE MARGIN – SINGLE “WHAT IF” PRE-TRADE POSITION IN GUI

Manual Position Upload (Margin Testing)

1. To manually calculate margin on a single hypothetical /pre-trade position for margin calculation, **select the New Deal-Single Name or Index option** in the GUI menu
2. In the trade entry screen, **select a counterparty** ('Clearing Executing Broker') and a **clearing eligible instrument** with a notional amount, scheduled termination date, and fixed rate (spread)
3. On a Pre-trade basis, users may select the '**View Proj. Margin**' button without actually uploading the trade to run the margin calculation
4. On the margin calculation selection screen, select the **Clearing House 'Include Cleared Trades'** options if calculating against existing trades and select OK to perform the calculation

Note: A list of clearing instruments are available in the Margin Upload file in the help documents screen or on the internet at

https://www.theice.com/publicdocs/clear_credit/ICE_Clear_Credit_Clearing_Eligible_Products.xls

ICE CDS MARGIN SIMULATION CALCULATOR

SUPPORT, SALES, WEB INFORMATION

SUPPORT:

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WEB:

ICE Clearing House

<https://www.theice.com/clear-credit>

<https://www.theice.com/clear-europe/cds>

ICE Link web information page <https://www.theice.com/technology/ice-link>

ICE Link Documentation Portal <https://community.theice.com> (requires registration)