June 2018

NEXT GENERATION RISK MODELS

WORKSHOP

HKEX
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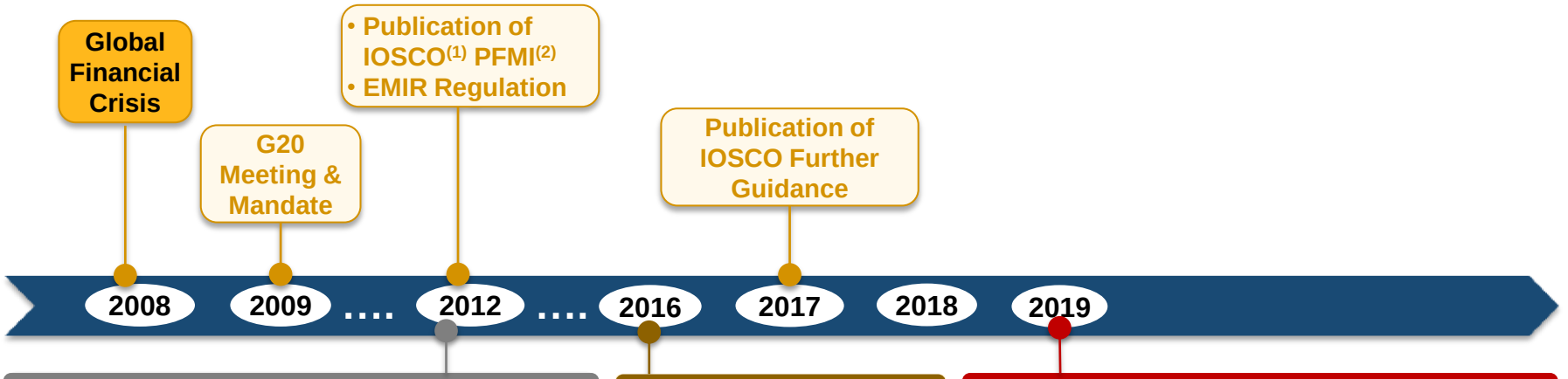
Agenda

1. Background
2. Margin Calculation Overview
3. Margin Calculation – Tier P
4. Margin Calculation – Tier N
5. Final Margin
6. Appendix: Specific Stock Collateral & Specific Cash Collateral

Evolution of Global Regulation and HKSCC Risk Management



Risk Management Reform 1

Background

- Adopt 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 the cash equity market

Framework

- Single rate margin model
- Introduction of dynamic Default Fund (DF) component

Interim Enhancement

- Introduction of margin multiplier

HKSCC NG Risk Models

Background

- Meets evolving international regulatory standards
- Improves safety, integrity and efficiency of HK securities market

Framework

- More "risk-based" approach i.e. margin requirements and DF to better reflect the risk exposure of CP's portfolio

A continuous effort to improve compliance to international regulatory standards and the protection in HK securities market

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

MARGIN CALCULATION OVERVIEW

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Key Enhancements

HKSCC NG Risk Models Framework

Current HKSCC Model

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

HKSCC NG Risk Models

- Margin requirement based on individual stocks volatility
- Allows risk offset among securities
- Two-Tier Model
- Implied Volatility Modelling for DW/CBBC
- Liquidation cost is considered

Enhancements are more risk based and methodology-centric

Two-Tier Initial Margin Model Approach

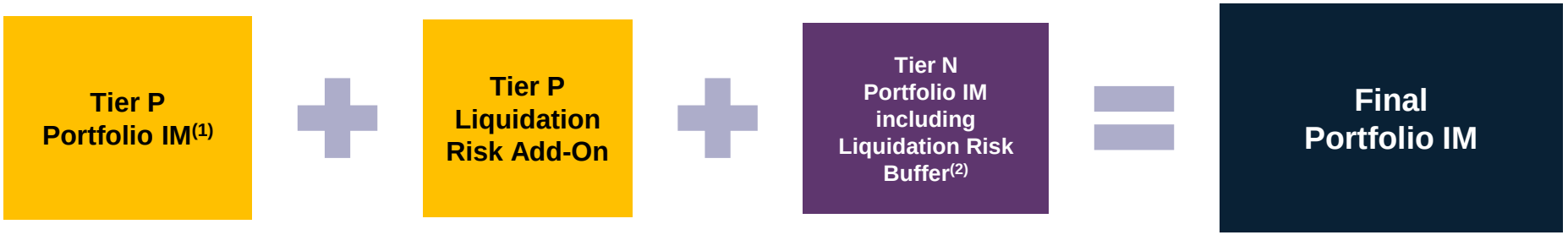
Two-tier : Hang Seng Composite Index (HSCI)-based		**Cash Equities and Structured Products (SP) Handling**
Primary Tier (Tier P)	▪ HSCI Large Cap and Mid Cap constituent stocks ➢ Covers securities which rank in the top 95% of the total market capitalization ▪ All Equity indices ETFs ▪ As at Mar 2018 : ➢ Includes ~450 instruments ➢ Covers 74% of the total market turnover	▪ Portfolio Margining and subject to minimum margin level ▪ Includes SP with Tier P underlying or HSI/ HHI Index
Non-Constituent Tier (Tier N)	▪ All instruments not in Tier P (e.g., GEM stocks, small / micro cap stocks, etc.) ▪ As at Mar 2018: ➢ Includes ~1,950 instruments	▪ Flat rate on higher of Long / Short CNS positions **(similar to current HKSCC method)** ▪ Margin multiplier where appropriate

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

Next Generation Margin Calculation Flow

Final Portfolio Margin

Margin Requirement for CP's portfolio



(1) Tier P margin is subject to minimum margin level
(2) Tier N portfolio IM is subject to margin multiplier and the multiplier is determined by the magnitude of a Clearing Participant's back-testing deficit

MARGIN CALCULATION

TIER P

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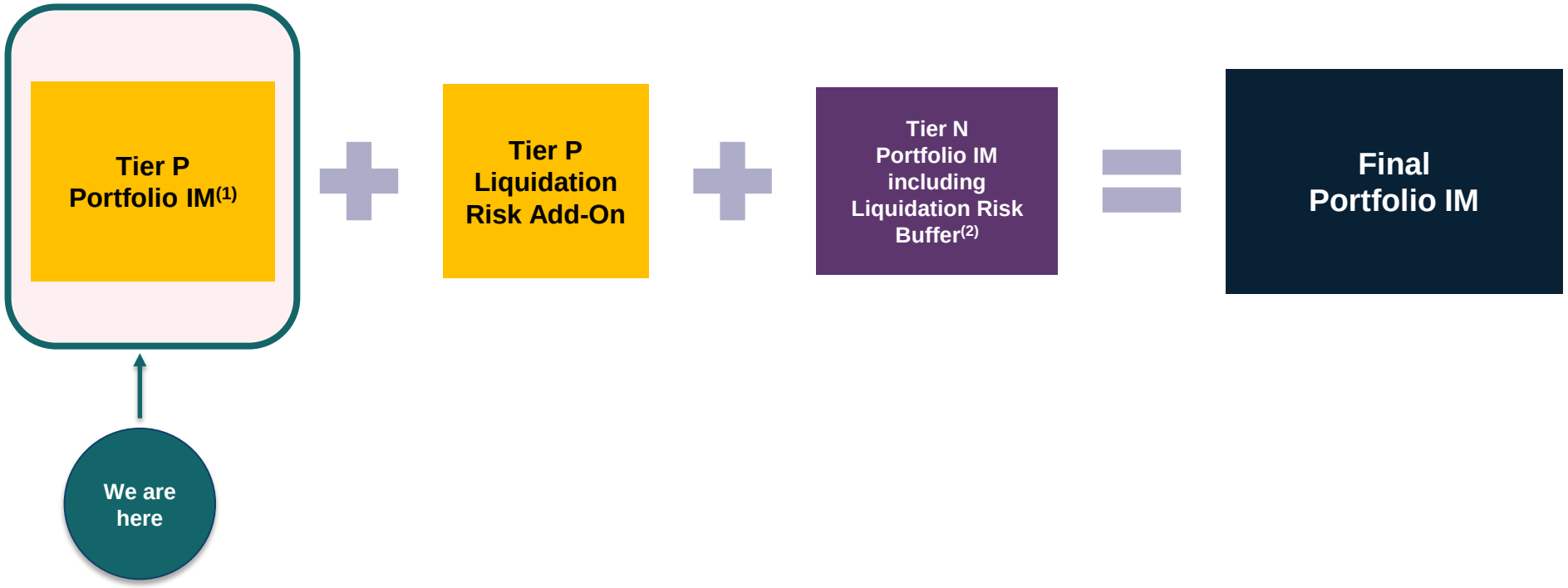
Next Generation Margin Calculation Flow

Final Portfolio Margin

Margin Requirement for CP's portfolio



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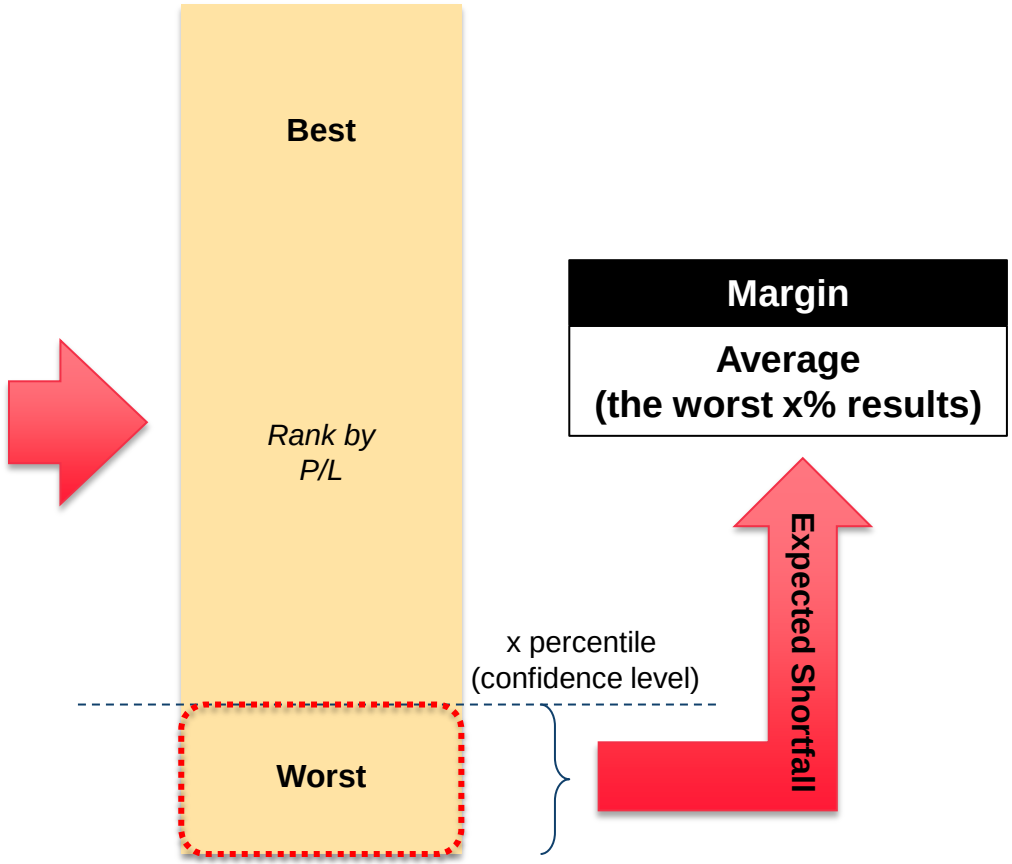
Overview of Tier P Margin Calculation – Scenario Analysis

Scenarios P/L

	1	2	3	…	N
Security 1	(570)	(100)	(840)	…	(10)
Security 2	(580)	870	(730)	…	230
⋮	⋮	⋮	⋮	⋮	⋮
Security K	(590)	90	430	…	(510)

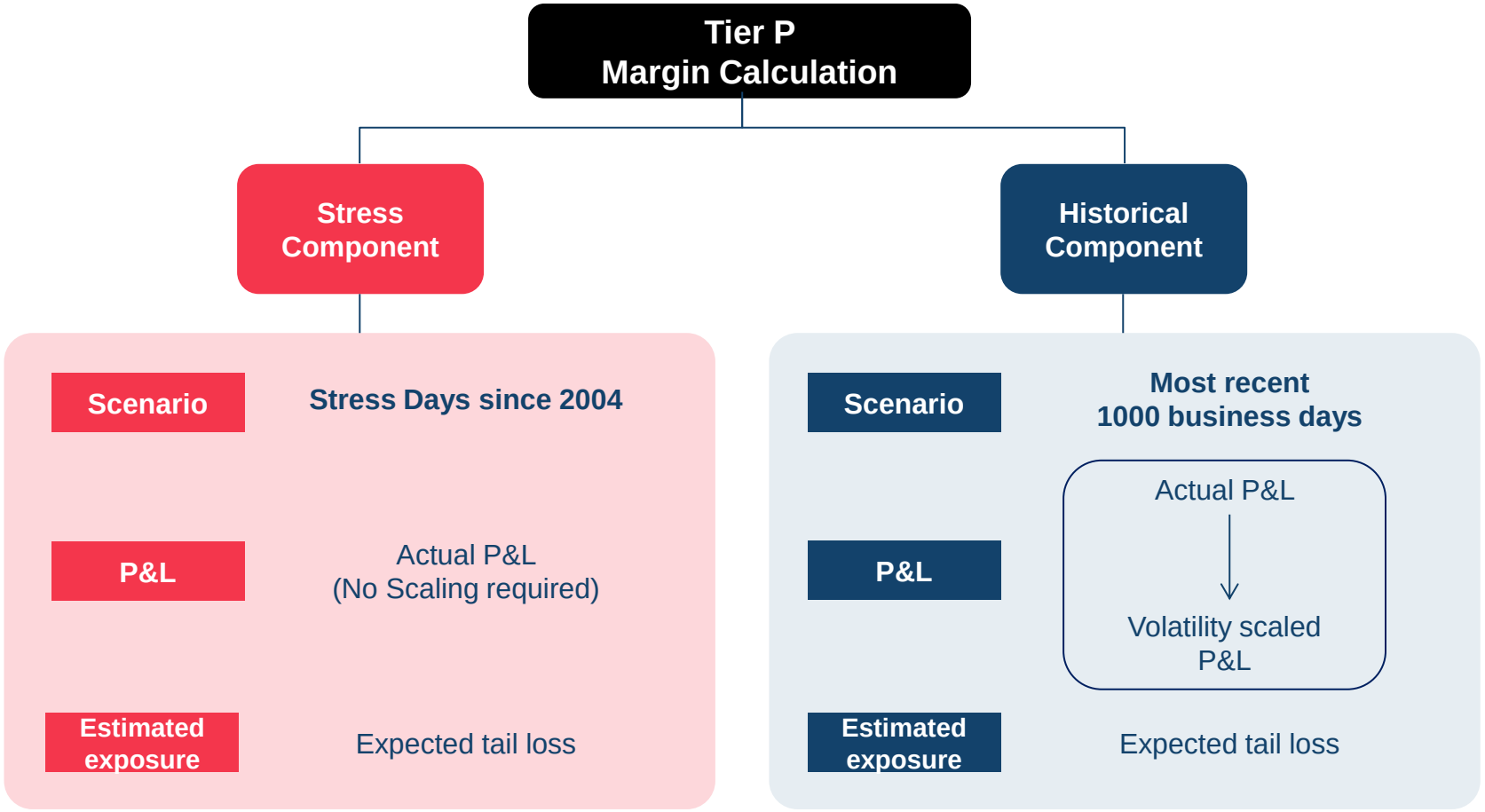
Portfolio Margining

Aggregate	(1740)	860	(1140)	…	290



Margin is quantified by the average of the worst X% scenarios identified under the new model

Overview of Tier P Margin Calculation – Two Components



Tier P Margin is calculated by estimating exposure from both Historical and Stress components

Stress Component

❶ Identify Scenarios

❷ Calculate Scenarios Returns
(Security Return x position quantity)

❸ Portfolio Margining

❹ Average of the Worst Scenarios

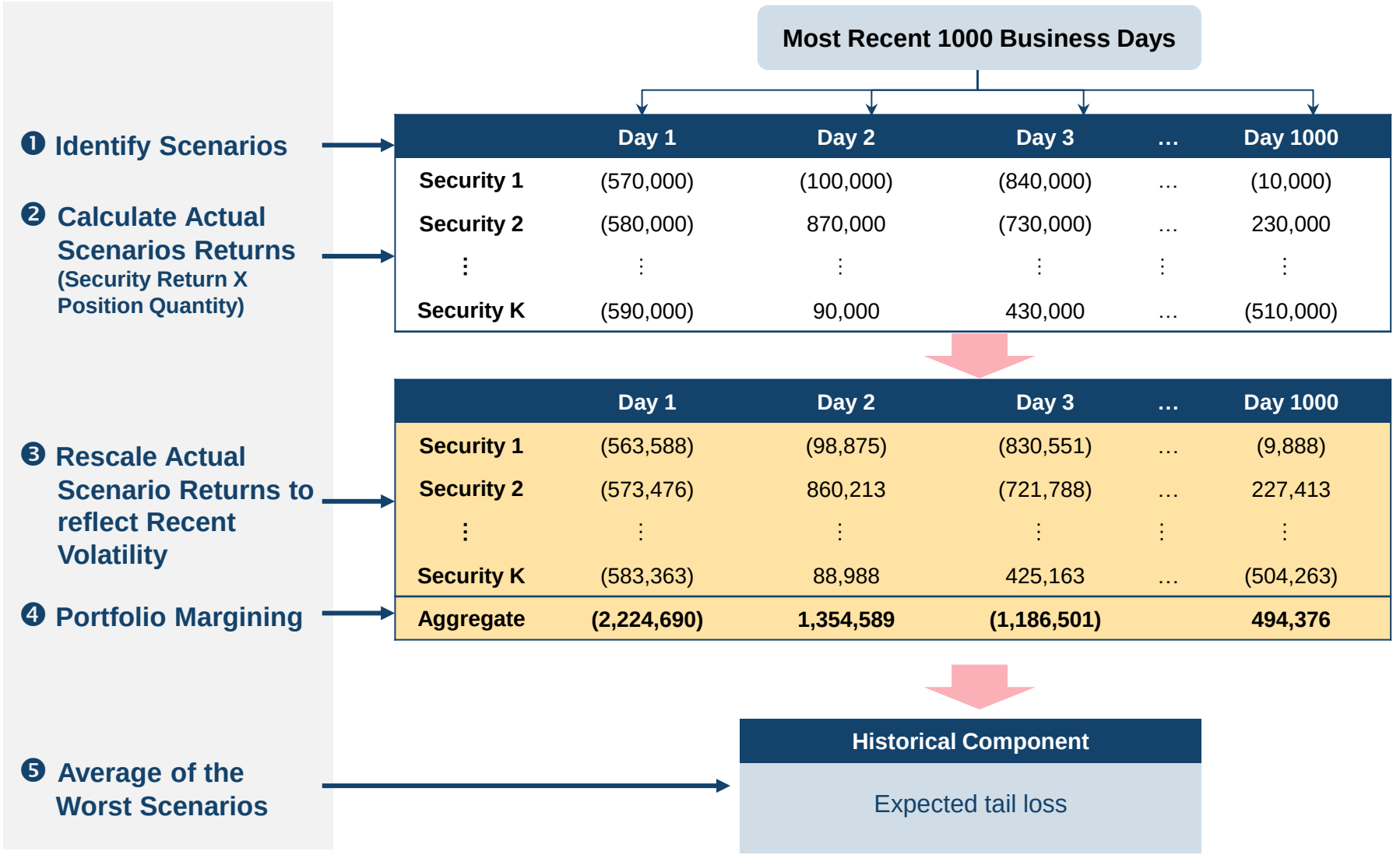
Stress dates since 2004

	Global Financial Crisis	EU Credit Crisis	China Stock Market Crash	…	Stress Scenario x
Security 1	(1,260,000)	(1,010,000)	(2,030,000)	…	(2,520,000)
Security 2	(2,390,000)	(680,000)	(1,280,000)	…	(930,000)
⋮	⋮	⋮	⋮	⋮	⋮
Security K	(410,000)	(1,590,000)	(1,020,000)	…	(2,410,000)
Aggregate	**(6,950,000)**	**(3,210,000)**	**(3,870,000)**		**(7,910,000)**

Stress Component

Expected tail loss

Historical Component



	Day 1	Day 2	Day 3	…	Day 1000
Security 1	(570,000)	(100,000)	(840,000)	…	(10,000)
Security 2	(580,000)	870,000	(730,000)	…	230,000
⋮	⋮	⋮	⋮	⋮	⋮
Security K	(590,000)	90,000	430,000	…	(510,000)

	Day 1	Day 2	Day 3	…	Day 1000
Security 1	(563,588)	(98,875)	(830,551)	…	(9,888)
Security 2	(573,476)	860,213	(721,788)	…	227,413
⋮	⋮	⋮	⋮	⋮	⋮
Security K	(583,363)	88,988	425,163	…	(504,263)
Aggregate	**(2,224,690)**	**1,354,589**	**(1,186,501)**		**494,376**

Exception Handling: Missing Return

Fallback mechanism

Exception handling for Tier P security with insufficient data or missing return

Proxy Index Return

×

Volatility Multiplier

=

Fallback Tier P Return

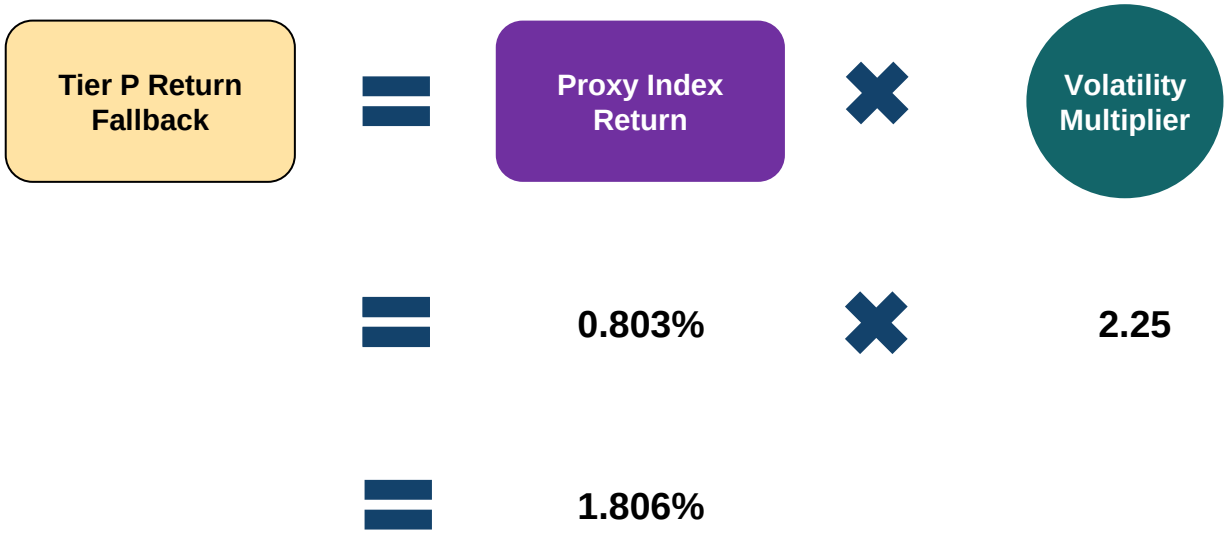
Volatility Multiplier 3x will be used for IPO

****Proxy index is the one that best matches with the nature of the Tier P security that requires fallback***

Exception Handling: Missing Return

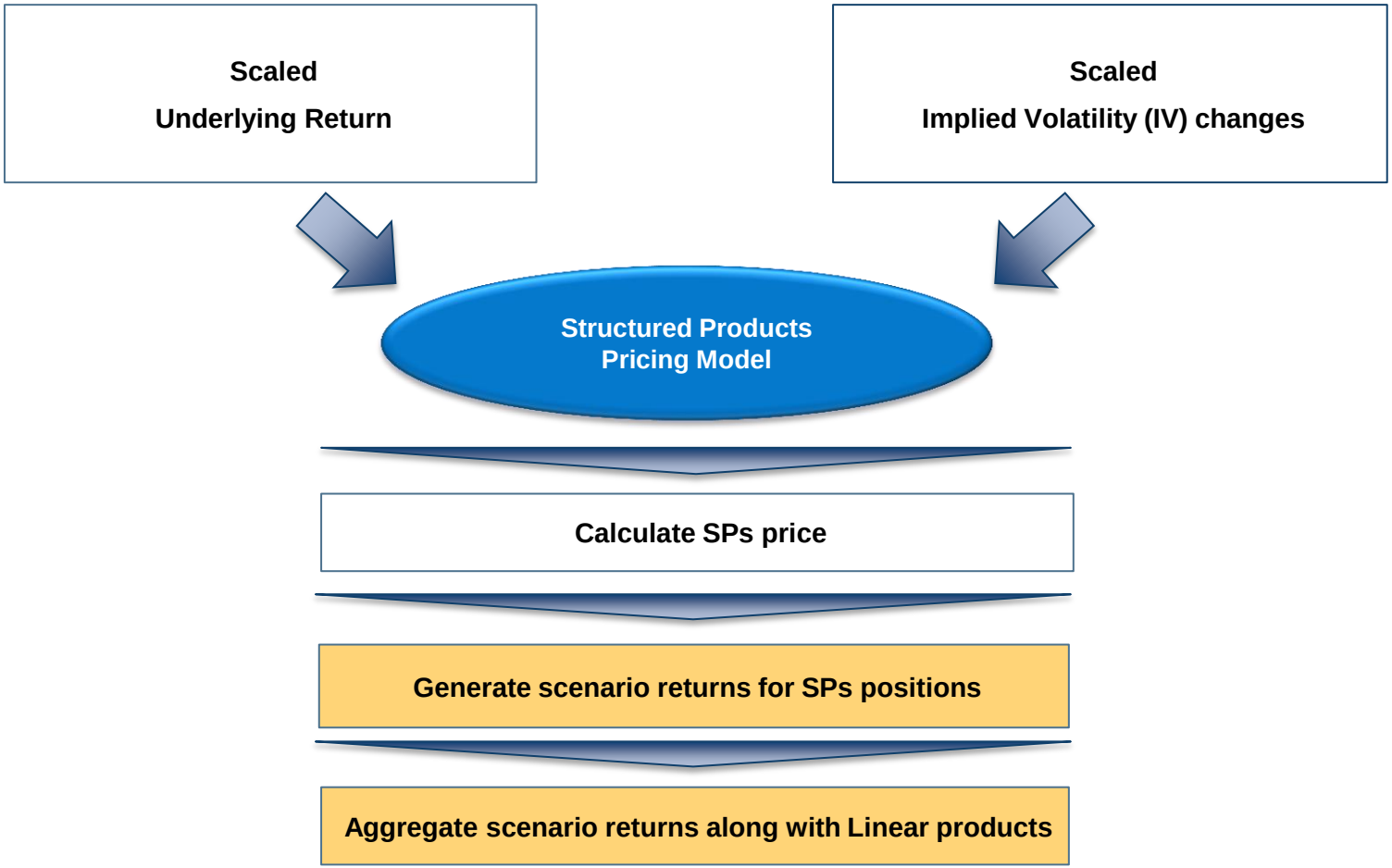
Example: Calculation of proxy return for security with missing return

	Security 1			Proxy Index	
Day	**Last Price**	**Daily Return**	**EWMA σ**	**Daily Return**	**EWMA σ**
804	Suspend	Missing Return	3.185%	-1.129%	1.423%
803	Suspend	**Missing Return**	3.218%	**0.803%**	1.438%
802	5.53	0.000%	**3.268%**	0.862%	**1.452%**
801	5.53	-0.162%	3.318%	-0.602%	1.471%

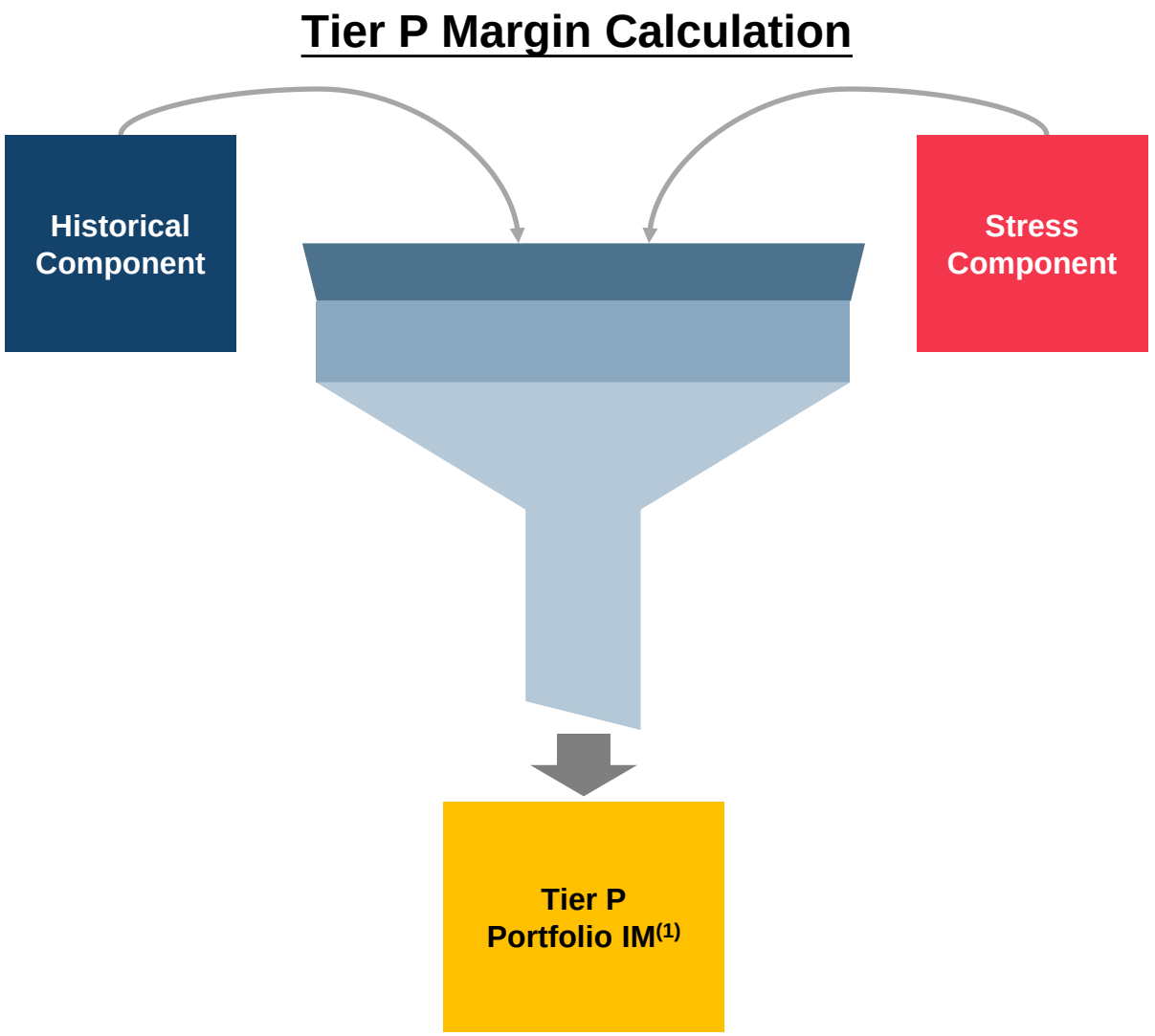


Pricing of Structured Products (SPs)

Additional parameter input (i.e. underlying's Implied Volatility) is required for SP pricing



Tier P Margin

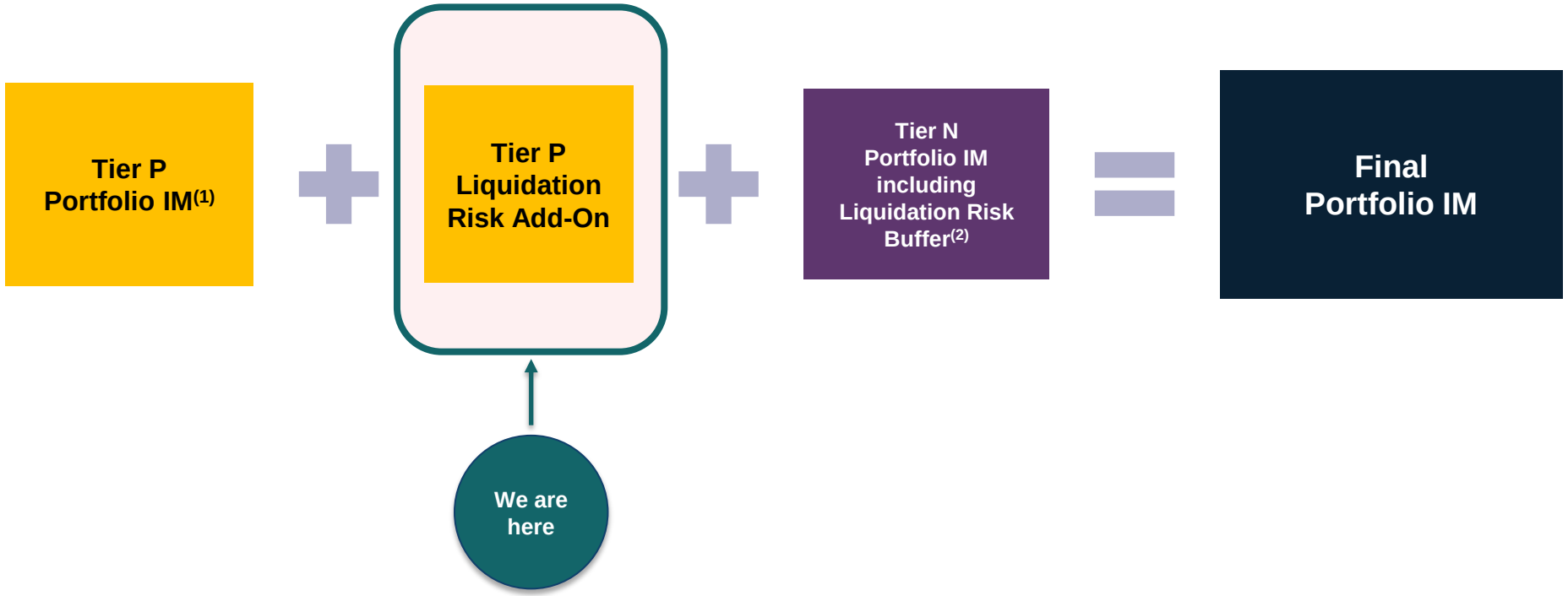


(1) Tier P margin is subject to minimum margin level

Next Generation Margin Calculation Flow

Final Portfolio Margin

Margin Requirement for CP's portfolio



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Liquidation Risk Add-On

Liquidation Risk Add-on	*Additional margin to cover the additional cost of portfolio handling in the default management process*

Tier P	Tier N
• Primarily reference the bid-ask spread and daily trading volume of instruments • Add-on will be triggered when CNS positions exceed the defined thresholds of trading volume	• Covered by the flat rate margin

More consistent with industry best practice

Liquidation risk add-on for Tier P instruments

Liquidation Risk Add-on Tier P

The Total Liquidation risk Add-on cost is the combination of the cost of liquidating concentrated position and the cost of hedging the portfolio

Type	**Cost of liquidating individual concentrated positions**	**Cost of Portfolio hedging**
Trigger thresholds	**Delta-equivalent Positions > Average Daily Trading Volume (ADTV)**	**Required Hedging Positions > ADTV**
Add-on Charge rate	**Bid-ask spread of concentrated positions' sector**	**Bid-ask spread of hedging positions**
Method	**Excess Volume x Bid-ask spread $_{sector}$**	**Excess Volume x Bid-ask spread $_{hedge}$**

Liquidation risk add-on calculation flow for tier P instruments

Cost of liquidating concentrated positions

Delta equivalent positions of instrument exceeding the ADTV threshold × *Price of instrument* × *Corresponding bid-ask spread by Bucket*

+

Cost of portfolio hedge

Positions of hedging position exceeding ADTV threshold × Price of hedge position × *Corresponding bid-ask spread rate*

CP's concentrated indiviual positions

Stock 1						
11,919,371	*x*	*0.19*	*x*	*0.52%*	=	*11,403*
Stock 2						
3,099	*x*	*6.15*	*x*	*0.50%*	=	*95*
Stock 3						
981,223	*x*	*5.35*	*x*	*0.49%*	=	*25,562*
				Total		*37,062*

CP 's required hedging portfolio

856,565	*x*	*21*	*x*	*0.26%*	=	*46,768*

Total Liquidation risk add-on
= 37,062 + 46,768 = 83,830

MARGIN CALCULATION

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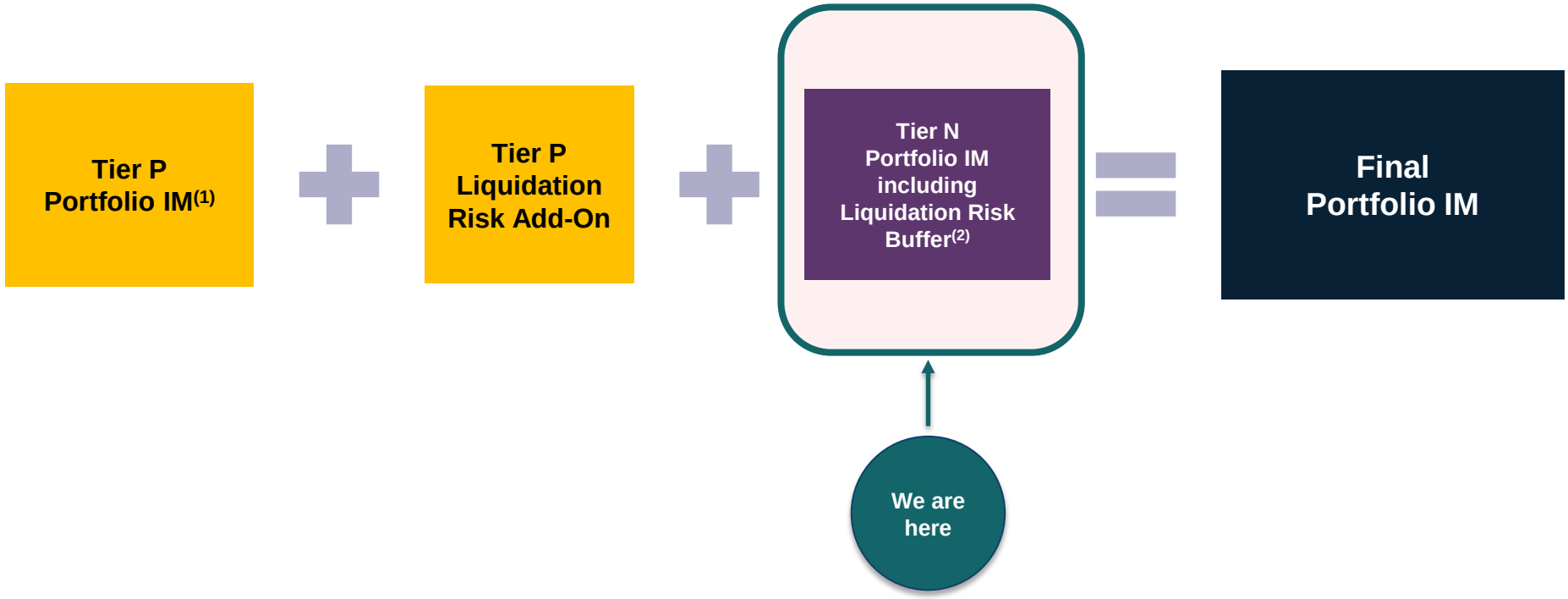
Next Generation Margin Calculation Flow

Final Portfolio Margin

Margin Requirement for CP's portfolio



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Calculation of Tier N Margin Requirement

Tier N

Margin Methodology

Flat Rate
e.g. 12%

With Liquidation Risk Buffer

×

Higher of Long/ Short Tier N CNS

Stock Code	L/S	Quantity	Tier	Market Value
0057.HK	Long	70000	N	1,435,000
0709.HK	Long	5000	N	210,500
8103.HK	Long	20000	N	338,000
Long CNS				1,983,500
0715.HK	Short	100000	N	-770,000
0855.HK	Short	23000	N	-1,196,000
Short CNS				-1,966,000

=

Tier N Portfolio IM(1)

238,020

Tier N Flat Rate reference:

- **Hang Seng Related Indices**
- **Margin Floor**

Tier N Flat rate is determined by reference to volatilities of Hang Seng related indices and is subject to margin floor

(1) Tier N portfolio IM may subject to margin multiplier
*All above figures are hypothetical for illustrative purpose only

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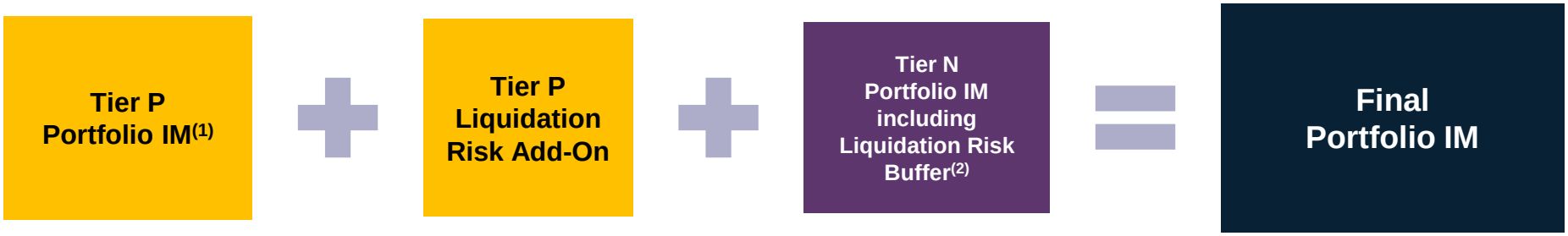
Next Generation Margin Calculation Flow

Final Portfolio Margin

Margin Requirement for CP's portfolio



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Contact us at

margin_modelling@hkex.com.hk

for further questions/feedback

APPENDIX:
SPECIFIC STOCK COLLATERAL
& SPECIFIC CASH COLLATERAL

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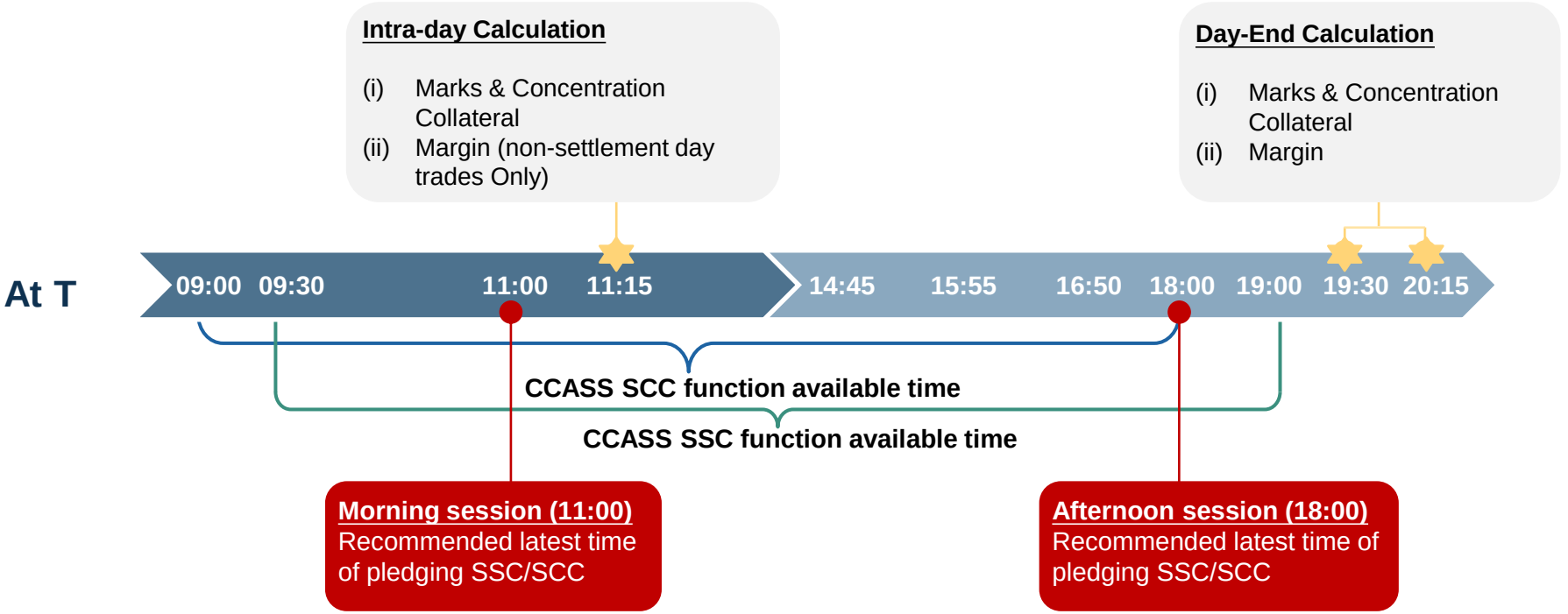
Overview of Specific Stock Collateral & Specific Cash Collateral

	Specific Stock Collateral (SSC) (1)	Specific Cash Collateral (SCC) (1)
Purpose	▪ Reduce a part or whole of CNS position for Margin calculation ▪ Exclude the covered **short** CNS position from Marks, Concentration Collateral and additional cash collateral calculations	▪ Exclude the covered **long** CNS position from Margin, Marks, Concentration Collateral and additional cash collateral calculations
Features	▪ On settlement day, SSC is automatically used for stock settlement	▪ On settlement day, SCC is automatically transferred to money ledger for money settlement

(1) General Rules of CCASS, Chapter 36 Risk Management Measure - CNS System, 3601A Margin

Timeline of Key Clearing Activities



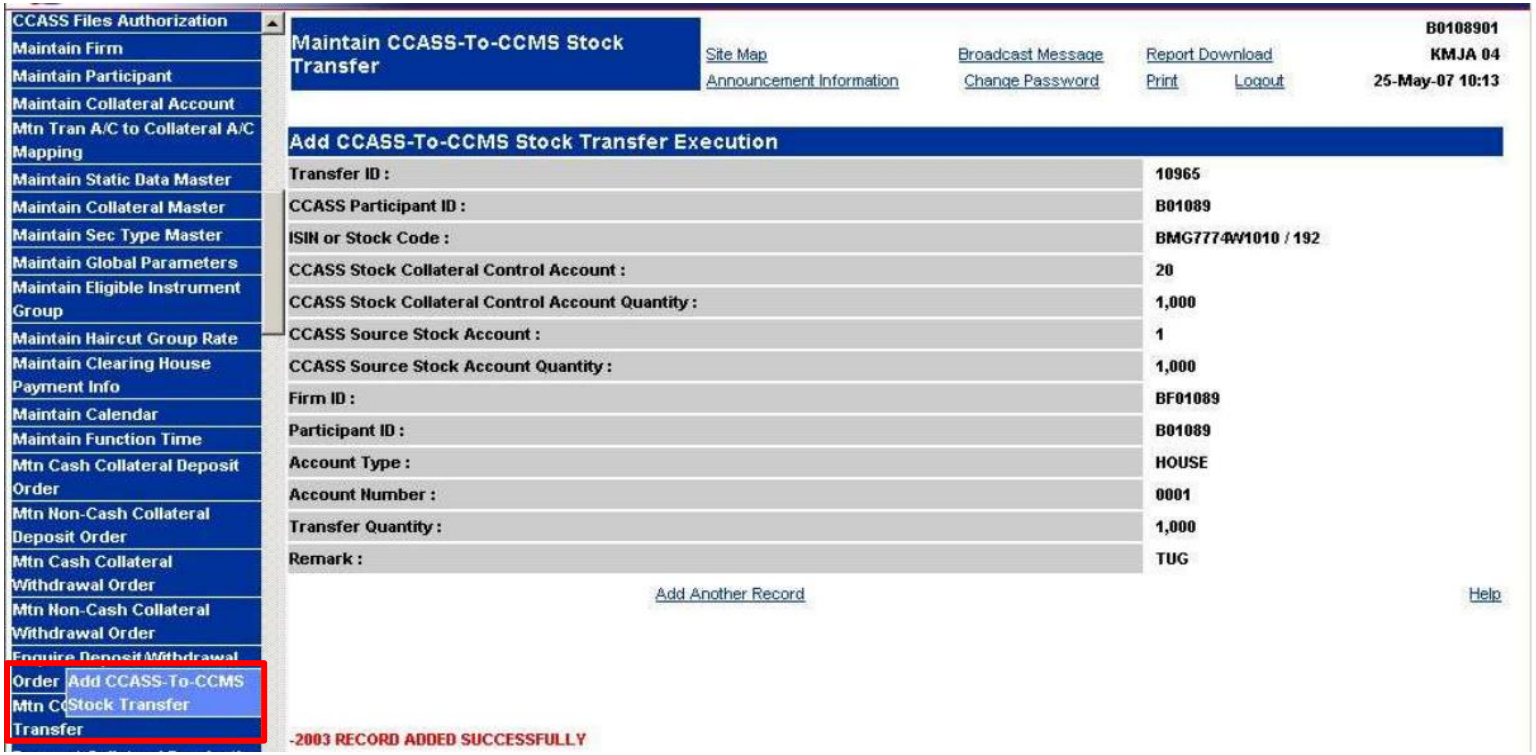
SSC/SCC reduces margining positions and the covered CNS position is exempted from the Marks & Margin calculation if posted before the cut-off time

Operation of Specific Stock Collateral (SSC)

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

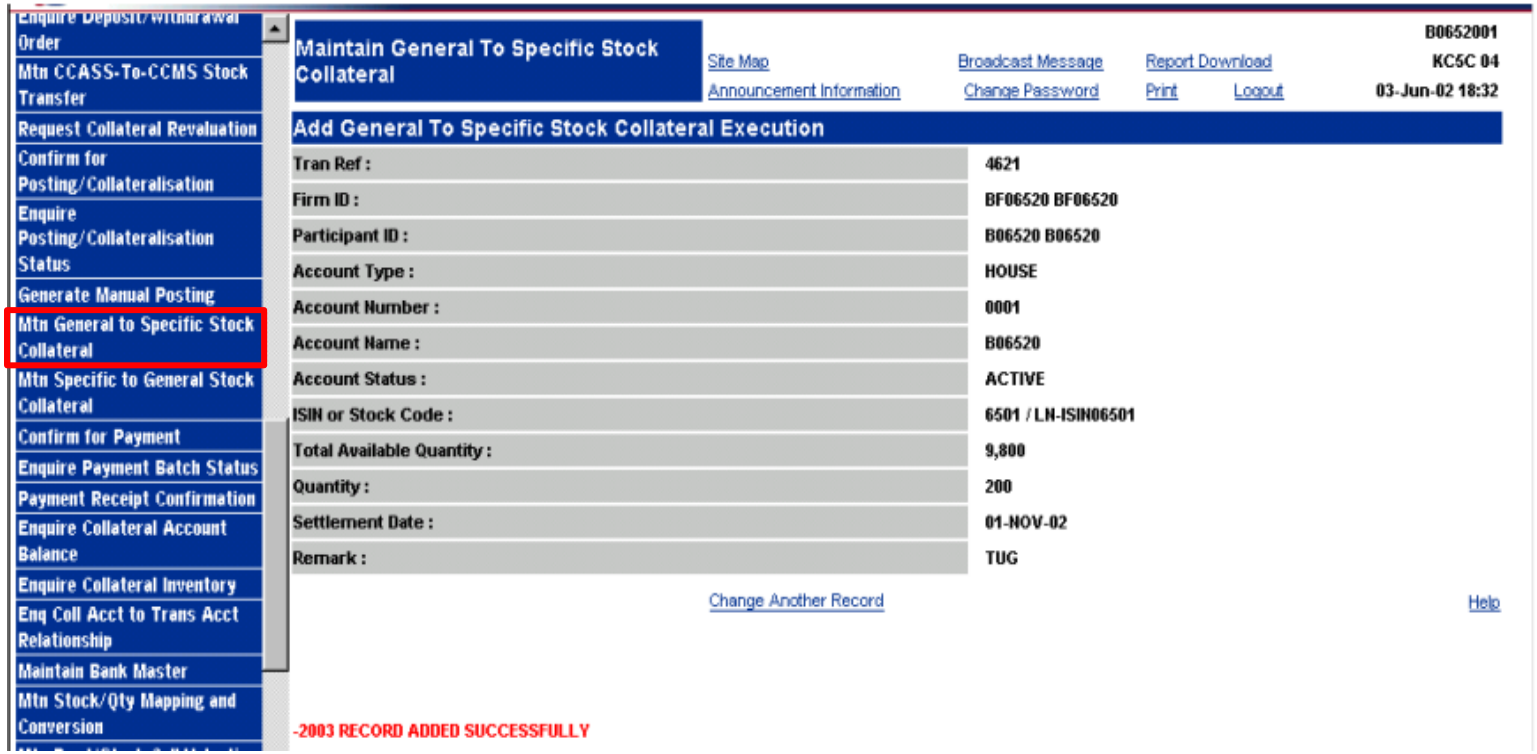
(1) Please visit http://www.hkex.com.hk/-/media/HKEX-Market/Services/Clearing/Securities/Infrastructure/CCASS-3-Terminal/CCASS-Terminal-User-Guide-for-Participants/ccms7_1_1.pdf?la=en

Operation of Specific Stock Collateral (SSC)

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**



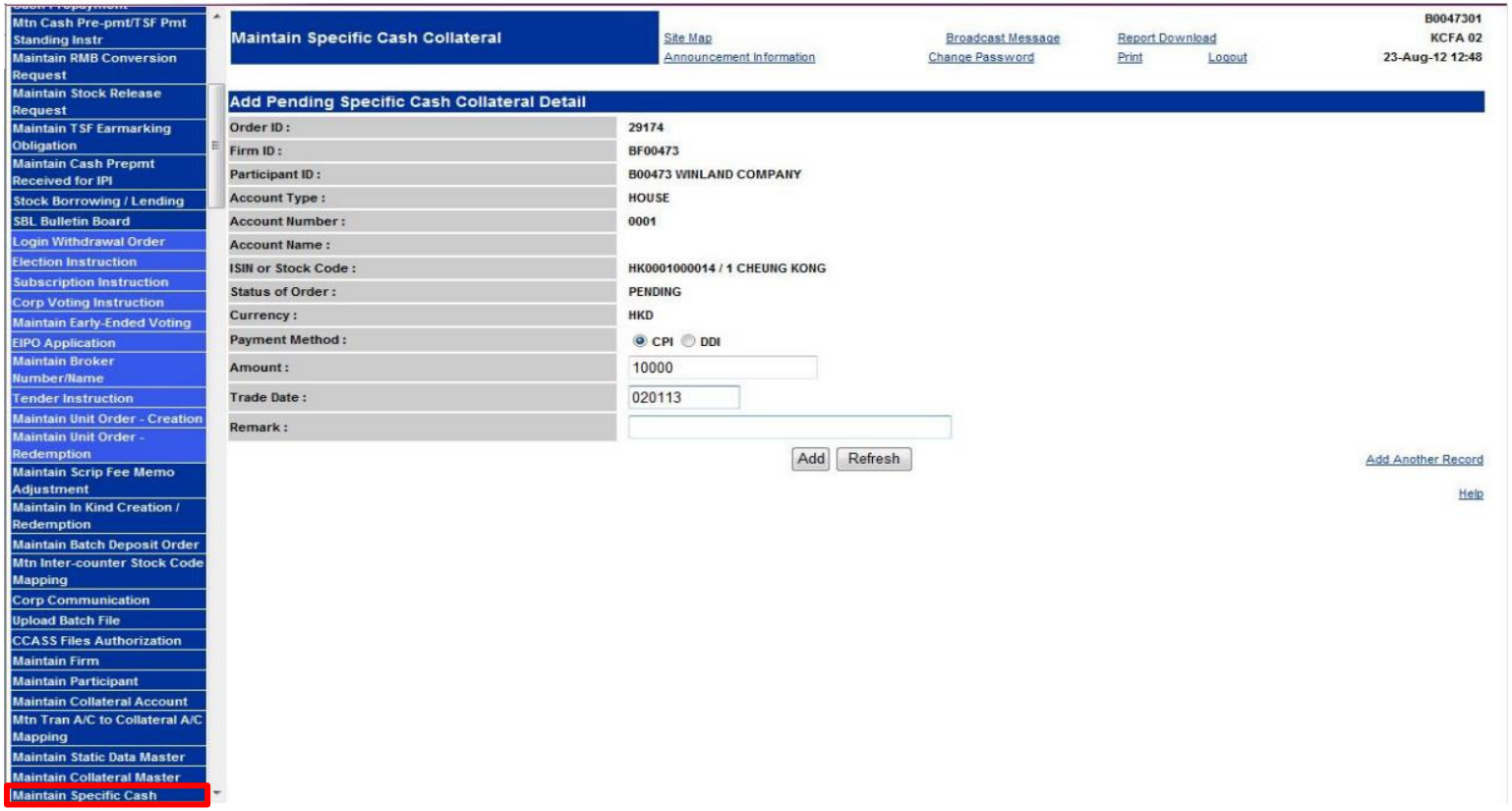
For more information, please refer to CCASS terminal user guide(1) Chapter 8.3.3 General to Specific Stock Collateral Maintenance.

(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

Operation of Specific Cash Collateral (SCC)

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**



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