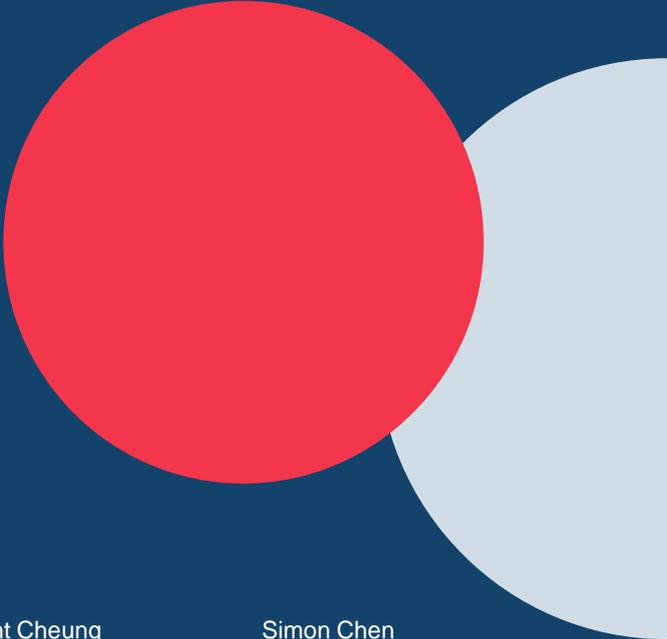


Next Generation (NG) Risk Models



Vincent Cheung
Group Risk Management
21 August 2019

Simon Chen
Clearing Risk Management
23 August 2019

AGENDA

1

Background

2

IM Model

3

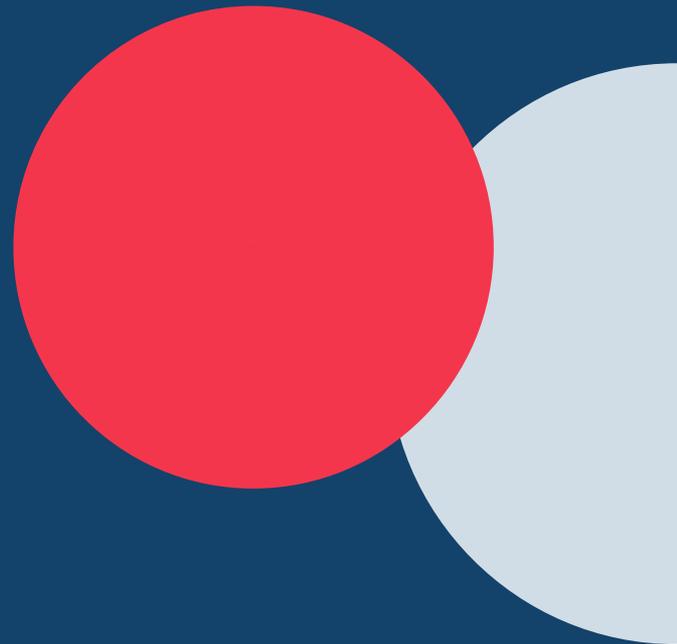
Stress Testing for Default Fund

4

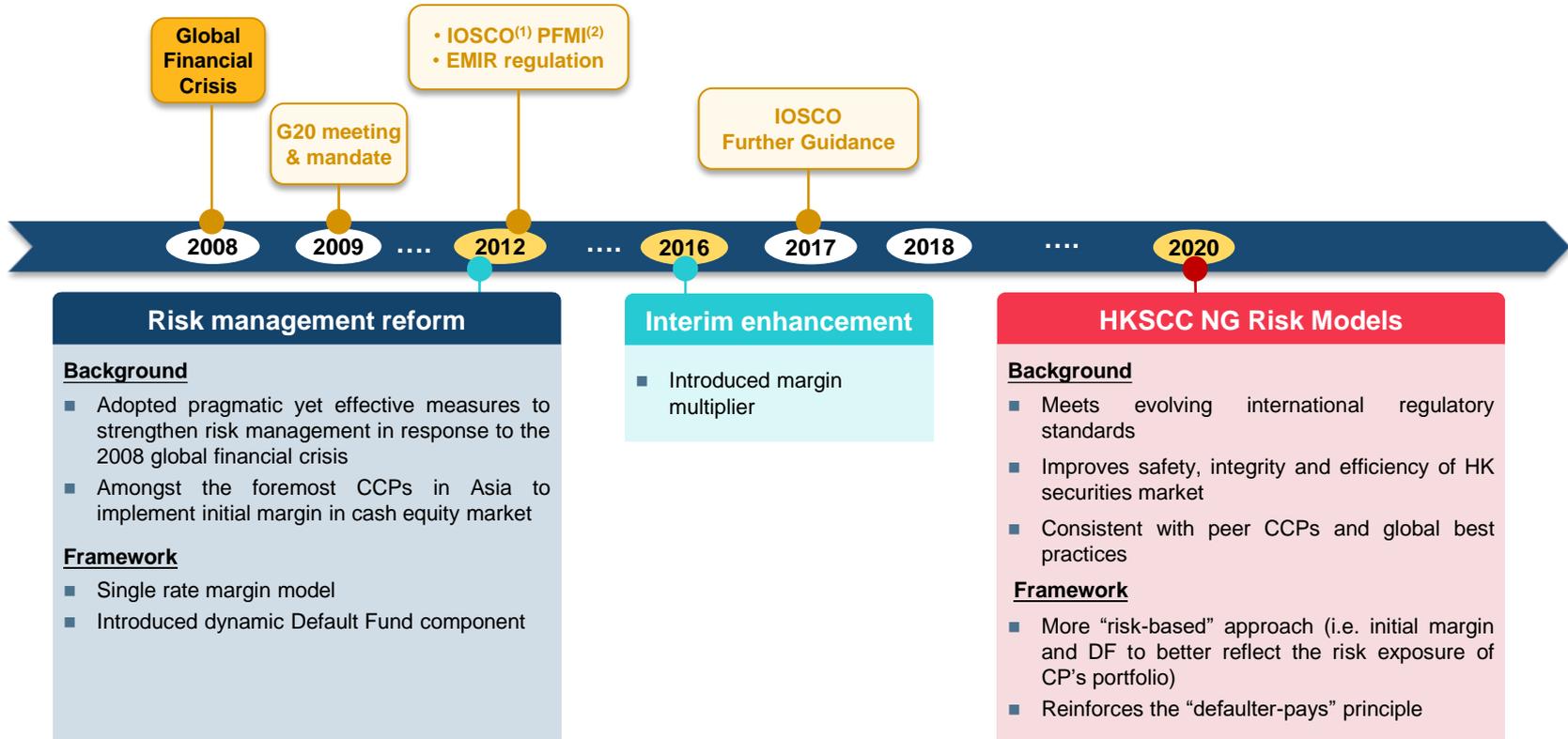
Operational highlights under NG Risk Models



Background



Evolution of global regulation and HKSCC risk management

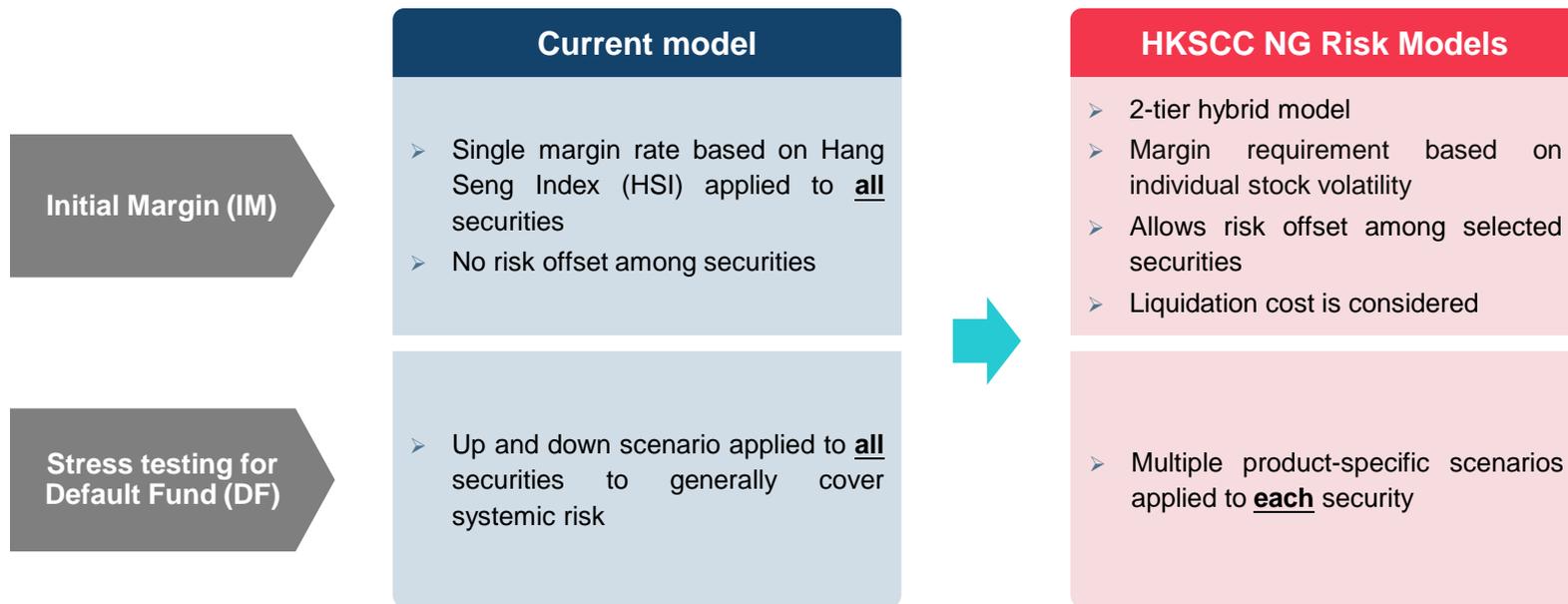


Continuous effort to improve compliance to international regulatory standards and protection in HK securities market



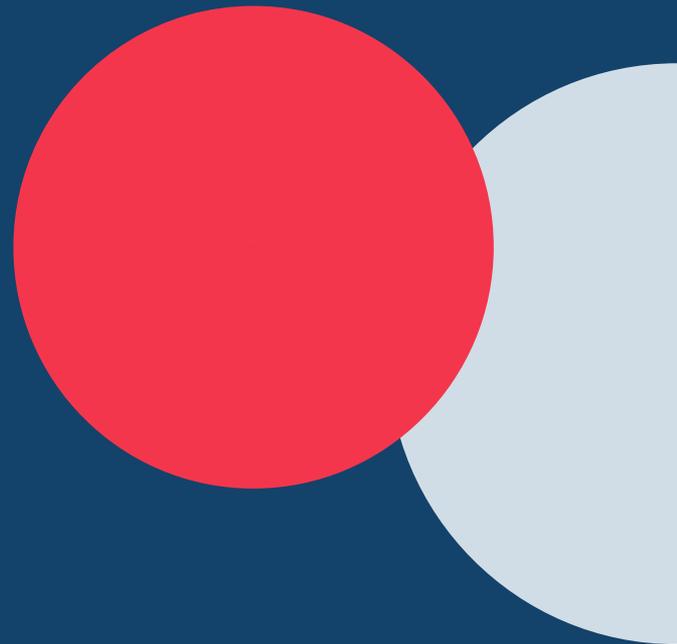
Note 1: International Organization of Securities Commissions
Note 2: Principles for Financial Market Infrastructures

HKSCC NG Risk Models – Key enhancements



HKSCC adopts methodology-centric enhancements in NG Risk Models

IM Model



Initial Margin Model

Portfolio margin requirement



- (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



A hybrid approach consists of portfolio margining (Tier P) and flat rate (Tier N)



Initial Margin Model

Methodology and parameters

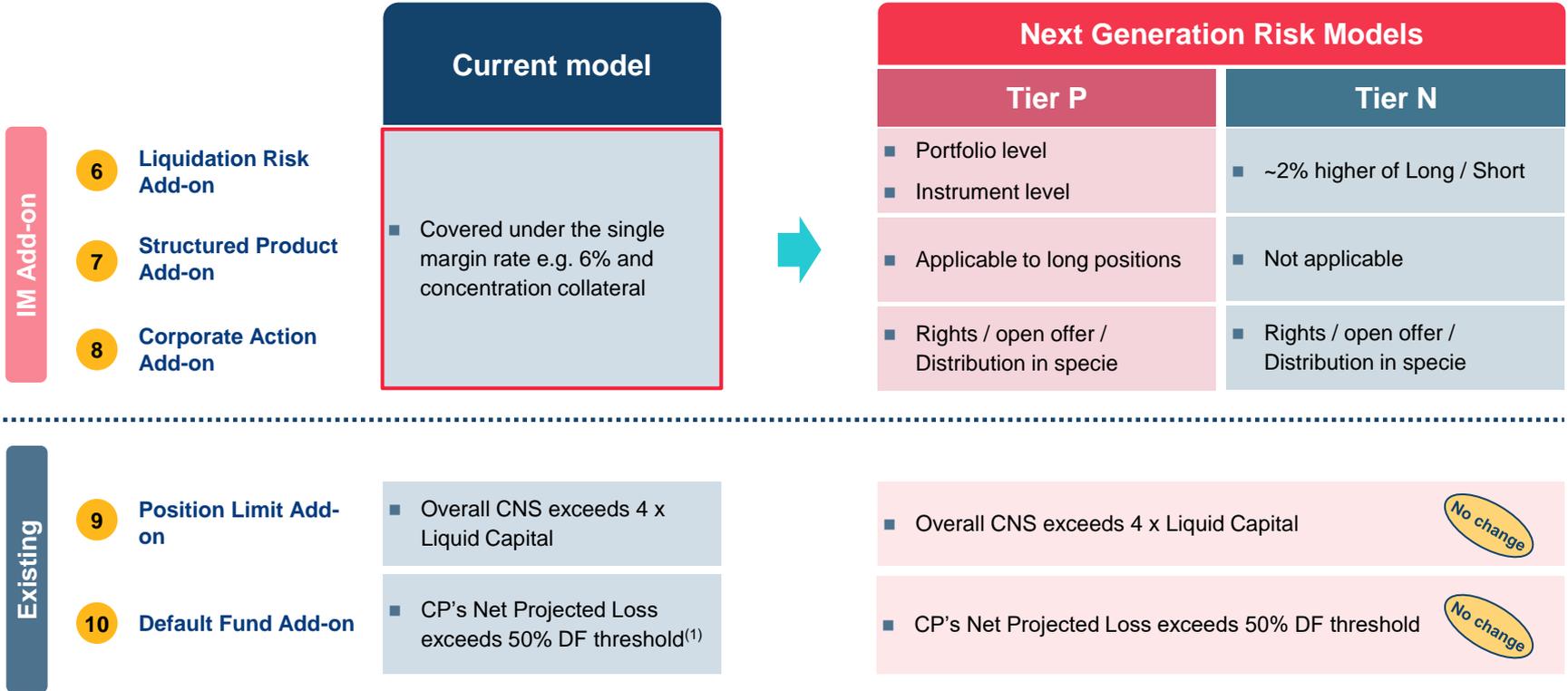
	Current model		Next Generation Risk Models	
	Tier P	Tier N		
1 Margin methodology	<ul style="list-style-type: none">One margin rate based on HSIMargin multiplier where appropriate	<ul style="list-style-type: none">One margin rate based on a reference market indexMargin multiplier where appropriate		
2 Portfolio margining	<ul style="list-style-type: none">Nil (higher of long / short CNS positions)	<ul style="list-style-type: none">Nil (higher of long / short CNS positions)		
3 Implied volatility modelling for DW/CBBC	<ul style="list-style-type: none">Nil	<ul style="list-style-type: none">Nil		
4 Margin floor	<ul style="list-style-type: none">5% x higher of long / short CNS positions	<ul style="list-style-type: none">[10]% x higher of long / short CNS positions		
5 Margin period of risk (MPOR)	<ul style="list-style-type: none">1 day liquidation period	<ul style="list-style-type: none">1 day liquidation period		

No change



Initial Margin Model

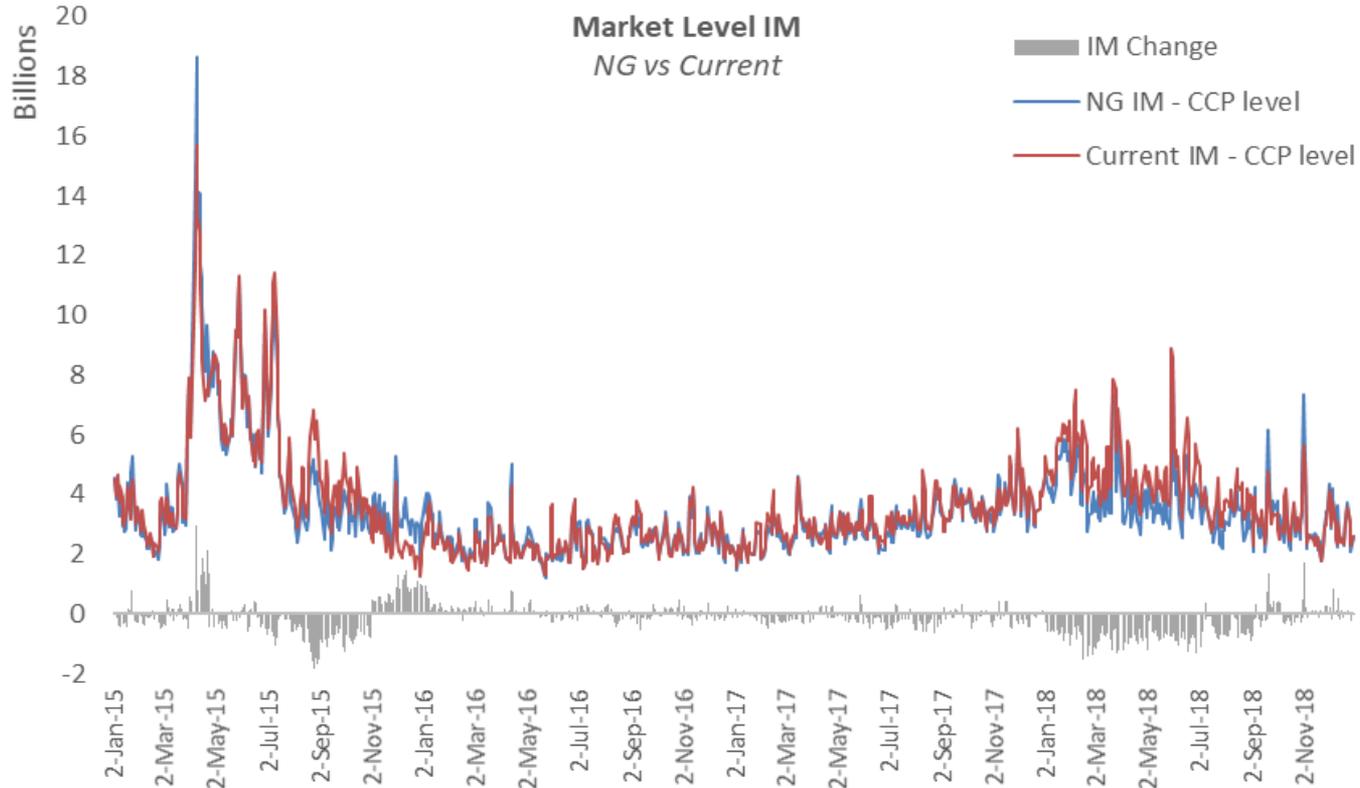
Add-ons



(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

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

More diversified portfolios will be subject to lower IM requirements under NG IM Model



Initial Margin Model

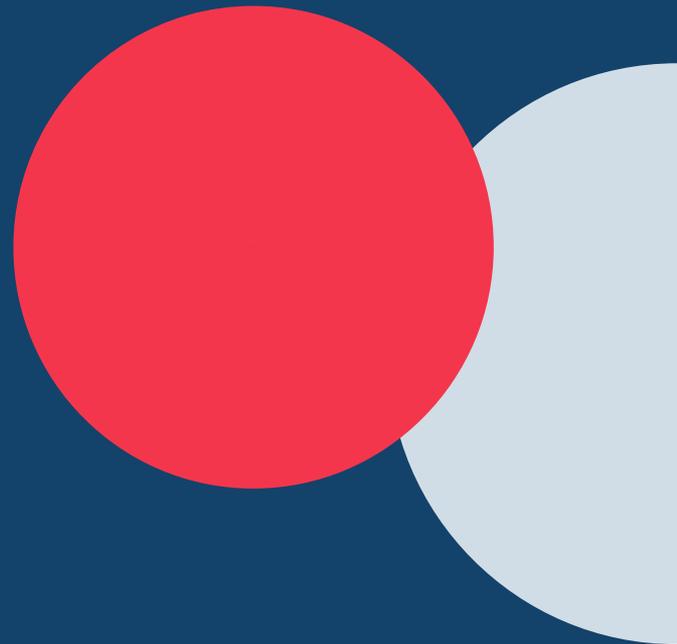
Operations-related arrangement

	Current model	Next Generation Risk Models
1 Tolerance limit (intraday)	<ul style="list-style-type: none"> HK\$5 million (applicable to Marks only) 	<ul style="list-style-type: none"> HK\$5 million (available to both Marks and Margin)
2 Marks credit limit	<ul style="list-style-type: none"> Same as DF Basic Contribution 	<ul style="list-style-type: none"> Not available¹
3 IM credit	<ul style="list-style-type: none"> HK\$5 million 	<ul style="list-style-type: none"> HK\$5 million <p><i>No change</i></p>
4 Favourable Marks-IM offset	<ul style="list-style-type: none"> Available 	<ul style="list-style-type: none"> Available <p><i>No change</i></p>
5 Intraday Margin for Holiday	<ul style="list-style-type: none"> Applicable to holiday periods > one business day 	<ul style="list-style-type: none"> Applicable to holiday periods > one business day <p><i>No change</i></p>
6 Intraday and Dayend Marks	<ul style="list-style-type: none"> ~11:00 and ~19:30 	<ul style="list-style-type: none"> ~11:00 and ~19:30 <p><i>No change</i></p>
7 IM refund for offset cash prepayment	<ul style="list-style-type: none"> Available 	<ul style="list-style-type: none"> Not available²
8 Periodic Margin projection / report	<ul style="list-style-type: none"> 14:45, 15:45, 16:30, 20:00 	<ul style="list-style-type: none"> 16:30, 20:00 + flexibility to simulate IM requirement intra-day

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

$$\text{Expected Uncollateralized Loss (EUL)} = \text{CP(s) Stress Testing Values} - \text{CP(s) Collateral}$$

Highest daily stressed
EUL_{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*

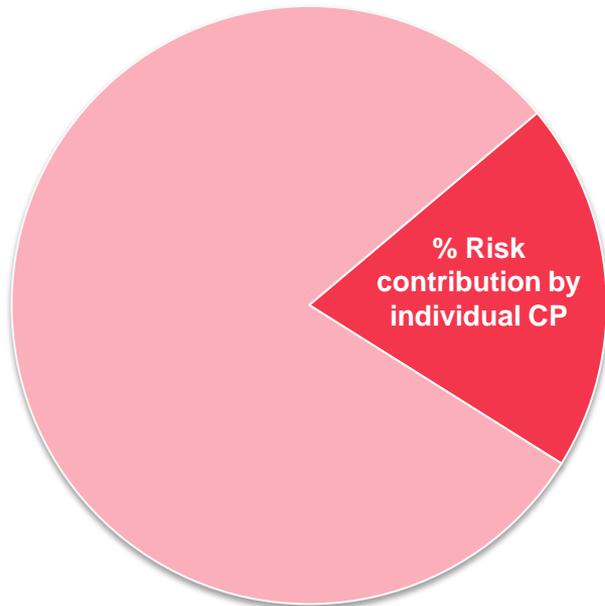
CPs' Dynamic Contributions
(HK\$1 million credit per CP)



* Total minimum Basic contribution is HK\$100 million
* Subject to finalization with SFC

Allocation of DF contributions

Risk-based allocation



Overall risk (EUL) of all CPs

CP Basic Contribution* =

$$\begin{aligned} &\sim\text{HK\$100 million} \\ &\quad \times \\ &\quad \% \text{ Average 60 days EUL} \\ &\quad (\% \text{ Risk contribution}) \end{aligned}$$

* Subject to minimum requirement of trading rights

CP Dynamic Contribution# =

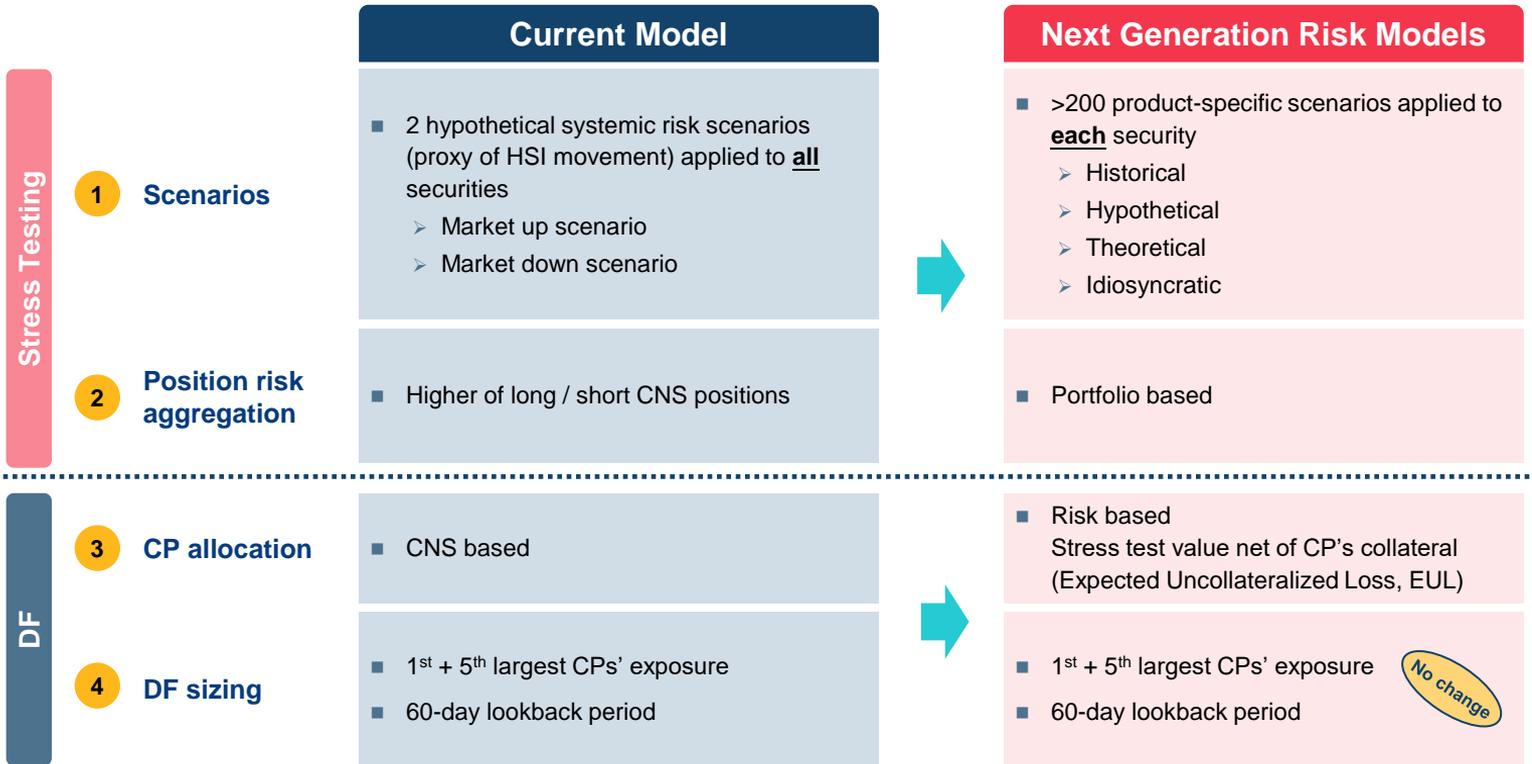
$$\begin{aligned} &\text{Overall Dynamic Contribution} \\ &\quad \times \\ &\quad \% \text{ Average 60 days EUL} \\ &\quad (\% \text{ Risk contribution}) \end{aligned}$$

HK\$1 million credit available for each CP



Stress testing and Default Fund (DF)

Methodology



Stress testing and Default Fund (DF)

Operations-related measures

	Current Model		Next Generation Risk Models
5 Review Frequency	<ul style="list-style-type: none">Monthly at start-of-monthAd-hoc		<ul style="list-style-type: none">Monthly at start-of-month <i>No change</i>Ad-hoc
6 Collection	<ul style="list-style-type: none">1 business day after review		<ul style="list-style-type: none">1 business day after review <i>No change</i>
7 DF credit	<ul style="list-style-type: none">HK\$1 million		<ul style="list-style-type: none">HK\$1 million <i>No change</i>
8 Report	<ul style="list-style-type: none">Available for DCP and GCP (with NCP projection) after review		<ul style="list-style-type: none">Available for DCP and GCP (with NCP projection) after review <i>No change</i>

Most existing operational arrangements remain unchanged under NG



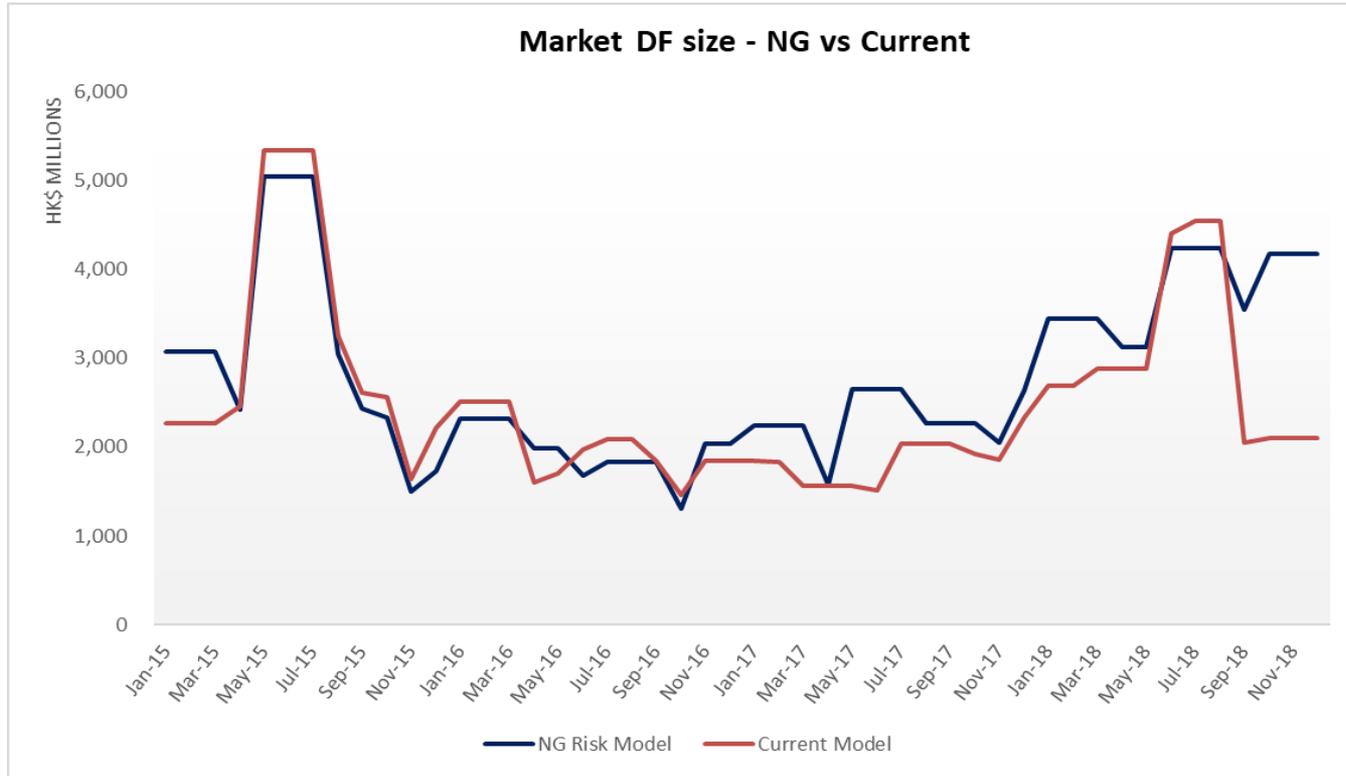
Stress testing scenarios

	Scenario Types	Details
1	Historical	<ul style="list-style-type: none">Historical stress events that consist of peak historical volatilities (e.g. Lehman default)
2	Hypothetical	<ul style="list-style-type: none">Potential “extreme but plausible” Macro-economic conditions which might drive extreme price changes among sectors
3	Theoretical	<ul style="list-style-type: none">Theoretical price changes of a portfolio due to break or boost in correlation between underlying securities
4	Idiosyncratic	<ul style="list-style-type: none">Sudden price collapse (surge) of position(s) in a portfolio



Market DF size

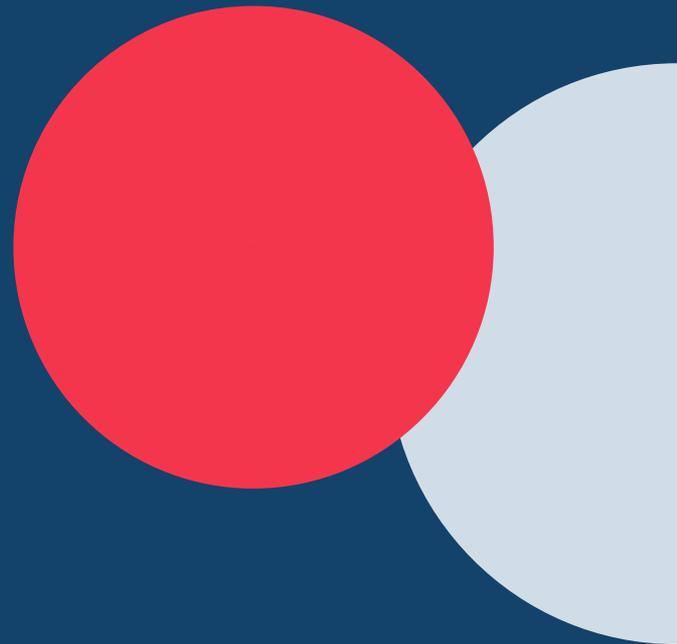
A comparison between current model and NG Models



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
- 2 Specific Stock Collateral (SSC) and Specific Cash Collateral (SCC)**
 - Trail period will be provided for CPs before official launch
 - 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

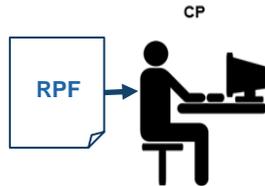
- Allow CPs to simulate / replicate margin requirement for existing portfolio and hypothetical trades
- Facilitate CPs' internal processes related to risk control and margin payment / collection under a relatively sophisticated margin model

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)

	Specific Stock Collateral (SSC) ⁽¹⁾	Specific Cash Collateral (SCC) ⁽¹⁾
Purpose	<ul style="list-style-type: none">To exclude covered Short CNS position from Marks and Margin calculations	<ul style="list-style-type: none">To exclude covered Long CNS position from Marks and Margin calculations
Feature	<ul style="list-style-type: none">On settlement day, SSC is automatically used for stock settlement	<ul style="list-style-type: none">On settlement day, SCC is automatically used for money settlement

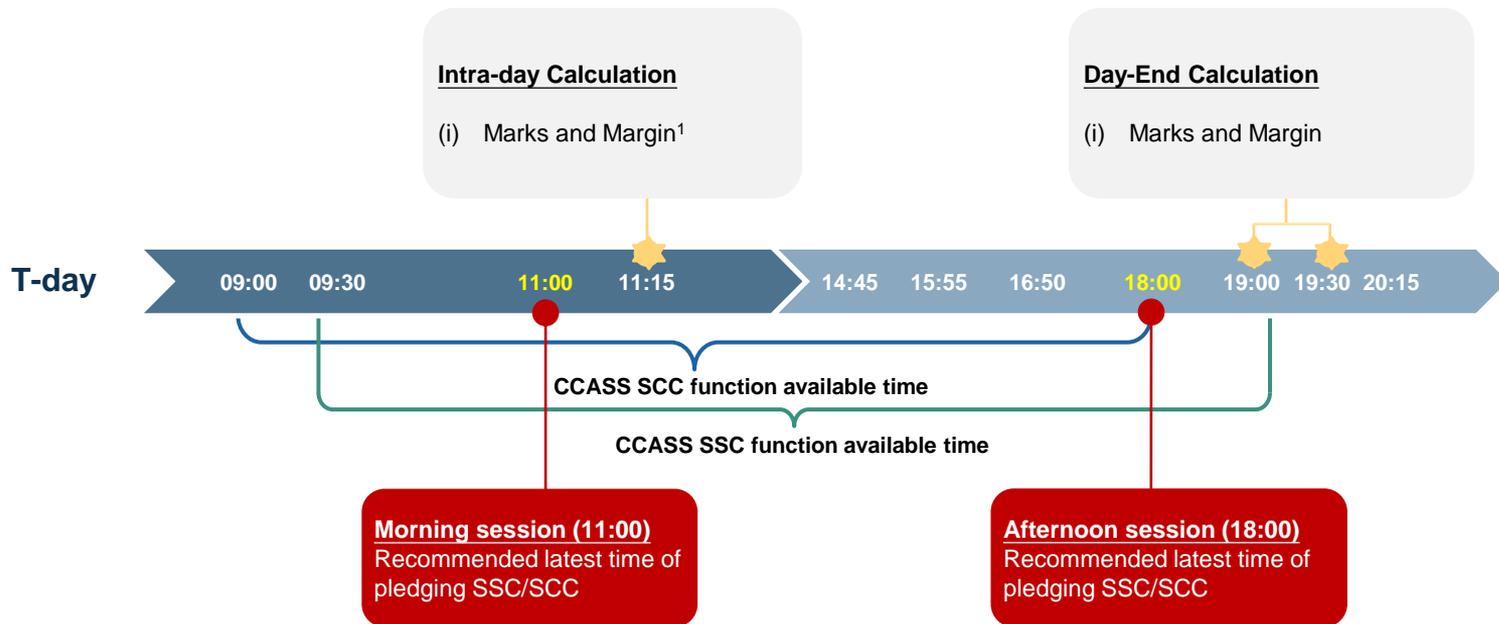
Note: Please refer to Appendix for inputs of SSC and SCC

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



Key clearing activities when placing SSC/SCC



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



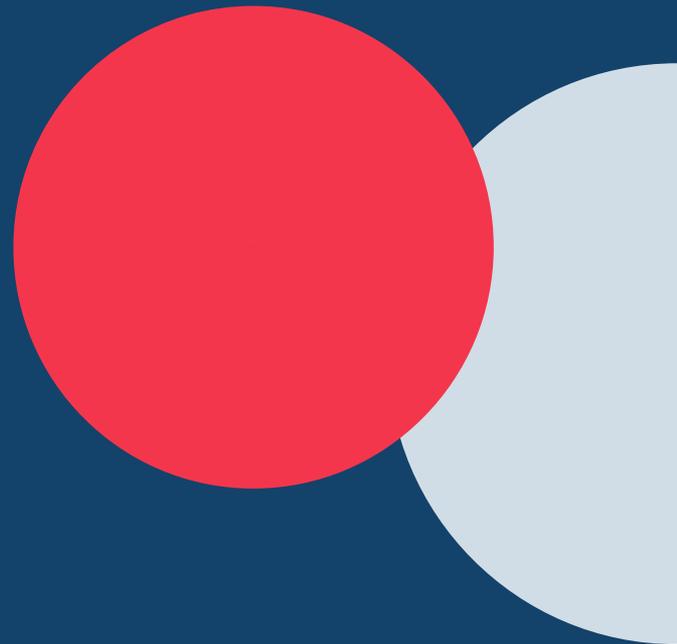
Next Generation Programme Documentation for Clearing Participants

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



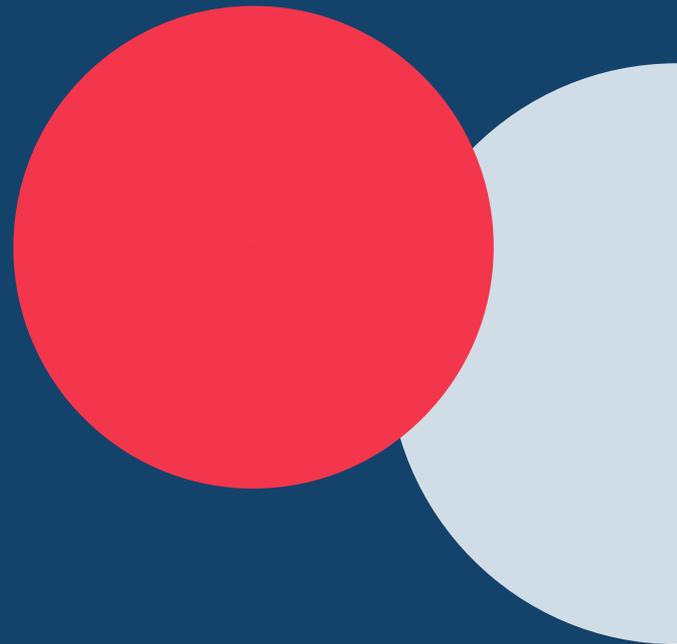
*The above timeline serves for indicative purpose and is subject to changes at HKEX discretion. Clearing Participants shall always refer to the latest announcements from HKEX.

Q&A



Contact us at margin_modelling@hkex.com.hk

Appendix



Contact us at margin_modelling@hkex.com.hk

Tier P: Hang Seng Composite Index (HSCI)-based

1. Go to <https://www.hsi.com.hk/HSI-Net/>
2. Click on “Indexes” tab and then click on “Market-Cap Weighted”

The screenshot shows the Hang Seng Indexes website. The 'Indexes' tab is selected and circled in red. Under 'All Indexes', the 'Market-Cap Weighted' option is also circled in red. Below this, there are sections for 'HONG KONG-LISTED', 'MAINLAND-LISTED', and 'CROSS-MARKET'. The Hang Seng Index is shown with a value of 25,483.09, up 180.81 (+0.71%) as of 15-08-2019 15:10. The Hang Seng China Enterprises Index is shown with a value of 9,923.22, up 57.04 (+0.58%) as of 15-08-2019 15:10.

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

The screenshot shows a list of Hang Seng Composite Indexes. The 'LargeCap', 'MidCap', and 'SmallCap' options are circled in red. The list includes:

- Hang Seng Composite Industry Index - Consumer Goods
- Hang Seng Composite Industry Index - Industrials
- Hang Seng Composite Industry Index - Materials
- Hang Seng Composite Industry Index - Energy
- Hang Seng Composite LargeCap Index
- Hang Seng Composite MidCap Index
- Hang Seng Composite SmallCap Index
- Hang Seng Composite LargeCap & MidCap Index
- Hang Seng Composite MidCap & SmallCap Index
- Hang Seng Foreign Companies Composite Index
- Hang Seng H40 Reference Index
- Hang Seng HK 35
- Hang Seng SCHK ex-AH Companies Index
- Hang Seng SCHK HK Companies Index
- Hang Seng SCHK Mainland China Companies Index
- Hang Seng Stock Connect China AH (H) Index
- Hang Seng Stock Connect Hong Kong Greater Bay Area Index
- Hang Seng Stock Connect Hong Kong Index
- Hang Seng Stock Connect Hong Kong MidCap & SmallCap Index

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

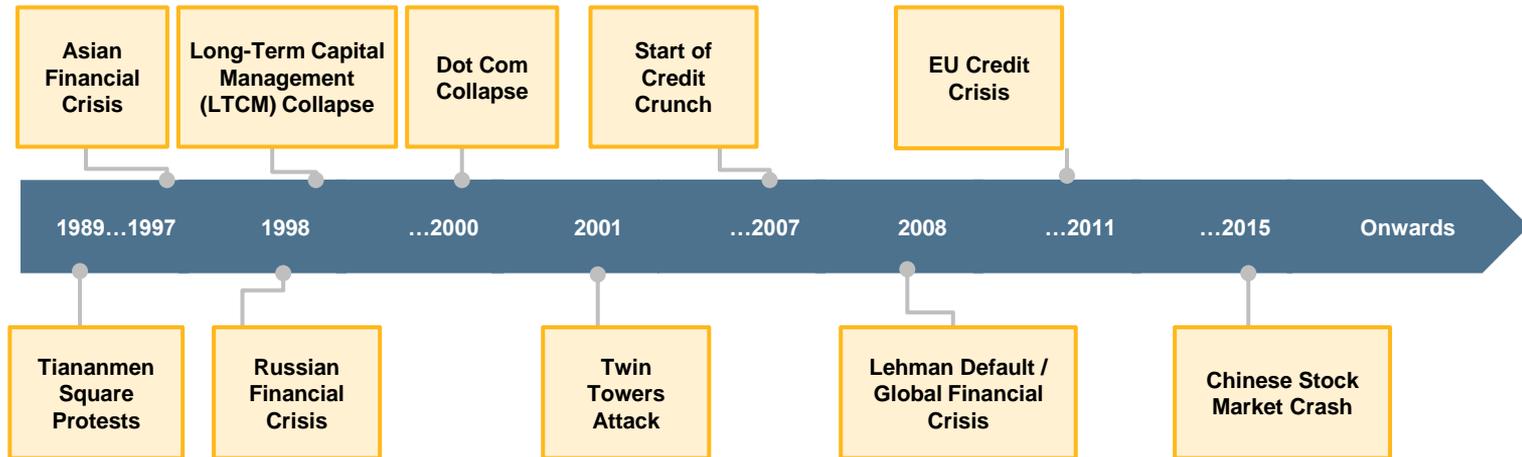
Add-ons

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



Historical stress events

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



Hypothetical stress events

Simulate extreme but plausible events



Financial Sector Shock

Depend heavily on real economy performance and sentiment

- Financials
- Properties & Construction



Telecom Sector Shock

Dominated by a few players with complex business models

- Telecommunication & IT



Energy Sector Shock

Energy crisis leads to price rise of resources

- Energy, Industrials and Utilities
- Transportation
- International Trading



Consumer Sector Shock

Political and economical factors impact consumer expenditure

- Consumer goods and services



Chinese Manufacturing Sector Shock

Shift from industrial to service sector in China

- Manufacturing, material and industrials
- Shanghai Composite Index (SCI)



Brexit

'Hard' or 'soft' Brexit, no agreement on trades, borders and travels yet

- Multinational corporations (especially conglomerates and financial institutions) with operations in the UK



China Debt Crisis

Risky and poorly collateralised shadow banking sector and high local government debt

- Financials
- Properties and construction



Decoupling of China-Hong Kong equity market

HSI and SCI move independently due to Chinese regulatory changes

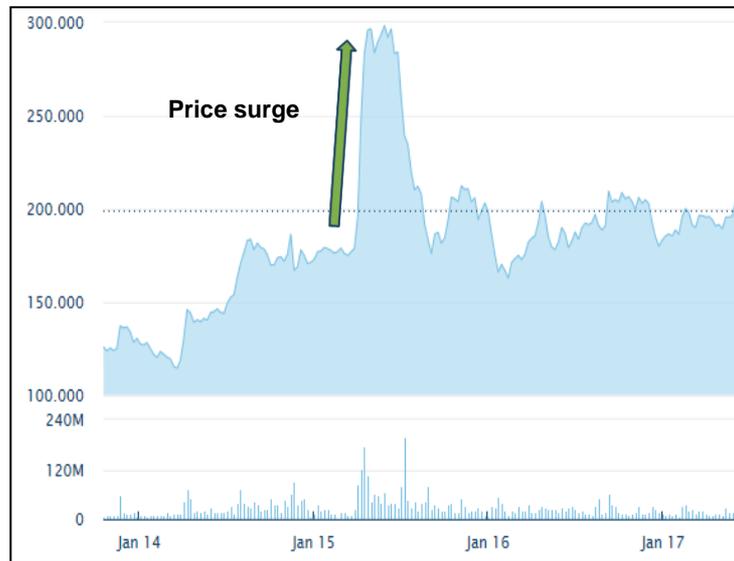
- Hang Seng Index

Theoretical stress events



Idiosyncratic stress events

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



Specific Stock Collateral (SSC) in CCASS

Step 1

Transfer CCASS stock from CCASS stock account to CCMS collateral account



CCASS Files Authorization	Maintain CCASS-To-CCMS Stock Transfer	Site Map	Broadcast Message	Report Download	B0108901
Maintain Firm		Announcement Information	Change Password	Print	KMJA 04
Maintain Participant				Logout	25-May-07 10:13
Maintain Collateral Account					
Mtn Tran A/C to Collateral A/C Mapping					
Maintain Static Data Master	Add CCASS-To-CCMS Stock Transfer Execution				
Maintain Collateral Master	Transfer ID :				10965
Maintain Sec Type Master	CCASS Participant ID :				B01089
Maintain Global Parameters	ISIN or Stock Code :				BMG7774W1010 / 192
Maintain Eligible Instrument Group	CCASS Stock Collateral Control Account :				20
Maintain Haircut Group Rate	CCASS Stock Collateral Control Account Quantity :				1,000
Maintain Clearing House Payment Info	CCASS Source Stock Account :				1
Maintain Calendar	CCASS Source Stock Account Quantity :				1,000
Maintain Function Time	Firm ID :				BF01089
Mtn Cash Collateral Deposit Order	Participant ID :				B01089
Mtn Non-Cash Collateral Deposit Order	Account Type :				HOUSE
Mtn Cash Collateral Withdrawal Order	Account Number :				0001
Mtn Non-Cash Collateral Withdrawal Order	Transfer Quantity :				1,000
Enquiry	Remark :				TUG
Order					
Mtn (Stock Transfer					
Transfer					

[Add Another Record](#) [Help](#)

-2003 RECORD ADDED SUCCESSFULLY

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

(1) Please visit http://www.hkex.com.hk/-/media/HKEX-Market/Services/Clearing/Securities/Infrastructure/CCASS-3-Terminal/CCASS-Terminal-User-Guide-for-Participants/ccms7_1_1.pdf?la=en

Specific Stock Collateral (SSC) in CCASS

Step 2

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



Enquire Deposit Withdrawal Order	Maintain General To Specific Stock Collateral	Site Map	Broadcast Message	Report Download	B0652001
Mtn CCASS-To-CCMS Stock Transfer		Announcement Information	Change Password	Print	KC5C 04
Request Collateral Revaluation	Add General To Specific Stock Collateral Execution			Logout	03-Jun-02 18:32
Confirm for Posting/Collateralisation	Tran Ref :	4621			
Enquire Posting/Collateralisation Status	Firm ID :	BF06520 BF06520			
Generate Manual Posting	Participant ID :	B06520 B06520			
Mtn General to Specific Stock Collateral	Account Type :	HOUSE			
Mtn Specific to General Stock Collateral	Account Number :	0001			
Confirm for Payment	Account Name :	B06520			
Enquire Payment Batch Status	Account Status :	ACTIVE			
Payment Receipt Confirmation	ISIN or Stock Code :	6501 /LN-ISIN06501			
Enquire Collateral Account Balance	Total Available Quantity :	9,800			
Enquire Collateral Inventory	Quantity :	200			
Eng Coll Acct to Trans Acct Relationship	Settlement Date :	01-NOV-02			
Maintain Bank Master	Remark :	TUG			
Mtn Stock/Qty Mapping and Conversion			Change Another Record		Help

-2003 RECORD ADDED SUCCESSFULLY

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

(1) Please visit http://www.hkex.com.hk/-/media/HKEX-Market/Services/Clearing/Securities/Infrastructure/CCASS-3-Terminal/CCASS-Terminal-User-Guide-for-Participants/ccms7_1_3.pdf?la=en

Specific Cash Collateral (SCC) in CCASS

Input instruction for paying the Specific Cash Collateral



Maintain Specific Cash Collateral

Site Map Broadcast Message Report Download
Announcement Information Change Password Print Logout

B0047301
KCFA 02
23-Aug-12 12:48

Add Pending Specific Cash Collateral Detail

Order ID :	29174
Firm ID :	BF00473
Participant ID :	B00473 WINLAND COMPANY
Account Type :	HOUSE
Account Number :	0001
Account Name :	
ISIN or Stock Code :	HK0001000014 / 1 CHEUNG KONG
Status of Order :	PENDING
Currency :	HKD
Payment Method :	<input checked="" type="radio"/> CPI <input type="radio"/> DDI
Amount :	<input type="text" value="10000"/>
Trade Date :	<input type="text" value="020113"/>
Remark :	<input type="text"/>

 [Add Another Record](#) [Help](#)

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



(1) Please visit http://www.hkex.com.hk/-/media/HKEX-Market/Services/Clearing/Securities/Infrastructure/CCASS-3-Terminal/CCASS-Terminal-User-Guide-for-Participants/ccms7_1_12.pdf?la=en