Next Generation (NG) Risk Models
AGENDA

1. Background
2. IM Model
3. Stress Testing for Default Fund
4. Operational highlights under NG Risk Models
Background
Evolution of global regulation and HKSCC risk management

Risk management reform

Background
- Adopted pragmatic yet effective measures to strengthen risk management in response to the 2008 global financial crisis
- Amongst the foremost CCPs in Asia to implement initial margin in cash equity market

Framework
- Single rate margin model
- Introduced dynamic Default Fund component

Interim enhancement
- Introduced margin multiplier

HKSCC NG Risk Models

Background
- Meets evolving international regulatory standards
- Improves safety, integrity and efficiency of HK securities market
- Consistent with peer CCPs and global best practices

Framework
- More “risk-based” approach (i.e. initial margin and DF to better reflect the risk exposure of CP’s portfolio)
- Reinforces the “defaulter-pays” principle

Continuous effort to improve compliance to international regulatory standards and protection in HK securities market

Note 1: International Organization of Securities Commissions
Note 2: Principles for Financial Market Infrastructures
HKSCC NG Risk Models – Key enhancements

**Current model**

- Single margin rate based on Hang Seng Index (HSI) applied to **all** securities
- No risk offset among securities

**HKSCC NG Risk Models**

- 2-tier hybrid model
- Margin requirement based on individual stock volatility
- Allows risk offset among selected securities
- Liquidation cost is considered

**Initial Margin (IM)**

- Up and down scenario applied to **all** securities to generally cover systemic risk

**Stress testing for Default Fund (DF)**

- Multiple product-specific scenarios applied to **each** security

HKSCC adopts methodology-centric enhancements in NG Risk Models
IM Model
Initial Margin Model

Portfolio margin requirement

- Portfolio IM\(^{(1)}\)
- Tier P Portfolio IM\(^{(2)}\)
- Tier N Portfolio IM\(^{(3)}\)
- Add-ons

(1) Overall IM will round up to the nearest ten thousand dollars (e.g. 7,821,555 will be rounded up to 7,830,000)
(2) Subject to minimum margin level
(3) Subject to margin multiplier determined by the magnitude of a Clearing Participant’s back-testing deficit
**Initial Margin Model**

Two-tier model and Hang Seng Composite Index (HSCI) based

<table>
<thead>
<tr>
<th>Tier P (Primary Tier)</th>
<th>Tier N (Non-Constituent Tier)</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ HSCI LargeCap and MidCap constituent stocks and related DW / CBBC</td>
<td></td>
</tr>
<tr>
<td>▪ Covers securities which rank in top 95% of total market capitalization</td>
<td></td>
</tr>
<tr>
<td>▪ All equity indices ETFs and related DW / CBBC</td>
<td></td>
</tr>
<tr>
<td>▪ Covers ~80% of total market turnover</td>
<td></td>
</tr>
<tr>
<td>▪ Contains all non-Tier P instruments (e.g. GEM stocks, small- / micro-cap stocks)</td>
<td></td>
</tr>
</tbody>
</table>

**Margin Methodology**

| ▪ VaR-based Portfolio Margining and subject to minimum margin level |
| ▪ Margin based on individual stock volatility |
| ▪ Flat rate margin similar to current single rate model |
| ▪ Margin multiplier where appropriate |

_A hybrid approach consists of portfolio margining (Tier P) and flat rate (Tier N)_
## Initial Margin Model

### Methodology and parameters

<table>
<thead>
<tr>
<th></th>
<th>Current model</th>
<th>Next Generation Risk Models</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Margin methodology</strong></td>
<td>Tier P</td>
</tr>
<tr>
<td></td>
<td>One margin rate based on HSI</td>
<td>Instrument-specific</td>
</tr>
<tr>
<td></td>
<td>Margin multiplier where appropriate</td>
<td>VaR based</td>
</tr>
<tr>
<td>2</td>
<td><strong>Portfolio margining</strong></td>
<td>Offset between long / short CNS positions</td>
</tr>
<tr>
<td></td>
<td>Nil (higher of long / short CNS positions)</td>
<td>1000-day lookback period with stress dates</td>
</tr>
<tr>
<td>3</td>
<td><strong>Implied volatility modelling for DW/CBBC</strong></td>
<td>DW / CBBC pricing models</td>
</tr>
<tr>
<td></td>
<td>Nil</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td><strong>Margin floor</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5% x higher of long / short CNS positions</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td><strong>Margin period of risk (MPOR)</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 day liquidation period</td>
<td></td>
</tr>
</tbody>
</table>

[ ] Subject to SFC final approval
**Initial Margin Model**

**Add-ons**

**Current model**
- Covered under the single margin rate e.g. 6% and concentration collateral

**Next Generation Risk Models**

<table>
<thead>
<tr>
<th>Tier P</th>
<th>Tier N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portfolio level</td>
<td>~2% higher of Long / Short</td>
</tr>
<tr>
<td>Instrument level</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Applicable to long positions</td>
<td>Rights / open offer / Distribution in specie</td>
</tr>
<tr>
<td>Rights / open offer / Distribution in specie</td>
<td></td>
</tr>
</tbody>
</table>

**Existing**

<table>
<thead>
<tr>
<th>9</th>
<th>Position Limit Add-on</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall CNS exceeds 4 x Liquid Capital</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>10</th>
<th>Default Fund Add-on</th>
</tr>
</thead>
<tbody>
<tr>
<td>CP’s Net Projected Loss exceeds 50% DF threshold(^{(1)})</td>
<td></td>
</tr>
</tbody>
</table>

---

\(^{(1)}\) DF Threshold is the maximum DF size(s) prescribed by the clearing house(s) with reference to the highest DF size in the past 10 years
Initial Margin Model – Market-wide impact

~70% of the time the Market-wide IM will decrease
## Initial Margin Model

### Relationship between Portfolio Risk Profile and NG IM requirements

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>Diversified</th>
<th>Directional</th>
<th>Concentration in volatile stocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristics</td>
<td>Consists of balanced long / short positions or hedged positions (e.g. Long Structured Products vs Short underlying, Long ETPs vs Short underlying)</td>
<td>Inclines towards long or short positions</td>
<td>Concentrates in volatile stocks or Structured Products</td>
</tr>
<tr>
<td>IM requirements</td>
<td>Lower (Portfolio margining)</td>
<td>Higher (Limited netting at portfolio level)</td>
<td>Higher (Higher margin on high volatility instruments)</td>
</tr>
</tbody>
</table>

More diversified portfolios will be subject to lower IM requirements under NG IM Model.
## Initial Margin Model

### Operations-related arrangement

<table>
<thead>
<tr>
<th>Current model</th>
<th>Next Generation Risk Models</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tolerance limit (intraday)</strong></td>
<td>HK$5 million (available to both Marks and Margin)</td>
</tr>
<tr>
<td>- HK$5 million (applicable to Marks only)</td>
<td>Not available¹</td>
</tr>
<tr>
<td><strong>Marks credit limit</strong></td>
<td></td>
</tr>
<tr>
<td>- Same as DF Basic Contribution</td>
<td></td>
</tr>
<tr>
<td><strong>IM credit</strong></td>
<td>HK$5 million</td>
</tr>
<tr>
<td>- HK$5 million</td>
<td></td>
</tr>
<tr>
<td><strong>Favourable Marks-IM offset</strong></td>
<td>Available</td>
</tr>
<tr>
<td><strong>Intraday Margin for Holiday</strong></td>
<td>Applicable to holiday periods &gt; one business day</td>
</tr>
<tr>
<td><strong>Intraday and Dayend Marks</strong></td>
<td>~11:00 and ~19:30</td>
</tr>
<tr>
<td><strong>IM refund for offset cash prepayment</strong></td>
<td>Available</td>
</tr>
<tr>
<td><strong>Periodic Margin projection / report</strong></td>
<td>14:45, 15:45, 16:30, 20:00</td>
</tr>
</tbody>
</table>

¹ Enhance default capital adequacy by isolation of DF resources
² Advance IM refund will create potential exposure for unsettled short positions
Stress Testing for Default Fund (DF)
DF size determination

Expected Uncollateralized Loss (EUL) = CP(s) Stress Testing Values - CP(s) Collateral

Highest daily stressed EUL\textsubscript{1+5 CPs} in past 60 days + 10% buffer

Required DF Size

HKSCC Skin in the Game

HKSCC appropriations + DF investment income

CPs’ Basic Contributions*

CPs’ Dynamic Contributions (HK$1 million credit per CP)

* Total minimum Basic contribution is HK$100 million
* Subject to finalization with SFC
CP’s contributions are in HKD cash

* Subject to finalization with SFC

Allocation of DF contributions

Risk-based allocation

CP Basic Contribution* =

~HK$100 million

×

% Average 60 days EUL

(% Risk contribution)

* Subject to minimum requirement of trading rights

CP Dynamic Contribution# =

Overall Dynamic Contribution

×

% Average 60 days EUL

(% Risk contribution)

# HK$1 million credit available for each CP

* CP’s contributions are in HKD cash

* Subject to finalization with SFC
Stress testing and Default Fund (DF)

Methodology

**Current Model**

1. **Scenarios**
   - 2 hypothetical systemic risk scenarios (proxy of HSI movement) applied to all securities
   - Market up scenario
   - Market down scenario

2. **Position risk aggregation**
   - Higher of long / short CNS positions

**Next Generation Risk Models**

3. **CP allocation**
   - CNS based

4. **DF sizing**
   - 1st + 5th largest CPs’ exposure
   - 60-day lookback period

*Subject to finalization with SFC*
Stress testing and Default Fund (DF)

Operations-related measures

<table>
<thead>
<tr>
<th></th>
<th>Current Model</th>
<th>Next Generation Risk Models</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td><strong>Review Frequency</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Monthly at start-of-month</td>
<td>Monthly at start-of-month</td>
</tr>
<tr>
<td></td>
<td>Ad-hoc</td>
<td>Ad-hoc</td>
</tr>
<tr>
<td>6</td>
<td><strong>Collection</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 business day after review</td>
<td>1 business day after review</td>
</tr>
<tr>
<td>7</td>
<td><strong>DF credit</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HK$1 million</td>
<td>HK$1 million</td>
</tr>
<tr>
<td>8</td>
<td><strong>Report</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Available for DCP and GCP (with NCP projection) after review</td>
<td>Available for DCP and GCP (with NCP projection) after review</td>
</tr>
</tbody>
</table>

Most existing operational arrangements remain unchanged under NG

*Subject to finalization with SFC*
<table>
<thead>
<tr>
<th>Scenario Types</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Historical</td>
<td>• Historical stress events that consist of peak historical volatilities (e.g. Lehman default)</td>
</tr>
<tr>
<td>2 Hypothetical</td>
<td>• Potential “extreme but plausible” Macro-economic conditions which might drive extreme price changes among sectors</td>
</tr>
<tr>
<td>3 Theoretical</td>
<td>• Theoretical price changes of a portfolio due to break or boost in correlation between underlying securities</td>
</tr>
<tr>
<td>4 Idiosyncratic</td>
<td>• Sudden price collapse (surge) of position(s) in a portfolio</td>
</tr>
</tbody>
</table>
Market DF size

A comparison between current model and NG Models

Market DF size is more stable under NG Model
Operational Impact under NG Risk Models
Operational highlights under NG Risk Models

Funding Projection

CPs’ IM and DF requirements can fluctuate as they are calculated based on the risk of CPs’ portfolios

Mitigating measures provided by HKSCC

1. Margin simulation tools *(see next slides)*
   - Facilitate CPs’ internal processes related to risk control and margin payment / collection
   - Allow CPs to replicate and simulate margin requirement for existing portfolios and hypothetical trades
   - Trail period will be provided for CPs before official launch

2. Specific Stock Collateral (SSC) and Specific Cash Collateral (SCC)
   - CNS stock positions covered by SSC or SCC are exempted from IM calculation

3. Margin and DF credit will continue
   - No change in current **HK$5 million** margin credit and **HK$1 million** DF credit

Other operational processes remain the same

- Relevant settlement reports (based on new margin requirement) will still be available via existing CCASS
- Timing of most existing operations remains unchanged
- Excess margin is refunded on the following day when exposure is reduced (i.e. upon settlement)
Margin simulation tools

**Purpose**
- Allow CPs to simulate / replicate margin requirement for existing portfolio and hypothetical trades
- Facilitate CPs’ internal processes related to risk control and margin payment / collection under a relatively sophisticated margin model

**Method 1:**
**Margin simulator**
- CPs input trades via a web-based Graphical User Interface (GUI) or spreadsheet upload for margin simulation
- Results can be downloaded from web portal for CP’s internal risk control purpose

**Method 2:**
**Risk Parameters File (RPF)**
- HKEX provides RPF (at granular risk parameter level) for each stock and structured product
- CPs download and use the RPF internally to estimate margin requirement of client portfolios
Specific Stock Collateral (SSC) & Specific Cash Collateral (SCC)

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Specific Stock Collateral (SSC)</th>
<th>Specific Cash Collateral (SCC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feature</td>
<td>To exclude covered Short CNS position from Marks and Margin calculations</td>
<td>To exclude covered Long CNS position from Marks and Margin calculations</td>
</tr>
<tr>
<td></td>
<td>On settlement day, SSC is automatically used for stock settlement</td>
<td>On settlement day, SCC is automatically used for money settlement</td>
</tr>
</tbody>
</table>

Note: Please refer to Appendix for inputs of SSC and SCC

CNS stock positions covered by SSC or SCC are exempted from Marks and Margin calculation

(1) General Rules of CCASS, Chapter 36 Risk Management Measure - CNS System, 3601A Margin
SSC/SCC reduces margining positions and the covered CNS position is exempted from the Marks & Margin calculation if posted before the cut-off time.

1. Intraday Margin for Holiday will only be collected on the day before long holiday.
**User Manuals & Technical Specifications** | **Publication Dates** | **Location**
---|---|---
Client Connect Familiarization Guidelines | 2019 May | [Client Connect Familiarization Guidelines](#)
Client Connect User Manual  
Client Connect FAQ | 2019 May  
2019 June | [Client Connect User Manual](#)  
[Client Connect FAQ](#)
VaR Risk Parameter file guide | 2019 Aug | To be advised
Stress testing Risk Parameter file guide | 2019 Aug | To be advised
NG Phase 1 Connectivity Guide (system connectivity and setup) | 2019 Sep | To be advised
Report Access Platform (Technical Guide) | 2019 Sep | To be advised
NGRM User Guide for Participants (including Margin Simulator function) | 2019 Dec | To be advised
Reports and Data Files Sample | 2020 Jan | To be advised
NG Phase 1 Installation and Configuration Document | 2020 Jan | To be advised

*The above timeline serves for indicative purpose and is subject to changes at HKEX discretion. Clearing Participants shall always refer to the latest announcements from HKEX.*
Q&A

Contact us at  margin_modelling@hkex.com.hk
Tier P: Hang Seng Composite Index (HSCI)-based


2. Click on “Indexes” tab and then click on “Market-Cap Weighted”

3. Select the LargeCap, MidCap and SmallCap Indexes from the list

HKEX will update Tier P stocks list for margining on a regular basis and notify CPs the change(s) beforehand.
Add-ons

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Liquidation Risk Add-on</td>
<td>Tackles the liquidity risk arising from bid-ask spread and concentration positions</td>
</tr>
<tr>
<td>2</td>
<td>Structured Product Add-on</td>
<td>Handles the huge percentage loss resulting from downward price movement approaching the minimum security prices of HK$0.01 for long SP positions</td>
</tr>
<tr>
<td>3</td>
<td>Corporate Action Add-on</td>
<td>Additional margin to reduce potential risk exposures arising from Corporate Action related entitlements (Rights / open offer; Distribution in specie)</td>
</tr>
<tr>
<td>4</td>
<td>Position Limit Add-on</td>
<td>Manages the settlement counterparty risk arising from excessive CNS exposure against CPs’ financial strength</td>
</tr>
<tr>
<td>5</td>
<td>Default Fund Add-on</td>
<td>Mitigates excessive risk exposures of individual CPs on Default Fund</td>
</tr>
</tbody>
</table>
Historical stress events

Global and regional events that have major impacts on the Hong Kong stock market

- Asian Financial Crisis
- Long-Term Capital Management (LTCM) Collapse
- Dot Com Collapse
- Start of Credit Crunch
- EU Credit Crisis
- Russian Financial Crisis
- Twin Towers Attack
- Lehman Default / Global Financial Crisis
- Chinese Stock Market Crash

*Subject to finalization with SFC
Hypothetical stress events

Simulate extreme but plausible events

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Depend heavily on real economy performance and sentiment</td>
<td>Dominated by a few players with complex business models</td>
<td>Energy crisis leads to price rise of resources</td>
<td>Political and economical factors impact consumer expenditure</td>
</tr>
<tr>
<td>▪ Financials</td>
<td>▪ Telecommunication &amp; IT</td>
<td>▪ Energy, Industrials and Utilities</td>
<td>▪ Consumer goods and services</td>
</tr>
<tr>
<td>▪ Properties &amp; Construction</td>
<td></td>
<td>▪ Transportation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ International Trading</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chinese Manufacturing Sector Shock</th>
<th>Brexit</th>
<th>China Debt Crisis</th>
<th>Decoupling of China-Hong Kong equity market</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shift from industrial to service sector in China</td>
<td>‘Hard’ or ‘soft’ Brexit, no agreement on trades, borders and travels yet</td>
<td>Risky and poorly collateralised shadow banking sector and high local government debt</td>
<td>HSI and SCI move independently due to Chinese regulatory changes</td>
</tr>
<tr>
<td>▪ Manufacturing, material and industrials</td>
<td>▪ Multinational corporations (especially conglomerates and financial institutions) with operations in the UK</td>
<td>▪ Financials</td>
<td>▪ Hang Seng Index</td>
</tr>
<tr>
<td>▪ Shanghai Composite Index (SCI)</td>
<td></td>
<td>▪ Properties and construction</td>
<td></td>
</tr>
</tbody>
</table>

*Subject to finalization with SFC*
Theoretical stress events

Correlation Boost

Correlation Break

Subject to finalization with SFC
Idiosyncratic stress events

Potential price collapse / surge of individual position(s) in a portfolio

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Specific Stock Collateral (SSC) in CCASS

Step 1
Transfer CCASS stock from CCASS stock account to CCMS collateral account

Logon to CCMS / CCASS → Select Maintain CCASS-To-CCMS Stock Transfer → Select Add CCASS-To-CCMS Stock Transfer → Execute selected function and press ‘Submit’ / ‘Confirm’ when finish

For more information, please refer to CCASS terminal user guide(1) Chapter 8.3.1 CCASS-To-CCMS Stock Transfer Maintenance

Specific Stock Collateral (SSC) in CCASS

**Step 2**

Change the stocks in CCMS collateral account from general collateral to specific collateral

Select Maintain General to Specific Stock Collateral  
Select Add General to Specific Stock Collateral  
Execute selected function and press ‘Submit’/’Confirm’ when finish

Select Maintain General to Specific Stock Collateral

Select Add General to Specific Stock Collateral

Execute selected function and press ‘Submit’/’Confirm’ when finish

For more information, please refer to CCASS terminal user guide (1) Chapter 8.3.3 General to Specific Stock Collateral Maintenance.

---

Specific Cash Collateral (SCC) in CCASS

Input instruction for paying the Specific Cash Collateral

Logon to CCMS / CCASS  →  Select Maintain Specific Cash Collateral  →  Select Add / Delete / Authorise / Enquire Specific Cash Collateral  →  Execute selected function and press ‘Submit’ / ‘Confirm’ when finish

for more information, please refer to CCASS terminal user guide(1) Chapter 8.3.6 Specific Cash Collateral Maintenance.