CME Group

Swaptions Clearing Overview


CLEARING THE WAY FORWARD
CME Group Swaptions Clearing

Launched based on strong client demand on April 11, 2016 with trades already cleared across dealer-to-dealer and dealer-to-client

Clearing Swaptions Amplifies our Unparalleled Capital Efficiencies

✓ 9 participants have cleared swaptions to date, including 4 buy-side customers and 5 liquidity providers
✓ Voluntary clearing allows market participants the flexibility to reduce the risk of their cleared IRS portfolios
✓ Margin offsets of up to 91% possible by adding swaptions to CME cleared IRS portfolios
✓ Portfolio margining with our cleared IRS and Eurodollar, Treasury, and Deliverable Swap Futures
✓ Reduces bilateral counterparty credit risk and frees up credit lines
✓ Improves capital ratios, lowering capital charges that could ultimately be passed onto end users

"With uncleared margin rules coming into greater focus for our clients, Credit Suisse is excited to facilitate voluntary swaptions clearing at CME Group. Clearing swaptions enables our clients to obtain the greatest operational and capital efficiencies from clearing, while reducing the risks in their portfolios."

John Dabbs, Global Head of Prime Derivatives Services at Credit Suisse

"Barclays is proud to collaborate with CME Group as one of the banks to execute the first cleared swaption trade. Clearing through CME will allow both Barclays as well as our clients to significantly improve the capital consumption and risk management of our swaptions portfolios."

Sabri El Jailani, Global Head of Rates Options Trading at Barclays

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### Cleared OTC IRS Swaptions Product Scope

#### Current Product Offering

<table>
<thead>
<tr>
<th>Currency</th>
<th>Type</th>
<th>Max Expiry</th>
<th>Final Settlement</th>
<th>Underlying Tenor</th>
<th>Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>USD</td>
<td>European</td>
<td>&lt; 2</td>
<td>Physical</td>
<td>30 50</td>
<td>1 3 6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt; 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt; 10</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- USD vanilla swaptions
- Includes Straddles, cleared as a single trade or separate payer/receiver
- All enumerations for USD-denominated 3 month LIBOR vanilla interest rate swaps supported, with the exception of:
  - Compounding
  - Forward starting swaps
  - Spreads and stubs
USD Swaptions Product Characteristics

- Straddles, the simultaneous right to pay and receive at the same strike & maturity, are supported & can be cleared as a single trade

- Both upfront and forward premiums are supported
  - Premiums may be settled on spot (T+1) through the expiration date +2 of the swaption

- Physical delivery into a cleared CME OTC interest rate swap transaction
  - Effective date equals exercise date +2
  - Trade date & cleared date of the underlying swap equals swaption exercise date

- CME performs three validations at the time a trade is submitted to clearing, same as current workflows
  - Account ID must be valid
  - Trade must pass credit limits and CME risk filters
  - Must meet supported product attributes

- At exercise, the underlying swap transaction bypasses validations (account, credit and product) & is automatically cleared
## Swaptions Initial Margin Methodology

**Methodology**

For margining swaptions with IRS, CME has extended the current historical VaR framework.

**Historical VaR**

- Margins built to provide **99%** coverage over a 5-day closeout period
- Historical scenarios are:
  - Generated using a 5-year look back period
  - Synchronized across all observed tenors on the zero curve, across all currencies
  - Scaled using Exponentially Weighted Moving Average (EWMA) based volatility forecasts
- Margin is currently the **99.7th %** of portfolio changes (loss) across all scenarios
- The liquidity/concentration model has been enhanced to compute liquidity risk at the individual Greek (Delta, Gamma, Vega) and skew level, then aggregate the sum to determine the portfolio liquidity cost
- Time decay on portfolios is captured to make the model consistent between swaps and swaptions

**Margin Tools**

CME CORE & the Margin API now support initial margin calculations for swaptions as well as portfolios containing IRS and swaptions.
The Most Capital Efficient Solution
Savings Analysis For 8 Portfolios of Swaptions and Swaps

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>Margin Savings*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1Y5Y Long Payer ATM Swaption Delta Hedged using Swap</td>
<td>89%</td>
</tr>
<tr>
<td>1Y5Y Short Payer ATM Swaption Delta Hedged using Swap</td>
<td>81%</td>
</tr>
<tr>
<td>1Y5Y Long Receiver ATM Swaption Delta Hedged using Swap</td>
<td>87%</td>
</tr>
<tr>
<td>1Y5Y Short Receiver ATM Swaption Delta Hedged using Swap</td>
<td>81%</td>
</tr>
<tr>
<td>2Y30Y Long Payer ATM Swaption Delta Hedged using Swap</td>
<td>88%</td>
</tr>
<tr>
<td>2Y30Y Short Payer ATM Swaption Delta Hedged using Swap</td>
<td>82%</td>
</tr>
<tr>
<td>2Y30Y Long Receiver ATM Swaption Delta Hedged using Swap</td>
<td>91%</td>
</tr>
<tr>
<td>2Y30Y Short Receiver ATM Swaption Delta Hedged using Swap</td>
<td>86%</td>
</tr>
</tbody>
</table>

* Savings = 1 – Portfolio Margin / (Swaption Margin + Swap Margin).
** Results are calculated as of September 2015. Values do not include transaction costs and are subject to change, depending on market volatility.
# Counterparty Netting with Swaptions

Clearing enables counterparties to net down exposures that otherwise would be held against each bilateral counterparty, which creates significant margin efficiencies.

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>No. of Trades</th>
<th>Margin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncleared Counterparty 1</td>
<td>235</td>
<td>$182,489,622</td>
</tr>
<tr>
<td>Uncleared Counterparty 2</td>
<td>430</td>
<td>$64,758,273</td>
</tr>
<tr>
<td>Uncleared Counterparty 3</td>
<td>159</td>
<td>$421,680,284</td>
</tr>
<tr>
<td>Uncleared Counterparty 4</td>
<td>130</td>
<td>$225,687,930</td>
</tr>
<tr>
<td>Uncleared Counterparty 5</td>
<td>469</td>
<td>$320,184,602</td>
</tr>
<tr>
<td>Uncleared Counterparty 6</td>
<td>476</td>
<td>$31,007,151</td>
</tr>
<tr>
<td>Uncleared Counterparty 7</td>
<td>112</td>
<td>$33,604,900</td>
</tr>
<tr>
<td>Uncleared Counterparty 8</td>
<td>501</td>
<td>$165,404,511</td>
</tr>
<tr>
<td>Uncleared Counterparty 9</td>
<td>464</td>
<td>$148,804,368</td>
</tr>
<tr>
<td>Uncleared Counterparty 10</td>
<td>330</td>
<td>$130,585,625</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3,306</strong></td>
<td><strong>$1,706,207,267</strong></td>
</tr>
</tbody>
</table>

Counterparty netting alone generates margin efficiencies of 78%
Swaption Claim Workflow

1. Client executes swaption with Executing Dealer (ED)
2. ED alleges swaption to Client
3. Client selects Clearing Member and affirms swaption
4. Affirmation Platform sends matched trade to CME for Clearing
5. CME sends “Pending DCM Approval” notification to Affirmation Platform
6. “Clearing Consent” notifications sent to Clearing Member (Client) & Clearing Member (ED)
7. Clearing Members of both parties accept the swaption
8. CME sends a Clearing Confirmation to Clearing Member(s)
9. CME sends “Cleared” notification to Affirmation Platform which displays trade status to principals
# Swaptions Netting

In support of swaptions, Clearing Members will specify whether a client or house account is eligible for gross, netting or explicit netting within a gross account.

## Netting Options

**Gross** - Trades will *not* net.

**Explicit Netting**
- Within an account set to gross, firms have the ability to select individual trades to net
- This process can be performed in bulk and firms can view the gross notional and line item reduction prior to netting

**Net** - Automatically nets eligible trades based solely on trade attributes.

## Netting Attributes

For swaptions to be eligible for netting at CME, the following trade attributes must match:
- Position Account
- Notional (remainder allowed for partial netting)
- Direction (Payer, Receive or Straddle) of the underlying swap
- Exercise Type (European)
- Exercise Date
- Settlement Type (Physical)
- Economics of the underlying swap transaction
Swaptions Cash Flows

Following cash flows will be applicable to CME cleared swaptions

- Variation Margin = Adjusted NPV (Close) – Adjusted NPV (Previous close)
- PAI = -Adjusted NPV (prev bus. day) x Latest Overnight Funding Rate x (Days/360)
- Premium (price) of the swaption

KEY POINTS

- Cash flows are analogous to CME Group cleared vanilla IRS
- The NPV of the premium will offset the NPV of the swaption
- Premiums may be settled on spot (T+1) through the Expiration Date +2
Swaptions Cash Flows

Example: Party L and S structured a very deep ITM swaption on day 1 which expires on day 5, and was exercised into a deep in the money swap (of tenor 3M).

**Party L: Long side**

<table>
<thead>
<tr>
<th>Day</th>
<th>Asset</th>
<th>NPV of Swaption</th>
<th>NPV of Swap</th>
<th>NPV of Premium</th>
<th>Discount Factor</th>
<th>NPV of all assets</th>
<th>VM</th>
<th>Cash Payment</th>
<th>Net Cash Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Long Swaption + Premium</td>
<td>956,000</td>
<td>-960,000</td>
<td></td>
<td>0.96</td>
<td>-4,000</td>
<td>-4,000</td>
<td>0</td>
<td>-4,000</td>
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<tr>
<td>2</td>
<td>Long Swaption + Premium</td>
<td>972,000</td>
<td>-970,000</td>
<td></td>
<td>0.97</td>
<td>2,000</td>
<td>6,000</td>
<td>0</td>
<td>6,000</td>
</tr>
<tr>
<td>3</td>
<td>Long Swaption + Premium</td>
<td>979,000</td>
<td>-980,000</td>
<td></td>
<td>0.98</td>
<td>-1,000</td>
<td>-3,000</td>
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<tr>
<td>4</td>
<td>Long Swaption + Premium</td>
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<td>-990,000</td>
<td></td>
<td>0.99</td>
<td>5,000</td>
<td>6,000</td>
<td>0</td>
<td>6,000</td>
</tr>
<tr>
<td>5</td>
<td>ITM Swap</td>
<td></td>
<td>995,000</td>
<td>0</td>
<td>1.00</td>
<td>995,000</td>
<td>990,000</td>
<td>-1,000,000</td>
<td>-10,000</td>
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<tr>
<td>6</td>
<td>ITM Swap</td>
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<td>995,000</td>
<td>995,000</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>3M later -1</td>
<td>ITM Swap</td>
<td></td>
<td>995,000</td>
<td>995,000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3M later</td>
<td>ITM Swap</td>
<td>995,000</td>
<td></td>
<td></td>
<td>0</td>
<td>-995,000</td>
<td>995,000</td>
<td>0</td>
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</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>-5,000</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
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</table>

**Party S: Short side**

<table>
<thead>
<tr>
<th>Day</th>
<th>Asset</th>
<th>NPV of Swaption</th>
<th>NPV of Swap</th>
<th>NPV of Premium</th>
<th>Discount Factor</th>
<th>NPV of all assets</th>
<th>VM</th>
<th>Cash Payment</th>
<th>Net Cash Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Short Swaption + Premium</td>
<td>-956,000</td>
<td>960,000</td>
<td></td>
<td>0.96</td>
<td>4,000</td>
<td>4,000</td>
<td>0</td>
<td>4,000</td>
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<tr>
<td>2</td>
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<td>970,000</td>
<td></td>
<td>0.97</td>
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<td>-6,000</td>
<td>0</td>
<td>-6,000</td>
</tr>
<tr>
<td>3</td>
<td>Short Swaption + Premium</td>
<td>-979,000</td>
<td>980,000</td>
<td></td>
<td>0.98</td>
<td>1,000</td>
<td>3,000</td>
<td>0</td>
<td>3,000</td>
</tr>
<tr>
<td>4</td>
<td>Short Swaption + Premium</td>
<td>-995,000</td>
<td>990,000</td>
<td></td>
<td>0.99</td>
<td>-5,000</td>
<td>-6,000</td>
<td>0</td>
<td>-6,000</td>
</tr>
<tr>
<td>5</td>
<td>OTM Swap</td>
<td></td>
<td>-995,000</td>
<td>0</td>
<td>1.00</td>
<td>-995,000</td>
<td>-990,000</td>
<td>1,000,000</td>
<td>10,000</td>
</tr>
<tr>
<td>6</td>
<td>OTM Swap</td>
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<td>-995,000</td>
<td>-995,000</td>
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<td>0</td>
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</tr>
<tr>
<td>3M later -1</td>
<td>OTM Swap</td>
<td></td>
<td>-995,000</td>
<td>-995,000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3M later</td>
<td>OTM Swap</td>
<td>995,000</td>
<td></td>
<td></td>
<td>0</td>
<td>995,000</td>
<td>-995,000</td>
<td>-995,000</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>5,000</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Assumption: Premium payment occurs at expiry
Swaptions Exercise Process

With CME as the swaptions counterparty to every trade, both the long and short benefit from a streamlined exercise and assignment process.

**Bilateral Process**
- **Long**: Post 11am ET and prior to EOD, Long effects swaption action via platform.
- **Short**: Prior to 11am ET, Counterparties agree to swaption action.
  - Records new position based upon agreement and hedges as appropriate.

**CME Cleared Process**
- **Option 1**: Prior to 11am ET, Long exercises swaption in real-time using CME DMS or via Platform (E&A API).
  - Real-time Status Notification.
  - Short receives real-time notification of assignment, hedges as appropriate.
- **Option 2**: Prior to 11am ET, Long sets an intent to exercise at expiry using CME DMS or via Platform (E&A API).
  - Notification at 11am ET expiry time.
  - Short receives notification of assignment at 11am ET, hedges as appropriate.

---

Long has the opportunity to take the desired action on the swaptions up until 11am ET, & may use the CME Deal Management System or send instructions via API rather than calling each counterparty.

- If the Long exercises in real-time, prior to 11 am ET cutoff, the Short will be notified in real-time.
- If the Long sets an intent to exercise at expiry, the Short will not be notified until the 11 am ET cutoff.

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# Daily Exercise Window

<table>
<thead>
<tr>
<th>Time</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>8:00 pm ET</strong></td>
<td><strong>Option Expiry Notification</strong> sent to all platforms connected to the API for all expiring positions.</td>
</tr>
<tr>
<td><strong>9:00 am ET</strong></td>
<td>Long may begin exercising or abandoning positions via DMS or the API. CME randomly assigns Shorts and sends instant notification via API to Platform and CMFs (status updated in DMS)</td>
</tr>
<tr>
<td><strong>10:50 am ET</strong></td>
<td>Long may continue to exercise or abandon positions via DMS or the API. <strong>CME Fallback Procedure</strong>: For positions that have not been exercised or abandoned (“Open” state), CME uses a 10:50 am ET valuation to determine moneyness, along with a 10 bps ITM threshold which is consistent with ISDA protocol (If Long is ITM by 10 bps or greater, Exercise, else Abandon)</td>
</tr>
<tr>
<td><strong>11:00 am ET</strong></td>
<td>Any remaining open positions are exercised or abandoned by CME according to the intent provided by the Long OR at the 10:50 am ET valuation determine by CME. CME randomly assigns Shorts and sends instant notification via API to Platform and CMFs (status updated in DMS)</td>
</tr>
<tr>
<td><strong>8:00 pm ET</strong></td>
<td>Trade register is posted to the CMFs FTP site displaying swaption and new swap status’</td>
</tr>
</tbody>
</table>

**IRS Market Open** (Sunday 6 pm ET)  
**Exercise Window Open** (9 am ET)  
**CME Fallback Procedure** (10:50 am ET)  
**Exercise Window Close** (11 am ET)  
**IRS Market Close** (Friday 7 pm ET)
CME E&A Module – Long Positions

- Swaptions expiring on the current day will be displayed under a new Options E&A tab
- Permissioned users may directly exercise or abandon long positions
  - Full or partial notional amounts may be exercised or abandoned
CME E&A Module – Short Positions

- If the Long exercises in real-time, prior to 11 am ET cutoff, the Short will be notified in real-time.
- If the Long sets an intent to exercise at expiry, the Short will not be notified until the 11 am ET cutoff.
Swaptions Valuation Methodology

CME Settlement Methodology

- Clearing Members participating in the Swaptions offering will be required to provide daily vol cube submissions as the primary input into the pricing model
- Data submissions include normal/log-normal volatility, DV01, Price and Forwards
- CME calibrates pricing parameters based on the submitted prices. Outputs from the calibration process include:
  - CME volatility cube
  - CME swaptions price and annuity
  - Average and standard deviation across dealer submissions

USD Swaptions End of Day Settlements Process

Daily submission is between 4pm to 5pm ET
CME settlement process is run between 5pm to 5:45pm ET
CME publishes blended vol cube at 5:45pm ET
Data Distribution

CME will report a subset of swaptions settlement data

- CME website: At-the-money strikes only
- Public FTP folder: ATM strikes in additional to strike increments ranging between +/- 25-200 bps

<table>
<thead>
<tr>
<th>Data Included</th>
<th>Website</th>
<th>Public FTP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Option Price</td>
<td>Limited CME Blended Data</td>
</tr>
<tr>
<td>Strikes Published</td>
<td>ATMs only</td>
<td>+/- 0, 25, 50, 100, 200</td>
</tr>
<tr>
<td>Expiry</td>
<td>1M, 3M, 6M, 1Y, 2Y</td>
<td>1M, 3M, 6M, 1Y, 2Y</td>
</tr>
<tr>
<td>Tenor</td>
<td>1Y, 2Y, 5Y, 10Y, 15Y, 20Y, 30Y</td>
<td>1Y, 2Y, 5Y, 10Y, 15Y, 20Y, 30Y</td>
</tr>
</tbody>
</table>
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