Consultation paper | CP 19.01

June 2019

Market Risk

HONG KONG MONETARY AUTHORITY
香港金融管理局

Contents

I INTRODUCTION

1 Purpose

1 This consultation paper sets out the Hong Kong Monetary Authority's (HKMA) proposal for revising the current regulations on the market risk capital charges in the Banking (Capital) Rules (BCR).

2 The HKMA invites comments on the proposal of this paper by 30 September 2019.

3 Following the close of this consultation, the HKMA will further refine its proposals taking into account the feedback received.

2 Background

4 In January 2019, the Basel Committee on Banking Supervision (BCBS) issued its revised *Minimum capital requirements for market risk*, commonly referred to as the "*Fundamental Review of the Trading Book*" (FRTB)[1]. The framework aims at addressing the structural shortcomings of the market risk framework under the Basel 2.5 regime. It follows up on an original version published in January 2016[2] and includes a set of amendments to address issues that have been identified through input from a wide spectrum of stakeholders. It also takes into account extensive feedback received on a consultative document[3] issued by the BCBS in March 2018 and it is calibrated based on the most recent set of the BCBS' quantitative impact study (QIS) data.

5 This consultation paper outlines the HKMA's plans for implementing the revised market risk framework in Hong Kong. It covers the new Standardised Approach, the new Internal Models Approach, the Simplified Standardised Approach, requirements related to the boundary between the trading book and banking book, as well as details on the qualifying criteria for using de-minimis exemptions.

6 The HKMA intends to implement the revised market risk framework closely aligned with the standards issued by the BCBS. Therefore, the wordings in this consultation paper follow closely the standards set out in the *Minimum capital requirements for market risk*.

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1 http://www.bis.org/bcbs/publ/d457.htm
2 http://www.bis.org/bcbs/publ/d352.htm
3 http://www.bis.org/bcbs/publ/d436.htm

3 Scope of Application

7 Under the revised market risk framework, market risk is defined as the risk of losses arising from movements in market prices. The risks subject to market risk capital charges include:

- Interest rate risk, credit spread risk, equity risk, foreign exchange risk, commodities risk and default risk for trading book instruments; and
- Foreign exchange risk and commodities risk for banking book instruments.

8 All transactions, including forward sales and purchases, should be included in the calculation of capital charges as of the date on which they were entered into. Although regular reporting will in principle take place only at intervals, an authorized institution (AI) is expected to:

- manage its market risk in such a way that the capital charges are being met at any time. The AI must not window-dress by showing systematically lower market risk positions on reporting dates; and
- maintain strict risk management systems to ensure that intraday exposures are not excessive. If an AI fails to meet the capital charges at any time, it should take immediate measures to rectify the situation.

9 A matched currency risk position will protect an AI against loss from movements in exchange rates, but will not necessarily protect its capital adequacy ratio. If the AI has its capital denominated in HKD and has a portfolio of foreign currency assets and liabilities that is completely matched, its capital/asset ratio will fall if HKD depreciates. By running a short risk position in HKD, the AI can protect its capital adequacy ratio, although the risk position would lead to a loss if HKD were to appreciate. The AI is allowed to protect its capital adequacy ratio in this way and exclude certain currency risk positions from the calculation of net open currency risk positions, subject to meeting each of the following conditions:

- The risk position is taken or maintained for the purpose of hedging partially or totally against the potential that changes in exchange rates could have an adverse effect on its capital ratio.
- The risk position is of a structural (i.e. non-dealing) nature such as positions stemming from:
  - investments in affiliated but not consolidated entities denominated in foreign currencies; or
  - investments in consolidated subsidiaries or branches denominated in foreign currencies.

- The exclusion is limited to the amount of the risk position that neutralises the sensitivity of the capital ratio to movements in exchange rates.
- The exclusion from the calculation is made for at least six months.
- The establishment of a structural FX position and any changes in its position should follow the AI's risk management policy for structural FX positions. This policy should be pre-approved by the HKMA.
- Any exclusion of the risk position needs to be applied consistently, with the exclusionary treatment of the hedge remaining in place for the life of the assets or other items.
- The AI should document and have available for supervisory review the positions and amounts to be excluded from market risk capital charges.

10 No FX risk capital charge need apply to positions related to items that are deducted from an AI's capital when calculating its capital base.

11 Holdings of capital instruments that are deducted from an AI's capital or risk-weighted at 1,250% are not allowed to be included in the market risk framework. This includes:

- holdings of the AI's own eligible regulatory capital instruments; and
- holdings of other AIs', securities firms' and other financial entities' eligible regulatory capital instruments, as well as intangible assets, where the HKMA requires that such assets are deducted from capital.

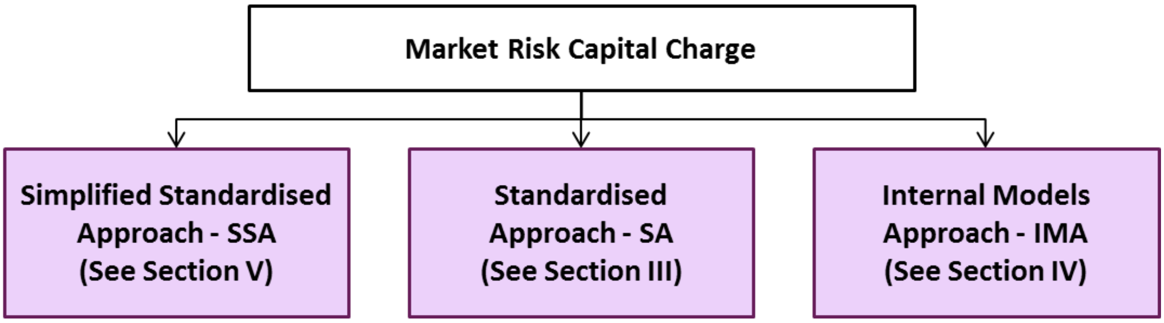
12 As usual, for the purposes of calculating the capital adequacy ratio of an AI that has one or more than one subsidiary, the HKMA may require the capital adequacy ratio of the AI to be calculated:

- on an unconsolidated basis in respect of the AI;
- on a consolidated basis in respect of the AI and one or more of such subsidiaries; or
- on an unconsolidated basis in respect of the AI and on a consolidated basis in respect of the AI and one or more of such subsidiaries.

13 An AI should include the net short and net long risk positions, no matter where they are booked. However, there will be circumstances in which the HKMA may demand that the individual risk positions be taken into the measurement system without any offsetting or netting against other risk positions. This may be needed, for example, where there are obstacles to the quick repatriation of profits from a foreign subsidiary or where there are legal and procedural difficulties in carrying out the timely management of risks on a consolidated basis.

4 Approaches to Calculation of Market Risk

14 For the purpose of determining the risk-weighted amount for market risk, all locally incorporated AIs will be required to calculate the market risk capital charge in accordance with the new market risk standards, except for locally incorporated AIs mentioned in paragraph 16. AIs may choose to calculate the market risk capital charge under the Standardised Approach, subject to approval the Internal Models Approach or the Simplified Standardised Approach.



15 All AIs, except for those that are allowed to use the Simplified Standardised Approach as set out in section V or qualify for the de-minimis exemption as set out in paragraph 16, should calculate the capital charges using the Standardised Approach. AIs that have an HKMA approval to use the Internal Models Approach for market risk capital charges should also report the capital charges calculated as set out below.

- An AI that uses the Internal Models Approach for any of its trading desks should also calculate the capital charge under the Standardised Approach for all instruments across all trading desks, regardless of whether those trading desks are eligible for the Internal Models Approach.
- In addition, an AI that uses the Internal Models Approach for any of its trading desks should calculate the Standardised Approach capital charge for each trading desk that is eligible for the Internal Models Approach as if that trading desk were a standalone regulatory portfolio (i.e. with no offsetting across trading desks). This will serve as an indication of the fallback capital charge for those desks that fail the eligibility criteria for inclusion in the AI's internal model as outlined in section IV.

16 The HKMA intends to continue allowing de-minimis exemptions for AIs with market risk positions permanently below (i) HKD 60 million and (ii) 6% of total assets in accordance with section 22 of the BCR. An AI that qualifies for the de-minimis exemption shall not include market risk in the calculation of its capital adequacy ratio.

17 The HKMA will incorporate the new standards into the BCR either through an amendment of Part 8 of the BCR or by replacing Part 8 with a new Part. The revised framework will also necessitate some consequential changes to other Parts of the BCR. Where appropriate, technical provisions may be set out in a new Code of Practice to be issued under section 97M of the Banking Ordinance.

5 Implementation Timeline

18 The HKMA intends to implement the new standards by 1 January 2022, in line with the BCBS timeline. Locally incorporated AIs would be required to start regulatory reporting based on the new standards starting from 1 January 2022. The first regulatory reporting date would be 31 January 2022.

	Legislative changes	Regulatory reporting
Q4 2020	Preliminary consultation on the proposed amendments to the BCR	
Q2 2021	Statutory consultation on draft amendments to the BCR	Industry consultation on draft revised CAR return and completion instructions
H2 2021	• Finalisation of revised rules taking into account industry comments • Gazetting of revised rules and table the rules at the Legislative Council for negative vetting	
1 January 2022	Revised BCR coming into effect	
January 2022		Launching of revised CAR return and completion instructions

Table 1

19 As the revised market risk capital framework in effect represents a significant overhaul of the current market risk capital framework, it is likely to have impacts on, among other things, the capital charges, systems, data and resources of AIs, particularly for those with material market risk exposures. All relevant AIs are therefore strongly recommended to consider the implications of implementation for

their institutions, and start preparing for the local implementation of the revised framework in 2019.

6 Application and Approval Process

20 AIs planning to adopt the Internal Models Approach with effect from 1 January 2022 should start discussing their implementation plans with their usual supervisory contact at the HKMA by December 2019, and inform the HKMA of such plans in writing by 31 March 2020. An implementation plan should at least include an outline of key characteristics of the internal models and clearly state the intended implementation timeline, the proposed trading desk structure and the market risk exposures intended to be covered. We will provide the industry with more details regarding the application and/or validation procedures for use of the Internal Models Approach at a later stage.

21 AIs planning to adopt the Simplified Standardised Approach with effect from 1 January 2022 should submit a written application to their usual supervisory contact at the HKMA by 31 December 2020. The AIs are expected to fulfil all of the eligibility criteria as set out in paragraph 428 on an ongoing basis. The HKMA will notify individual AIs by 29 January 2021 whether they are considered eligible to use the Simplified Standardised Approach.

22 AIs planning to adopt the FX base currency approach under the Standardised Approach with effect from 1 January 2022 (this is also applicable to AIs planning to adopt the Internal Models Approach) should submit a written application to their usual supervisory contact at the HKMA by 31 March 2021. The AIs should demonstrate to the satisfaction of the HKMA that they can fulfil the requirements as set out in paragraphs 113 to 118.

II BOUNDARY BETWEEN BOOKS

7 Scope of the Trading Book

23 A trading book consists of all instruments that meet the specifications for trading book instruments set out in paragraphs 24 to 35. All other instruments should be included in the banking book.

24 Instruments comprise financial instruments, foreign exchange (FX), and commodities. A financial instrument is any contract that gives rise to both a financial asset of one entity and a financial liability or equity instrument of another entity. Financial instruments include both primary financial instruments (or cash instruments) and derivative financial instruments. A financial asset is any asset that is cash, the right to receive cash or another financial asset or a commodity, or an equity instrument. A financial liability is the contractual obligation to deliver cash or another financial asset or a commodity. Commodities also include non-tangible (i.e. non-physical) goods such as electric power.

25 An AI should only include a financial instrument, instruments on FX or commodity in the trading book when there is no legal impediment against selling or fully hedging it.

26 An AI should fair value daily any trading book instrument and recognise any valuation change in the profit and loss (P&L) account.

7.1 Standards for Assigning Instruments to the Regulatory Books

27 When an AI holds any instrument for one or more of the following purposes, the AI should designate it as a trading book instrument upon initial recognition on its books, unless specifically otherwise provided for in paragraph 25 or paragraph 30:

- short-term resale;
- profiting from short-term price movements;
- locking in arbitrage profits; or
- hedging risks that arise from instruments meeting the criteria above.

28 Any of the following instruments is seen as being held for at least one of the purposes listed in paragraph 27 and should therefore be included in the trading book, unless specifically otherwise provided for in paragraph 25 or paragraph 30:

- instruments in the correlation trading portfolio;[4]
- instruments that would give rise to a net short credit or equity position in the banking book;[5] or
- instruments resulting from underwriting commitments, where underwriting commitments refer only to securities underwriting, and relate only to securities that are expected to be actually purchased by an AI on the settlement date.

29 Any instrument which is not held for any of the purposes listed in paragraph 27 at inception, nor seen as being held for these purposes according to paragraph 28, should be assigned to the banking book.

30 An AI should assign the following instruments to the banking book:

- unlisted equities;
- instruments designated for securitisation warehousing;
- real estate holdings, where in the context of assigning instrument to the trading book, real estate holdings relate only to direct holdings of real estate as well as derivatives on direct holdings;
- retail and small or medium-sized enterprise (SME) credit;
- equity investments in a fund, unless the AI meets at least one of the following conditions:
  - the AI is able to look through the fund to its individual components and there is sufficient and frequent information, verified by an independent third party, provided to the AI regarding the fund's composition; or
  - the AI obtains daily price quotes for the fund and it has access to the information contained in the fund's mandate or in the national regulations governing such investment funds;
- hedge funds;
- derivative instruments and funds that have the above instrument types as underlying assets; or
- instruments held for the purpose of hedging a particular risk of a position in the types of instrument above.

31 There is a general presumption that any of the following instruments are being held for at least one of the purposes listed in paragraph 27 and therefore are trading book instruments, unless specifically otherwise provided for in paragraph 25 or paragraph 30:

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[4] The term "correlation trading portfolio" has the same meaning as defined in section 281 of the BCR.

[5] An AI will have a net short risk position for equity risk or credit risk in the banking book if the present value of the banking book increases when an equity price decreases or when a credit spread on an issuer or group of issuers of debt increases.

- instruments held as accounting trading assets or liabilities;[6]
- instruments resulting from market-making activities;
- equity investments in a fund excluding those assigned to the banking book in accordance with paragraph 30;
- listed equities;[7]
- trading-related repo-style transaction;[8] or
- options including embedded derivatives[9] from instruments that the institution issued out of its own banking book and that relate to credit or equity risk.

32 An AI is allowed to deviate from the presumptive list specified in paragraph 31 according to the process set out below.

- If an AI believes that it needs to deviate from the presumptive list established in paragraph 31 for an instrument, it should submit a request to the HKMA and receive explicit approval. In its request, the AI should provide evidence that the instrument is not held for any of the purposes in paragraph 27.
- In cases where this approval is not given by the HKMA, an AI should designate the instrument as a trading book instrument. The AI should document any deviations from the presumptive list in detail on an ongoing basis.

7.2 *Supervisory Powers*

33 Notwithstanding the process established in paragraph 32 for instruments on the presumptive list, the HKMA may require an AI to provide evidence that an instrument in the trading book is held for at least one of the purposes of paragraph 27. If the HKMA is of the view that the AI has not provided enough evidence or if the HKMA believes the instrument customarily would belong in the

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[6] Under HKAS 39, these instruments would be designated as held for trading. Under HKFRS 9, these instruments would be held within a trading business model. These instruments would be fair valued through the P&L account.

[7] Subject to the HKMA's review, certain listed equities may be excluded from the market risk framework. Examples of equities that may be excluded include, but are not limited to, equity positions arising from deferred compensation plans, convertible debt securities, loan products with interest paid in the form of "equity kickers", equities taken as a debt previously contracted, bank-owned life insurance products, and legislated programmes. The set of listed equities that an AI wishes to exclude from the market risk framework should be made available to, and discussed with, the HKMA and should be managed by a desk that is separate from desks for proprietary or short-term buy/sell instruments.

[8] Repo-style transactions that are (i) entered for liquidity management and (ii) valued at accrual for accounting purposes are not part of the presumptive list of paragraph 31.

[9] An embedded derivative is a component of a hybrid contract that includes a non-derivative host such as liabilities issued out of an AI's own banking book that contain embedded derivatives. The embedded derivative associated with the issued instrument (i.e. host) should be bifurcated and separately recognised on the AI's balance sheet for accounting purposes.

banking book, the HKMA may require the AI to assign the instrument to the banking book, except if it is an instrument listed under paragraph 28.

34 The HKMA may require an AI to provide evidence that an instrument in the banking book is not held for any of the purposes of paragraph 27. If the HKMA is of the view that the AI has not provided enough evidence, or if the HKMA believes such instruments would customarily belong in the trading book, the HKMA may require the AI to assign the instrument to the trading book, except if it is an instrument listed under paragraph 30.

7.3 *Documentation of Instrument Designation*

35 An AI should have clearly defined policies, procedures and documented practices for determining which instruments to include in or to exclude from the trading book for the purposes of calculating their regulatory capital, ensuring compliance with the criteria set forth in this subsection, and taking into account an AI's risk management capabilities and practices. The AI's internal control functions should conduct an ongoing evaluation of instruments both in and out of the trading book to assess whether its instruments are being properly designated initially as trading or non-trading instruments in the context of the AI's trading activities. Compliance with the policies and procedures should be fully documented and subject to periodic (at least yearly) internal audit and the results should be available for the HKMA to review.

7.4 *Restrictions on Moving Instruments between the Regulatory Books*

36 Apart from moves required by subsection 7.1, there is a strict limit on the ability of an AI to move instruments between the trading book and the banking book by their own discretion after initial designation, which is subject to the process in paragraphs 37 and 38. Switching instruments for regulatory arbitrage is strictly prohibited. In practice, switching should be rare and will be allowed by the HKMA only in extraordinary circumstances. Examples are a major publicly announced event, such as an AI restructuring that results in the permanent closure of trading desks, requiring termination of the business activity applicable to the instrument or portfolio or a change in accounting standards that allows an item to be fair-valued through P&L. Market events, changes in the liquidity of a financial instrument, or a change of trading intent alone are not valid reasons for reassigning an instrument to a different book. When switching positions, the AI should ensure that the standards described in subsection 7.1 are always strictly observed.

37 Without exception, a capital benefit as a result of switching will not be allowed in any case or circumstance. This means that an AI should determine its total capital charge (across the banking book and trading book) before and immediately after the switch. If this capital charge is reduced as a result of this switch, the difference as measured at the time of the switch will be imposed on the AI as a disclosed Pillar 1 capital surcharge. This surcharge will be allowed to run off as the positions mature or expire, in a manner agreed with the HKMA. To maintain operational simplicity, it is not envisaged that this additional capital charge would be recalculated on an ongoing basis, although the positions would continue to also be subject to the ongoing capital charges of the book into which they have been switched.

38 Any reassignment between books should be approved by senior management and the HKMA as follows. Any reallocation of securities between the trading book and banking book, including outright sales at arm's length, should be considered a reassignment of securities and is governed by requirements of this paragraph.

- Any reassignment should be approved by senior management; thoroughly documented; determined by internal review to be in compliance with an AI's policies; subject to prior approval by the HKMA based on supporting documentation provided by the AI; and publicly disclosed.
- Unless required by changes in the characteristics of a position, any such reassignment is irrevocable.
- If an instrument is reclassified to be an accounting trading asset or liability there is a presumption that this instrument is in the trading book, as described in paragraph 31. Accordingly, in this case an automatic switch without approval of the HKMA is acceptable.

39 An AI should adopt relevant policies that are updated at least yearly. Updates should be based on an analysis of all extraordinary events identified during the previous year. Updated policies with changes highlighted should be sent to the HKMA. Policies should include the following:

- The reassignment restriction requirements in paragraphs 36 to 38, especially the restriction that re-designation between the trading book and banking book may only be allowed in extraordinary circumstances, and a description of the circumstances or criteria where such a switch may be considered.
- The process for obtaining senior management and supervisory approval for such a transfer.
- How the AI identifies an extraordinary event.

A requirement that re-assignments into or out of the trading book be publicly disclosed at the earliest reporting date.

8 Treatment of Internal Risk Transfers

40 An internal risk transfer is an internal written record of a transfer of risk within the banking book, between the banking and the trading book or within the trading book (between different desks).

41 There will be no regulatory capital recognition for internal risk transfers from the trading book to the banking book. Thus, if an AI engages in an internal risk transfer from the trading book to the banking book (e.g. for economic reasons) this internal risk transfer would not be taken into account when the regulatory capital charges are determined.

42 For internal risk transfers from the banking book to the trading book, subsections 8.1 and 8.2 apply.

8.1 *Internal Risk Transfer of Credit and Equity Risk*

43 When an AI hedges a banking book credit risk exposure or equity risk exposure using a hedging instrument purchased through its trading book (i.e. using an internal risk transfer),

- The credit exposure in the banking book is deemed to be hedged for capital charge purposes if and only if:
  - the trading book enters into an external hedge with an eligible third-party protection provider that exactly matches the internal risk transfer; and
  - the external hedge meets the requirements in section 99 of the BCR.[10]
- The equity exposure in the banking book is deemed to be hedged for capital charge purposes if and only if:
  - the trading book enters into an external hedge from an eligible third-party protection provider that exactly matches the internal risk transfer; and
  - the external hedge is recognised as a hedge of a banking book equity exposure.
- External hedges for the purposes of this paragraph can be made up of multiple transactions with multiple counterparties as long as the aggregate external hedge exactly matches the internal risk transfer, and the internal risk transfer exactly matches the aggregate external hedge.

[10] With respect to section 99 of the BCR, the cap of 60% on a credit derivative without a restructuring obligation only applies with regard to recognition of credit risk mitigation of the banking book instrument for regulatory capital purposes and not with regard to the amount of the internal risk transfer.

44 Where the requirements in paragraph 43 are fulfilled, the banking book exposure is deemed to be hedged by the banking book leg of the internal risk transfer for capital purposes in the banking book. Moreover both the trading book leg of the internal risk transfer and the external hedge should be included in the market risk capital charges.

45 Where the requirements in paragraph 43 are not fulfilled, the banking book exposure is not deemed to be hedged by the banking book leg of the internal risk transfer for capital purposes in the banking book. Moreover, the third-party external hedge should be fully included in the market risk capital charges and the trading book leg of the internal risk transfer should be fully excluded from the market risk capital charges.

46 A banking book short credit position or a banking book short equity position created by an internal risk transfer[11] and not capitalised under banking book rules should be capitalised under the market risk rules together with the trading book exposure.

8.2 *Internal Risk Transfer of General Interest Rate Risk*

47 When an AI hedges a banking book interest rate risk exposure using an internal risk transfer with its trading book, the trading book leg of the internal risk transfer is treated as a trading book instrument under the market risk framework if and only if:

- the internal risk transfer is documented with respect to the banking book interest rate risk being hedged and the sources of such risk;
- the internal risk transfer is conducted with a dedicated internal risk transfer trading desk which has been specifically approved by the HKMA for this purpose; and
- the internal risk transfer should be subject to trading book capital charges under the market risk framework on a stand-alone basis for the dedicated internal risk transfer desk, separate from any other GIRR or other market risks generated by activities in the trading book.

48 Where the requirements in paragraph 47 are fulfilled, the banking book leg of the internal risk transfer should be included in the banking book's measure of interest rate risk exposures for regulatory capital purposes.

49 The approved internal risk transfer desk may include instruments purchased from the market (i.e. external parties to an AI). Such transactions may be executed directly

[11] Banking book instruments that are over-hedged by their respective documented internal risk transfer create a short (risk) position in the banking book.

between the internal risk transfer desk and the market. Alternatively, the internal risk transfer desk may obtain the external hedge from the market via a separate non-internal risk transfer trading desk acting as an agent, if and only if the GIRR internal risk transfer entered into with the non-internal risk transfer trading desk exactly matches the external hedge from the market. In this latter case the respective legs of the GIRR internal risk transfer are included in the internal risk transfer desk and the non-internal risk transfer desk.

8.3 *Internal Risk Transfers between Trading Desks*

50 Internal risk transfers between trading desks within the scope of application of the market risk capital charges (including FX risk and commodities risk in the banking book) will generally receive regulatory capital recognition. Internal risk transfers between the internal risk transfer desk and other trading desks will only receive regulatory capital recognition if the constraints in subsection 8.2 are fulfilled.

51 The trading book leg of internal risk transfers should fulfil the same requirements under section II as instruments in the trading book transacted with external counterparties.

8.4 *Eligible Hedges for the CVA Capital Charge*

52 Eligible external hedges that are included in the credit valuation adjustment (CVA) capital charge should be removed from an AI's market risk capital charge calculation.

53 An AI may enter into internal risk transfers between the CVA portfolio and the trading book. Such an internal risk transfer consists of a CVA portfolio side and a non-CVA portfolio side. Where the CVA portfolio side of an internal risk transfer is recognised in the CVA risk capital charge, the CVA portfolio side should be excluded from the market risk capital charge, while the non-CVA portfolio side should be included in the market risk capital charge.

54 In any case, such internal CVA risk transfers can only receive regulatory capital recognition if the internal risk transfer is documented with respect to the CVA risk being hedged and the sources of such risk.

55 Internal CVA risk transfers that are subject to curvature, default risk or residual risk add-on as set out in section III may be recognised in the CVA portfolio capital charge and market risk capital charge only if the trading book additionally enters into an external hedge with an eligible third-party protection provider that exactly matches the internal risk transfer.

56 Independent from the treatment in the CVA risk capital charge and the market risk capital charge, internal risk transfers between the CVA portfolio and the trading book can be used to hedge the counterparty credit risk exposure of a derivative instrument in the trading or banking book as long as the requirements of paragraph 43 are met.

9 Definition of Trading Desks

57 For the purposes of market risk capital calculations, a trading desk is the level at which model approval is granted for the Internal Models Approach and is defined as a group of traders or trading accounts that implements a well-defined business strategy operating within a clear risk management structure.

58 Trading desks are defined by the AI but subject to the regulatory approval of the HKMA for regulatory capital purposes under the Internal Models Approach.

59 The HKMA will consider the definition of the trading desk as part of the initial model approval for the trading desk, as well as ongoing approval.

- The HKMA shall determine, based on the size of the AI's overall trading operations, whether the proposed trading desk definitions are sufficiently granular.
- The HKMA shall review the policy document prepared by the AI documenting how the proposed definition of trading desk meets the criteria listed in this subsection.

60 An AI may further define operational subdesks for internal operational purposes without the HKMA approval.

61 A trading desk for regulatory capital purpose is an unambiguously defined group of traders or trading accounts[12].

- The trading desk should have one head trader who has direct oversight of the group of traders or trading accounts. The trading desk can have up to two head traders provided their roles, responsibilities and authorities are either clearly separated or one has ultimate oversight over the other.
- Each trader or each trading account in the trading desk should have a clearly defined specialty (or specialities).
- Each trading account should only be assigned to a single trading desk that has a clearly defined risk scope (e.g. permitted risk class and risk factors) consistent with its pre-established objectives.
- There is a presumption that traders (as well as head traders) are allocated to one trading desk. An AI can deviate from this presumption provided it can be justified to the HKMA on the basis of sound management, business and/or resource allocation reasons. Such assignments should not be made for the only

[12] A trading account is an indisputable and unambiguous unit of observation in accounting for trading activity.

purpose of avoiding other trading desk requirements (e.g. to optimise the likelihood of success in the backtesting and profit and loss attribution tests).

- The trading desk should have a clear reporting line to the senior management, and should have a clear and formal compensation policy clearly linked to the pre-established objectives of the trading desk.

62 A trading desk should have a well-defined and documented business strategy.

- There should be a clear description of the economics of the business strategy for the trading desk, its primary activities and trading/hedging strategies.
- The management team at the trading desk should have a clear annual plan for the budgeting and staffing of the trading desk.
- The documented business strategy of a trading desk should include regular management information reports, covering revenue, costs and risk-weighted assets for the trading desk.

63 A trading desk should have a clear risk management structure.

- The AI should identify key groups and personnel responsible for overseeing the risk-taking activities at the trading desk.
- A trading desk should clearly define trading limits (e.g. sensitivity or notional limits) based on the business strategy of the trading desk and these limits should be reviewed at least annually by senior management of the AI. In setting limits, the trading desk should have well-defined trader mandates.
- A trading desk should produce, at least weekly, appropriate risk management reports. This would include, at a minimum:
  - profit and loss reports, which would be periodically reviewed, validated and modified (if necessary) by Product Control; and
  - internal and regulatory risk measure reports, including trading desk value-at-risk (VaR) / expected shortfall (ES), trading desk VaR/ES sensitivities to risk factors and backtesting.

64 The AI should prepare, evaluate, and have available for the HKMA the following for all trading desks:

- inventory ageing reports;
- daily limit reports including exposures, limit breaches, and follow-up action;
- reports on intraday limits and respective utilisation and breaches for AIs with active intraday trading; and
- reports on the assessment of market liquidity.

65 Any foreign exchange or commodity positions held in the banking book should be included in the market risk capital charge as set out in paragraph 7. For regulatory capital calculation purposes, these positions will be treated as if they were held on notional trading desks within the trading book.

III STANDARDISED APPROACH

10 Structure

66 An AI should calculate and report the capital charges under the Standardised Approach to the HKMA on a monthly basis, except for AIs that qualifies for the de-minimis exemption mentioned in paragraph 16 or, subject to approval of the HKMA, uses the Simplified Standardised Approach.

67 An AI should also determine its regulatory capital charge for market risk according to the Standardised Approach at any time at the demand of the HKMA.

68 An AI should calculate the capital charge for market risk with the Standardised Approach for all its trading book positions and the foreign exchange and commodity risks from its banking book positions as the sum of the following three components, as well as any capital surcharge specified elsewhere in the framework:

- **Sensitivities-based method (SBM)** allows the use of sensitivities to capture delta, vega and curvature risks within a prescribed set of risk classes. The SBM entails expanding the use of sensitivities across the Standardised Approach;
- **Residual risk add-on (RRAO)** is introduced to capture any other risks beyond the main risk factors already captured in the sensitivities-based method and the default risk charge. It provides for a simple and conservative capital treatment for the universe of more sophisticated instruments; and
- **Standardised default risk charge (SA-DRC)** is intended to capture jump-to-default risk for equity and credit instruments.

		SBM		**RRAO**		**SA-DRC**
Total capital charge under Standardised Approach for market risk	=	**Capital charge under the sensitivities-based method (SBM) for delta, vega and curvature risk factor sensitivities within a prescribed set of risk classes:** • General interest rate risk; • Credit spread risk for non-securitisation; • Credit spread risk for securitisations (non-correlation trading portfolio); • Credit spread risk for securitisations (correlation trading portfolio); • Foreign exchange risk; • Equity risk; and • Commodity risk.	+	**Capital charge for residual risk add-on (RRAO):** Risk weights applied to notional amounts of instruments with • an exotic underlying; and/or • bearing other residual risks.	+	**Capital charge for standardised default risk (DRC) for prescribed risk classes:** • Standardised default risk charge for non-securitisation; • Standardised default risk charge for securitisations (non-correlation trading portfolio); and • Standardised default risk charge for securitisations (correlation trading portfolio).

11 Sensitivities-based Method (SBM)

11.1 *Main Definitions*

69 **Risk class** means one of the following seven risk classes for the sensitivities-based method: (i) general interest rate risk, (ii) credit spread risk for non-securitisation, (iii) credit spread risk for securitisations[13] (non-correlation trading portfolio), (iv) credit spread risk for securitisations (correlation trading portfolio), (v) equity risk, (vi) commodity risk and (vii) foreign exchange risk.

70 **Risk factor** means a variable, e.g. a tenor of an interest rate curve or an equity price, that affects the value of an instrument falling within the scope of the risk factor definitions in subsection 12. Risk factors are mapped to a risk class.

71 **Risk position** is the main input that enters the risk charge computation. For delta and vega risks, it is a sensitivity to a risk factor. For curvature risk, it is based on the worse of upward and downward stress scenarios.

72 **Bucket** means a set of risk factors within one risk class which are grouped together by common characteristics, as defined in paragraphs 141, 148, 154, 157, 163 and 174.

73 **Risk charge** is the amount of capital that an AI should hold as a consequence of the risks it takes; it is computed as an aggregation of risk positions first at the bucket level, and then across buckets within a risk class defined for the sensitivities-based method.

11.2 *Components of the SBM*

74 An AI should calculate the risk charge for market risk under the sensitivities-based method by aggregating the following risk measures:

- **Delta risk** which captures the risk of changes in the market value of an AI's position due to movements in its non-volatility linear risk factors, as defined in paragraphs 85, 95, 99, 103, 106, 109, 112 and 113;
- **Vega risk** which captures the risk of changes in the market value of an AI's position due to movements in its volatility linear risk factors, as defined in paragraphs 92, 96, 100, 104, 107, 110 and 115; and

[13] The term "securitisation" has the same meaning of "securitization exposure" as defined in section 2(1) of the BCR.

- **Curvature risk** which captures the risk of changes in the market value of an AI's position due to movements in its non-volatility risk factors not captured by the delta risk, as defined in paragraphs 93, 97, 101, 105, 108, 111, 116 and 117. Curvature risk is based on two stress scenarios involving an upward and a downward shock to a given risk factor.

75 The above three risk measures specify risk weights to be applied to the regulatory risk factor sensitivities. To calculate the overall capital charge, the risk-weighted sensitivities are aggregated using specified correlation parameters to recognise diversification benefits between risk factors. In order to address the risk that correlations may increase or decrease in periods of financial stress, three risk charge figures should be calculated for each risk class defined under the sensitivities-based method (see paragraphs 83 to 84 for details), based on three different scenarios on the specified values for the correlation parameter ρ_{kl} (i.e. correlation between risk factors within a bucket) and γ_{bc} (i.e. correlation between risk factors across buckets within a risk class). There should be no diversification benefit recognised between individual risk classes.

11.3 *Instrument Prices and Sensitivity Calculation*

76 In calculating the capital charge under the sensitivities-based method, an AI should determine each delta and vega sensitivity and curvature scenario based on instrument prices or pricing models that an independent risk control unit within the AI uses to report market risks or actual profits and losses to senior management.

77 A key assumption of the Standardised Approach for market risk is that an AI's pricing model used in actual profit and loss reporting provides an appropriate basis for the determination of regulatory capital charges for all market risks. To ensure such adequacy, an AI should at minimum fulfil the requirements in section 4A of the BCR and the Supervisory Policy Manual (SPM) Module CA-S-10 "Financial Instrument Fair Value Practices".

11.4 *Instruments Subject to Delta, Vega and Curvature*

78 All instruments held in trading desks and subject to the sensitivities-based method (i.e. excluding instruments where the value at any point in time is purely driven by an exotic underlying as set out in subsection 16), are subject to delta risk capital charge. Additionally:

- An instrument with optionality, or with non-zero vega sensitivities[14] is subject to risk charges for vega risk and curvature risk;
- An instrument with an embedded prepayment option[15] is an instrument with optionality. Accordingly, the embedded option is subject to risk charges for vega and curvature risk with respect to the interest rate risk and credit spread risk (non-securitisation and securitisation) risk classes. When the prepayment option is a behavioural option, the instrument may also be subject to the residual risk add-on as per paragraph 198. The pricing model of the AI should reflect such behavioural patterns where relevant. Instruments in the securitised portfolio may have embedded prepayment options as well. In this case they may be subject to the residual risk add-on;
- Instruments whose cash flows cannot be written as a linear function of underlying notional are subject to vega risk and curvature risk charges. For example, the cash flows generated by a plain-vanilla option cannot be written as a linear function (as they are the maximum of the spot and the strike). Therefore all options are subject to vega risk and curvature risk. Instruments whose cash flows generated by a coupon-bearing bond can be written as a linear function, are not subject to vega risk nor curvature risk charges.

- Curvature risks may be calculated for all instruments subject to delta risk, not limited to those subject to vega risk as specified above. For example, where an AI manages the non-linear risk of instruments with optionality and other instruments holistically, the AI may choose to include instruments without optionality in the calculation of curvature risk. This treatment is allowed subject to the following restrictions: (i) use of this approach shall be applied consistently through time; and (ii) curvature risk should be calculated for all instruments subject to the sensitivities-based method.

11.5 *Delta and Vega Risks*

79 An AI should apply the delta and vega risk factors defined in subsection 12 to calculate the risk charge for delta and vega risks.

80 For each risk class, an AI should determine its instruments' sensitivity to a set of prescribed risk factors, risk-weight those sensitivities, and aggregate the resulting

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[14] There are some instruments that are not options, but are still subject to risk charges for vega risk and curvature risk. For example, convexity adjustments on constant maturity swaps (CMS) can generate significant vega risk, which are subject to vega and curvature risk charges.

[15] An instrument with a prepayment option is a debt instrument which grants the debtor the right to repay part or the entire principal amount before the contractual maturity without having to compensate for any foregone interest. The debtor can exercise this option with a financial gain by obtaining funding over the remaining maturity of the instrument at a lower rate in other ways in the market.

risk-weighted sensitivities separately for delta and vega risk using the following step-by-step approach.

Step 1: For each risk factor, a sensitivity is determined as set out in subsection 12.

Step 2: Sensitivities to the same risk factor should be netted to give a net sensitivity s_k across all instruments in the portfolio to each risk factor k. In calculating the net sensitivity, all sensitivities to the same given risk factor (e.g. all sensitivities to the 1-year tenor point of the HKD 3-month swap curve) from instruments of opposite direction should offset, irrespective of the instrument from which they derive.

Step 3: The risk-weighted sensitivity WS_k is the product of the net sensitivity s_k and the corresponding risk weight RW_k as defined in subsections 13 and 14.

$$WS_k = RW_k s_k$$

Step 4: Within bucket aggregation: The risk position for delta (respectively vega) bucket b, K_b, should be determined by aggregating the weighted sensitivities to risk factors within the same bucket using the corresponding prescribed correlation ρ_{kl} set out in the following formula:

$$K_b = \sqrt{max\left(\sum_k WS_k^2 + \sum_k \sum_{l \neq k} \rho_{kl} WS_k \, WS_l \, , 0\right)}$$

Step 5: Across bucket aggregation: The delta (respectively vega) risk charge is determined from risk positions aggregated between the delta (respectively vega) buckets within each risk class, using the corresponding prescribed correlations γ_{bc} as set out in the following formula:

$$\text{Delta (respectively vega)} = \sqrt{\sum_b K_b^2 + \sum_b \sum_{c \neq b} \gamma_{bc} \, S_b S_c}$$

where $S_b = \sum_k WS_k$ for all risk factors in bucket b and $S_c = \sum_k WS_k$ in bucket c.

If these values for S_b and S_c produce a negative number for the overall sum of $\sum_b K_b^2 + \sum_b \sum_{c \neq b} \gamma_{bc} \, S_b S_c$, an AI should calculate the delta (respectively vega) risk capital charge using an alternative specification whereby $S_b = \max\left[\min\left(\sum_k WS_k, K_b\right), -K_b\right]$ for all risk factors in bucket b and $S_c = \max\left[\min\left(\sum_k WS_k, K_c\right), -K_c\right]$ for all risk factors in bucket c.

11.6 *Curvature Risk*

81 An AI should apply two stress scenarios on given risk factors which are defined in subsection 12 to calculate the risk charge for curvature risk. The two stress scenarios are to be computed per risk factor (an upward and a downward shock) with the delta effect being removed. They are shocked by risk weights and the worst loss is aggregated by correlations provided in subsection 15.

82 An AI should apply the following step-by-step approach to each risk class separately to capture curvature risk:

Step 1: For each instrument sensitive to curvature risk factor *k*, an upward shock and a downward shock should be applied to *k*. For example for GIRR, all tenors of all the curves within a given currency (e.g. HKD 1-month swap curve, HKD 3-month swap curve) should be shifted upward. The potential loss, after deduction of the delta risk positions, is the outcome of the upward scenario (CVR_k^+). The same approach should be followed on a downward scenario (CVR_k^-). If the price of an option depends on several risk factors, the curvature risk is determined separately for each risk factor.

Step 2: The net curvature risk capital charge, determined by the values of CVR_k^+ and CVR_k^- for risk factor *k* is calculated as follows.

$$CVR_k^+ = -\sum_i \left\{V_i(x_k^{RW(Curvature)^+}) - V(x_k) - RW_k^{Curvature} \cdot s_{ik}\right\}$$

$$CVR_k^- = -\sum_i \left\{V_i\left(x_k^{RW(Curvature)^-}\right) - V(x_k) + RW_k^{Curvature} \cdot s_{ik}\right\}$$

This calculates the aggregate incremental loss beyond the delta capital charge for the prescribed shocks, where:

- *i* is an instrument subject to curvature risks associated with risk factor *k*;
- x_k is the current level of risk factor *k*;
- $V_i(x_k)$ is the price of instrument *i* depending on the current level of risk factor *k*;
- $V_i\left(x_k^{\left(RW^{(curvature)+}\right)}\right)$ and $V_i\left(x_k^{\left(RW^{(curvature)-}\right)}\right)$ both denote the price of instrument *i* after x_k is shifted (i.e. “shocked”) upward and downward;
- under the FX and Equity risk classes:
  - $RW_k^{(curvature)}$ is the risk weight for curvature risk factor *k* for instrument *i* determined in accordance with paragraph 191; and

- s_{ik} is the delta sensitivity of instrument *i* with respect to the delta risk factor that corresponds to curvature risk factor *k*.

- under the general interest rate risk (GIRR), credit spread risk (CSR) and commodity risk classes:
  - $RW_k^{(curvature)}$ is the risk weight for curvature risk factor *k* for instrument *i* determined in accordance with paragraph 193; and
  - s_{ik} is the sum of delta risk sensitivities to all tenors of the relevant curve(s) of instrument *i* with respect to curvature risk factor *k*.

Step 3: Within bucket aggregation: The curvature risk exposure should be aggregated within each bucket using the corresponding prescribed correlation ρ_{kl} as set out in the following formula:

$$K_b = \max(K_b^+, K_b^-)$$

$$where \begin{cases} K_b^+ = \sqrt{\max\left(0, \sum_k max(CVR_k^+, 0)^2 + \sum_k \sum_{l \neq k} \rho_{kl} CVR_k^+ CVR_l^+ \psi(CVR_k^+, CVR_l^+)\right)} \\ K_b^- = \sqrt{\max\left(0, \sum_k max(CVR_k^-, 0)^2 + \sum_k \sum_{l \neq k} \rho_{kl} CVR_k^- CVR_l^- \psi(CVR_k^-, CVR_l^-)\right)} \end{cases}$$

where:

- the bucket level capital charge (K_b) is determined as the greater of the capital charge under the upward scenario (K_b^+) and the capital charge under the downward scenario (K_b^-). Notably, the selection of upward and downward scenarios is not necessarily the same across the high, medium and low correlations scenarios specified in paragraph 83.
  - Where K_b=K_b^+, this shall be termed “selecting the upward scenario”.
  - Where K_b=K_b^-, this shall be termed “selecting the downward scenario”.
  - In the specific case where K_b^+,= K_b^-, if $\sum_k CVR_k^+ > \sum_k CVR_k^-$, it is deemed that the upward scenario is selected; otherwise the downward scenario is selected.
- $\psi(CVR_k, CVR_l)$ takes the value 0 if CVR_k and CVR_l both have negative signs. In all other cases, $\psi(CVR_k, CVR_l)$ takes the value of 1.

Step 4: Across bucket aggregation: Curvature risk positions should then be aggregated across buckets within each risk class, using the corresponding prescribed correlation γ_{bc}.

$$Curvature\ risk = \sqrt{max(0, \sum_b K_b^2 + \sum_b \sum_{c \neq b} \gamma_{bc} S_b S_c \psi(S_b, S_c))}$$

where:

- $S_b = \sum_k CVR_k^+$ for all risk factors in bucket b, when the upward scenario has been selected for bucket *b* above. $S_b = \sum_k CVR_k^-$ otherwise ; and
- $\psi(S_b, S_c)$ takes the value 0 if S_b and S_c both have negative signs. In all other cases, $\psi(S_b, S_c)$ takes the value of 1.

11.7 *Correlation Scenarios and Aggregation of Risk Charges*

83 In order to address the risk that correlations increase or decrease in periods of financial stress, an AI will be required to calculate three risk charge figures for each risk class, corresponding to three different scenarios on the specified values for the correlation parameters ρ_{kl} (correlation between risk factors within a bucket) and γ_{bc} (correlation across buckets within a risk class).

- the "high correlations" scenario, whereby the correlation parameters ρ_{kl} and γ_{bc} that are specified in subsections 13, 14 and 15 are uniformly multiplied by 1.25, with ρ_{kl} and γ_{bc} subject to a cap at 100%;
- the "medium correlations" scenario, whereby the correlation parameters ρ_{kl} and γ_{bc} remain unchanged from those specified in subsections 13, 14 and 15; and
- the "low correlations" scenario whereby the corresponding prescribed correlations are the correlations given in subsections 13, 14 and 15 are replaced by ρ_{kl}^{low}= max(2 · ρ_{kl} − 100%, 75% · ρ_{kl}) and γ_{bc}^{low} = max(2 · γ_{bc} − 100%, 75% · γ_{bc}).

84 The total capital charge under the sensitivities-based method is aggregated as follows:

- For each scenario, an AI should simple sum up the delta, vega and curvature risk charges for all risk classes to determine the overall risk charge for that scenario.
- The ultimate risk capital charge is the largest capital charge from the three scenarios.
  - For the calculation of capital charge for all instruments in all trading desks using the Standardised Approach as set out in paragraph 15, the capital charge is calculated for all instruments in all trading desks.

- For the calculation of capital charge for each trading desk using the Standardised Approach as if that desk were a standalone regulatory portfolio as set out in paragraph 15, the capital charges under each correlation scenario are calculated and compared at each trading desk level, and the maximum for each trading desk is taken as the capital charge.

12 SBM: Risk Factor and Sensitivity Definitions

12.1 *Risk Factor Definitions*

General interest rate risk (GIRR)

85 The GIRR delta risk factors are defined along two dimensions: (i) a risk-free yield curve for each currency in which interest rate-sensitive instruments are denominated and (ii) the following tenors: 0.25 years, 0.5 years, 1 year, 2 years, 3 years, 5 years, 10 years, 15 years, 20 years and 30 years.[16]

86 An AI should construct the risk-free yield curve per currency by using money market instruments held in the trading book that have the lowest credit risk, such as overnight index swaps (OIS). Alternatively, the AI can construct the risk-free yield curve based on one or more market-implied swap curves used by the AI to mark positions to market, such as interbank offered rate swap curves.

87 When data on market-implied swap curves described in paragraph 86 is insufficient, an AI should derive the risk-free yield curve from the most appropriate sovereign bond curve for a given currency, e.g. Exchange Fund Bills and Notes issued by the HKMA for HKD. In such cases the sensitivities related to sovereign bonds are not exempt from the credit spread risk charge. In case if the AI cannot separate the yield into risk-free rate and credit spread, i.e. $y = r + cs$, any sensitivity of credit spread with respect to yield is allocated to the GIRR and to CSR risk classes as appropriate with the risk factor and sensitivity definitions in the Standardised Approach. Applying swap curves to bond-derived sensitivities for GIRR will not change the requirement for basis risk to be captured between bond and CDS curves in the CSR risk class.

88 For the purpose of constructing the risk-free yield curve per currency, an OIS curve and an interbank offered rate swap curve should be considered two different curves. Two interbank offered rate swap curves (e.g. HKD 1-month swap curve and HKD 3-month swap curve) should be considered two different curves. An onshore and an offshore currency curve (e.g. CNY and CNH) should be considered two different curves.

89 An AI should use its risk-free yield curve per currency on a consistent basis over time.

[16] Assignment of risk factors to the specified tenors should be performed by linear interpolation or a method that is agreed to be most consistent with the pricing functions used by the independent risk control function of an AI to report market risks or profits and losses to senior management.

90 The GIRR delta risk factors should also include a flat curve of market-implied inflation rates for each currency with term structure not recognised as a risk factor.

- The sensitivity to the inflation rate from the exposure to implied coupons in an inflation instrument gives rise to a specific capital charge. All inflation risks for a currency should be aggregated to one number via simple sum;
- This risk factor is only relevant for an instrument when a cash flow is functionally dependent on a measure of inflation (e.g. the notional amount or an interest payment depending on a consumer price index). GIRR risk factors other than for inflation risk will apply to such an instrument notwithstanding;
- Inflation rate risk is considered in addition to the sensitivity to interest rates from the same instrument, which should be allocated, according to the GIRR framework, in the term structure of the relevant risk-free yield curve in the same currency.

91 The GIRR delta risk factors should also include one of two possible cross-currency basis risk factors[17] for each currency (i.e. each GIRR bucket) with term structure not recognised as a risk factor (i.e. both cross-currency basis curves are flat).

- The two cross-currency basis risk factors are basis of each currency over USD or basis of each currency over EUR. For instance, an AI trading a JPY/USD cross-currency basis swap would have a sensitivity to the JPY/USD basis but not to the JPY/EUR basis.
- Cross-currency bases that do not relate to either basis over USD or basis over EUR should be computed either on “basis over USD” or “basis over EUR” but not both. GIRR risk factors other than for cross-currency basis risk will apply to such an instrument notwithstanding.
- Cross-currency basis risk is considered in addition to the sensitivity to interest rates from the same instrument, which should be allocated, according to the GIRR framework, in the term structure of the relevant risk-free yield curve in the same currency.
- A term structure based cross currency basis spread curve may be used. In doing so, sensitivities to individual tenors are aggregated by a simple sum.
- Cross-currency basis risk for a currency for both onshore and offshore curves may be aggregated via a simple sum of weighted sensitivities.

[17] Cross-currency basis are basis added to a yield curve in order to evaluate a swap for which the two legs are paid in two different currencies. They are in particular used by market participants to price cross-currency interest rate swaps paying a fixed or a floating leg in one currency, receiving a fixed or a floating leg in a second currency, and including an exchange of the notional in the two currencies at the start date and at the end date of the swap.

92 The GIRR vega risk factors for each currency should be defined as the implied volatilities of options that reference GIRR-sensitive underlyings; further defined along two dimensions:[18]

- Maturity of the option: The implied volatility of the option as mapped to one or several of the following maturity tenors: 0.5 years, 1 year, 3 years, 5 years and 10 years; and
- Residual maturity of the underlying of the option at the expiry date of the option: The implied volatility of the option as mapped to one (or two) of the following residual maturity tenors: 0.5 years, 1 year, 3 years, 5 years and 10 years.

93 The GIRR curvature risk factors should be defined along one dimension: the constructed risk-free yield curve without term structure decomposition per currency. For example, the HKD 1-month and HKD 3-month swap curves should be shifted at the same time in order to compute the relevant HKD risk-free yield curve curvature risk charge. For the calculation of sensitivities, all tenors (as defined for delta GIRR) are to be shifted in parallel. There is no curvature risk charge for inflation and cross-currency basis risks.

94 The treatment described in paragraph 87 for GIRR delta also applies to GIRR vega and GIRR curvature risk factors.

Credit spread risk for non-securitisation (CSR non-SEC)

95 The CSR non-SEC delta risk factors are defined along two dimensions: (i) the relevant issuer credit spread curves (bond and CDS) and (ii) the following tenors: 0.5 years, 1 year, 3 years, 5 years and 10 years to which delta risk factors are assigned.

96 The CSR non-SEC vega risk factors are the implied volatilities of options that reference the relevant credit issuer names as underlyings (bond and CDS); further defined along the maturity of the option: the implied volatility of the option as mapped to one or several of the following maturity tenors: 0.5 years, 1 year, 3 years, 5 years and 10 years.

97 The CSR non-SEC curvature risk factors are defined along one dimension: the relevant issuer credit spread curves (bond and CDS) without term structure decomposition. For instance, the bond-inferred spread curve of company A and the CDS-inferred spread curve of company A should be considered a single spread curve.

[18] For example, an option with a forward-starting 12-month cap on 3-month HIBOR starting in one year will have four caplets with periods of 3 months each. The option maturities for each caplet are 12, 15, 18 and 21 months while the underlying maturity for all the caplets is always 3 months.

For the calculation of sensitivities, all tenors (as defined for CSR) are to be shifted in parallel.

Credit spread risk for securitisations (non-CTP) (CSR SEC (non-CTP))

98 For securitisation instruments that do not meet the definition of correlation trading portfolio as defined in section 281 of the BCR (i.e. non-CTP), the sensitivities of delta risk factors should be calculated with respect to the spread of the tranche rather than the spread of the underlying of the instruments.

99 The CSR SEC (non-CTP) delta risk factors are defined along two dimensions: (i) the relevant tranche credit spread curves and (ii) the following tenors: 0.5 years, 1 year, 3 years, 5 years and 10 years to which delta risk factors are assigned.

100 The CSR SEC (non-CTP) vega risk factors are the implied volatilities of the relevant options that reference non-CTP credit spreads as underlyings (bond and CDS), further defined along the maturity of the option. The implied volatility of the option as mapped to one or several of the following maturity tenors: 0.5 years, 1 year, 3 years, 5 years and 10 years.

101 The CSR SEC (non-CTP) curvature risk factors are defined along one dimension: the relevant tranche credit spread curves (bond and CDS) without term structure decomposition. For instance, the bond-inferred spread curve of a given residential mortgage-backed security (RMBS) tranche and the CDS-inferred spread curve of that given RMBS tranche would be considered a single spread curve. For the calculation of sensitivities, all the tenors are to be shifted in parallel.

Credit spread risk for securitisations (CTP) (CSR SEC (CTP))

102 For securitisation instruments that meet the definition of a CTP as defined in section 281 of the BCR, the sensitivities of delta risk factors should be computed with respect to the names underlying the securitisation or nth-to-default instrument.

103 The CSR SEC (CTP) delta risk factors are defined along two dimensions: (i) the relevant underlying credit spread curves (bond and CDS) and (ii) the following tenors: 0.5 years, 1 year, 3 years, 5 years and 10 years to which delta risk factors are assigned.

104 The CSR SEC (CTP) vega risk factors are the implied volatilities of options that reference CTP credit spreads as underlyings (bond and CDS), further defined along the maturity of the option. The implied volatility of the option as mapped to one or

several of the following maturity tenors: 0.5 years, 1 year, 3 years, 5 years and 10 years.

105 The CSR SEC (CTP) curvature risk factors are defined along one dimension: the relevant underlying credit spread curves (bond and CDS) without term structure decomposition. For instance, the bond-inferred spread curve of a given name within an iTraxx series and the CDS-inferred spread curve of that given underlying would be considered a single spread curve. For the calculation of sensitivities, all the tenors are to be shifted in parallel.

Equity risk

106 The equity delta risk factors are all the equity spot prices and all the equity repurchase agreement rates (equity repo rates).

107 The equity vega risk factors are the implied volatilities of options that reference the equity spot prices as underlyings as defined along the maturity of the option. The implied volatility of the option as mapped to one or several of the following maturity tenors: 0.5 years, 1 year, 3 years, 5 years and 10 years. There is no vega risk capital charge for equity repo rates.

108 The equity curvature risk factors are all the equity spot prices. There is no curvature risk charge for equity repo rates.

Commodity risk

109 The commodity delta risk factors are all the commodity spot prices. However for some commodities such as electricity (which is defined to fall within bucket 3 (energy – electricity and carbon trading) in paragraph 174) the relevant risk factor can either be the spot or the forward price. Commodity delta risk factors are defined along two dimensions: (i) legal terms with respect to the delivery location[19] of the commodity and (ii) time to maturity of the traded instrument at the following tenors: 0 years, 0.25 years, 0.5 years, 1 year, 2 years, 3 years, 5 years, 10 years, 15 years, 20 years and 30 years.

110 The commodity vega risk factors are the implied volatilities of options that reference commodity spot prices as underlyings. No differentiation between commodity spot prices by the maturity of the underlying or delivery location is required. The

[19] For example, a contract that can be delivered in five ports can be considered having the same delivery location as another contract if and only if it can be delivered in the same five ports. However, it cannot be considered having the same delivery location as another contract that can be delivered in only four (or less) of those five ports.

commodity vega risk factors are further defined along the maturity of the option. The implied volatility of the option as mapped to one or several of the following maturity tenors: 0.5 years, 1 year, 3 years, 5 years and 10 years.

111 The commodity curvature risk factors are defined along only one dimension: the constructed curve without term structure decomposition per commodity spot prices. For the calculation of sensitivities, all tenors (as defined for delta commodity) are to be shifted in parallel.

Foreign exchange risk

112 The foreign exchange delta risk factors are all the exchange rates between the currency in which an instrument is denominated and the reporting currency (i.e. HKD). For transactions that reference an exchange rate between a pair of non-reporting currencies, the foreign exchange delta risk factors are all the exchange rates between (i) HKD and (ii) both the currency in which an instrument is denominated and any other currencies referenced by the instrument.[20]

113 Subject to supervisory approval, AIs may choose to use the FX base currency approach[21]. In this case, FX risk may alternatively be calculated relative to a selected base currency instead of HKD. In such case the AI should account for (i) the FX risk against the base currency; and (ii) the FX risk between HKD and the base currency (i.e. translation risk). The resulting FX risk calculated relative to the base currency is converted to the capital charge in HKD using the spot HKD / base currency exchange rate reflecting the FX risk between the base currency and HKD.[22]

114 The FX base currency approach could be allowed under the following conditions: (i) an AI could only consider a single currency as its base currency; and (ii) the AI shall demonstrate to the HKMA that calculating FX risk relative to its proposed base currency provides an appropriate risk representation for their portfolio (for example, by demonstrating that it does not inappropriately reduce capital charge relative to those that would be calculated without the base currency approach) and that the translation risk between the base currency and HKD is taken into account.

115 The foreign exchange vega risk factors are the implied volatilities of options that reference exchange rates between currency pairs; further defined along the maturity

[20] For example, for an FX forward referencing EUR/JPY, the relevant risk factors for a HKD-reporting AI to consider are the exchange rates EUR/HKD and JPY/HKD.

[21] The application procedure is set out in paragraph 22.

[22] Following the example in footnote 20, if the AI calculates FX risk relative to USD as a base currency, it would consider separate deltas for JPY/USD, EUR/USD and HKD/USD and then translate the resulting capital charge to HKD at the USD/HKD spot exchange rate.

of the option. The implied volatility of the option as mapped to one or several of the following maturity tenors: 0.5 years, 1 year, 3 years, 5 years and 10 years.

116 The foreign exchange curvature risk factors are all the exchange rates between the currency in which an instrument is denominated and the reporting currency (i.e. HKD). For transactions that reference an exchange rate between a pair of non-reporting currencies, the FX risk factors are all the exchange rates between (i) HKD and (ii) both the currency in which an instrument is denominated and any other currencies referenced by the instrument.

117 Where supervisory approval for the base currency approach has been granted for delta risks, foreign exchange curvature risks shall also be calculated relative to a base currency instead of HKD, and then converted to the capital charge in HKD using the spot HKD / base currency exchange rate.

118 An AI using the FX base currency approach should also be able to calculate its regulatory capital charge for FX risk relative to HKD at the demand of the HKMA.

119 No distinction is required between onshore and offshore variants of a currency for all foreign exchange delta, vega and curvature risk factors.

12.2 *Sensitivity Definitions*

120 An AI should use the prescribed formulations as set in paragraphs 124 to 126 to calculate the sensitivities for each risk class respectively. The AI may make use of alternative formulations of sensitivities based on pricing models that the AI's independent risk control unit uses to report market risk exposure or actual profits and losses to senior management.

121 Regardless of whether the prescribed or alternative formulations are used, the pricing models that are used for deriving the sensitivities should be validated by an appropriately qualified and experienced external or internal party to ensure the accuracy of the sensitivities for the calculation of the market risk capital charge. The party responsible for validation should be independent of the risk-taking functions and the party who develops or implements the relevant pricing models. If an AI makes use of alternative formulations of sensitivities, it should also demonstrate to the satisfaction of the HKMA that the alternative formulations of sensitivities adopted are conceptually sound and yield results very close to the prescribed formulations.

122 An AI should calculate sensitivities for each risk class in terms of HKD.

123 For each risk factor defined in paragraphs 85 to 119, sensitivities are calculated as the change in the market value of the instrument as a result of applying a specified shift to each risk factor, assuming all the other relevant risk factors are held at the current level.

Delta risk sensitivities

124 An AI should calculate the delta risk sensitivities of (i) GIRR, (ii) CSR non-SEC, (iii) CSR SEC (non-CTP), (iv) CSR SEC (CTP) and (v) equity (repo rate) risk factors in accordance with the following formula:

$$s_k = \frac{V_i(RF_k + 0.0001) - V_i(RF_k)}{0.0001}$$

where:

- s_k is the delta sensitivity of risk factor *k*;
- RF_k is the risk factor *k*; and
- $V_i(.)$ is the market value of the instrument *i* as a function of the risk factor *k*.

125 An AI should calculate the delta risk sensitivities of (i) equity (spot rate), (ii) commodity and (iii) foreign exchange risk factors in accordance with the following formula:

$$s_k = \frac{V_i(1.01RF_k) - V_i(RF_k)}{0.01}$$

Vega risk sensitivities

126 The option-level vega risk sensitivity to a given risk factor[23] is the mathematical product of the vega and the implied volatility of the option in accordance with the following formula:

$$s_k = vega \times implied\ volatility$$

where:

- vega, $\frac{\partial \mathrm{V_i}}{\partial \sigma_\mathrm{i}}$, is defined as the change in the market value of the option $\mathrm{V_i}$ as a result of a small amount of change to the implied volatility σ_i; and
- the instrument's vega and implied volatility should be sourced from pricing models used by the independent risk control function of the AI.

[23] The implied volatility of the option must be mapped to one or more maturity tenors.

127 The following sets out how vega risk sensitivities are to be derived in specific cases:

- Options that do not have a maturity are assigned to the longest prescribed maturity tenor, and these options are also assigned to the residual risks add-on;
- Options that do not have a strike or barrier and options that have multiple strikes or barriers, are mapped to strikes and maturity used internally to price the option, and these options are assigned to the residual risks add-on; and
- CTP securitisation tranches which do not have an implied volatility, are not subject to vega risk capital charge. Such instruments may not, however, be exempt from delta and curvature risk capital charges.

12.3 *Other Requirements on Sensitivity Computations*

128 When computing the first-order sensitivity for instruments with vega risk, an AI should assume that the implied volatility skew for an option remains unchanged either with strike, i.e. sticky strike approach, or with a given level of delta, i.e. sticky delta approach.

129 When computing a vega GIRR or CSR sensitivity, an AI may assume that the underlying follows either a lognormal or normal distribution in the pricing models from which sensitivities are derived. An AI may choose a mix of lognormal and normal distribution assumption for different currencies. When computing a vega equity, commodity or foreign exchange sensitivity, an AI should assume that the underlying follows a lognormal distribution in the pricing models from which sensitivities are derived.[24]

130 If, for internal risk management, an AI computes vega sensitivities using different definitions than the definitions proposed in this paper, the AI may transform the sensitivities computed for internal risk management to deduce the sensitivities to be used for the calculation of the vega risk measure.

131 All sensitivities should be computed ignoring the impact of credit valuation adjustments (CVA).

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[24] Since the vega ($\frac{\partial V}{\partial \sigma_i}$) on an instrument is multiplied by its implied volatility (σ_i), the vega risk sensitivity for that instrument will be the same under the lognormal distribution assumption and the normal distribution assumption. As a consequence, an AI may use a lognormal or normal distribution assumption for GIRR and CSR (in recognition of the trade-offs between constrained specification and computational burden for a Standardised Approach). For the other risk classes, an AI should only use a lognormal distribution assumption.

12.4 *Instruments with Multiple Constituents*

132 In the delta and curvature risk context: for index instruments and multi-underlying options, a look-through approach should be used. However, an AI may opt not to apply the look-through approach for instruments referencing any listed and widely recognised and accepted equity or credit index, where:

(i) It is possible to look-through the index (i.e. the constituents and their respective weightings are known);
(ii) The index contains at least 20 constituents;
(iii) No single constituent contained within the index represents more than 25% of the total index;
(iv) The largest 10% of constituents represents less than 60% of the total index; and
(v) The total market capitalisation of all the constituents of the index is no less than HKD 312 billion.

133 For a given instrument, irrespective of whether a look-through approach is adopted or not, the sensitivity inputs used for the delta and curvature risk calculation should be consistent.

134 Where an AI opts not to apply the look-through approach in accordance to paragraph 132, a single sensitivity shall be calculated with respect to each widely recognised and accepted index that an instrument references. The sensitivity to the index should be assigned to the relevant delta risk bucket defined in paragraphs 148 and 163 as follows.

- Where more than 75% of constituents in that index (taking into account the weightings of that index) would be mapped to a specific sector bucket (i.e. bucket 1 to bucket 11 for equity risk, or bucket 1 to bucket 16 for CSR), the sensitivity to the index shall be mapped to that single specific sector bucket and treated like any other single-name sensitivity in that bucket.
- In all other cases, the sensitivity may be mapped to an "index" bucket (i.e. bucket 12 or bucket 13 for equity risk; or bucket 17 or bucket 18 for CSR).

135 An AI should always use the look-through approach for indices that do not meet the criteria set out in paragraph 132(ii) to (v), and for any multi-underlying instruments that reference a bespoke set of equities or credit positions.

- Where a look-through approach is adopted, for index instruments and multi-underlying options other than the CTP, the sensitivities to constituent risk factors from those instruments or options are allowed to net with sensitivities to single-name instruments without restriction.

- Index CTP instruments cannot be broken down into its constituents (i.e. the index CTP should be considered a risk factor as a whole) and the above-mentioned netting at the issuer level does not apply either.
- Where a look-through approach is adopted, it shall be applied consistently through time[25], and shall be used for all identical instruments that reference the same index.

136 For equity investments in funds that can be looked through as set out in paragraph 30, an AI should apply a look-through approach and treat the underlying positions of the fund as if the positions were held directly by the AI (taking into account the AI's share of the equity of the fund, and any leverage in the fund structure), except for the funds that meet the following conditions:

- For funds that hold an index instrument that meets the criteria set out under paragraph 132, an AI should still apply a look-through and treat the underlying positions of the fund as if the positions were held directly by the AI, but the AI may then choose to apply the "no look-through" approach for the index holdings of the fund as set out in paragraph 134.
- For funds that track an index benchmark, an AI may opt not to apply the look-through approach and opt to measure the risk assuming the fund is a position in the tracked index only where: (i) the fund has an absolute value of a tracking difference (ignoring fees and commissions) of less than 1%; and (ii) the tracking difference is checked at least annually and is defined as the annualised return difference between the fund and its tracked benchmark over the last 12 months of available data (or a shorter period in the absence of a full 12 months of data).

137 For equity investments in funds that cannot be looked through, but that an AI has access to daily price quotes and knowledge of the mandate of the fund as set out in paragraph 30, the AI may calculate capital charges for the fund in one of three ways:

- If the fund tracks an index benchmark and meets the requirement set out in paragraph 136, the AI may assume that the fund is a position in the tracked index, and may assign the sensitivity to the fund to relevant sector specific buckets or index buckets as set out in paragraph 134.

[25] In other words, an AI can initially not apply a look-through approach, and later decide to apply a look-through approach. But once it applies a look-through approach (for a certain type of instrument referencing a particular index), the AI will require supervisory approval to revert to a "no look-through" approach.

- Subject to supervisory approval, the AI may consider the fund as a hypothetical portfolio in which the fund invests to the maximum extent allowed under the fund's mandate in those assets attracting the highest capital charge under the sensitivities-based method, and then progressively in those other assets implying lower capital charge. If more than one risk weight can be applied to a given exposure under the sensitivities-based method, the maximum risk weight applicable should be used.
    - This hypothetical portfolio should be subject to market risk capital charges on a standalone basis for all positions in that fund, separate from any other positions subject to market risk capital charges.
    - The counterparty credit and CVA risks of the derivatives of this hypothetical portfolio should be calculated in accordance with the corresponding treatment of equity investments in funds in the banking book.
- An AI may treat their equity investment in the fund as an unrated equity exposure to be allocated to the "other sector" bucket (Bucket 11). In applying this treatment, the AI should also consider whether, given the mandate of the fund, the default risk capital risk weight prescribed to the fund is sufficiently prudent (as set out in paragraph 216), and whether the residual risk add-on should apply (as set out in paragraph 204).

138 Net long equity investments in a given fund in which the AI cannot look through or does not meet the requirements of paragraph 30 should be assigned to the banking book. Net short positions in funds, where the AI cannot look through or does not meet the requirements of paragraph 30, should be excluded from any trading book capital charges under the market risk framework, with the net position instead subjected to a 100% capital charge.

139 In the vega risk context:

- Multi-underlying options (including index options) are usually priced based on the implied volatility of the option, rather than the implied volatility of its underlying constituents and a look through approach may not need to be applied, regardless of the approach applied to the delta and curvature risk calculation as set out above.[26]
- For indices, the vega risk with respect to the implied volatility of the multi-underlying options will be calculated using a sector-specific bucket or an index bucket defined in paragraphs 148 and 163 as follows:

[26] The implied volatility of an option must be mapped to one or more maturity tenors.

- Where more than 75% of constituents in that index (taking into account the weightings of that index) would be mapped to a single specific sector bucket (i.e. bucket 1 to bucket 11 for equity risk; or bucket 1 to bucket 16 for CSR), the sensitivity to the index shall be mapped to that single specific sector bucket and treated like any other single-name sensitivity in that bucket.
- In all other cases, the sensitivity may be mapped to an "index" bucket (i.e. bucket 12 or bucket 13 for equity risk or bucket 17 or bucket 18 for CSR).

13 SBM: Delta Risk Weights and Correlations

140 An AI should calculate the risk-weighted sensitivity in accordance with the prescribed risk weights and correlations in this section which have been calibrated to the liquidity-adjusted time horizon related to each risk class.

13.1 *General Interest Rate Risk (GIRR)*

141 Each bucket represents an individual currency exposure to GIRR, so all risk factors in risk-free yield curves for the same currency in which interest rate-sensitive instruments are denominated are grouped into the same bucket. The risk weights are set as follows:

Tenor	0.25 years	0.5 years	1 year	2 years	3 years
Risk weight (percentage points)	1.7%	1.7%	1.6%	1.3%	1.2%

Tenor	5 years	10 years	15 years	20 years	30 years
Risk weight (percentage points)	1.1%	1.1%	1.1%	1.1%	1.1%

Table 2

- A risk weight of 1.6% is set for all the inflation risk factors and the cross-currency basis risk factors, respectively; and
- For the currencies HKD, AUD, CAD, EUR, GBP, JPY, SEK and USD the above risk weights may, at the discretion of an AI, be divided by the square root of 2.[27]

142 For aggregating GIRR risk positions within a bucket, the correlation parameter ρ_{kl} is set at 99.9% between weighted sensitivities WS_k and WS_l within the same bucket (i.e. same currency), with the same assigned tenor but corresponding to different yield curves. In aggregating delta risk positions for cross-currency basis risk for onshore and offshore curves, which should be considered two different curves as set out in paragraph 88, an AI may choose to aggregate all cross-currency basis risk for a currency (i.e. "Curr/USD" or "Curr/EUR") for both onshore and offshore curves by a simple sum of weighted sensitivities.

[27] This list of currencies could be subject to update. AIs should build their market risk capital calculation systems with sufficient flexibility to account for this potential periodic update.

143 The delta risk correlation ρ_{kl} between weighted sensitivities WS_k and WS_l within the same bucket (i.e. same currency), with different tenor and corresponding to the same yield curve is set in the following table.[28]

Delta GIRR correlations (ρ_{kl}) within the same bucket, with different tenor (in years) and same curve										
Tenor (in years)	0.25	0.5	1	2	3	5	10	15	20	30
0.25	100.0%	97.0%	91.4%	81.1%	71.9%	56.6%	40.0%	40.0%	40.0%	40.0%
0.5	97.0%	100.0%	97.0%	91.4%	86.1%	76.3%	56.6%	41.9%	40.0%	40.0%
1	91.4%	97.0%	100.0%	97.0%	94.2%	88.7%	76.3%	65.7%	56.6%	41.9%
2	81.1%	91.4%	97.0%	100.0%	98.5%	95.6%	88.7%	82.3%	76.3%	65.7%
3	71.9%	86.1%	94.2%	98.5%	100.0%	98.0%	93.2%	88.7%	84.4%	76.3%
5	56.6%	76.3%	88.7%	95.6%	98.0%	100.0%	97.0%	94.2%	91.4%	86.1%
10	40.0%	56.6%	76.3%	88.7%	93.2%	97.0%	100.0%	98.5%	97.0%	94.2%
15	40.0%	41.9%	65.7%	82.3%	88.7%	94.2%	98.5%	100.0%	99.0%	97.0%
20	40.0%	40.0%	56.6%	76.3%	84.4%	91.4%	97.0%	99.0%	100.0%	98.5%
30	40.0%	40.0%	41.9%	65.7%	76.3%	86.1%	94.2%	97.0%	98.5%	100.0%

Table 3

144 The delta risk correlation ρ_{kl} between weighted sensitivities WS_k and WS_l within the same bucket (i.e. same currency), with different tenor and corresponding to different yield curves is set at the correlation parameter specified in paragraph 143 multiplied by 99.9%.[29]

145 The delta risk correlation ρ_{kl} between a weighted sensitivity WS_k to the inflation curve and a weighted sensitivity WS_l to a given tenor of the relevant yield curve is 40%.

146 The delta risk correlation ρ_{kl} between a weighted sensitivity WS_k to a cross-currency basis curve and a weighted sensitivity WS_l to either (i) a given tenor

[28] The delta GIRR correlation parameters (ρ_{kl}) are determined by $max\left[e^{\left(-\theta\cdot\frac{|T_k-T_l|}{min\{T_k;T_l\}}\right)};40\%\right]$, where T_k (respectively T_l) is the tenor that relates to WS_k (respectively WS_l); and θ set at 3%. For example, the correlation between a sensitivity to the 1-year tenor of the HKD 3-month swap curve and a sensitivity to the 5-year tenor of the HKD 3-month swap curve in the same currency is $max\left[e^{\left(-3\%\cdot\frac{|1-5|}{min\{1;5\}}\right)};40\%\right] = 88.69\%$.

[29] For example, the correlation between a sensitivity to the 1-year tenor of the HKD 1-month swap curve and a sensitivity to the 5-year tenor of the HKD 3-month swap curve in the same currency is $(88.69\%)\cdot(0.999) = 88.60\%$.

of the relevant yield curve, (ii) the inflation curve or (iii) another cross-currency basis curve (if relevant) is 0%.

147 The parameter γ_{bc} of 50% should be used for aggregating across different buckets (i.e. different currencies).

13.2 *Credit Spread Risk for Non-securitisation (CSR non-SEC)*

148 The risk weights for each of the buckets 1 to 18 are set out in the following table. Risk weights are the same for all tenors (i.e. 0.5 years, 1 year, 3 years, 5 years and 10 years) within each bucket:

Bucket number	Credit quality	Sector	Risk weight (%)
1	Investment grade[30]	Sovereigns including central banks, multilateral development banks	0.5%
2		Local government, government-backed non-financials, education, public administration	1.0%
3		Financials including government-backed financials	5.0%
4		Basic materials, energy, industrials, agriculture, manufacturing, mining and quarrying	3.0%
5		Consumer goods and services, transportation and storage, administrative and support service activities	3.0%
6		Technology and telecommunications	2.0%
7		Health care, utilities, professional and technical activities	1.5%
8		Covered bonds[31]	2.5%[32]
9	Non-investment grade & unrated	Sovereigns including central banks, multilateral development banks	2.0%
10		Local government, government-backed non-financials, education, public administration	4.0%
11		Financials including government-backed financials	12.0%
12		Basic materials, energy, industrials, agriculture, manufacturing, mining and quarrying	7.0%
13		Consumer goods and services, transportation and storage, administrative and support service activities	8.5%
14		Technology and telecommunications	5.5%
15		Health care, utilities, professional and technical activities	5.0%
16	Other sector[33]		12.0%
17	Investment grade indices		1.5%
18	Non-investment grade indices		5.0%

Table 4

149 To assign a risk exposure to a sector, an AI should rely on a classification that is commonly used in the market for grouping issuers by industry sector. The AI should assign each issuer to one and only one of the sector buckets in the table under

[30] Unless otherwise specified, "investment grade" has the same meaning as specified in section 281 of the BCR.

[31] Covered bonds must meet the criteria provided in paragraphs 68, 70 and 71 of the *Supervisory framework for measuring and controlling large exposures*, published by the BCBS in April 2014 (www.bis.org/publ/bcbs283.pdf).

[32] For covered bonds that are rated AA– or higher, the applicable risk weight may at the discretion of the AI be 1.5%.

[33] Credit quality is not a differentiating consideration for this bucket.

paragraph 148. Risk positions from any issuer that an AI cannot assign to a sector in this fashion should be assigned to the other sector bucket (i.e. bucket 16).

150 For buckets 1 to 15, for aggregating delta CSR non-securitisations risk positions within a bucket, the correlation parameter ρ_{kl} between two weighted sensitivities WS_k and WS_l within the same bucket is set as follows:

$$\rho_{kl} = \rho_{kl}^{(name)} \cdot \rho_{kl}^{(tenor)} \cdot \rho_{kl}^{(basis)}$$

where:

- $\rho_{kl}^{(name)}$ is equal to 1 if the two names of sensitivities *k* and *l* are identical, and 35% otherwise;
- $\rho_{kl}^{(tenor)}$ is equal to 1 if the two tenors of the sensitivities *k* and *l* are identical, and 65% otherwise; and
- $\rho_{kl}^{(basis)}$ is equal to 1 if the two sensitivities are related to same curves, and 99.9% otherwise.

For example, the correlation between a sensitivity to the 5-year Apple bond curve and a sensitivity to the 10-year Google CDS curve would be $35\% \cdot 65\% \cdot 99.9\% = 22.73\%$.

151 For buckets 17 and 18, for aggregating delta CSR non-securitisations risk positions within a bucket, the correlation parameter ρ_{kl} between two weighted sensitivities WS_k and WS_l within the same bucket is set as follows:

$$\rho_{kl} = \rho_{kl}^{(name)} \cdot \rho_{kl}^{(tenor)} \cdot \rho_{kl}^{(basis)}$$

where:

- $\rho_{kl}^{(name)}$ is equal to 1 if the two names of sensitivities *k* and *l* are identical, and 80% otherwise;
- $\rho_{kl}^{(tenor)}$ is equal to 1 if the two tenors of the sensitivities *k* and *l* are identical, and to 65% otherwise; and
- $\rho_{kl}^{(basis)}$ is equal to 1 if the two sensitivities are related to same curves, and 99.9% otherwise.

152 The correlations mentioned above do not apply to the other sector bucket. The aggregation of delta and vega CSR non-securitisation risk positions within the other sector bucket would be equal to the simple sum of the absolute values of the net weighted sensitivities allocated to this bucket.

For delta and vega: $K_{b(other\ bucket)} = \sum_k |WS_k|$

The aggregation of curvature CSR non-securitisation risk positions within the other sector bucket would be calculated by the formula below.

For curvature: $K_{b(other\ bucket)} = \max(\sum_k max(CVR_k^+, 0), \sum_k max(CVR_k^-, 0))$

153 For aggregating delta CSR non-securitisation risk positions across buckets 1 to 16, the correlation parameter γ_{bc} is set as follows:

$$\gamma_{bc} = \gamma_{bc}^{(rating)} \cdot \gamma_{bc}^{(sector)}$$

where:

- $\gamma_{bc}^{(rating)}$ is equal to 50% where the two buckets *b* and *c* are both in buckets 1 to 15 and have the different credit quality category (either investment grade or non-investment grade/unrated), and 1 otherwise; and
- $\gamma_{bc}^{(sector)}$ is equal to 1 if the two buckets belong to the same sector category, and to the following percentages otherwise:

Bucket	1/9	2/10	3/11	4/12	5/13	6/14	7/15	8	16	17	18
1/9		75%	10%	20%	25%	20%	15%	10%	0%	45%	45%
2/10			5%	15%	20%	15%	10%	10%	0%	45%	45%
3/11				5%	15%	20%	5%	20%	0%	45%	45%
4/12					20%	25%	5%	5%	0%	45%	45%
5/13						25%	5%	15%	0%	45%	45%
6/14							5%	20%	0%	45%	45%
7/15								5%	0%	45%	45%
8									0%	45%	45%
16										0%	0%
17											75%
18											

Table 5

13.3 *Credit Spread Risk for Securitisations (CTP) (CSR SEC (CTP))*

154 Sensitivities to CSR SEC (CTP) and its related hedges belong to the same risk class. This risk class applies the same bucket structure and correlation structure as those for the CSR non-SEC framework with an exception of index buckets (i.e. buckets 17 and 18). The risk weights and correlations of the delta CSR non-SEC are also modified to reflect longer liquidity horizons and larger basis risk. Risk weights are the same for all tenors (i.e. 0.5 years, 1 year, 3 years, 5 years and 10 years) within each bucket:

Bucket number	Credit quality	Sector	Risk weight (%)
1	Investment grade	Sovereigns including central banks, multilateral development banks	4.0%
2		Local government, government-backed non-financials, education, public administration	4.0%
3		Financials including government-backed financials	8.0%
4		Basic materials, energy, industrials, agriculture, manufacturing, mining and quarrying	5.0%
5		Consumer goods and services, transportation and storage, administrative and support service activities	4.0%
6		Technology and telecommunications	3.0%
7		Health care, utilities, professional and technical activities	2.0%
8		Covered bonds	6.0%
9	Non-investment grade & unrated	Sovereigns including central banks, multilateral development banks	13.0%
10		Local government, government-backed non-financials, education, public administration	13.0%
11		Financials including government-backed financials	16.0%
12		Basic materials, energy, industrials, agriculture, manufacturing, mining and quarrying	10.0%
13		Consumer goods and services, transportation and storage, administrative and support service activities	12.0%
14		Technology and telecommunications	12.0%
15		Health care, utilities, professional and technical activities	12.0%
16	Other sector[34]		13.0%

Table 6

[34] Credit quality is not a differentiating consideration for this bucket.

155 For aggregating delta CSR securitisations (CTP) risk positions within a bucket, the delta risk correlation ρ_{kl} is derived the same way as in paragraph 150, except that $\rho_{kl}^{(basis)}$ is now equal to 1 if the two sensitivities are related to same curves, and 99% otherwise.

156 For aggregating delta CSR securitisations (CTP) risk positions across buckets, the delta risk correlation γ_{bc} are derived the same way as in paragraph 153.

13.4 *Credit Spread Risk for Securitisations (non-CTP) (CSR SEC (non-CTP))*

157 The risk weights for each of the buckets 1 to 25 are set out in the following table.

Bucket number	Credit quality	Sector	Risk weight
1	Senior investment grade	RMBS – Prime	0.9%
2		RMBS – Mid-prime	1.5%
3		RMBS – Sub-prime	2.0%
4		Commercial mortgage-backed securities (CMBS)	2.0%
5		Asset-backed securities (ABS) – Student loans	0.8%
6		ABS – Credit cards	1.2%
7		ABS – Auto	1.2%
8		CLO non-CTP	1.4%
9	Non-senior investment grade	RMBS – Prime	1.125%
10		RMBS – Mid-prime	1.875%
11		RMBS – Sub-prime	2.5%
12		CMBS	2.5%
13		ABS – Student loans	1%
14		ABS – Credit cards	1.5%
15		ABS – Auto	1.5%
16		CLO non-CTP	1.75%
17	Non-investment grade & unrated	RMBS – Prime	1.575%
18		RMBS – Mid-prime	2.625%
19		RMBS – Sub-prime	3.5%
20		CMBS	3.5%
21		ABS – Student loans	1.4%
22		ABS – Credit cards	2.1%
23		ABS – Auto	2.1%
24		CLO non-CTP	2.45%
25	Other sector[35]		3.5%

Table 7

158 To assign a risk exposure to a sector, an AI should rely on a classification that is commonly used in the market for grouping tranches by type. The AI should assign each tranche to one of the sector buckets in the table in paragraph 157. Risk

[35] Credit quality is not a differentiating consideration for this bucket.

positions from any tranche that the AI cannot assign to a sector in this fashion should be assigned to the other sector bucket (i.e. bucket 25).

159 For aggregating delta CSR securitisations (non-CTP) risk positions within a bucket, the correlation parameter ρ_{kl} between two weighted sensitivities WS_k and WS_l within the same bucket is set as follows:

$$\rho_{kl} = \rho_{kl}^{(tranche)} \cdot \rho_{kl}^{(tenor)} \cdot \rho_{kl}^{(basis)}$$

where:

- $\rho_{kl}^{(tranche)}$ is equal to 1 if the two names of sensitivities *k* and *l* are within the same bucket and related to the same securitisation tranche (more than 80% overlap in notional terms), and 40% otherwise;
- $\rho_{kl}^{(tenor)}$ is equal to 1 if the two tenors of the sensitivities *k* and *l* are identical, and to 80% otherwise; and
- $\rho_{kl}^{(basis)}$ is equal to 1 if the two sensitivities are related to same curves, and 99.9% otherwise.

160 The correlations mentioned in paragraph 159 do not apply to the other sector bucket. The aggregation of delta and vega CSR securitisations (non-CTP) risk positions within the other sector bucket would be equal to the simple sum of the absolute values of the net weighted sensitivities allocated to this bucket.

For delta and vega: $K_{b(other\ bucket)} = \sum_k |WS_k|$

The aggregation of curvature CSR securitisations (non-CTP) risk positions within the other sector bucket would be calculated by the formula below.

For curvature: $K_{b(other\ bucket)} = \max(\sum_k max(CVR_k^+, 0), \sum_k max(CVR_k^-, 0))$

161 For aggregating delta CSR securitisations (non-CTP) risk positions across buckets 1 to 24, the correlation parameter γ_{bc} is set at 0%.

162 For aggregating delta CSR securitisations (non-CTP) risk positions between the other sector bucket (i.e. bucket 25) and buckets 1 to 24, the correlation parameter γ_{bc} is set at 1.

13.5 *Equity Risk*

163 The risk weights for the sensitivities to equity spot price and equity repo rate for buckets 1 to 11 are set out in the following table:

Bucket number	Market capitalisation	Economy	Sector	Risk weight for Equity spot price	Risk weight for Equity repo rate
1	Large	Emerging market economy	Consumer goods and services, transportation and storage, administrative and support service activities, healthcare, utilities	55%	0.55%
2			Telecommunications, industrials	60%	0.60%
3			Basic materials, energy, agriculture, manufacturing, mining and quarrying	45%	0.45%
4			Financials including government-backed financials, real estate activities, technology	55%	0.55%
5		Advanced economy	Consumer goods and services, transportation and storage, administrative and support service activities, healthcare, utilities	30%	0.30%
6			Telecommunications, industrials	35%	0.35%
7			Basic materials, energy, agriculture, manufacturing, mining and quarrying	40%	0.40%
8			Financials including government-backed financials, real estate activities, technology	50%	0.50%
9	Small	Emerging market economy	All sectors described under bucket numbers 1, 2, 3 and 4	70%	0.70%
10		Advanced economy	All sectors described under bucket numbers 5, 6, 7 and 8	50%	0.50%
11	Other sector[36]			70%	0.70%
12	Large market capitalisation, advanced economy equity indices (non-sector specific)			15%	0.15%
13	Other equity indices (non-sector specific)			25%	0.25%

Table 8

[36] Market capitalisation or economy (i.e. advanced or emerging market) is not a differentiating consideration for this bucket.

164 Market capitalisation for the purpose of subsection 13.5 refers to the sum of the market capitalisations based on the market value of the total outstanding shares issued by the same legal entity across all stock markets globally. Under no circumstances should the sum of the market capitalisations of multiple related listed entities be used to determine whether a listed entity is "large market capitalisation" or "small market capitalisation".

165 Large market capitalisation is defined as a market capitalisation equal to or greater than HKD 15.6bn and small market capitalisation is defined as a market capitalisation of less than HKD 15.6bn. The determination of market capitalisation should be updated in a regular interval, at least on a weekly basis, and at the end of every month.

166 The advanced economies are the euro area, the non-euro area western European countries (Denmark, Norway, Sweden, Switzerland and the United Kingdom), Oceania (Australia and New Zealand), Canada, Japan, Mexico, Singapore, the United States and Hong Kong.[37]

167 To assign a risk exposure to a sector, an AI should rely on a classification that is commonly used in the market for grouping issuers by industry sector. The AI should assign each issuer to one of the sector buckets in the table under paragraph 163 and it should assign all issuers from the same industry to the same sector. Risk positions from any issuer that the AI cannot assign to a sector in this fashion should be assigned to the other sector bucket (i.e. bucket 11). For multinational multi-sector equity issuers, the allocation to a particular bucket should be done according to the most material region and sector in which the issuer operates.

168 For aggregating delta equity risk positions within a bucket, the correlation parameter ρ_{kl} is set at 99.9% between two weighted sensitivities WS_k and WS_l within the same bucket where one is a sensitivity to an equity spot price and the other is a sensitivity to an equity repo rate, where both are related to the same equity issuer name.

169 Otherwise, the correlation parameter ρ_{kl} between two weighted sensitivities WS_k and WS_l to equity spot price within the same bucket is defined as:

- 15% between two sensitivities within the same bucket that fall under large market capitalisation, emerging market economy (bucket number 1, 2, 3 or 4);

[37] This list of advanced economies could be subject to update. AIs should build their market risk capital calculation systems with sufficient flexibility to account for this potential periodic update.

- 25% between two sensitivities within the same bucket that fall under large market capitalisation, advanced economy (bucket number 5, 6, 7 or 8);
- 7.5% between two sensitivities within the same bucket that fall under small market capitalisation, emerging market economy (bucket number 9);
- 12.5% between two sensitivities within the same bucket that fall under small market capitalisation, advanced economy (bucket number 10); and
- 80% between two sensitivities within the same bucket that fall under either index bucket (bucket number 12 or 13).

170 The correlation parameter ρ_{kl} between two weighted sensitivities WS_k and WS_l to equity repo rate within the same bucket is also defined according to paragraph 169.

171 Between two weighted sensitivities WS_k and WS_l within the same bucket where one is a sensitivity to an equity spot price and the other a sensitivity to an equity repo rate and both sensitivities relate to a different equity issuer name, the correlation parameter ρ_{kl} is set at the correlations specified in paragraph 169 multiplied by 99.9%.

172 The correlations above do not apply to the other sector bucket (i.e. bucket 11). The capital charge for the delta and vega risk within the other sector bucket would be equal to the simple sum of the absolute values of the net weighted sensitivities allocated to this bucket.

For delta and vega: $K_{b(other\ bucket)} = \sum_k |WS_k|$

The capital charge for the curvature risk within the other sector bucket would be calculated by the formula below.

For curvature: $K_{b(other\ bucket)} = \max\left(\sum_k max(CVR_k^+, 0), \sum_k max(CVR_k^-, 0)\right)$

173 For aggregating delta equity risk positions across buckets, the correlation parameter γ_{bc} is set at:

- 15% if bucket *b* and bucket *c* fall within bucket numbers 1 to 10;
- 0% if either bucket *b* and bucket *c* is bucket 11;
- 75% if bucket *b* and bucket *c* are bucket numbers 12 and 13 (i.e. one is bucket 12 and the other one is bucket 13); and
- 45% otherwise.

13.6 *Commodity Risk*

174 The risk weights depend on the eleven buckets, in which several commodities with common characteristics are grouped, are set out in the following table:

Bucket	Commodity bucket	Examples of commodities allocated to each commodity bucket (non-exhaustive)	Risk weight (percentage points)
1	Energy - Solid combustibles	Coal, charcoal, wood pellets, uranium	30%
2	Energy - Liquid combustibles	Light-sweet crude oil, heavy crude oil, WTI crude oil and Brent crude oil, etc. (i.e. various types of crude oil); Bioethanol, biodiesel, etc. (i.e. various biofuels); Propane, ethane, gasoline, methanol, butane, etc. (i.e. various petrochemicals); Jet fuel, kerosene, gasoil, fuel oil, naptha, heating oil, diesel, etc. (i.e. various refined fuels)	35%
3	Energy - Electricity and carbon trading	Spot electricity, day-ahead electricity, peak electricity and off-peak electricity (i.e. various electricity types); Certified emissions reductions, in-delivery month EU allowance, RGGI CO_2 allowance, renewable energy certificates, etc. (i.e. various carbon emissions trading)	60%
4	Freight	Capesize, panamex, handysize, supramax, etc. (i.e. various types of dry-bulk route); Suezmax, Aframax, very large crude carriers, etc. (i.e. various types of liquid-bulk/gas shipping route)	80%
5	Metals – non-precious	Aluminium, copper, lead, nickel, tin, zinc, etc. (various base metals); Steel billet, steel wire, steel coil, steel scrap, steel rebar, iron ore, tungsten, vanadium, titanium, tantalum, etc. (i.e. various steel raw materials); Cobalt, manganese, molybdenum, etc. (i.e. various minor metals)	40%
6	Gaseous combustibles	Natural gas; liquefied natural gas	45%
7	Precious metals (including gold)	Gold; silver; platinum; palladium	20%
8	Grains & oilseed	Rice; corn; wheat; soybean seed; soybean oil; soybean meal; oats; palm oil; canola; barley; rapeseed seed; rapeseed oil; rapeseed meal; red bean; sorghum; coconut oil; olive oil; peanut oil; sunflower oil	35%
9	Livestock & dairy	Live cattle; feeder cattle; hog; poultry; lamb; fish; shrimp; milk, whey, eggs, butter; cheese	25%
10	Softs and other agriculturals	Cocoa; Arabica coffee; Robusta coffee; tea; citrus and orange juice; potatoes; sugar; cotton; wool; lumber and pulp; rubber	35%
11	Other commodity	Potash, fertilizer, phosphate rocks, etc. (i.e. various industrial minerals); Rare earths; terephthalic acid; flat glass	50%

Table 9

175 For the purpose of correlation recognition, any two commodities are considered distinct commodities if there exists in the market two contracts differentiated only by the underlying commodity to be delivered against each contract. For example, in bucket 2 (Energy – Liquid Combustibles) WTI and Brent would typically be treated as distinct commodities.

176 The correlation parameter ρ_{kl} between two weighted sensitivities WS_k and WS_l within the same bucket is set as follows:

$$\rho_{kl} = \rho_{kl}^{(cty)} \cdot \rho_{kl}^{(tenor)} \cdot \rho_{kl}^{(basis)}$$ [38]

where:

- $\rho_{kl}^{(cty)}$ is equal to 1 where the two commodities of sensitivities *k* and *l* are identical, and to the intra-bucket correlations in the table below otherwise;
- $\rho_{kl}^{(tenor)}$ is equal to 1 is the two tenors of the sensitivities *k* and *l* are identical, and to 99% otherwise;
- $\rho_{kl}^{(basis)}$ is equal to 1 if the two sensitivities are identical in delivery location of a commodity, and 99.9% otherwise.

Bucket	Commodity category	Correlation ($\rho_{kl}^{(cty)}$)
1	Energy - Solid combustibles	55%
2	Energy - Liquid combustibles	95%
3	Energy - Electricity and carbon trading	40%
4	Freight	80%
5	Metals – non-precious	60%
6	Gaseous combustibles	65%
7	Precious metals (including gold)	55%
8	Grains & oilseed	45%
9	Livestock & dairy	15%
10	Softs and other agriculturals	40%
11	Other commodity	15%

Table 10

177 The correlation parameters γ_{bc} that applies to the aggregation of delta commodity risk positions across buckets is set at:

[38] For example, the correlation between the sensitivity to Brent, one-year tenor, for delivery in Le Havre and the sensitivity to WTI, five-year tenor, for delivery in Oklahoma is 95%·99%·99.9% = 93.96%.

- 20% if bucket *b* and bucket *c* fall within bucket numbers 1 to 10; and
- 0% if either bucket *b* or bucket *c* is bucket number 11.

178 For determining the commodity correlation parameter ($\rho_{kl}^{(cty)}$) as set out in paragraph 176, further definitions related to delivery time and location are as follows:

- For bucket 3 (energy – electricity and carbon trading), each time interval (i) at which the electricity can be delivered and (ii) that is specified in a contract that is made on a financial market is considered a distinct electricity commodity (e.g. peak and off-peak). Electricity produced in a specific region should also be considered distinct electricity commodities.
- For bucket 4 (freight), each combination of freight type, route and each week at which a good has to be delivered is a distinct commodity.

13.7 *Foreign Exchange Risk*

179 A foreign exchange risk bucket is set for each exchange rate between HKD and the currency in which an instrument is denominated.

180 A risk weight of 15% applies to risk sensitivities of all the currency pairs except USD/HKD and the currency pairs in the footnote[39] below.

181 The risk weight of USD/HKD may, at the discretion of the AI, be set at 1.3% on the rationale that this risk weight captures the fluctuation of USD/HKD within the Convertibility Undertaking range (i.e. 7.75 to 7.85) under the Linked Exchange Rate System. AIs using the FX base currency approach as set out in paragraph 113 with USD as the selected base currency, will not be allowed to make use of this preferential risk weight.

182 The risk weight of the currency pairs mentioned in footnote 39 may, at the discretion of the AI, be set at 15% divided by the square root of 2.

183 A uniform correlation parameter γ_{bc} that applies to the aggregation of delta foreign exchange risk positions is set at 60%.

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[39] Selected currency pairs are: USD/AUD, USD/BRL, USD/CAD, USD/CHF, USD/CNY, USD/EUR, USD/GBP, USD/INR, USD/JPY, USD/KRW, USD/MXN, USD/NOK, USD/NZD, USD/RUB, USD/SEK, USD/SGD, USD/TRY, USD/ZAR, their first-order cross-currency pairs between each other, and their first-order cross-currency pairs with USD/HKD. For example, EUR/HKD is not among the selected currency pairs, but is a first-order cross of USD/EUR and USD/HKD. The selected currency pairs could be subject to update. AIs should build their market risk capital calculation systems with sufficient flexibility to account for this potential periodic update.

14 SBM: Vega Risk Weights and Correlations

184 The delta buckets are replicated in the vega context, unless specified otherwise in the subsections 12 and 13.

185 The risk of market illiquidity is incorporated into the determination of vega risk by assigning different liquidity horizons for each risk class. The liquidity horizon and the respective risk weight for each risk class[40] is set out as follows.

Risk class	$LH_{risk\ class}$(days)	Risk weights
GIRR	60	100%
CSR non-SEC	120	100%
CSR SEC (CTP)	120	100%
CSR SEC (non-CTP)	120	100%
Equity (large cap and indices)	20	77.78%
Equity (small cap and other sector)	60	100%
Commodity	120	100%
FX	40	100%

Table 11

186 The correlation parameter ρ_{kl} between vega risk positions within the same bucket of the GIRR risk class is set as follows:

$$\rho_{kl} = min\left[\rho_{kl}^{(option\ maturity)} \cdot \rho_{kl}^{(underlying\ maturity)}; 1\right]$$

where:

- $\rho_{kl}^{(option\ maturity)}$ is equal to $e^{-\alpha \cdot \frac{|T_k - T_l|}{min\{T_k;T_l\}}}$ where α is set at 1%, T_k (respectively T_l) is the maturity of the option from which the vega risk sensitivity VR_k (VR_l) is derived, expressed in years;
- $\rho_{kl}^{(underlying\ maturity)}$ is equal to $e^{-\alpha \cdot \frac{|T_k^U - T_l^U|}{min\{T_k^U;T_l^U\}}}$, where α is set at 1%, T_k^U (respectively T_l^U) is the maturity of the underlying of the option from which the sensitivity VR_k (VR_l) is derived, expressed in years after the maturity of the option.

[40] The risk weight for a given vega risk factor k (RW_k) is determined by the following function: $RW_k = min\left[RW_\sigma \cdot \frac{\sqrt{LH_{risk\ class}}}{\sqrt{10}}; 100\%\right]$, where RW_σ is set at 55%; and $LH_{risk\ class}$ is the regulatory liquidity horizon to be prescribed in the paragraph 185.

187 The correlation parameter ρ_{kl} between vega risk positions within a bucket of the other risk classes (i.e. non-GIRR) is set as follows:

$$\rho_{kl} = min\left[\rho_{kl}^{(DELTA)} \cdot \rho_{kl}^{(option\,maturity)}; 1\right]$$

where:

- $\rho_{kl}^{(DELTA)}$ is equal to the correlation that applies between the delta risk factors that correspond to vega risk factors k and l. For instance, if k is the vega risk factor from equity option X and l is the vega risk factor from equity option Y then $\rho_{kl}^{(DELTA)}$ is the delta correlation applicable between X and Y; and
- $\rho_{kl}^{(option\,maturity)}$ is defined as in paragraph 186.

188 With regard to vega risk positions between buckets within a risk class (GIRR and non-GIRR), the same correlation parameters for γ_{bc}, as specified for delta correlations for each risk class in subsection 13, are to be used in the vega risk context (e.g. γ_{bc} = 50% is to be used for aggregation of vega risk positions across different GIRR buckets).

189 There is no diversification or hedging benefit recognised in the Standardised Approach between vega and delta risk factors. Vega and delta risk charges are aggregated by simple summation.

15 SBM: Curvature Risk Weights and Correlations

190 The delta buckets are replicated in the curvature context, unless specified otherwise in the preceding paragraphs.

191 For foreign exchange and equity curvature risk factors, the curvature risk weight is the relative shift (shock) to a given risk factor, which are equal to the respective delta risk weights.

192 For foreign exchange curvature risk, for options that do not reference HKD (or base currency as set out in paragraph 113) as an underlying, net curvature risk charges (CVR_k^+ and CVR_k^-) may be divided by a scalar of 1.5. Alternatively, and subject to supervisory approval, an AI may apply the scalar of 1.5 consistently to all FX instruments provided curvature sensitivities are calculated for all currencies, including sensitivities determined by shocking HKD (or base currency where used) relative to all other currencies.

193 For GIRR, CSR and commodity curvature risk factors, the curvature risk weight is the parallel shift of all the tenors for each curve based on the highest prescribed delta risk weight for each curve. For example, in the case of GIRR the risk weight assigned to the 0.25-year tenor (i.e. most punitive tenor risk weight) is applied to all the tenors simultaneously for each risk-free yield curve (consistent with a "translation", or "parallel shift" risk calculation).

194 For aggregating curvature risk positions within a bucket, the curvature risk correlation parameters ρ_{kl} should be determined by squaring the corresponding delta correlation parameters ρ_{kl} except for CSR non-securitisations, CSR securitisations (CTP) and CSR securitisations (non-CTP). In applying the high and low correlations scenario set out in paragraph 83, the curvature risk charge is calculated by applying the curvature correlation parameters ρ_{kl} determined in this paragraph.

195 For CSR non-securitisations, CSR securitisations (CTP) and CSR securitisations (non-CTP), an AI should define the buckets along the relevant credit spread curve as set out in paragraphs 97, 101 and 105. The correlation parameter ρ_{kl} as defined in paragraphs 150, 151 and 159 is not applicable to the curvature risk. The curvature correlation parameter is determined by whether the two names of weighted sensitivities are the same. In paragraphs 150, 151 and 159, the correlation parameters $\rho_{kl}^{(basis)}$ and $\rho_{kl}^{(tenor)}$ need not apply and only $\rho_{kl}^{(name)}$ (for paragraphs 150 and 151) or $\rho_{kl}^{(tranche)}$ (for paragraph 159) applies between two weighted sensitivities within the same bucket. This correlation parameter should be squared.

196 For aggregating curvature risk positions across buckets, the curvature risk correlation parameters γ_{bc} are determined by squaring the corresponding delta correlation parameters γ_{bc}. For instance, between CVR_{EUR} and CVR_{USD} in the GIRR context, the correlation should be $50\%^2 = 25\%$. In applying the high and low correlations scenario set out in paragraph 83, the curvature risk charge is calculated by applying the curvature correlation parameters γ_{bc} determined in this paragraph.

16 Residual Risk Add-on (RRAO)

197 The HKMA acknowledges that not all market risks can be captured in the Standardised Approach, as this might necessitate an unduly complex regime. We propose an AI should calculate a residual risk add-on for all instruments bearing residual risk separately and in addition to other components of the capital charge under the Standardised Approach for market risk.

16.1 *Instruments subject to the RRAO*

198 All instruments with an exotic underlying and instruments bearing other residual risks are subject to the RRAO.

199 Instruments with an exotic underlying are instruments with an underlying exposure whose risk profile is not captured by the sensitivities-based method or default risk charge in the Standardised Approach.[41]

200 Instruments bearing other residual risks are those that meet either of the following criteria:

- instruments subject to vega or curvature risk capital charges in the trading book and with pay-offs that cannot be written or perfectly replicated as a finite linear combination of vanilla options with a single underlying equity price, commodity price, exchange rate, bond price, credit default swap (CDS) price or interest rate swap; or
- instruments which fall under the definition of the CTP, except for those instruments that are recognised in the market risk framework as eligible hedges of risks within the CTP.

201 A non-exhaustive list of other residual risks types and instruments that may fall in the scope of RRAO includes:

- Gap risk: risk of a significant change in vega parameters in options due to small movements in the underlying, which results in hedge slippage. Relevant instruments subject to gap risk include all path dependent options, such as barrier options, and Asian options, as well as all digital options;
- Correlation risk: risk of a change in a correlation parameter necessary for determining the value of an instrument with multiple underlyings. Relevant

[41] Examples of exotic underlying exposures include: longevity risk, weather, natural disasters, future realised volatility (as an underlying exposure for a swap).

instruments subject to correlation risk include all basket options, best-of-options, spread options, basis options, Bermudan options and quanto options; and

- Behavioural risk: risk of a change in exercise/prepayment outcomes such as those that arise in fixed rate mortgage products where retail clients may make decisions motivated by factors other than pure financial gain (e.g. demographical features and/or and other social factors). A callable bond may only be seen as possibly having behavioural risk if the right to call lies with a retail client.

202 An AI is not required to calculate the RRAO to an instrument that meets the following conditions:

- The instrument is listed on an exchange;
- The instrument is eligible for central clearing; or
- The instrument exactly matches with a third-party transaction in the trading book (i.e. a back-to-back transaction, in which case both transactions should be excluded from the RRAO).

203 When an instrument is subject to one or more of the following risk types, this by itself will not cause the instrument to be subject to the RRAO:

- Risk from a cheapest-to-deliver option;
- Smile risk: the risk of a change in an implied volatility parameter necessary for determining the value of an instrument with optionality relative to the implied volatility of other instruments with the same underlying and maturity, but different moneyness;
- Correlation risk arising from multi-underlying European or American plain vanilla options, and from any options that can be written as a linear combination of such options. This exemption applies in particular to the relevant index options; and
- Dividend risk arising from a derivative instrument whose underlying does not consist solely of dividend payments.

204 Index instruments and multi-underlying options of which treatment for delta, vega or curvature risk are set out in subsection 12.4. These are subject to the RRAO if they fall within the definitions set out in this subsection. For funds that are treated as an unrated “other sector” equity as set out in paragraph 137, an AI shall assume the fund is exposed to exotic underlying exposures, and to other residual risks, to the maximum possible extent allowed under the fund’s mandate.

16.2 *Calculation of the RRAO*

205 An AI should calculate the RRAO in addition to any other capital charges within the standardised approach.

206 The scope of instruments that are subject to the RRAO should not have an impact in terms of increasing or decreasing the scope of risk factors subject to (i) the delta, vega and curvature or (ii) default risk capital treatments in the Standardised Approach.

207 An AI should calculate the capital charge for the RRAO[42] as the simple sum of gross notional amounts of the instruments bearing residual risks multiplied by the following risk weights:

- 1.0% for instruments with an exotic underlying; and
- 0.1% for instruments bearing other residual risks.

[42] Where an AI cannot satisfy the HKMA that the residual risk add-on provides a sufficiently prudent capital charge, the HKMA would address any potentially under-capitalised risks by imposing a conservative additional capital charge under Pillar 2A.

17 Standardised Default Risk Charge (SA-DRC)

208 The SA-DRC is intended to capture jump-to-default risk for equity and credit instruments.

209 An AI should calculate the SA-DRC to capture the jump-to-default risk in three components (i) non-securitisation, (ii) securitisations (non-CTP) and (iii) securitisations (CTP). The final default risk charge under the Standardised Approach is the simple sum of the three components.

210 An AI should apply the following step-by-step approach to determine the SA-DRC for each component:

- Determine the gross jump-to-default (JTD) risk amount for each instrument subject to default risk separately;
- Determine the net JTD risk amount with respect to each obligor by offsetting the gross JTD risk amount of long and short exposures with respect to the same obligor (where permissible);
- Determine the risk-weighted net JTD risk amount by prescribed risk weights and allocating them into different buckets (taking into account the hedging benefit ratio within the bucket) for the calculation of bucket level DRC; and
- Determine the overall SA-DRC as a simple sum of bucket level DRC.

211 There should be no diversification benefit between the SA-DRC for (i) non-securitisation, (ii) securitisations (non-CTP) and (iii) securitisations (CTP).

212 For traded non-securitisation credit and equity derivatives, JTD risk amounts for each individual constituent issuer legal entity should be determined by applying a look-through approach.

213 When decomposing multiple underlying positions of a single instrument, the JTD equivalent is defined as the difference between the value of the instrument assuming that each single name referenced by the instrument, separately from the others, defaults (with zero recovery) and the value of the security or product assuming that none of the names referenced by the security or product default.

214 For the CTP, the capital charge includes the SA-DRC for securitisation exposures and for non-securitisation hedges. These hedges are to be removed from the default risk non-securitisation calculations.

215 Exposures to sovereigns and multilateral development banks which would be allocated a 0% risk weight under the standardised (credit risk) approach according to

sections 55, 56 or 58 of the BCR should also be subject to a 0% risk weight for the purpose of the SA-DRC.

216 For exposures in an equity investment in a fund that is treated as an unrated "other sector" equity as set out in paragraph 137, an AI should treat the equity investment in the fund as an unrated equity instrument. Where the mandate of that fund allows the fund to invest in primarily high-yield or distressed names, the AI should apply the maximum risk weight as set out in paragraph 232 that is achievable under the fund's mandate (by calculating the effective average risk weight of the fund when assuming that the fund invests first in defaulted instruments to the maximum possible extent allowed under its mandate, and then in CCC-rated names to the maximum possible extent, and then B-rated, and then BB-rated). Neither offsetting nor diversification between these generated exposures and other exposures is allowed.

17.1 *SA-DRC for Non-securitisation*

Gross JTD risk amount

217 An AI should calculate gross jump-to-default (JTD) risk position for each instrument subject to default risk as follows, except instruments mentioned in paragraph 221:

For a long exposure,

$$JTD_{Long} = max(Notional \cdot LGD + P\&L, 0)$$

For a short exposure,

$$JTD_{Short} = min(Notional \cdot LGD + P\&L, 0)$$

where

- The notional of an instrument that gives rise to a long exposure is recorded as a positive value and to a short exposure is recorded as a negative value;
- P&L captures the cumulative mark-to-market loss (or gain) over the principal already taken on the exposure. The P&L loss (gain) is recorded as a negative (positive) value;
- If the contractual/legal terms of the derivative allow for the unwinding of the instrument with no exposure to default risk, then the JTD is equal to zero; and
- A long exposure results from an instrument for which the default of the underlying obligor results in a loss. A short exposure results from an instrument for which the default of the underlying obligor results in a gain.

218 The gross JTD risk amount captures the loss at default, generally representing the difference between the market value and the notional amount recovered at default.

219 An AI should apply the following LGD for the calculation of the gross JTD in paragraph 217:

- Equity instruments and non-senior debt instruments are assigned an LGD of 100%;
- senior debt instruments are assigned an LGD of 75%;
- qualifying covered bonds are assigned an LGD of 25%; and
- when the price of the instrument is not linked to the recovery rate of the defaulter, there should be no multiplication of the notional by the LGD.

220 The notional amount of a bond is the face value, while for credit derivatives the notional amount of a CDS contract or a put option on a bond is the notional amount of the derivative contract. In the case of a call option on a bond, however, the notional amount to be used in the JTD equation is zero (since, in the event of default, the call option will not be exercised). In this case, a jump-to-default would extinguish the call option's value and this loss would be captured through the P&L term in the JTD equation.

221 The gross JTD risk amount for a spot equity position is the market value of the equity.

222 The SA-DRC is intended to capture stress events in the tail of the default distribution which may not be captured by credit spread shocks in mark-to-market risk. Therefore, the representation of positions uses notional amount and market values for the capitalisation of JTD risk.

223 The table below provides an illustration to calculate the terms notional amount and P&L in paragraph 217 for credit instruments.

Examples of components in the JTD equation for credit instruments			
Position	JTD exposure	Notional	P&L
Long bond	Long	Face value of bond	Market value of bond – Face value of bond
Short bond	Short	– Face value of bond	Face value of bond – │Market value of bond│
Long CDS[43]	Short	– Notional of CDS	│MtM value of CDS position│
Short CDS[43]	Long	Notional of CDS	–│MtM value of CDS position│
Long call option on a bond	Long	0	│MtM value of option│
Short call option on a bond	Short	0	–│MtM value of option│
Long put option on a bond	Short	– Notional of option	(Notional of option + │MtM value of option│) – Strike
Short put option on a bond	Long	Notional of option	(Strike –│MtM value of option│) – Notional of option

Table 12

224 The table below provides an illustration to calculate the terms notional amount and P&L in paragraph 217 for equity instruments.

Examples of components in the JTD equation for equity instruments			
Position	JTD exposure	Notional	P&L
Long call option on an equity	Long	0	│MtM value of option│
Short call option on an equity	Short	0	–│MtM value of option│
Long put option on an equity	Short	0	│MtM value of option│– Strike
Short put option on an equity	Long	0	Strike –│MtM value of option│

Table 13

Net JTD risk amount

225 An AI should calculate the net JTD by offsetting the gross JTD risk amounts of long and short exposures to the same obligor where the short exposure has the same or lower seniority relative to the long exposure. For example, a short exposure in equity may offset a long exposure in a bond while a short exposure in a bond cannot offset a long exposure in the equity. Exposures of different maturities that meet this offsetting criterion may be offset as follows:

[43] This refers to CDS with upfront payments only.

- All exposures with maturities longer than the capital horizon (one year) may be fully offset; and
- All or either one of the exposures with a maturity less than one year, in which the size of the gross JTD risk amount of that exposure should be scaled down by the ratio of the exposure's maturity relative to one year before offsetting. No scaling is applied to the JTD risk amount for exposures of one year or greater.[44]

226 Cash equity positions are assigned to a maturity of either more than one year or three months, at an AI's discretion.

227 For derivative exposures, the maturity of the derivative contract is considered in determining the offsetting criterion, not the maturity of the underlying instrument.

228 The maturity weighting applied to the gross JTD for any sort of product with maturity less than 3 months (such as short-term lending) is floored at a weighting factor of 0.25.

229 For the purposes of determining whether a guaranteed bond is an exposure to the underlying obligor or an exposure to the guarantor, the credit risk mitigation (CRM) requirements as set out in sections 98–99 of the BCR apply.

SA-DRC

230 The weighted net JTD amounts are then allocated to the following buckets: corporates, sovereigns and local governments/municipalities.

231 An AI should calculate the overall capital charge for each bucket as follows:

$$SA\_DRC_b = max\left[\left(\sum_{i \in Long} RW_i \cdot net\ JTD_i\right) - HBR \cdot \left(\sum_{i \in Short} RW_i \cdot |net\ JTD_i|\right), 0\right]$$

where

- i refers to an instrument belonging to bucket b;
- HBR is the hedge benefit ratio, which recognises the hedging relationship between long and short positions within a bucket, and is equal to $\frac{\sum net\ JTD_{long}}{\sum net\ JTD_{long} + \sum |net\ JTD_{short}|}$;
- $\sum net\ JTD_{long}$ is a simple sum of the net (not risk-weighted) long JTD risk amounts; and

[44] This paragraph refers to the scaling of gross JTD (i.e. not net JTD).

- $\sum|net\ JTD_{short}|$ is a simple sum of the net (not risk-weighted) short JTD risk amounts.

232 An AI should calculate the weighted net JTD by multiplying each net JTD with the corresponding default risk weight in accordance with its credit quality as follows:

Credit quality category	Default risk weight
AAA	0.5%
AA	2%
A	3%
BBB	6%
BB	15%
B	30%
CCC	50%
Unrated	15%
Defaulted	100%

Table 14

233 An AI should calculate the total capital charge for default risk non-securitisation as a simple sum of the bucket-level capital charge, i.e. no hedging is recognised between different buckets of corporates, sovereigns as well as local governments and municipalities.

17.2 *SA-DRC for Securitisations (Non-CTP)*

Gross JTD risk amount

234 An AI should follow the same approach as described for non-securitisations in order to compute the gross JTD risk amounts for securitisations (non-CTP), except that an LGD ratio is not applied to the exposure. The reason for this is that the LGD is already included in the default risk weights for securitisations to be applied to the securitisation exposure.

235 For the purposes of offsetting and hedging recognition for securitisations (non-CTP), positions in underlying names or a non-tranched index position may be decomposed proportionately into the equivalent replicating tranches that span the entire tranche structure. When underlying names are used in this way, they should be removed from the non-securitisation default risk treatment.

Net JTD risk amount

236 Offsetting should be limited to securitisation exposures with the same underlying asset pool and belonging to the same tranche, unless otherwise specified in paragraphs 235 and 238. This means that:

- no offsetting is permitted across securitisation exposures with different underlying securitised portfolio (i.e. underlying asset pools), even if the attachment and detachment points are the same; and
- no offsetting is permitted across securitisation exposures arising from different tranches with the same securitised portfolio.

237 Securitisation exposures that are otherwise identical except for maturity may be offset, subject to the same restriction as for positions of less than one year described in paragraphs 226 and 228 for non-securitisation.

238 Offsetting within a specific securitisation exposure is allowed as follows.

- Securitisation exposures that can be perfectly replicated through decomposition may be offset. Specifically, if a collection of long securitisation exposures can be replicated by a collection of short securitisation exposures, then the securitisation exposures may be offset.
- Furthermore, when a long securitisation exposure can be replicated by a collection of short securitisation exposures with different securitised portfolios, then the securitisation exposure with the "mixed" securitisation portfolio may be offset by the combination of replicated securitisation exposures.
- After the decomposition, the offsetting rules would apply as in any other case. As in the case of SA-DRC for non-securitisation, a long securitisation exposure means that the default of the underlying obligor in the securitisation leads to a loss for an AI while a short securitisation exposure means that the default of the underlying obligor in the securitisation leads to a gain for an AI.

SA-DRC

239 The weighted net JTD for default risk (securitisations: non-CTP) are allocated to the following buckets:

- One unique bucket for all corporates (excluding small and medium enterprises), regardless of their region; and
- Other 44 buckets are defined along the two dimensions asset class and region. The 11 asset classes are asset-backed commercial Paper (ABCP), auto loans/leases, residential mortgage-backed securities (RMBS), credit cards,

commercial mortgage-backed securities (CMBS), collateralised loan obligations, CDO-squared, small and medium enterprises, student loans, other retail, other wholesale. The 4 regions are Asia, Europe, North America, and/or other regions.

240 In order to assign a securitisation exposure to a bucket, an AI should rely on a classification that is commonly used in the market for grouping securitisation exposures by type and region of underlying. The AI should assign each securitisation exposure to one and only one of the buckets above and it should assign all securitisations with the same type and region of underlying to the same bucket. Any securitisation exposure that an AI cannot assign to a type or region of underlying in this fashion should be assigned to the buckets other retail, other wholesale or other regions respectively.

241 Within buckets, the SA-DRC (securitisations: non-CTP) is determined in a similar approach to that for non-securitisation. The hedge benefit ratio *HBR*, as defined in paragraph 231, is applied to net short securitisation exposures in that bucket, and the capital charge is calculated as in paragraph 231.

242 For calculating the weighted net JTD, the risk weights of securitisation exposures are defined by tranche instead of credit quality.

243 The default risk weights for securitisation exposures are based on the risk weights in the corresponding treatment for the banking book, which is available in Part 7 of the BCR. To avoid double-counting of risks in the maturity adjustment (of the banking book approach) since migration risk in the trading book will be captured in the credit spread charge, a maturity of one year is assumed in the Securitisation Internal Ratings-Based Approach, the Securitisation External Ratings-Based Approach and the Securitisation Standardised Approach. Following the corresponding treatment in the banking book, the hierarchy of approaches in determining the risk weights should be applied at the tranche level. The SA capital charge for an individual cash securitisation position can be capped at the fair value of the transaction.

244 An AI should calculate the total SA-DRC (securitisations: non-CTP) as a simple sum of the bucket-level capital charge, i.e. no hedging recognised between different buckets.

17.3 *SA-DRC for Securitisations (CTP)*

Gross JTD risk amount

245 An AI should follow the same approach as described in paragraph 234 for securitisations (non-CTP) in order to compute the gross JTD risk amounts for securitisations (CTP).

246 The gross JTD for non-securitisation in the CTP (i.e. single-name and index hedges) positions is defined as their market value.

247 Nth-to-default products should be treated as tranched products with attachment and detachment points defined as:

- *attachment point = (N – 1) / Total Names*; and
- *detachment point = N / Total Names*,

where “Total Names” is the total number of names in the underlying basket or pool.

Net JTD risk amount

248 An AI should calculate the net JTD by offsetting long and short gross JTD risk amounts. Exposures that are otherwise identical except for maturity may be offset, subject to the specifications for exposures of less than one year described in paragraphs 226 and 228 for non-securitisations.

249 For index products, offsetting is possible across maturities among the identical index family (e.g. CDX NA IG), series (e.g. series 18) and tranche (e.g. 0–3%) subject to offsetting allowance as set out in paragraph 248.

250 Long and short exposures that are perfect replications through decomposition may be offset through decomposition into single name equivalent exposures using a valuation model as follows:

- Decomposition with a valuation model means that a single name equivalent constituent of a securitisation (e.g. tranched position) is valued as the difference between the unconditional value of the securitisation and the conditional value of the securitisation assuming that the single name defaults with zero recovery. In such cases, the decomposition into single-name equivalent exposures should account for the effect of marginal defaults of the single names in the securitisation, where in particular the sum of the decomposed single name amounts should be equivalent to the value of the securitisation before decomposition; and

- Decomposition is restricted to “vanilla” securitisations (e.g. vanilla CDOs, index tranches or bespokes) while the decomposition of “exotic” securitisations (e.g. CDO-squared, resecuritisation) is prohibited.

251 Moreover, for long and short positions in index tranches and indices (non-tranched), offsetting is allowed across maturities among the exact same series of the index by replication or decomposition. For instance, a long securitisation exposure in a 10–15% tranche vs. combined short securitisation exposures in 10–12% and 12–15% tranches on the same index/series can be offset against each other. Similarly, long securitisation exposures in the various tranches that, when combined perfectly, replicate a position in the index series (non-tranched) can be offset against a short securitisation exposure in the index series if all the positions are to the exact same index and series (e.g. CDX NA IG series 18). Long and short positions in indices and single-name constituents in the index may also be offset by decomposition. For instance, single-name long securitisation exposures that perfectly replicate an index may be offset against a short securitisation exposure in the index.

252 In case if a perfect replication is not possible, offsetting is not allowed except as indicated in this paragraph: where the long and short securitisation exposures are otherwise equivalent except for a residual component, offsetting is allowed and the net JTD risk amount should reflect the residual exposure. For instance, a long securitisation exposure in an index of 125 names, and short securitisation exposures of the appropriate replicating amounts in 124 of the names, would result in a net long securitisation exposure in the missing 125th name of the index.

253 Different tranches of the same index or series, different series of the same index and different index families cannot be offset.

SA-DRC

254 The weighted net JTD for securitisations (CTP) are allocated to buckets that correspond to an index. A non-exhaustive list of indices include: CDX North America IG, iTraxx Europe IG, CDX HY, iTraxx XO, LCDX (loan index), iTraxx LevX (loan index), Asia Corp, Latin America Corp, Other Regions Corp, Major Sovereign (G7 and Western Europe), Other Sovereign.

255 Bespoke securitisation exposures should be allocated to the index bucket of the index they are a bespoke tranche of. For instance, the bespoke tranche 5–8% of a given index should be allocated to the bucket of that index.

256 An AI should calculate the weighted net JTD by multiplying each net JTD with the corresponding default risk weights as follows:

- for non-tranched products, the default risk weights corresponding to their credit quality as specified in paragraph 232; and
- for tranched products, the default risk weights using the banking book treatment as specified in paragraph 243.

257 Within a bucket (i.e. for each index), the SA-DRC (CTP) is determined in a similar approach to that for non-securitisations. The hedge benefit ratio *HBR,* as defined in paragraph 231, is applied to net short positions in that bucket as in the equation below. In this case, however, the hedge benefit ratio *HBR* is determined using the combined long and short positions across all indices in the CTP (i.e. not only the long and short positions of the bucket by itself). A deviation from the approach used for non-securitisations is that no floor at 0 is made at bucket level, and as a consequence, the SA-DRC at index level ($SA\text{-}DRC_b$) can be negative:

$$SA\text{-}DRC_b = \left(\sum_{i \in Long} RW_i \cdot net\ JTD_i\right) - HBR_{ctp} \cdot \left(\sum_{i \in Short} RW_i \cdot |net\ JTD_i|\right)$$

The summation of risk-weighted amounts in the equation spans all exposures relating to the index (i.e. index tranche, bespoke, non-tranche index, or single name). The subscript *ctp* for the term HBR_{ctp} indicates that the hedge benefit ratio is calculated using the combined long and short positions across the entire CTP and not just the positions in the particular bucket.

258 The total SA-DRC for securitisations (CTP) is calculated by aggregating bucket level capital amounts as follows.

$$SA\text{-}DRC_{ctp} = max\left\{\sum_b \left(max(DRC_b, 0) + 0.5 \cdot min(DRC_b, 0)\right), 0\right\}$$

For instance, if the SA-DRC for the index CDX North America IG is +100 and the SA-DRC for the index Major Sovereign (G7 and Western Europe) is -100, the total SA-DRC for the correlation trading portfolio is $100 - 0.5 \cdot 100 = 50$.[45]

[45] The procedure for the $SA\text{-}DRC_b$ and $SA\text{-}DRC_{ctp}$ terms accounts for the basis risk in cross index hedges, as the hedge benefit from cross-index short positions is discounted twice, first by the hedge benefit ratio *HBR* in $SA\text{-}DRC_b$, and again by the term 0.5 in the $SA\text{-}DRC_{ctp}$ equation.

IV INTERNAL MODELS APPROACH

18 General Provisions

18.1 *Modular Concept of IMA Use*

259 Like under the current market risk rules, the FRTB allows AIs with sophisticated risk management systems to use an Internal Models Approach (IMA) to determine their market risk capital charges. The use of internal models requires an explicit approval from the HKMA. With the HKMA approval[46], an AI should calculate and report the capital charge under the IMA to the HKMA on a monthly basis.

260 Unlike under the current rules, the approval will refer to individual trading desks which over time may disqualify and requalify for the use of an IMA.

261 Banks with an IMA approval should be required to calculate their market risk capital charges additionally based on the Standardised Approach for all of their trading book exposures. This will allow that (i) AIs can immediately switch to a standardised calculation if a trading desk should lose model eligibility and (ii) they can calculate the threshold for the Basel III output floor.

18.2 *General Criteria*

262 In order to obtain an IMA approval for trading desks to be nominated by an AI, the AI should demonstrate to the satisfaction of the HKMA that it is in full compliance with all the requirements related to using an IMA as specified in Section IV.

263 An AI should not calculate the market risk capital charge using the Internal Models Approach for (i) securitisation exposures and (ii) equity investments in funds that cannot be looked through but are assigned to the trading book in accordance to the conditions set out in paragraph 30.

264 The HKMA would require an AI, at the minimum, to meet the following general criteria for adopting internal models to calculate its capital charges for its market risk exposures:

- the AI's market risk management system should be conceptually sound and implemented with integrity;

[46] The application procedure is set out in paragraph 20.

- the AI should have a sufficient number of staff who are qualified and trained to use models in the AI's trading area, risk control, audit and back office functions;
- the AI's internal models should have a proven track record of reasonable accuracy in measuring risk;
- the AI should regularly conduct stress tests along the lines set out in subsection 18.6; and
- the AI's positions included in the internal models should be held in trading desks that have obtained an explicit HKMA model approval and that have passed the required tests described in paragraph 284.

265 The HKMA would request for a period of initial monitoring and live testing of an AI's internal models before they can be used for regulatory capital adequacy purposes. Any AI which intends to use internal models to calculate its capital charges should be prepared to participate in any such testing exercise to facilitate the HKMA's assessment of the accuracy and reliability of such models.

266 The revised market risk framework allows for a modular model approval process based on a set of individual trading desks. The scope of these trading desks is defined based on a three-prong approach as set out in paragraphs 267 to 269.

267 An AI should satisfy the HKMA that both its organisational infrastructure (including the definition and structure of trading desks) and its firm-wide internal models meet all of the qualitative evaluation criteria, as set out in subsection 18.3.

268 An AI should nominate individual trading desks, as defined in subsection 9, for which the AI seeks model approval in order to use the IMA.

- The AI should nominate trading desks that it intends to be in scope and trading desks that are out of scope for the IMA use. The AI should specify in writing the basis for these nominations.
- The AI should not nominate a trading desk to be out of scope for model approval on the ground that its capital charge determined using the Standardised Approach being lower than that determined using the IMA.
- The AI should use the Standardised Approach to determine the market risk capital charges for trading desks that are out of scope for model approval. The positions in these out-of-scope trading desks are to be combined with all other positions that are subject to the Standardised Approach in order to determine the AI's Standardised Approach capital charge.
- Trading desks that the AI does not nominate for model approval will be ineligible to use the IMA for a period of at least one year from the date of the latest model approval.

269 Following the approval of regulatory trading desks, this step determines, (i) which trading desks are eligible to use the IMA and (ii) which risk factors within those trading desks are eligible to be included in the AI's internal expected shortfall (ES) models to determine market risk capital charges as set out in subsection 22.

- Each trading desk should satisfy profit and loss (P&L) attribution tests (PLAT) on an ongoing basis to be eligible to use the IMA for regulatory capital purpose. In order to conduct the PLAT, the AI should identify the set of risk factors to be used to determine its market risk capital charges.
- Each trading desk should in addition satisfy backtesting requirements on an ongoing basis to be eligible to use the IMA as set out in subsection 21.1.
- The AI should conduct PLAT and backtesting on a quarterly basis to update the eligibility and classification in PLAT for each trading desk to use the IMA.
- The AI should determine the market risk capital charges for risk factors that satisfy the risk factor eligibility test as set out in subsection 20 by ES models as specified in subsection 22.
- The AI should determine the market risk capital charges for risk factors that do not satisfy the risk factor eligibility test by stressed expected shortfall (SES) models as specified in subsection 23.

18.3 *Qualitative Standards*

270 An AI should meet the qualitative criteria set out below on an ongoing basis. The HKMA should be satisfied that the AI has met the qualitative criteria before granting an IMA approval.

271 An AI should have a risk control unit which is functionally independent of the AI's staff and management responsible for originating and trading market risk exposures (i.e. trading units) and reports directly to the AI's senior management. This unit should generally be responsible for:

- the design, testing and implementation of the AI's market risk management system;
- the oversight of the effectiveness of the AI's market risk management system;
- the production and analysis of daily management reports based on the output of the AI's internal models (including an evaluation of the relationship between measures of market risk exposures and trading limits);
- the ongoing review of, and changes to, the AI's market risk management system; and

- the conduct of regular backtesting and PLAT to verify the accuracy and reliability of the AI's internal models. Both of these exercises should be conducted at the trading desk level, while regular backtesting should also be conducted at the firm wide level.

272 An AI should have a distinct unit, separated from the risk control unit, to conduct the initial and ongoing validation of all internal models for capital adequacy purpose. Internal models should be validated on at least an annual basis.

273 The Board of Directors and senior management of an AI should be actively involved in the market risk control process and should devote appropriate resources to risk control as an essential aspect of the business. In particular, the daily reports prepared by the independent risk control unit should be reviewed by a level of management with sufficient seniority and authority to enforce both reductions of positions taken by individual traders and reductions in the AI's overall risk exposure.

274 Internal models used for regulatory purpose may to some extent differ from those used for internal risk management purpose by an AI in its day-to-day risk management activities. Nevertheless, the core design elements of both the regulatory models and the ones used for internal risk management should be identical.

- Valuation models that are a feature of both models should be consistent. These valuation models should be an integral part of the internal identification, measurement, management and internal reporting of price risks within the AI's trading desks.
- Internal risk management models should, at a minimum, be used to assess the risk of the positions that are subject to market risk capital charges, although they may assess a broader set of positions.
- The construction of the AI's regulatory models should be based on the methodologies used in the AI's internal risk management models with regard to risk factor identification, parameter estimation and proxy concepts and deviate only if this is appropriate due to regulatory requirements. It is expected that the same risk factors are covered in the regulatory internal models as in the internal risk management models for all in-scope desks.

275 An AI should have a routine and rigorous programme for conducting regular stress tests to supplement the AI's risk analyses based on the output of its internal models. [47] The stress testing results should be:

[47] An AI should also fulfil the requirements on stress testing as set out in subsection 18.6.

- reviewed at least monthly by the AI's senior management and periodically communicated to the AI's Board of Directors;
- used in the AI's internal assessment of capital adequacy; and
- reflected in the policies and limits set by the AI's senior management and the AI's Board of Directors.

276 Where stress tests reveal particular vulnerability to a given set of circumstances, an AI should take prompt action to mitigate those risks appropriately (e.g. by hedging against that outcome, reducing the size of exposures or increasing capital).

277 An AI should maintain a protocol for compliance with a documented set of internal manuals, policies, procedures and controls concerning the operation of the internal market risk management models. Such documentation should include a comprehensive risk management manual that describes the basic principles of the AI's risk management models and that provides a detailed explanation of the empirical techniques used to measure market risk.

278 Internal models should be comprehensively documented. Such documentation should consist of two components: (i) the core model documentation and (ii) a set of non-core model documentation modules.

279 The core model documentation should cover all the key components of the internal models. All model changes that impact the core model documentation need to be explicitly approved by the HKMA.

280 Non-core model documentation modules should cover a comprehensive range of specified detailed aspects of the internal models. All updates of these modules require a notification to the HKMA.

281 Both the core documentation and the non-core documentation modules should be systematically organised with version numbers and dates indicating when each specific version was in force. There should be no differences between (i) the documentation and (ii) the actually used internal models and their implementation.

282 The internal models for capital adequacy purpose should address the full set of positions that are in the scope of application of the models. All models' measurements of risk should be based on a sound theoretical basis, calculated correctly, and reported accurately.

283 The internal audit and validation functions or external auditor of an AI should conduct an independent review of its market risk measurement system on an annual basis. Such a review should include the activities of both the AI's trading units and

the independent risk control unit. The independent review should be sufficiently detailed to determine which trading desks are impacted by any failings. At a minimum, the scope of the independent review should include the following:

- the organisation of the risk control unit;
- the adequacy of the documentation of the risk management models and processes;
- the accuracy and appropriateness of the market risk management models (including any significant changes);
- the verification of the consistency, timeliness and reliability of data sources used to run the internal models, including the independence of such data sources;
- the approval process for pricing models and valuation systems used by the front- and back-office units;
- the scope of market risks reflected in the AI's internal models at the trading desk level;
- the integrity of the AI's management information system;
- the accuracy and completeness of position data;
- the accuracy and appropriateness of volatility and correlation assumptions;
- the accuracy of valuation and risk transformation calculations;
- the verification of accuracy of the AI's internal models at the trading desk level through regular backtesting and PLAT; and
- the general alignment between the regulatory internal models and the internal risk management models the AI uses in its day-to-day internal management functions.

18.4 *Model Validation Standards*

284 An AI should maintain a process to ensure that its internal models have been adequately validated by suitably qualified parties independent of the model development and implementation process to ensure that each model is conceptually sound and adequately reflects all material risks. Model validation should be conducted both when the model is initially developed and when any significant changes are made to the model. The AI should revalidate its models periodically, particularly when there have been significant structural changes in the markets or changes to the composition of the AI's portfolio that might lead to the models no longer being adequate. Model validation should include backtesting and PLAT, and should, at a minimum, also include the following:

- The AI should perform tests to demonstrate that any assumptions made within internal models are appropriate and do not underestimate risk. This may include reviewing the appropriateness of distribution assumptions and any pricing models.
- Further to the regulatory backtesting programmes, model validation should assess the hypothetical P&L (HPL) calculation methodology.
- The AI should use hypothetical portfolios to ensure that internal models are able to account for particular structural features that may arise. For example, where the data history for a particular instrument does not meet the quantitative standards in subsection 22 and the AI maps these positions to proxies, the AI should ensure that the proxies produce conservative results under relevant market scenarios, with sufficient consideration given to ensuring:
  – that material basis risks are adequately reflected (including mismatches between long and short positions by maturity or by issuer); and
  – that the models reflect concentration risk that may arise in an undiversified portfolio.

18.5 *External Validation*

285 In reviewing an AI's internal model, the HKMA and external auditors will require assurance that:

- Verification that the internal validation processes described in subsection 18.4 are operating in a satisfactory manner;
- Confirmation that the formulae used in the calculation process, as well as for the pricing of options and other complex instruments, are validated by a qualified unit, which in all cases should be independent from the AI's trading area;
- Confirmation that the structure of internal models is adequate with respect to the AI's activities and geographical coverage;
- Review of the results of both the AI's backtesting of its internal models (i.e. comparison of value-at-risk with actual P&L and HPL) and its PLAT to ensure that the models provide a reliable measure of potential losses over time. On request, the AI should make available to the HKMA and/or to its external auditors the results as well as the underlying inputs to ES calculations and details of the PLAT; and
- Confirmation that data flows and processes associated with the risk measurement system are transparent and accessible. On request, the AI should

provide the HKMA and its external auditors access to the models' specifications and parameters.

18.6 *Stress Testing*

286 An AI that uses the IMA for determining its market risk capital charges should have in place a rigorous and comprehensive stress testing programme both at the trading desk level and at the firm-wide level.

287 Stress testing serves to identify events or influences that could significantly impact the AI's financial soundness and forms a key component of the AI's internal assessment of capital adequacy.

288 An AI should adopt stress scenarios which cover a range of factors that (i) can create extraordinary losses or gains in trading portfolios, or (ii) make the control of risk in those portfolios very difficult. These factors include low-probability events in all major types of risk, including the various components of market, credit and operational risks. The AI should design stress scenarios to assess the impact of such factors on positions that feature both linear and non-linear price characteristics (i.e. options and instruments that have option-like characteristics).

289 An AI's stress tests should be of a quantitative and qualitative nature, incorporating both market risk and liquidity risk aspects of market disturbances.

- Quantitative elements should identify plausible stress scenarios to which the AI could be exposed.
- Qualitatively, the AI's stress testing programme should evaluate the capacity of the AI's capital to absorb potential significant losses and identify steps the AI can take to reduce its risk and conserve capital.

290 Results of stress testing should be reviewed at least monthly by an AI's senior management and should be periodically communicated to the AI's Board of Directors.

291 An AI should combine the use of supervisory stress scenarios with stress tests developed by the AI itself to reflect its specific risk characteristics. In particular, the HKMA would require the AI to provide information relating to its stress testing results in three broad areas as discussed below.

Supervisory scenarios requiring no simulations by an AI

292 An AI should provide the HKMA with information on its five largest daily losses experienced at the firm-wide and trading desk level respectively during each calendar quarter. This loss information can be compared to the level of the AI's capital charges that would result from the AI's internal models. For example, the AI may be required to provide the HKMA with an assessment of how many days of peak day losses would have been covered by a given ES estimate.

Scenarios requiring a simulation by an AI

293 An AI should subject its portfolios to a series of simulated stress scenarios and provide the HKMA with the results on a quarterly basis. These scenarios could include testing the current portfolio against past periods of significant market disturbance.

294 A second type of scenario would evaluate the sensitivity of an AI's market risk exposure to changes in the assumptions about volatilities and correlations. Applying this test would require an evaluation of the historical range of variation for volatilities and correlations and evaluation of the AI's current positions against the extreme values of the historical range.

AI-specific stress scenarios

295 An AI should also develop its own specific stress tests that it identifies as most adverse based on the characteristics of its portfolio (e.g. problems in a key region of the world combined with a sharp move in oil prices). The AI should provide the HKMA with a description of the methodology used to determine the scenarios as well as with a description of the results derived from these scenarios.

19 Specification of Risk Factors

296 Internal models for an AI's trading desk should specify an appropriate set of market risk factors, i.e. the market rates and prices that affect the value of the AI's market risk exposures. They should be sufficient to represent the risks inherent in the AI's portfolio of on- and off-balance sheet trading positions. Although an AI may have some discretion in specifying the risk factors for its internal models, the following requirements should be fulfilled.

297 An AI should include all risk factors that are used for pricing. Where a risk factor is incorporated in a pricing model but not in the internal models, the AI should justify this omission to the satisfaction of the HKMA.

298 An AI's internal models should include all risk factors that are specified in the Standardised Approach for the corresponding risk class, as set out in section III. Where a Standardised Approach risk factor is not included in the internal models, the AI should demonstrate to the HKMA that the internal models are able to capture the risk in a more appropriate way.

299 For securitised products, AIs are prohibited from using internal models to determine the market risk capital charges. AIs, except for those that are allowed to use the Simplified Standardised Approach as set out in section V or qualify for the de-minimis exemption as set out in paragraph 16, should use the Standardised Approach as set out in section III instead. Accordingly, an AI should not specify risk factors for securitisations as defined in paragraphs 98 to 105 for its internal models.

300 An AI should address non-linearities for options and other relevant products, as well as correlation risk and relevant basis risks (e.g. basis risks between credit default swaps and bonds) in its internal model and any stress scenarios calculated for non-modellable risk factors (NMRF).

301 An AI may use proxies for which there is an appropriate track record for their representation of a position (e.g. an equity index used as a proxy for a position in an individual stock). In the event the AI uses proxies, the AI should support its use to the satisfaction of the HKMA.

19.1 *For Interest Rate Risk*

302 An AI should use a set of risk factors corresponding to interest rates in each currency in which the AI has interest rate-sensitive on- or off-balance sheet trading positions.

303 An AI's internal models should model a yield curve using one of a number of generally accepted approaches, e.g. estimating forward rates of zero coupon yields. The yield curve should be divided into several maturity buckets in order to capture variations in the volatility of interest rates along the yield curve.

304 For material exposures to interest rate movements in the most relevant currencies and markets, an AI should model the yield curve using a minimum of six risk factors. The number of risk factors used should ultimately be driven by the nature of the AI's trading strategies. For instance, if an AI engages in complex arbitrage strategies or if an AI's portfolio of exposures comprises various types of securities across many points of the yield curve, the AI's internal models should include a greater number of risk factors in order to capture its interest rate risk more accurately.

305 An AI should incorporate separate risk factors to capture credit spread risk (e.g. between bonds and swaps). A variety of approaches may be used to reflect the credit spread risk arising from less-than-perfectly correlated movements between the interest rates of sovereign and other fixed-income instruments, such as specifying a completely separate yield curve for non-sovereign fixed-income instruments (e.g. swaps or municipal securities) or estimating the spread over sovereign interest rates at various points along the yield curve.

19.2 *For Foreign Exchange Risk*

306 An AI should incorporate risk factors corresponding to individual foreign currencies in which its positions are denominated. As the output of the AI's risk measurement system will be expressed in HKD, any net position denominated in other currencies will introduce foreign exchange risk. The AI should utilise risk factors that correspond to the exchange rate between HKD and each foreign currency in which it has an exposure except exposure as set out in paragraphs 9 and 10.

19.3 *For Equity Risk*

307 An AI should incorporate risk factors corresponding to each of the equity markets in which the AI holds positions.

308 At a minimum, an AI should utilise risk factors that reflect market-wide movements in equity prices (e.g. a market index). Positions in individual securities or in sector indices may be expressed in beta-equivalents relative to a market-wide index.

309 An AI may utilise risk factors corresponding to various sectors of the overall equity market (e.g. industry sectors or cyclical and non-cyclical sectors). Positions in

individual equities within each sector may be expressed in beta-equivalents relative to a sector index.

310 An AI should also utilise risk factors corresponding to the volatility of individual equities.

311 The sophistication and nature of the modelling technique for a given equity market should correspond to an AI's overall exposures to the market as well as its concentration in individual equities in that market.

19.4 *For Commodity Risk*

312 An AI should incorporate risk factors corresponding to each of the commodity markets in which the AI holds positions.

313 When an AI holds relatively limited exposures in commodities, it may utilise a straightforward specification of risk factors. Such a specification would likely entail one risk factor for each commodity price to which the AI is exposed (including different risk factors for different geographical locations where relevant).

314 When an AI has active trading in commodities, the internal models should account for variation in the convenience yield[48] between derivatives positions such as forwards and swaps and cash positions in the commodity.

19.5 *For the Risks Associated with Equity Investments in Funds*

315 For funds with look-through possibility as set out in paragraph 30, an AI should consider the risks of the fund, and of any associated hedges, as if the fund's positions were held directly by the AI (taking into account the AI's share of the equity of the fund, and any leverage in the fund structure). The AI should assign these positions to the trading desk to which the fund is assigned.

316 For funds without look-through possibility but with daily prices and knowledge of the fund's mandate as set out in paragraph 30, an AI should use the Standardised Approach to calculate capital charges for the fund.

[48] The convenience yield reflects the benefits from direct ownership of the physical commodity (e.g. the ability to profit from temporary market shortages). The convenience yield is affected both by market conditions and by factors such as physical storage costs.

20 Model Eligibility of Risk Factors

317 An AI should determine which risk factors within its trading desks that have received approval to use the IMA are eligible to be included in the ES model for regulatory capital charges. A necessary condition for a risk factor to be classified as modellable is that it passes the risk factor eligibility test (RFET). The RFET requires the identification of a sufficient number of real prices that are representative of the risk factor. Collateral reconciliations or valuations are not considered as real prices to meet the RFET. A price will be considered real if it meets at least one of the following criteria:

- It is a price at which the AI has conducted a transaction;
- It is a verifiable price for an actual transaction between other arms-length parties;
- It is a price obtained from a committed quote made by (i) the AI itself or (ii) another party. The committed quote should be collected and verified through a third-party vendor, a trading platform or an exchange; or
- It is a price that is obtained from a third-party vendor, where:
  - the transaction or committed quote has been processed through the vendor;
  - the vendor agrees to provide evidence of the transaction or committed quote to the HKMA upon the AI's request; and
  - the price meets any of the three criteria listed in the first three bullet points of this paragraph.

318 To pass the RFET, a risk factor that an AI uses in an internal model should meet either of the following criteria on a quarterly basis. Any real price that is observed for a transaction could be counted as an observation for all of the risk factors for which it is representative.

- The AI should identify for the risk factor at least 24 real price observations per year (measured over the period used to calibrate the current ES model, with no more than one real price observation per day to be included in this count).[49] Moreover, over the previous 12 months there should not be any 90-day period in which fewer than four real price observations are identified for the risk factor (with no more than one real price observation per day to be included in this count). The above criteria should be monitored on a monthly basis; or

[49] In particular, an AI may add modellable risk factors, and replace NMRF by a basis between these additional modellable risk factors and these NMRF. This basis will then be considered an NMRF. A combination between modellable and NMRF will be an NMRF.

- The AI should identify for the risk factor at least 100 real price observations over the previous 12 months (with no more than one real price observation per day to be included in this count).

319 When an AI uses data for real price observations from an external source, and those observations are provided with a time lag (e.g. data provided for a particular day is only made available a number of weeks later), the period used for the RFET may differ from the period used to calibrate the current ES model. The difference in periods used for the RFET and calibration of the ES model should not be greater than one month, i.e. the AI could use, for each risk factor, a one-year time period finishing up to one month before the RFET assessment instead of the period used to calibrate the current ES model.

320 In order for a risk factor to pass the RFET, an AI may also count real price observations based on information collected from a third-party vendor provided all of the following criteria are met:

- The vendor communicates to the AI the number of corresponding real price observations and the dates at which they have been observed.
- The vendor provides, individually, a minimum necessary set of identifier information to enable the AI to map real price observations to risk factors.
- The vendor is subject to an external audit regarding the validity of its pricing information on at least an annual basis. The results and reports of this audit must be made available to the HKMA and AIs as a precondition for the AI to be allowed to use real price observations collected by the third-party vendor.
- The HKMA has not explicitly disallowed the AI from using the data for the RFET.

321 A real price is representative for a risk factor of an AI, if the AI is able to extract the value of the risk factor from the real price. The AI should have policies and procedures that describe its mapping of real price observations to risk factors. The AI should provide sufficient information to the HKMA in order to determine if its methodologies are appropriate.

20.1 *Bucketing Approach for the RFET*

322 Where a risk factor is a point on a curve or a surface (or other higher dimensional objects such as cubes), in order to count real price observations for the RFET, an AI may choose from the following two bucketing approaches:

- The own bucketing approach: the AI should define its own buckets and meet the following requirements:
  - Each bucket should include only one risk factor, and all risk factors should correspond to the risk factors that are used to derive the risk-theoretical profit and loss (RTPL) for the purpose of the PLAT.[50]
  - The buckets should be non-overlapping.

- The regulatory bucketing approach: the AI should use the following sets of standard buckets.

Bucket	set A	set B	set C	set D
1	0y ≤ t < 0.75y	0y ≤ t < 0.75y	0y ≤ t < 1.5y	0 ≤ δ < 0.05
2	0.75y ≤ t < 1.5y	0.75y ≤ t < 4y	1.5y ≤ t < 3.5y	0.05 ≤ δ < 0.3
3	1.5y ≤ t < 4y	4y ≤ t < 10y	3.5y ≤ t < 7.5y	0.3 ≤ δ < 0.7
4	4y ≤ t < 7y	10y ≤ t < 18y	7.5y ≤ t < 15y	0.7 ≤ δ < 0.95
5	7y ≤ t < 12y	18y ≤ t < 30y	t ≥ 15y	0.95 ≤ δ ≤ 1.00
6	12y ≤ t < 18y	t ≥ 30y		
7	18y ≤ t < 25y			
8	25y ≤ t < 35y			
9	t ≥ 35y			

Table 15

  - For interest rate, foreign exchange and commodity risk factors (excluding implied volatilities) with one maturity dimension t, the bucket set A should be used.
  - For interest rate, foreign exchange and commodity risk factors (excluding implied volatilities) with several maturity dimensions t, the bucket set B should be used for each maturity dimension.
  - Credit spread and equity risk factors (excluding implied volatilities) with one or several maturity dimensions t, the bucket set C should be used for each maturity dimension.

[50] The requirement to use the same buckets or segmentation of risk factors for the PLAT and the RFET recognises the trade-off in determining buckets for an ES model. The use of more granular buckets may facilitate a trading desk to pass the PLAT, but additional granularity may challenge an AI's ability to source a sufficient number of real price observations for each bucket to satisfy the RFET. AIs should consider this trade-off when designing their ES models.

– For any risk factors with one or several strike dimensions δ, where δ represents the probability that an option is "in the money" at maturity, the bucket set D should be used for each strike dimension.[51]
– For expiry and strike dimensions of implied volatility risk factors (excluding those of interest rate swaptions), the bucket set C for the expiry dimension and D for the strike dimension should be used.
– For maturity, expiry and strike dimensions of implied volatility risk factors from interest rate swaptions, only the bucket set B for the maturity dimension, C for the expiry dimension and D for the strike dimension should be used.

323 An AI may count all real price observations allocated to a bucket to assess whether it passes the RFET for any risk factors that belong to the bucket. A real price observation should be allocated to a bucket for which it is representative of any risk factors that belong to the bucket.

324 As debt instruments mature, real price observations for those products that have been identified within the prior 12 months are usually still counted in the maturity bucket which they were initially allocated to as set out in paragraph 323. When an AI no longer needs to model a credit spread risk factor belonging to a given maturity bucket, the AI is allowed to re-allocate the real price observations of this bucket to the adjacent (shorter) maturity bucket.[52] A real price observation may only be counted in a single maturity bucket for the purposes of the RFET.

325 Where an AI uses a parametric function to represent a curve, surface or a higher dimensional object and defines the function's parameters as the risk factors, the RFET should be assessed at the level of the market data used to calibrate the function's parameters and not be assessed directly at the level of these risk factor parameters (due to the fact that real price observations that are directly representative of these parameters may not exist).

326 An AI may use systematic credit or equity risk factors within its models that are designed to capture market-wide movements for a given economy, region or sector, but not the idiosyncratic risk of a specific issuer (the idiosyncratic risk of a specific issuer would be an NMRF unless there are sufficient real price observations of that issuer). Real price observations of market indices or instruments of individual issuers

[51] For options markets where alternative definitions of moneyness are standard, AIs shall convert the regulatory delta buckets to the market-standard convention using their own approved pricing models.
[52] For example, if a bond with an original maturity of four years, had a real price observation on its issuance date eight months ago, banks can opt to allocate this real price observation to the bucket associated with a maturity between 1.5 and 3.5 years instead of to the bucket associated with a maturity between 3.5 and 7.5 years to which it would normally be allocated.

may be considered representative for a systematic risk factor as long as they share the same attributes as the systematic risk factor.

327 In addition to the approach set out in paragraph 326, where systematic risk factors of credit or equity risk factors include a maturity dimension (e.g. a credit spread curve), one of the bucketing approaches set out above must be used for this maturity dimension to count real price observations for the RFET.

328 Once a risk factor has passed the RFET, an AI should choose the most appropriate data to calibrate its model. The data used for calibration of the model does not need to be the same data used to pass the RFET.

329 Once a risk factor has passed the RFET, an AI should demonstrate that the data used to calibrate its ES model are appropriate based on the principles set out in subsection 20.2. Where the AI has not met these principles to the satisfaction of the HKMA for a particular risk factor, the HKMA may choose to deem the data unsuitable to calibrate the model and, in such case, the risk factor should be excluded from the ES model and subject to capital charges as an NMRF.

330 There may, on very rare occasions, be a valid reason why a significant number of modellable risk factors across different AIs may become non-modellable due to a widespread reduction in trading activities (for instance, during periods of significant cross-border financial market stress affecting several AIs or when financial markets are subjected to a major regime shift). One possible supervisory response in this instance could be to consider a risk factor that no longer passes the RFET as modellable. However, such a response should not facilitate a decrease in capital charges. The HKMA will only pursue such a response under the most extraordinary, systemic circumstances.

20.2 *Modellability of Risk Factors Passing the RFET*

331 An AI may use various types of models to determine the risks resulting from its trading book positions. The data requirements for each model may be different. For any given model, the AI may use different sources or types of data for risk factors. The AI should not rely solely on the number of real price observations to determine whether a risk factor is modellable. The accuracy of the source of real price observations should also be considered.

332 In addition to the requirements specified above, an AI should follow the principles set out in paragraphs 333 to 339 to determine whether a risk factor that passed the RFET can be modelled using the ES model or should be subject to capital charges as

an NMRF. The AI is required to demonstrate to the HKMA that these principles are being followed. The HKMA may determine a given risk factor to be non-modellable in the event the AI does not follow these principles for the risk factor.

333 Principle one: The data used to price instruments may include combinations of modellable risk factors. In general, risk factors derived solely from a combination of modellable risk factors are modellable. For example, risk factors derived through multifactor beta models for which inputs and calibrations are based solely on modellable risk factors can be classified as modellable. However, a risk factor derived from a combination of modellable risk factors that are mapped to distinct buckets of a given curve/surface is modellable only if this risk factor also passes the RFET.

334 Principle two: The data should allow the internal models to capture both general market and idiosyncratic risk. If the data used in the model do not reflect either idiosyncratic or general market risk, an AI should apply an NMRF charge for those aspects that are not adequately captured in its models.

335 Principle three: The data should allow the model to reflect volatility and correlation of the risk positions. An AI should ensure that it does not understate the volatility of an asset (e.g. by using inappropriate averaging of data or proxies) and accurately reflects the correlation arising between risk factors.

336 Principle four: The data should be reflective of prices observed and/or quoted in the market. Where data are not derived from real price observations, an AI should demonstrate that the data are reasonably representative of real price observations. The AI should periodically reconcile price data used in its internal model with front and back office prices. The AI should also document its approaches to deriving risk factors from market prices.

337 Principle five: The data should be updated at a sufficient frequency (at a minimum on a monthly basis but preferably daily) in order to account for frequent turnover of positions in the trading portfolio and changing market conditions. Furthermore, where an AI uses parametric functions, e.g. regressions, to estimate risk factor parameters, these should be regularly re-estimated at a minimum on a bi-weekly basis. Calibration of pricing models in the internal models should also not be less frequent than the calibration of front office pricing models. The AI should have clear policies and sound processes for backfilling and/or gap-filling missing data.

338 Principle six: The data used to determine stressed expected shortfall ($ES_{R,S}$) should be reflective of market prices observed and/or quoted in the period of stress. The data

for the $ES_{R,S}$ model should be sourced directly from the relevant historical period whenever possible. There may be cases where the characteristics of current instruments in the market differ from those in the stress period. Nevertheless, an AI should empirically justify any instances where the market prices used for the stress period in its internal models are different from the market prices actually observed during that period. Further, in cases where instruments that are currently traded did not exist during a period of significant financial stress, the AI should demonstrate that the prices used match changes in prices or spreads of similar instruments during the stress period.

339 Principle seven: An AI should limit the use of proxies, and proxies used should have sufficiently similar characteristics to the transactions they represent. Proxies should be appropriate for the region, quality and type of instrument they are intended to represent. The HKMA will assess whether methods for combining risk factors are conceptually and empirically sound.

21 Backtesting and PLAT

340 As set out in paragraph 269, an AI that intends to use the IMA to determine market risk capital charges for a trading desk should conduct and successfully pass (i) backtesting at the firm-wide level and (ii) backtesting and PLAT at the trading desk level.

341 For an AI to remain eligible to use the IMA, a minimum of 30% of its aggregate market risk capital charges should be based on positions held in trading desks that qualify for the use of internal models by satisfying the backtesting and PLAT as set out in this subsection. This 30% criterion should be assessed by the AI on a quarterly basis when calculating the aggregate capital charges for market risk according to subsection 25.

342 The implementation of backtesting and the PLAT should begin on the same date that the internal models are starting to be used for the calculation of the capital requirements.

- For the HKMA approval process of an internal model, the AI should provide a one-year backtesting and PLAT report to confirm the quality of the model.
- The HKMA will determine any necessary supervisory response to backtesting results based on the number of backtesting exceptions over the course the most recent 250 trading days generated by the AI's internal model.
  - Based on the assessment on the significance of backtesting exceptions, the HKMA may initiate a dialogue with the AI to determine if there is a problem with its internal model.
  - In the most serious cases, the HKMA will impose an additional add-on to the AI's capital charges or disallow the use of the internal model.

21.1 *Backtesting Requirements*

343 Backtesting requirements compare the value-at-risk (VaR) measure calibrated to a one-day holding period against each of the actual P&L (APL) and hypothetical P&L (HPL) data points over the prior 250 trading days. Specific requirements to be applied at the firm-wide level and trading desk level are set out below.

Backtesting at the firm-wide level

344 An AI should perform backtesting at the firm-wide level in accordance with a VaR measure calibrated at a one-tailed 99th percentile confidence level.

- A backtesting exception occurs when either the AI's actual loss or the hypothetical loss of the firm-wide trading book registered in a day of the backtesting period exceeds the corresponding daily VaR resulting from the internal model. Exceptions for actual losses are counted separately from exceptions for hypothetical losses; and the overall number of exceptions is the greater of these two amounts.
- In the event either the P&L or the daily VaR measure is not available or impossible to compute, it will count as a backtesting exception.

345 In the event a backtesting exception can be shown by an AI to relate to an NMRF, and the capital charges for that NMRF exceed the AI's actual or hypothetical loss for that day, it may be disregarded for the purpose of the overall backtesting process if the HKMA is notified accordingly and does not object to this treatment. In these cases, the AI should document the historical movements of the value of the relevant NMRF and have supporting evidence that the NMRF has caused the relevant loss.

346 The scope of the portfolio subject to firm-wide backtesting should be updated quarterly based on the results of the latest trading desk-level backtesting, RFET and PLAT.

347 The framework for the supervisory interpretation of backtesting results for the firm-wide internal model encompasses a range of possible supervisory responses, depending on the strength of the signal generated from the backtesting. These responses are classified into three backtesting zones:

- Green zone: This corresponds to a number of backtesting exceptions that does not suggest a problem with the quality of an internal model.
- Yellow zone: This encompasses results that do raise questions regarding the quality of an internal model without allowing firm conclusions.
- Red zone: This corresponds to a backtesting result that indicates a high probability of a problem with an internal model.

348 These zones are defined according to the number of backtesting exceptions. The table below sets out boundaries for these zones and the presumptive supervisory response for each backtesting outcome. Where the backtesting results indicate issues with an internal model, the minimum multiplier of 1.5 will be increased by an add-on factor.

Zone	Number of backtesting exceptions out of 250 observations	Backtesting add-on factor
Green zone	≤4	0.00
Yellow zone	5	0.20
	6	0.26
	7	0.33
	8	0.38
	9	0.42
Red zone	≥10	0.50

Table 16

349 Results in the green zone would generally not lead to any backtesting add-ons.

350 Results in the yellow zone allow no firm conclusion on the quality of an internal model. However, they are generally deemed to indicate issues with an internal model's accuracy. Within the yellow zone, the HKMA will therefore impose an add-on to the AI's multiplier which increases with the number of backtesting exceptions.

351 An AI should also document all of the exceptions generated from its ongoing backtesting programme, including an explanation on the factors driving the observed backtesting exceptions.

352 Independent of any outcomes that place an AI in the yellow zone, in the case of severe problems with the basic integrity of the model, the HKMA may disallow the AI to use the internal models for market risk capital charge purposes at any time.

353 If an internal model falls into the red zone, the HKMA will automatically increase the multiplication factor applicable to the model or may disallow use of the model.

Backtesting at the trading desk level

354 In addition to the firm-wide backtesting, the performance of the internal models will also be tested at the trading desk level through backtesting.

355 This backtesting assessment is considered to be complementary to the PLAT when determining the eligibility of a trading desk for the IMA.

356 At the trading desk level, backtesting should compare each desk's one-day VaR measure (calibrated to the most recent 250 trading days' data, equally weighted) at

both a one-tailed 97.5th percentile and a one-tailed 99th percentile confidence level, using at least the most recent 250 one-day P&L data points of the desk.

- A trading desk backtesting exception occurs when either the desk's actual or hypothetical loss registered in a day of the backtesting period exceeds the corresponding daily VaR measure resulting from the trading desk's internal model. Exceptions for actual losses are counted separately from exceptions for hypothetical losses; and the overall number of exceptions is the greater of these two numbers.
- In the event either the P&L or the risk measure is not available or impossible to compute, it will count as a trading desk backtesting exception.

357 If any given trading desk experiences either (i) more than 12 backtesting exceptions at the 99th percentile confidence level or (ii) 30 backtesting exceptions at the 97.5th percentile confidence level in the most recent 250 trading day period, the capital charges for all of the positions in the trading desk should be determined using the Standardised Approach.[53]

21.2 *PLAT Requirements*

358 The PLAT compares the daily risk-theoretical P&L (RTPL) with the daily HPL for each trading desk. It intends to:

- measure the materiality of simplifications in the internal models used for determining market risk capital charges driven by missing risk factors and differences in the way positions are valued compared with an AI's front office systems; and
- prevent AIs from using their internal models for capital adequacy purposes when such simplifications are considered material.

359 The PLAT should be performed on a standalone basis for each trading desk in scope for the use of the IMA.

Definition of P&L

360 The RTPL is the daily trading desk-level P&L that is produced by the valuation engine of the trading desk's internal model.

[53] Desks with exposure to issuer default risk should pass a two-stage approval process. First, the market risk model must pass backtesting and PLAT. Conditional on approval of the market risk model, the desk may then apply for approval to model default risk. Desks that fail either test should be capitalised under the Standardised Approach.

- The RTPL should take into account all risk factors, i.e. both the modellable risk factors that are included in the ES model and the NMRFs.
- The RTPL should not take into account any risk factors that an AI does not include in its trading desk's internal model.

361 Movements in all risk factors contained in the internal model should be included, even if the forecasting component of the internal model uses data that incorporate additional residual risk.

362 The PLAT compares a trading desk's RTPL with its HPL. The HPL used for the PLAT should be identical to the HPL used for backtesting purposes. This comparison determines whether the risk factors included and the valuation engines used in the internal models capture the material drivers of an AI's reported daily P&L by assessing if there is a significant degree of association between the two P&L measures observed over a suitable time period. The RTPL can differ from the HPL for a number of reasons. However, the internal models should provide a reasonably accurate assessment of the risks of a trading desk to be deemed eligible for the IMA.

363 The HPL should be calculated by revaluing the positions held at the end of the previous day using the market data of the present day (i.e. using static positions). The HPL measures changes in portfolio value that would occur by assuming end-of-day positions remain unchanged. It should therefore not take into account intraday trading nor new or modified deals, in contrast to the APL. Both APL and HPL include foreign denominated positions and commodities included in the banking book.

364 Both the APL and HPL should exclude (i) fees and commissions, (ii) valuation adjustments for which separate regulatory capital approaches have been otherwise specified as part of the rules (e.g. credit valuation adjustments and its associated eligible hedges) and (iii) valuation adjustments that are deducted from Common Equity Tier 1 capital (e.g. the impact on the debt valuation adjustment component of the fair value of financial instruments should be excluded from these P&Ls).

365 The APL should include any other market risk-related valuation adjustments, irrespective of the frequency by which they are updated while the HPL must only include valuation adjustments updated daily, unless an AI has received specific approval from the HKMA to exclude them. Smoothing of valuation adjustments that

are not calculated daily is not allowed. APL, HPL and RTPL should include P&L resulting from the passage of time.[54]

366 Valuation adjustments that an AI is unable to calculate at the trading desk level (e.g. because they are assessed in terms of the AI's overall positions/risks or because of other constraints around the assessment process) are not required to be included in the HPL and APL for backtesting at the trading desk level, but should be included for firm-wide backtesting. The AI should provide evidence to the HKMA for valuation adjustments that are not computed at the trading desk level.

367 Both APL and HPL should be computed based on the same pricing models (e.g. same pricing functions, pricing configurations, model parametrisation, market data and systems) as the ones used to produce the reported daily P&L.

PLAT data input alignment

368 For the sole purpose of the PLAT, an AI is allowed to align RTPL input data for its risk factors with the data used in HPL if these alignments are documented, justified to the HKMA and the requirements set out below are fulfilled:

- The AI should demonstrate that HPL input data can be appropriately used for RTPL purposes, and that no risk factor differences or valuation engine differences are omitted when transforming HPL input data into a format which can be applied to the risk factors used in the RTPL calculation.
- Any adjustment of RTPL input data should be properly documented, validated and justified to the HKMA.
- The AI should have procedures in place to identify changes with regard to the adjustments of RTPL input data. The AI should notify the HKMA of any such changes.
- The AI should provide assessments on the effect these input data alignments would have on the RTPL and the PLAT. To do so, the AI should compare RTPL based on HPL-aligned market data with the RTPL based on market data without alignment. This comparison should be performed when designing or changing the input data alignment process and upon request of the HKMA.

369 Adjustments to RTPL input data is allowed when the input data for a given risk factor that are included in both the RTPL and the HPL differ due to (i) different providers of market data sources, (ii) time fixing of market data sources or (iii) transformations of

[54] Time effects can include various elements such as: the sensitivity to time, or theta effect (i.e. using mathematical terminology, the first-order derivative of the price relative to time), and carry or costs of funding.

market data into input data suitable for the risk factors of the underlying pricing models. These adjustments can be done either:

- by direct replacement of the RTPL input data (e.g. par rate tenor x, provider a) with the HPL input data (e.g. par rate tenor x, provider b); or
- by using the HPL input data (e.g. par rate tenor x, provider b) as a basis to calculate the risk factor data needed in calculating the RTPL (e.g. zero rate tenor x).

370 If the HPL uses market data in a different manner to RTPL to calculate risk parameters that are essential to the valuation engine, these differences should be reflected in the PLAT and as a result in the calculation of HPL and RTPL. In this regard, HPL and RTPL are allowed to use the same market data only as a basis, but should use their respective methods (which can differ) to calculate the respective valuation engine parameters. This would be the case, for example, where market data are transformed as part of the valuation process used to calculate RTPL. In that instance, an AI may align market data between RTPL and HPL pre-transformation but not post-transformation.

371 An AI is not permitted to align HPL input data for risk factors with input data used in RTPL. Adjustments to RTPL or HPL to address residual operational noise are also not permitted. Residual operational noise arises from computing HPL and RTPL in two different systems at two different points in time. It may originate from transitioning large portions of data across systems, and potential data aggregations may result in minor reconciliation gaps below tolerance levels for intervention; or from small differences in static/reference data and configuration.

PLAT metrics

372 For the P&L attribution, an AI should calculate the following two P&L test metrics based on the data from the most recent 250 trading days for each trading desk:

- the Spearman correlation metric to assess the correlation between RTPL and HPL; and
- the Kolmogorov-Smirnov (KS) test metric to assess similarity of the distributions of RTPL and HPL.

373 An AI should calculate the Spearman correlation metric as follows.

- **Step 1:** For a time series of HPL, a corresponding time series of ranks based on the size (R_{HPL}) should be produced. That is, the lowest value in the HPL time series receives a rank of 1, the next lowest value receives a rank of 2 and so on.

- **Step 2:** Similarly, for a time series of RTPL, a corresponding time series of ranks based on size $(\mathrm{R_{RTPL}})$ should be produced.
- **Step 3:** The Spearman correlation coefficient (r_S) of the two time series of rank values of $\mathrm{R_{RTPL}}$ and $\mathrm{R_{HPL}}$ based on size should be calculated by using the following formula:

$$r_S = \frac{cov(R_{HPL}, R_{RTPL})}{\sigma_{R_{HPL}} \cdot \sigma_{R_{RTPL}}}$$

where $\sigma_{R_{HPL}}$ and $\sigma_{R_{RTPL}}$ are the standard deviations of R_{HPL} and R_{RTPL}.

374 An AI should calculate the Kolmogorov-Smirnov test metric as follows.

- **Step 1:** The empirical cumulative distribution function of RTPL should be calculated. For any value of RTPL, the empirical cumulative distribution is the mathematical product of 0.004 and the number of RTPL observations that are less than or equal to the specified RTPL.
- **Step 2:** The empirical cumulative distribution function of HPL should be calculated. For any value of HPL, the empirical cumulative distribution is the mathematical product of 0.004 and number of HPL observations that are less than or equal to the specified HPL.
- **Step 3:** The KS test metric is the largest absolute difference observed between these two empirical cumulative distribution functions at any P&L value.

375 An AI should allocate a trading desk into either a green, yellow or red zone based on the outcome of the metrics as set out as below.

Zone	**Conditions**
Green zone	if both – the correlation metric is above 0.80; and – the KS distributional test metric is below 0.09 (p-value is above 0.264).
Yellow zone	if it is allocated neither to the green nor to the red zone.
Red zone	if – the correlation metric is less than 0.7; or – the KS distributional test metric is above 0.12 (p-value is below 0.055).

Table 17

376 If a trading desk is in the PLAT red zone, it is ineligible to use the IMA to determine its market risk capital charges and should use the Standardised Approach.

- Risk exposures held by these ineligible trading desks should be included with the out-of-scope trading desks for the purpose of determining the market risk capital charges under the Standardised Approach.
- A trading desk deemed ineligible to use the IMA should remain out-of-scope to use the IMA until:
  - the trading desk produces outcomes in the PLAT green zone; and
  - the trading desk has satisfied the backtesting exceptions requirements over the past 12 months.

377 If a trading desk is in the PLAT yellow zone, it is not considered an out-of-scope trading desk for the use of IMA Approach.

- If a trading desk is in the PLAT yellow zone, it cannot return to the PLAT green zone until:
  - the trading desk produces outcomes in the PLAT green zone; and
  - the trading desk has satisfied its backtesting exceptions requirements over the prior 12 months.
- Trading desks in the PLAT yellow zone are subject to a capital surcharge as specified in paragraph 427.

Treatment for exceptional situations

378 There may, on very rare occasions, be a valid reason for an accurate model to produce many backtesting exceptions or inadequately track the P&L produced by the front office pricing model (for instance, during periods of significant cross-border financial market stress affecting several AIs or when financial markets are subjected to a major regime shift). One possible supervisory response in this instance would be to permit the relevant trading desks to continue to use the IMA but require the internal model of each trading desk to take into account the regime shift or significant market stress as quickly as practicable while maintaining the integrity of its procedures for updating the model. The HKMA would only pursue such a response under the most extraordinary circumstances with systemic relevance.

21.3 *Transitional arrangements*

379 AIs are required to conduct the PLAT beginning 1 January 2022 as set out in this subsection. The outcomes of the PLAT will be used for Pillar 2 purposes starting from 1 January 2022. The Pillar 1 capital requirement consequences of assigning trading desks to the PLAT yellow zone or PLAT red zone, will apply starting from 1 January 2023.

22 Capital Charges under the IMA

22.1 *Expected Shortfall for Modellable Risk Factors*

380 The new IMA replaces VaR and stressed VaR with a single ES metric. Unlike VaR which ignores risks in the tail of the statistical distribution, ES measures provide indications on both the likelihood and the size of losses above a certain confidence level. AIs should however be aware that such measures do not represent an exact quantification of the actual risk but only provide estimates based on a limited set of available historical input data.

381 The HKMA does not prescribe any particular type of ES model for calculating market risk capital charges. All such models should however meet the following minimum standards:

382 ES should be computed on a daily basis for the firm-wide internal models. It should also be computed on a daily basis for each trading desk that uses the IMA.

383 An AI should calculate ES measures as follows:

- It should use a one-tailed 97.5th percentile confidence level; and
- The liquidity horizons described in paragraph 392 should be reflected by scaling an ES calculated at a base liquidity horizon of 10 days as follows.

$$ES = \sqrt{\left(ES_T(P)\right)^2 + \sum_{j \geq 2} \left(ES_T(P,j) \cdot \sqrt{\frac{(LH_j - LH_{j-1})}{T}} \right)^2}$$

where

- *ES* is the regulatory liquidity-adjusted ES;
- *T* is the length of the base horizon, i.e. 10 days;
- $ES_T(P)$ is the ES at horizon *T* of a portfolio with positions $P = (p_i)$ with respect to shocks to all risk factors that the positions *P* are exposed to;
- $ES_T(P, j)$ is the ES at horizon *T* of a portfolio with positions $P = (p_i)$ with respect to shocks for each position p_i in the subset of risk factors $Q(p_i , j)$, with all other risk factors held constant;
- the ES at horizon *T*, $ES_T(P)$ should be calculated for changes in the risk factors, and $ES_T(P, j)$ should be calculated for changes in the relevant subset $Q(p_i , j)$ of risk factors, over the time interval *T* without scaling from a shorter horizon;

- $Q(p_i, j)$ is the subset of risk factors for which liquidity horizons, as specified in paragraph 392, for the desk where p_i is booked are at least as long as LH_j according to the table below. For example, $Q(p_i, 4)$ is the set of risk factors with a 60-day horizon and a 120-day liquidity horizon. Note that $Q(p_i, j)$ is a subset of $Q(p_i, j–1)$;
- the time series of changes in risk factors over the base time interval T may be determined by overlapping observations; and
- LH_j is the liquidity horizon j, with lengths in the following table:

j	***LH_j* (days)**
1	10
2	20
3	40
4	60
5	120

Table 18

384 An AI should calibrate the ES measure to a period of stress. Specifically, the measure should replicate an ES outcome that would be generated on the AI's current portfolio if the relevant risk factors were experiencing a period of stress. This is a joint assessment across all relevant risk factors, which will capture stressed correlation measures.

385 This calibration is to be based on an indirect approach using a reduced set of risk factors. An AI should specify a reduced set of risk factors that are relevant for its portfolio and for which there is a sufficiently long history of observations.

- This reduced set of risk factors is subject to approval by the HKMA and should meet the data quality requirements for a modellable risk factor as outlined in subsection 20.
- The identified reduced set of risk factors should be able to explain a minimum of 75% of the variation of the full ES model, i.e. the ES of the reduced set of risk factors should be at least equal to 75% of the fully specified ES model on average measured over the preceding 12-week period.

386 An AI should calculate the ES measure using the reduced set of risk factors, i.e. $ES_{R,S}$, calibrated to historical data from the most severe 12-month period of stress available over the observation horizon. That value is then scaled up by the ratio of (i)

the current ES using the full set of risk factors, $ES_{F,C}$, to (ii) the current ES measure using the reduced set of factors, $ES_{R,C}$. The ratio is floored as 1, i.e.

$$ES = ES_{R,S} \cdot max\left(\frac{ES_{F,C}}{ES_{R,C}}, 1\right)$$

387 For ES measures based on stressed observations ($ES_{R,S}$), an AI should identify the 12-month period of stress over the observation horizon for which the portfolio experiences the largest loss. The observation horizon for determining the most stressful 12 months should, at a minimum, span back to and include 2007. Observations within this period should be equally weighted. AIs should update their 12-month stressed period at least quarterly, or whenever there are material changes in the compositions of the portfolio or in the time series of the relevant risk factors. Whenever the AI updates its 12-month stressed period it should also update the reduced set of risk factors (as the basis for the calculations of $ES_{R,C}$ and $ES_{R,S}$) accordingly.

388 For measures based on current observations ($ES_{F,C}$ and $ES_{R,C}$), an AI should update its data sets no less frequently than once every three months and should also reassess data sets whenever market prices are subject to material changes.

- This updating process should be flexible enough to allow for more frequent updates.
- For shorter-term periods of high volatility, the HKMA may also require an AI to calculate its ES using an observation period of less than one year but not less than six months.

389 No particular type of ES model is prescribed. Provided that each internal model used captures all the material risks run by an AI, as confirmed through the backtesting and PLAT, and conforms to each of the requirements set out in this subsection, the AI may use models based on either historical simulation, Monte Carlo simulation, or other appropriate analytical methods.

390 An AI may recognise empirical correlations of factors affecting market risk within broad regulatory risk factor classes. Empirical correlations across broad risk classes will be constrained by the supervisory aggregation scheme, as described in paragraphs 394 and 395, and should be calculated and used in a manner consistent with the applicable liquidity horizons, clearly documented and able to be justified to the HKMA on request.

391 An AI's ES models should accurately capture the risks associated with options within each of the risk classes. The following criteria apply to the measurement of options risk. In particular,

- the AI's internal models should be able to capture the non-linear price characteristics of options positions;
- the AI's internal models should include a set of risk factors that captures the volatilities of the rates and prices of the AI's option positions, i.e. vega risk; and
- if the AI's portfolio of options is relatively large or complex, there should be detailed specifications of the relevant volatilities. This means that the AI should model the volatility surface across both strike prices and tenors.

392 As set out in paragraph 383, an AI should calculate a scaled ES based on the liquidity horizon *n* determined as follows:

- the AI should map each risk factor on to one of the risk factor sub-classes shown below using consistent and clearly documented procedures.
- the mapping of risk factors should be set out in writing, validated by the AI's risk management made available to the HKMA; and subject to the AI's internal audit review.
- *n* is determined for each risk factor sub-class as set out in the table below. However, on a desk-by-desk basis, *n* can be increased relative to the values in the table below (i.e. the liquidity horizon specified below can be treated as a floor). Where *n* is increased, the increased horizon should be 20, 40, 60 or 120 days and the rationale should be documented and be subject to approval by the HKMA.
- liquidity horizons should be capped at the maturity of the related instrument.

Risk class	***Risk factor sub-class***	***Liquidly horizon n (days)***
Interest rate	Specified currencies – HKD, AUD, CAD, EUR, GBP, JPY, SEK and USD[55]	10
	Unspecified currencies	20
	Volatility	60
	Other types	60
Credit spread	Sovereign (investment grade)	20
	Sovereign (high yield)	40
	Corporate (investment grade)	40

[55] The liquidity horizons of cross-currency basis and inflation rate should be consistent with liquidity horizons for interest rate risk factors for their particular currency or currency pair.

Risk class	Risk factor sub-class	Liquidly horizon n (days)
	Corporate (high yield)	60
	Volatility	120
	Other types	120
Equity	Equity price (large cap)	10
	Equity price (small cap)	20
	Volatility (large cap)	20
	Volatility (small cap)	60
	Other types	60
FX	Specified currency pairs [56]	10
	Other currency pairs	20
	Volatility	40
	Other types	40
Commodity	Energy and carbon emissions trading price	20
	Precious metals and non-ferrous metals price	20
	Other commodities price	60
	Energy and carbon emissions trading volatility	60
	Precious metals and non-ferrous metals volatility	60
	Other commodity volatility	120
	Other types	120

Table 19

393 For those trading desks that are permitted to use the IMA, all risk factors that are deemed to be modellable should be included in an AI's firm-wide ES model. The AI should calculate its internally modelled capital charges at the firm-wide level using this model, with no supervisory constraints on cross-risk class correlations ($IMCC(C)$).

394 An AI should calculate a series of partial ES capital charges (i.e. all other risk factors should be held constant) for the range of all risk classes (interest rate risk, credit spread risk, equity risk, foreign exchange risk and commodity risk). These partial, non-diversifiable (constrained) ES ($IMCC(C_i)$) will then be summed to provide an aggregated risk class ES capital charge.

[56] USD/EUR, USD/JPY, USD/GBP, USD/AUD, USD/CAD, USD/CHF, USD/MXN, USD/CNY, USD/NZD, USD/RUB, USD/HKD, USD/SGD, USD/TRY, USD/KRW, USD/SEK, USD/ZAR, USD/INR, USD/NOK, USD/BRL, EUR/JPY, EUR/GBP, EUR/CHF, JPY/AUD and first-order crosses of these currency pairs.

395 The aggregate capital charge for modellable risk factors (*IMCC*) is based on the weighted average of the constrained and unconstrained ES capital charges as follows,

$$IMCC = 0.5 \cdot \left(IMCC(C)\right) + 0.5 \cdot \left(\sum_{i=1}^{5} IMCC(C_i)\right)$$

where:

- $IMCC(C) = ES_{R,S} \cdot \max\left(\frac{ES_{F,C}}{ES_{R,C}}, 1\right)$ and

$$IMCC(C_i) = ES_{R,S,i} \cdot \max\left(\frac{ES_{F,C,i}}{ES_{R,C,i}}, 1\right)$$

- the stress period used in the risk class level $ES_{R,S,i}$ should be the same as that used to calculate the portfolio-wide $ES_{R,S}$.

23 Capital Charges for Non-modellable Risk Factors

396 An AI should capitalise each non-modellable risk factor (NMRF) using a stress scenario that is calibrated to be at least as prudent as the ES calibration used for modellable risk factors (i.e. a loss calibrated to a 97.5th percentile over a period of stress). In determining that period of stress, the AI should determine a common 12-month period of stress across all NMRFs in the same risk class. Subject to approval by the HKMA, an AI may be permitted to calculate stress scenario capital charges at the bucket level (i.e. using the same buckets that the AI uses in the RFET, as set out in paragraph 322) for risk factors that belong to curves, surfaces or cubes (i.e. a single stress scenario capital charge for all the NMRFs that belong to the same bucket).

397 For each NMRF, the liquidity horizon of the stress scenario should be the greater of the liquidity horizon assigned to the risk factor in paragraph 392 and 20 days. The HKMA may require a higher liquidity horizon.

398 For NMRFs arising from idiosyncratic credit spread risk, an AI may apply a common 12-month stress period. Likewise, for NMRFs arising from idiosyncratic equity risk arising from spot, futures and forward prices, equity repo rates, dividends and volatilities, the AI may apply a common 12-month stress scenario. Additionally, a zero correlation assumption may be used when aggregating gains and losses provided the AI conducts analysis to demonstrate to the HKMA that this is appropriate.[57] Correlation or diversification effects between other non-idiosyncratic NMRFs are recognised through the formula set out in paragraph 399. In the event that an AI cannot provide a stress scenario which is acceptable for the HKMA, the AI will have to use the maximum possible loss as the stress scenario.

399 The aggregate regulatory capital measure for *I* (non-modellable idiosyncratic credit spread risk factors that have been demonstrated to be appropriate to aggregate with zero correlation), *J* (non-modellable idiosyncratic equity risk factors that have been demonstrated to be appropriate to aggregate with zero correlation) and the remaining *K* (risk factors in model-eligible trading desks that are non-modellable) is calculated as follows:

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[57] The tests are generally done on the residuals of panel regressions where the dependent variable is the change in issuer spread while the independent variables can be either a change in a market factor or a dummy variable for sector and/or region. The assumption is that the data on the names used to estimate the model suitably proxies the names in the portfolio and the idiosyncratic residual component captures the multifactor-name basis. If the model is missing systematic explanatory factors or the data suffers from measurement error, then the residuals would exhibit heteroscedasticity and/or serial correlation and/or cross-sectional correlation (clustering).

$$SES = \sqrt{\sum_{i=1}^{I} ISES_{NM,i}^2} + \sqrt{\sum_{j=1}^{J} ISES_{NM,j}^2} + \sqrt{\left(0.6 \cdot \sum_{k=1}^{K} SES_{NM,k}\right)^2 + 0.64 \cdot \sum_{k=1}^{K} SES_{NM,k}^2}$$

where:

- $ISES_{NM,i}$ is the stress scenario capital charge for idiosyncratic credit spread non-modellable risk *i* from the *I* risk factors aggregated with zero correlation;
- $ISES_{NM,j}$ is the stress scenario capital charge for idiosyncratic equity non-modellable risk *j* from the *J* risk factors aggregated with zero correlation; and
- $SES_{NM,k}$ is the stress scenario capital charge for non-modellable risk *k* from *K* risk factors.

24 IMA Default Risk Charge

400 An AI should have a separate internal model to measure the default risk of trading book positions. The general criteria in subsection 18.2 and the qualitative standards in subsection 18.3 also apply to the default risk model.

401 Default risk is the risk of direct loss due to an obligor's default as well as the potential for indirect losses that may arise from a default event.

402 An AI should measure the IMA default risk charge (IMA-DRC) by using a VaR model.

- The AI should use a default simulation model with two types of systematic risk factors.
- Default correlations should be based on credit spreads or on listed equity prices. Correlations should be based on data covering a period of 10 years that includes a period of stress as defined in paragraph 384 and based on a one-year liquidity horizon.
- The AI should have clear policies and procedures that describe the correlation calibration process, documenting in particular in which cases credit spreads or equity prices are used.
- The AI has the discretion to apply a minimum liquidity horizon of 60 days to the determination of default risk capital charge for equity sub-portfolios.
- The VaR calculation should be conducted weekly and be based on a one-year time horizon at a one-tailed 99.9th percentile.

403 All positions subject to market risk capital charges that include default risk as defined in paragraph 401, with the exception of those positions subject to the Standardised Approach, are subject to the IMA-DRC model.

- All sovereign exposures (independent of their denomination currency), equity positions and defaulted debt positions should be included in the model.
- For equity positions, the default of an issuer should be modelled as resulting in the equity price dropping to zero.

404 The IMA-DRC is the greater of:

- the average of the IMA-DRC measures over the previous 12 weeks; or
- the most recent IMA-DRC measure.

405 An AI should assume constant positions over the one-year horizon, or 60 days in the context of designated equity sub-portfolios.

406 Default risk should be measured for each obligor.

- Market-implied probabilities of default (PDs) are not acceptable unless they are corrected to obtain an objective PD.
- PDs are subject to a floor of 0.03%.

407 An AI may reflect netting of long and short exposures to the same obligor in its IMA-DRC model. If such exposures span different instruments with exposure to the same obligor, the effect of the netting should account for different losses in different instruments (e.g. differences in seniority).

408 The basis risk between long and short exposures of different obligors should be modelled explicitly. The potential for offsetting default risk among long and short exposures across different obligors should be included through the modelling of defaults. The pre-netting of positions before input into the model other than as described in paragraph 407 is not allowed.

409 An AI's IMA-DRC model should recognise the impact of correlations between defaults among obligors, including the effect on correlations of periods of stress as described below.

- These correlations should be based on objective data and not chosen in an opportunistic way (depending on the mix of long and short exposures).
- The AI should validate that its modelling approach for these correlations is appropriate for its portfolio, including the choice and weights of its systematic risk factors. The AI should document its modelling approach and the period of time used to calibrate the model.
- These correlations should be measured over a liquidity horizon of one year.
- These correlations should be calibrated over a period of at least 10 years.
- The AI should reflect all significant basis risks in recognising these correlations, including, for example, maturity mismatches, internal or external ratings etc.

410 An AI's IMA-DRC model should capture any material mismatch between a position and its hedge. With respect to default risk within the one-year capital horizon, the model should account for the risk in the timing of defaults to capture the relative risk from the maturity mismatch of long and short positions of less-than-one-year maturity.

411 The IMA-DRC model should reflect the effect of issuer and market concentrations, as well as concentrations that can arise within and across product classes during stressed conditions.

412 As part of the IMA-DRC model, an AI should calculate, for each and every position subjected to the model, an incremental loss amount relative to the current valuation that the AI would incur in the event that the obligor of the position defaults.

413 Loss estimates should reflect the economic cycle; for example, the model should incorporate the dependence of the recovery on the systemic risk factors.

414 The IMA-DRC model should reflect the non-linear impact of options and other positions with material non-linear behaviour with respect to default. In the case of equity derivatives positions with multiple underlyings, subject to approval by the HKMA, simplified modelling approaches (e.g. modelling approaches that rely solely on individual jump-to-default sensitivities to estimate losses when multiple underlyings default) may be applied.

415 Default risk should be assessed from the perspective of the incremental loss from default in excess of the mark-to-market losses already taken into account in the current valuation.

416 Owing to the high confidence level and long capital horizon of the IMA-DRC, robust direct validation of the IMA-DRC model through standard backtesting methods will not be possible.

- Accordingly, validation of an IMA-DRC model necessarily should rely more heavily on indirect methods, including but not limited to stress tests, sensitivity analyses and scenario analyses, to assess its qualitative and quantitative reasonableness, particularly with regard to the treatment of concentrations.
- Such tests should not be limited to the range of events experienced historically in order to ensure the soundness of the IMA-DRC model.
- The validation of an IMA-DRC model represents an ongoing process in which an AI and the HKMA jointly determine the exact set of validation procedures to be employed.

417 An AI should strive to develop relevant internal modelling benchmarks to assess the overall accuracy of its IMA-DRC model.

418 Due to the unique relationship between credit spread and default risk, an AI should seek approval from the HKMA for each trading desk with exposure to these risks, both for credit spread risk and default risk. Trading desks which do not receive approval will be deemed ineligible for internal modelling standards and be subject to the Standardised Approach.

419 Where an AI has approved PD estimates as part of the internal ratings-based (IRB) approach, these data should be used. Where such estimates do not exist, PDs should be computed using a methodology consistent with the IRB methodology and satisfy the following conditions.

- The AI should not use risk-neutral PDs as estimates of observed (historical) PDs.
- The AI should measure PDs based on historical default data including both formal default events and price declines equivalent to default losses. Where possible, these data should be based on publicly traded securities over a complete economic cycle. The minimum historical observation period for calibration purposes is five years.
- The AI should estimate PDs based on historical data of default frequency over a one-year period. The PD may also be calculated on a theoretical basis (e.g. geometric scaling) provided that the AI is able to demonstrate that such theoretical derivations are in line with historical default experience (e.g. by using proxies).
- The AI may also use PDs provided by external sources as long as they are relevant to its portfolio.

420 Where an AI has approved loss-given-default (LGD)[58] estimates as part of its IRB approach, these data should be used. Where such estimates do not exist, LGDs should be computed using a methodology consistent with the IRB methodology and satisfy the following conditions.

- The AI should determine LGDs from a market perspective, based on a position's current market value minus the position's expected market value subsequent to default. The LGD should reflect the type and seniority of the position and cannot be less than zero.
- LGDs should be based on an amount of historical data that is sufficient to derive robust, accurate estimates.
- An AI may also use LGDs provided by external sources as long as they are relevant to its portfolio.

421 An AI should establish a hierarchy ranking its preferred sources for PDs and LGDs, in order to avoid the cherry-picking of parameters.

[58] LGD should be interpreted in this context as 1 – recovery rate.

25 Aggregation of Capital Charge

422 The regulatory capital charge associated with trading desks that are either out-of-scope for model approval or that have been deemed ineligible to use an internal model (C_u) is to be calculated by aggregating all such risks and applying the Standardised Approach.

423 The aggregate (non-DRC) capital charge for those trading desks approved and eligible for the IMA (i.e. trading desks that pass the backtesting requirements and that have been assigned to the PLAT green or yellow zone (C_Y) in paragraphs 375 to 377) is equal to the maximum of the most recent observation and a weighted average of the previous 60 days scaled by a multiplier and is calculated as follows where *SES* is the aggregate regulatory capital measure for the risk factors in model-eligible trading desks that are non-modellable.

$$C_Y = max\left(IMCC_{t-1} + SES_{t-1}, m_c \cdot IMCC_{avg} + SES_{avg}\right)$$

424 The multiplication factor m_c is fixed at 1.5 unless it is set at a higher level by the HKMA to reflect the addition of a qualitative add-on and/or a backtesting add-on in accordance with the following considerations.

- The backtesting add-on factor will range from 0 to 0.5 based on the outcome of the backtesting of the AI's daily VaR at the 99th percentile confidence level based on current observations on the full set of risk factors (VaR_{FC}).
- If the backtesting results are satisfactory and the AI meets all of the qualitative standards set out in subsection 18.3, the add-on factor could be zero. Subsection 21.1 presents in detail the approach to be applied for backtesting and the add-on factor.
- The backtesting add-on factor is determined based on the maximum of the exceptions generated by the backtesting results against APL and HPL as described in subsection 21.1.

425 The aggregate capital charge for market risk (MR_{total}) is equal to the aggregate capital charge for approved and eligible trading desks ($IMA_{G,Y}$ = C_Y + IMA-DRC) plus the Standardised Approach capital charge for trading desks that are either out-of-scope for model approval or that have been deemed ineligible to use the Internal Models Approach (C_u). If at least one eligible trading desk is in the PLAT yellow zone, a capital surcharge is added. The impact of the capital surcharge is limited by the formula:

$$MR_{total} = min\left(IMA_{G,Y} + Capital\ surcharge + C_u\ ,\ SA_{all\ desk}\right) + max\left(0, IMA_{G,Y} - SA_{G,Y}\right)$$

426 For the purposes of calculating the capital charge, the RFET, the PLAT and the trading desk-level backtesting are applied on a quarterly basis to update the modellability of risk factors and trading desk classification to the PLAT green, yellow, or red zone. In addition, the stressed period and the reduced set of risk factors ($E_{R,C}$ and $E_{R,S}$) should be updated on a quarterly basis. The reference dates to perform the tests and to update the stress period and selection of the reduced set of risk factors should be consistent. An AI should reflect updates to the stressed period and to the reduced set of risk factors as well as the test results in calculating capital charges in a timely manner. The averages of the previous 60 days (*IMCC*, *SES*) and/or respectively 12 weeks (*IMA-DRC*) have only to be calculated at the end of the quarter for the purpose of calculating the capital charge.

427 The capital surcharge is calculated as the difference between the aggregated standardised capital charges ($SA_{G,Y}$) and the aggregated internal models-based capital charges ($IMA_{G,Y} = C_Y + DRC$) multiplied by a factor *k*. To determine the aggregated capital charges, positions in all of the trading desks in the PLA green or yellow zone are taken into account. The capital surcharge is floored at zero.

$$Capital\ surcharge = k \cdot max\left(0, SA_{G,Y} - IMA_{G,Y}\right)$$

where:

- $k = 0.5 \cdot \frac{\sum_{i \in Y} SA_i}{\sum_{i \in G,Y} SA_i}$;
- SA_i denotes the standardised capital charge for all the positions of trading desk *i*;
- $i \in Y$ denotes the indices of all the approved trading desks in the yellow zone; and
- $i \in G, Y$ denotes the indices of all the approved trading desks in the green or yellow zone.

V SIMPLIFIED STANDARDISED APPROACH

26 Eligibility Criteria

428 The HKMA acknowledges the complexity of calculations in the new Standardised Approach and it may pose implementation challenge to AIs with relatively smaller or simpler market risk exposure. As such, the HKMA intends to adopt the recalibrated Basel II Standardised Approach as a simplified version of the Standardised Approach. However, the use of the Simplified Standardised Approach is subject to a prior approval of the HKMA[59] and is only limited to AIs fulfilling all of the following quantitative and qualitative eligibility criteria.

- The AI's market risk risk-weighted assets, when using the Simplified Standardised Approach, must not exceed HKD 1 billion;
- The AI's market risk risk-weighted assets, when using the Simplified Standardised Approach, must not exceed 2% of its total risk-weighted assets;
- The aggregate notional amount of non-centrally cleared derivatives (including both banking book and trading book positions) must not exceed HKD 6 trillion;
- The AI must not be a global systemically important bank (G-SIB), a subsidiary of a G-SIB or a domestic systemically important bank (D-SIB); and
- The AI must not hold any correlation trading positions.

429 The HKMA can mandate that an AI with relatively complex or sizeable risks in particular risk classes apply the full Standardised Approach instead of the Simplified Standardised Approach (SSA), even if the AI meets all the eligibility criteria stated in paragraph 428.

430 When an AI that has been approved to use the SSA can no longer on a permanent basis fulfil all of the eligibility criteria to use the SSA, the AI should give immediate notice in writing to the HKMA. The HKMA would require the AI to use the full Standardised Approach to calculate its market risk capital charge within a specified period of time.

[59] The application procedure is set out in paragraph 21.

27 Capital Charges under the SSA

431 The capital charge resulting from the Simplified Standardised Approach equal the simple sum of the recalibrated capital from each of the four risk classes under Basel II Standardised Approach, i.e. interest rate risk, equity risk, FX risk and commodity risk as detailed in the formula below.

$$\text{Capital charge } = K_{IRR} \cdot SF_{IRR} + K_{EQ} \cdot SF_{EQ} + K_{FX} \cdot SF_{FX} + K_{COMM} \cdot SF_{Comm}$$

where:

- K_{IRR} = capital charge for interest rate risk, plus additional requirements for option risks from debt instruments (non-delta risks);
- K_{EQ} = capital charge for equity risk plus additional requirements for option risks from equity instruments (non-delta risks);
- K_{FX} = capital charge for foreign exchange risk, plus additional requirements for option risks from foreign exchange instruments (non-delta risks);
- K_{COMM} = capital charge for commodities risk, plus additional requirements for option risks from commodities instruments (non-delta risks);
- SF_{IRR} = scaling factor of 1.30;
- SF_{EQ} = scaling factor of 3.50;
- SF_{Comm} = scaling factor of 1.90; and
- SF_{FX} = scaling factor of 1.20.

432 An AI should calculate the capital charge of securitisation positions in accordance with the corresponding method for such positions in the banking book as set out in Part 7 of the BCR.

433 A partial use of the new Standardised Approach and the Simplified Standardised Approach is not allowed. For AIs that will have obtained the approval of the HKMA to calculate their market risk capital charge under the Internal Models Approach, a partial use of the Internal Models Approach and the Simplified Standardised Approach is not allowed.