



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-7: Operational Risk</b>

## CA-7.1 The Measurement Methodologies

CA-7.1.1 The framework outlined below presents two methods for calculating operational risk capital charges in a continuum of increasing sophistication and risk sensitivity:

- The Basic Indicator Approach; and
- The Standardised Approach.

CA-7.1.2 Banks are encouraged to move towards standardised approach as they develop more sophisticated operational risk measurement systems and practices.

CA-7.1.3 A bank will not be allowed to choose to revert to basic indicator approach once it has been approved for standardised approach without CBB's approval. However, if CBB determines that a bank using standardised approach no longer meets the qualifying criteria for standardised approach, it may require the bank to revert to basic indicator approach for some or all of its operations, until it meets the conditions specified by the CBB for returning to standardised approach.

### *Basic Indicator Approach*

#### CA-7.1.4

Banks applying the Basic Indicator Approach must hold capital for operational risk equal to the average over the previous three years of a fixed percentage (denoted alpha) of positive annual gross income. Figures for any year in which annual gross income is negative or zero should be excluded from both the numerator and denominator when calculating the average.<sup>59</sup> The charge may be expressed as follows:

$$K_{BIA} = [\sum (GI_{1..n} \alpha n)]/n$$

where:

$K_{BIA}$  = the capital charge under the Basic Indicator Approach

GI = annual gross income, where positive, over the previous three years (audited financial years)

N = number of the previous three years for which gross income is positive

$\alpha$  = 15%, relating the industry wide level of required capital to the industry wide level of the indicator.

<sup>59</sup> If negative gross income distorts a bank's Pillar 1 capital charge, CBB will consider appropriate supervisory action.



MODULE	CA:	Capital Adequacy
CHAPTER	CA-7:	Operational Risk

## CA-7.1 The Measurement Methodologies (continued)

CA-7.1.5 Gross income is defined as net interest income plus net non-interest income.<sup>60</sup> This measure should: (i) be gross of any provisions (e.g. for unpaid interest); (ii) be gross of operating expenses, including fees paid to outsourcing service providers<sup>61</sup>; (iii) exclude realised profits/losses from the sale of securities in the banking book;<sup>62</sup> and (iv) exclude extraordinary or irregular items as well as income derived from insurance.

CA-7.1.6 In case of a bank with negative gross income for the previous three years, a newly licensed bank with less than 3 years of operations, or a merger, acquisition or material restructuring, the CBB shall discuss with the concerned licensed bank an alternative method for calculating the operational risk capital charge. For example, a newly licensed bank may be required to use the projected gross income in its 3-year business plan. Another approach that the CBB may consider is to require such licensed banks to observe a higher CAR.

CA-7.1.7 Banks applying this approach are encouraged to comply with the principles set in Section OM-8.2 of Operational Risk Management Module.

### *The Standardised Approach*

CA-7.1.8 In the Standardised Approach, banks' activities are divided into eight business lines: corporate finance, trading & sales, retail banking, commercial banking, payment & settlement, agency services, asset management, and retail brokerage. The business lines are defined in detail in **Appendix CA-9**. The bank must meet the requirements detailed in Section OM-8.3 to qualify for the use of standardised approach.

CA-7.1.9 Within each business line, gross income is a broad indicator that serves as a proxy for the scale of business operations and thus the likely scale of operational risk exposure within each of these business lines. The capital charge for each business line is calculated by multiplying gross income by a factor (denoted beta) assigned to that business line. Beta serves as a proxy for the industry-wide relationship between the operational risk loss experience for a given business line and the aggregate level of gross income for that business line. It should be noted that in the Standardised Approach, gross income is measured for each business line, not the whole institution, i.e. in corporate finance, the indicator is the gross income generated in the corporate finance business line. An example of calculation of gross income is provided in **Appendix CA-10**.

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<sup>60</sup>As defined under International Financial Reporting Standards as applicable in the Kingdom of Bahrain.

<sup>61</sup> In contrast to fees paid for services that are outsourced, fees received by banks that provide outsourcing services shall be included in the definition of gross income.

<sup>62</sup> Realised profits/losses from securities classified as "held to maturity" and "available for sale", which typically constitute items of the banking book, are also excluded from the definition of gross income.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-7: Operational Risk</b>

## CA-7.1 The Measurement Methodologies (continued)

### CA-7.1.10

The total capital charge is calculated as the three-year average of the simple summation of the regulatory capital charges across each of the business lines in each year. In any given year, negative capital charges (resulting from negative gross income) in any business line can not off-set positive capital charges in other business lines. Where the aggregate capital charge across all business lines within a given year is negative, then the input to the numerator for that year will be zero.<sup>63</sup> The total capital charge may be expressed as:

$$K_{TSA} = \{ \sum_{\text{years 1-3}} \max[(GI_{1-8} \times \beta_{1-8}, 0] \} / 3$$

where:

$K_{TSA}$  = the capital charge under the Standardised Approach

$GI_{1-8}$  = annual gross income in a given year, as defined above in the Basic Indicator Approach, for each of the eight business lines

$\beta_{1-8}$  = a fixed percentage, relating the level of required capital to the level of the gross income for each of the eight business lines.

The values of the betas are detailed below.

<b>Business Lines</b>	<b>Beta Factors</b>
<b>Corporate Finance (<math>\beta_1</math>)</b>	<b>18%</b>
<b>Trading and Sales (<math>\beta_2</math>)</b>	<b>18%</b>
<b>Retail Banking (<math>\beta_3</math>)</b>	<b>12%</b>
<b>Commercial Banking (<math>\beta_4</math>)</b>	<b>15%</b>
<b>Payment and Settlement (<math>\beta_5</math>)</b>	<b>18%</b>
<b>Agency Services (<math>\beta_6</math>)</b>	<b>15%</b>
<b>Asset Management (<math>\beta_7</math>)</b>	<b>12%</b>
<b>Retail Brokerage (<math>\beta_8</math>)</b>	<b>12%</b>

<sup>63</sup> As under the Basic Indicator Approach, if negative gross income distorts a bank's Pillar 1 capital charge under the Standardised Approach, CBB will consider appropriate supervisory action.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-8: Market Risk - Trading Book</b>

## CA-8.1 Definition of the Trading Book

CA-8.1.1 The following definition of the trading book replaces the previous definition. Chapters CA-9 to CA-14 deal with market risk rules.

### CA-8.1.2

A trading book consists of positions in financial instruments and commodities held either with trading intent or in order to hedge other elements of the trading book. To be eligible for trading book capital treatment, financial instruments must either be free of any restrictive covenants on their tradability or able to be hedged completely. In addition, positions should be frequently and accurately valued, and the portfolio should be actively managed (at the present time, open equity stakes in hedge funds, private equity investments, positions in a securitisation warehouse and real estate holdings do not meet the definition of the trading book, owing to significant constraints on the ability of banks to liquidate these positions and value them reliably on a daily basis. Such holdings must therefore be held in the bank's banking book and treated as equity holding in corporates, except real estates which should be treated as per CA-3.2.29).

CA-8.1.3 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 the contractual right to exchange financial assets on potentially favourable terms, or an equity instrument. A financial liability is the contractual obligation to deliver cash or another financial asset or to exchange financial liabilities under conditions that are potentially unfavourable.

CA-8.1.4 Positions held with trading intent are those held intentionally for short-term resale and/or with the intent of benefiting from actual or expected short-term price movements or to lock in arbitrage profits, and may include for example proprietary positions, positions arising from client servicing (e.g. matched principal broking) and market making. It is therefore possible that banks may sometimes not have a trading book as defined above. Nonetheless the bank's strategy and business plan must take account of the requirements of this Chapter in case a bank does take on positions with trading intent.

### CA-8.1.5

Banks must have clearly defined policies and procedures for determining which exposures to include in, and to exclude from, the trading book for purposes of calculating their regulatory capital, to ensure compliance with the criteria for trading book set forth in this Section and taking into account the bank's risk management capabilities and practices. Compliance with these policies and procedures must be fully documented and subject to periodic internal audit.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-8: Market Risk - Trading Book</b>

## CA-8.1 Definition of the Trading Book (continued)

### CA-8.1.6

These policies and procedures must, at a minimum, address the following general considerations:

- (a) The activities the bank considers to be trading and as constituting part of the trading book for regulatory capital purposes;
- (b) The extent to which an exposure can be marked-to-market daily by reference to an active, liquid two-way market;
- (c) For exposures that are marked-to-model, the extent to which the bank can:
  - Identify the material risks of the exposure;
  - Hedge the material risks of the exposure and the extent to which hedging instruments would have an active, liquid two-way market;
  - Derive reliable estimates for the key assumptions and parameters used in the model.
- (d) The extent to which the bank can and is required to generate valuations for the exposure that can be validated externally in a consistent manner;
- (e) The extent to which legal restrictions or other operational requirements would impede the bank's ability to effect an immediate liquidation of the exposure;
- (f) The extent to which the bank is required to, and can, actively risk manage the exposure within its trading operations; and
- (g) The extent to which the bank may transfer risk or exposures between the banking and the trading books and criteria for such transfers.

The list above is not intended to provide a series of tests that a product or group of related products must pass to be eligible for inclusion in the trading book. Rather, the list provides a minimum set of key points that must be addressed by the policies and procedures for overall management of a firm's trading book.

### CA-8.1.7

The following will be the basic requirements for positions eligible to receive trading book capital treatment:

- (a) Clearly documented trading strategy for the position/instrument or portfolios, approved by senior management (which would include expected holding horizon);



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-8: Market Risk - Trading Book</b>

### CA-8.1 Definition of the Trading Book (Continued)

- (b) Clearly defined policies and procedures for the active management of the position, which must include:
- Positions are managed on a trading desk;
  - Position limits are set and monitored for appropriateness;
  - Dealers have the autonomy to enter into/manage the position within agreed limits and according to the agreed strategy;
  - Positions are marked to market at least daily and when marking to model the parameters must be assessed on a daily basis;
  - Positions are reported to senior management as an integral part of the institution's risk management process; and
  - Positions are actively monitored with reference to market information sources (assessment should be made of the market liquidity or the ability to hedge positions or the portfolio risk profiles). This would include assessing the quality and availability of market inputs to the valuation process, level of market turnover, sizes of positions traded in the market, etc.
- (c) Clearly defined policy and procedures to monitor the positions against the bank's trading strategy including the monitoring of turnover and stale positions in the bank's trading book.

CA-8.1.8 When a bank hedges a banking book credit risk exposure using a credit derivative booked in its trading book (i.e. using an internal hedge), the banking book exposure is not deemed to be hedged for capital purposes unless the bank purchases from an eligible third party protection provider a credit derivative meeting the requirements of Paragraph CA-4.5.3 vis-à-vis the banking book exposure. Where such third party protection is purchased and is recognised as a hedge of a banking book exposure for regulatory capital purposes, neither the internal nor external credit derivative hedge would be included in the trading book for regulatory capital purposes.

#### CA-8.1.8.A

Positions in the bank's own eligible regulatory capital instruments are deducted from capital. Positions in other banks', securities firms', and other financial entities' eligible regulatory capital instruments, as well as intangible assets, are subject to the same treatment as that set down by the CBB for such assets held in the banking book (see Module PCD).



MODULE	CA: Capital Adequacy
CHAPTER	CA-8: Market Risk - Trading Book

## CA-8.1 Definition of the Trading Book (Continued)

### CA-8.1.9

Term trading-related repo-style transactions that a bank accounts for in its banking book may be included in the bank's trading book for regulatory capital purposes so long as all such repo-style transactions are included. For this purpose, trading-related repo-style transactions are defined as only those that meet the requirements of Paragraphs CA-8.1.4 and CA-8.1.7 and both legs are in the form of either cash or securities includable in the trading book.

### CA-8.1.10

Regardless of where they are booked, all repo-style transactions are subject to a banking book counterparty credit risk charge.

### CA-8.1.11

For the purposes of this framework, the correlation trading portfolio incorporates securitisation exposures and n-th-to-default credit derivatives that meet the following criteria:

- (a) The positions are neither re-securitisation positions, nor derivatives of securitisation exposures that do not provide a pro-rata share in the proceeds of a securitisation tranche (this therefore excludes options on a securitisation tranche, or a synthetically leveraged super-senior tranche); and
- (b) All reference entities are single-name products, including single-name credit derivatives, for which a liquid two-way market exists. This will include commonly traded indices based on these reference entities. A two-way market is deemed to exist where there are independent bona fide offers to buy and sell so that a price reasonably related to the last sales price or current bona fide competitive bid and offer quotations can be determined within one day and settled at such price within a relatively short time conforming to trade custom.

Positions which reference an underlying that would be treated as a retail exposure, a residential mortgage exposure or a commercial mortgage exposure under the standardised approach to credit risk are not included in the correlation trading portfolio. Positions which reference a claim on a special purpose entity are not included either. A bank may also include in the correlation trading portfolio positions that hedge the positions described above and which are neither securitisation exposures nor n-th-to-default credit derivatives and where a liquid two-way market as described above exists for the instrument or its underlyings.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-8: Market Risk - Trading Book</b>

**CA-8.2** [This Chapter has been moved to Chapter CA-16 in January 2012]





<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-8: Market Risk - Trading Book</b>

### CA-8.3 Treatment of Counterparty Credit Risk in the Trading Book

#### CA-8.3.1

Banks must calculate the counterparty credit risk charge for OTC derivatives, repo-style and other transactions booked in the trading book, separate from the capital charge for general market risk and specific risk.<sup>64</sup> The risk weights to be used in this calculation must be consistent with those used for calculating the capital requirements in the banking book. Thus, banks applying the standardised approach in the banking book will use the standardised approach risk weights in the trading book and banks applying the IRB approach in the banking book will use the IRB risk weights in the trading book in a manner consistent with the IRB roll out situation in the banking book as described in Paragraphs CA-5.2.28 to CA-5.2.31. For counterparties included in portfolios where the IRB approach is being used the IRB risk weights will have to be applied. The 50% cap on risk weights for OTC derivative transactions is abolished.

CA-8.3.2 In the trading book, for repo-style transactions, all instruments, which are included in the trading book, may be used as eligible collateral. Those instruments which fall outside the banking book definition of eligible collateral shall be subject to a haircut at the level applicable to non-main index equities listed on recognised exchanges (as noted in Paragraph CA-4.3.7. Where banks are applying a VaR approach to measuring exposure for repo-style transactions, they also may apply this approach in the trading book in accordance with Paragraphs CA-4.3.22 to CA-4.3.25 and Appendix CA-2.

CA-8.3.3 The calculation of the counterparty credit risk charge for collateralised OTC derivative transactions is the same as the rules prescribed for such transactions booked in the banking book.

CA-8.3.4 The calculation of the counterparty charge for repo-style transactions will be conducted using the rules in Paragraphs CA-4.3.3 to CA-4.3.25 and **Appendix CA-2** spelt out for such transactions booked in the banking book. The firm-size adjustment for SMEs as set out in Paragraph CA-5.3.4 shall also be applicable in the trading book.

#### *Credit Derivatives*

CA-8.3.5 The counterparty credit risk charge for single name credit derivative transactions in the trading book will be calculated applying the following potential future exposure add-on factors:

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<sup>64</sup> The treatment for unsettled foreign exchange and securities trades is set forth in Paragraph CA-3.3.13.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-8: Market Risk - Trading Book</b>

**CA-8.3 Treatment of Counterparty Credit Risk in the Trading Book  
(continued)**

	<b>Protection buyer</b>	<b>Protection seller</b>
<b>Total Return Swap</b>		
“Qualifying” reference obligation	5%	5%
“Non-qualifying” reference obligation	10%	10%
<b>Credit Default Swap</b>		
“Qualifying” reference obligation	5%	5%**
“Non-qualifying” reference obligation	10%	10%**

There will be no difference depending on residual maturity.

The definition of “qualifying” is the same as for the “qualifying” category for the treatment of specific risk under the standardised measurement method in chapter CA-9.

\*\* The protection seller of a credit default swap shall only be subject to the add-on factor where it is subject to closeout upon the insolvency of the protection buyer while the underlying is still solvent. Add-on should then be capped to the amount of unpaid premiums.

CA-8.3.6 Where the credit derivative is a first to default transaction, the add-on will be determined by the lowest credit quality underlying in the basket, i.e. if there are any non-qualifying items in the basket, the non-qualifying reference obligation add-on should be used. For second and subsequent to default transactions, underlying assets should continue to be allocated according to the credit quality, i.e. the second lowest credit quality will determine the add-on for a second to default transaction etc.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-9: Market Risk - Interest Rate Risk – (STA)</b>

## CA-9.1 Introduction

CA-9.1.1 This chapter describes the standardised approach for the measurement of the interest rate risk in the bank's trading book, in order to determine the capital requirement for this risk. The interest rate exposure captured includes exposure arising from interest-bearing and discounted financial instruments, derivatives which are based on the movement of interest rates, foreign exchange forwards, and interest rate exposure embedded in derivatives which are based on non-interest rate related instruments.

CA-9.1.2 For the guidance of the banks, and without being exhaustive, the following list includes financial instruments in the trading book to which interest rate risk capital requirements will apply, irrespective of whether or not the instruments carry coupons:

- (a) Bonds/loan stocks, debentures etc;
- (b) Non-convertible preference shares;
- (c) Convertible securities such as preference shares and bonds, which are treated as debt instruments<sup>65</sup>;
- (d) Mortgage backed securities and other securitised assets<sup>66</sup>;
- (e) Certificates of Deposit;
- (f) Treasury bills, local authority bills, banker's acceptances;
- (g) Commercial paper;
- (h) Euronotes, medium term notes, etc;
- (i) Floating rate notes, FRCs etc;
- (j) Foreign exchange forward positions;
- (k) Derivatives based on the above instruments and interest rates; and
- (l) Interest rate exposure embedded in other financial instruments.

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<sup>65</sup> See Section CA-10.1 for an explanation of the circumstances in which convertible securities should be treated as equity instruments. In other circumstances, they should be treated as debt instruments.

<sup>66</sup> Traded mortgage securities and mortgage derivative products possess unique characteristics because of the risk of pre-payment. It is possible that including such products within the standardised methodology as if they were similar to other securitised assets may not capture all the risks of holding positions in them. Banks which have traded mortgage securities and mortgage derivative products should discuss their proposed treatment with the CBB and obtain the CBB's prior written approval for it.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-9: Market Risk - Interest Rate Risk – (STA)</b>

## CA-9.1 Introduction (continued)

### CA-9.1.3

A security which is the subject of a repurchase or securities lending agreement will be treated as if it were still owned by the lender of the security, i.e., it will be treated in the same manner as other securities positions.

### CA-9.1.4

The minimum capital requirement is expressed in terms of two separately calculated charges, one applying to the “specific risk” of each security, whether it is a short or a long position, and the other to the interest rate risk in the portfolio (termed “general market risk”) where long and short positions in different securities or instruments can be offset. The bank must, however, determine the specific risk capital charge for the correlation trading portfolio as follows: The bank computes (i) the total specific risk capital charges that would apply just to the net long positions from the net long correlation trading exposures combined, and (ii) the total specific risk capital charges that would apply just to the net short positions from the net short correlation trading exposures combined. The larger of these total amounts is then the specific risk capital charge for the correlation trading portfolio.

### CA-9.1.4A

During a transitional period until 31 December 2013, the bank may exclude positions in securitisation instruments which are not included in the correlation trading portfolio from the calculation according to Paragraph CA-9.1.4 and determine the specific risk capital charge as follows: The bank computes (i) the total specific risk capital charge that would apply just to the net long positions in securitisation instruments in the trading book, and (ii) the total specific risk capital charge that would apply just to the net short positions in securitisation instruments in the trading book. The larger of these total amounts is then specific risk capital charge for the securitisation positions in the trading book. This calculation must be undertaken separately from the calculation for the correlation trading portfolio.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-9: Market Risk - Interest Rate Risk – (STA)</b>

### CA-9.1 Introduction (continued)

CA-9.1.5 The specific risk capital requirement recognises that individual instruments may change in value for reasons other than shifts in the yield curve of a given currency. The general risk capital requirement reflects the price change of these products caused by parallel and non-parallel shifts in the yield curve, as well as the difficulty of constructing perfect hedges.

CA-9.1.6 There is general market risk inherent in all interest rate risk positions. This may be accompanied by one or more out of specific interest rate risk, counterparty risk, equity risk and foreign exchange risk, depending on the nature of the position. Banks must consider carefully which risks are generated by each individual position. It should be recognised that the identification of the risks will require the application of the appropriate level of technical skills and professional judgment.

#### CA-9.1.7

**Banks which have the intention and capability to use internal models for the measurement of general and specific interest rate risks and, hence, for the calculation of the capital requirement, should seek the prior written approval of the CBB for those models. The CBB's detailed rules for the recognition and use of internal models are included in chapter CA-14. Banks which do not use internal models should adopt the standardised approach to calculate the interest rate risk capital requirement, as set out in detail in this chapter.**



MODULE	CA: Capital Adequacy
CHAPTER	CA-9: Market Risk - Interest Rate Risk – (STA)

## CA-9.2 Specific Risk Calculation

CA-9.2.1 The capital charge for specific risk is designed to protect against a movement in the price of an individual instrument, owing to factors related to the individual issuer.

### CA-9.2.2

In measuring the specific risk for interest rate related instruments, a bank may net, by value, long and short positions (including positions in derivatives) in the same debt instrument to generate the individual net position in that instrument. Instruments will be considered to be the same where the issuer is the same, they have an equivalent ranking in a liquidation, and the currency, the coupon and the maturity are the same.

### CA-9.2.3

The specific risk capital requirement is determined by weighting the current market value of each individual net position, whether long or short, according to its allocation among the following broad categories:

Categories	External credit assessment	Specific risk capital charge
Government (including GCC governments)	AAA to AA-	0%
	A+ to BBB-	0.25% (residual term to final maturity 6 months or less) 1.00% (residual term to final maturity greater than 6 and up to and including 24 months) 1.60% (residual term to final maturity exceeding 24 months)
	BB+ to B-	8.00%
	Below B-	12.00%
	Unrated	8.00%
Qualifying		0.25% (residual term to final maturity 6 months or less) 1.00% (residual term to final maturity greater than 6 and up to and including 24 months) 1.60% (residual term to final maturity exceeding 24 months)
Other	Similar to credit risk charges under the standardised approach, e.g.:	
	BB+ to BB-	8.00%
	Below BB-	12.00%
	Unrated	8.00%



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-9: Market Risk - Interest Rate Risk – (STA)</b>

## CA-9.2 Specific Risk Calculation (continued)

CA-9.2.4 When the government paper is denominated in the domestic currency and funded by the bank in the same currency, a 0% specific risk charge may be applied.

**CA-9.2.5** Central "government" debt instruments will include all forms of government paper, including bonds, treasury bills and other short-term instruments.

**CA-9.2.6** However the CBB reserves the right to apply a specific risk weight to securities issued by certain foreign governments, especially to securities denominated in a currency other than that of the issuing government.

**CA-9.2.7** The "qualifying" category includes securities issued by or fully guaranteed by public sector entities and multilateral development banks (refer to Paragraph CA-3.2.8), plus other securities that are:

- (a) Rated investment grade by at least two internationally recognised credit rating agencies (to be agreed with the CBB); or
- (b) Deemed to be of comparable investment quality by the reporting bank, provided that the issuer is rated investment grade by at least two internationally recognised credit rating agencies (to be agreed with the CBB); or
- (c) Rated investment grade by one credit rating agency and not less than investment grade by any internationally recognised credit rating agencies (to be agreed with the CBB); or
- (d) Unrated (subject to the approval of the CBB), but deemed to be of comparable investment quality by the reporting bank and where the issuer has securities listed on a recognised stock exchange, may also be included.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-9: Market Risk - Interest Rate Risk – (STA)</b>

## CA-9.2 Specific Risk Calculation (continued)

### *Specific Risk Rules for Unrated Debt Securities*

- CA-9.2.8 Unrated securities may be included in the “qualifying” category when they are (subject to CBB’s approval) unrated, but deemed to be of comparable investment quality by the reporting bank, and the issuer has securities listed on a recognised stock exchange. This will remain unchanged for banks applying the standardised approach. For banks applying the IRB approach for a portfolio, unrated securities can be included in the “qualifying” category if both of the following conditions are met:
- (a) The securities are rated equivalent<sup>67</sup> to investment grade under the reporting bank’s internal rating system, which the CBB has confirmed complies with the requirements for an IRB approach; and
  - (b) The issuer has securities listed on a recognised stock exchange.

### *Specific Risk Rules for Non-qualifying Issuers*

- CA-9.2.9 Instruments issued by a non-qualifying issuer will receive the same specific *risk charge as a non-investment* grade corporate borrower under the standardised approach for credit risk under chapter CA-4.
- CA-9.2.10 However, since this may in certain cases considerably underestimate the specific risk for debt instruments which have a high yield to redemption relative to government debt securities, CBB will have the discretion, on a case by case basis:
- (a) To apply a higher specific risk charge to such instruments; and/or
  - (b) To disallow offsetting for the purposes of defining the extent of general market risk between such instruments and any other debt instruments.
- CA-9.2.11 In that respect, securitisation exposures that would be subject to a deduction treatment under the securitisation framework set forth in chapter CA-6 (e.g. equity tranches that absorb first loss), as well as securitisation exposures that are unrated liquidity lines or letters of credit must be subject to a capital charge that is no less than the charge set forth in the securitisation framework.

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<sup>67</sup> Equivalent means the debt security has a one-year PD equal to or less than the one year PD implied by the long-run average one-year PD of a security rated investment grade or better by a qualifying rating agency.





<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-9: Market Risk - Interest Rate Risk – (STA)</b>

## CA-9.2 Specific Risk Calculation (continued)

### *Specific Risk Rules for Positions Covered under the Securitisation Framework*

#### CA-9.2.11A

The specific risk of securitisation positions as defined in Paragraphs CA-6.1.1 to CA-6.1.6 which are held in the trading book is to be calculated according to the method used for such positions in the banking book unless specified otherwise below. To that effect, the risk weight has to be calculated as specified below and applied to the net positions in securitisation instruments in the trading book. The total specific risk capital charge for the correlation trading portfolio is to be computed according to Paragraph CA-9.2.17, and the total specific risk capital charge for securitisation exposures is to be computed according to Paragraph CA-9.1.4.

#### CA-9.2.11B

The specific risk capital charges for positions covered under the standardised approach for securitisation exposures are defined in the table below. These charges must be applied by banks using the standardised approach for credit risk. For positions with long-term ratings of B+ and below and short-term ratings other than A-1/P-1, A-2/P-2, A-3/P-3, deduction from capital as defined in Paragraph CA-6.4.2 is required. Deduction is also required for unrated positions with the exception of the circumstances described in Paragraphs CA-6.4.12 to CA-6.4.16. The operational requirements for the recognition of external credit assessments outlined in Paragraph CA-6.4.6 apply.

### *Specific Risk Capital Charges under the Standardised Approach Based on External Credit Ratings*

External Credit Assessment	AAA to AA- A-1/P-1	A+ to A- A-2/P-2	BBB+ BBB- A-3/P-3	BB+ to BB-	Below BB- and below A-3/P-3 or unrated
Securitisation Exposures	1.6%	4%	8%	28%	Deduction
Re-securitisation Exposures	3.2%	8%	18%	52%	Deduction



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-9: Market Risk - Interest Rate Risk – (STA)</b>

## CA-9.2 Specific Risk Calculation (continued)

### CA-9.2.11C

The specific risk capital charges for rated positions covered under the internal ratings-based approach for securitisation exposures are defined in the table below. For positions with long-term ratings of B+ and below and short-term ratings other than A-1/P-1, A-2/P-2, A-3/P-3, deduction from capital as defined in Paragraph CA-6.4.2 is required. The operational requirements for the recognition of external credit assessments outlined in Paragraph CA-6.4.6 apply:

- (a) For securitisation exposures, banks may apply the capital charges defined in the table below for senior granular positions if the effective number of underlying exposures (N, as defined in CA-6.4.77) is 6 or more and the position is senior as defined in CA-6.4.55. When N is less than 6, the capital charges for non-granular securitisation exposures of the table below apply. In all other cases, the capital charges for non-senior granular securitisation exposures of the table below apply; and
- (b) Re-securitisation exposures as defined in Paragraph CA-6.1.5 are subject to specific risk capital charges depending on whether or not the exposure is senior as defined in Paragraph CA-6.4.55.

Specific risk capital charges based on external credit ratings (IRB)					
External rating (illustrative)	Securitisation exposures			Re-securitisation exposures	
	Senior, granular	Non-senior, granular	Non-granular	Senior	Non-senior
AAA/A-1/P-1	0.56%	0.96%	1.60%	1.60%	2.40%
AA	0.64%	1.20%	2.00%	2.00%	3.20%
A+	0.80%	1.44%	2.80%	2.80%	4.00%
A/A-2/P-2	0.96%	1.60%		3.20%	5.20%
A-	1.60%	2.80%		4.80%	8.00%
BBB+	2.80%	4.00%		8.00%	12.00%
BBB/A-3/P-3	4.80%	6.00%		12.00%	18.00%
BBB-	8.00%			16.00%	28.00%
BB+	20.00%			24.00%	40.00%
BB	34.00%			40.00%	52.00%
BB-	52.00%			60.00%	68.00%
Below BB-/ A-3/P-3	Deduction				



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-9: Market Risk - Interest Rate Risk – (STA)</b>

## CA-9.2 Specific Risk Calculation (continued)

### CA-9.2.11D

The specific risk capital charges for unrated positions under the securitisation framework as defined in Paragraphs CA-6.1.1 to CA-6.1.6 will be calculated as set out below, subject to CBB approval:

- (a) If a bank has approval for the internal ratings-based approach for the asset classes which include the underlying exposures, the bank may apply the supervisory formula approach (Paragraphs CA-6.4.66 to CA-6.4.81). When estimating PDs and LGDs for calculating KIRB, the bank must meet the minimum requirements for the IRB approach;
- (b) To the extent that a bank has approval to apply the internally developed approach referred to in CA-14.11.1B to the underlying exposures and the bank derives estimates for PDs and LGDs from the internally developed approach specified in Paragraphs CA-14.11.7 and CA-14.11.8 that are in line with the quantitative standards for the internal ratings-based approach, the bank may use these estimates for calculating KIRB and, consequently, for applying the supervisory formula approach (Paragraphs CA-6.4.66 to CA-6.4.81); and
- (c) In all other cases the capital charge can be calculated as 12% of the weighted average risk weight that would be applied to the securitised exposures under the standardised approach, multiplied by a concentration ratio. If the concentration ratio is 12.5 or higher the position has to be deducted from capital as defined in Paragraph CA-6.4.2. This concentration ratio is equal to the sum of the nominal amounts of all the tranches divided by the sum of the nominal amounts of the tranches junior to or pari passu with the tranche in which the position is held including that tranche itself.

The resulting specific risk capital charge must not be lower than any specific risk capital charge applicable to a rated more senior tranche. If a bank is unable to determine the specific risk capital charge as described above or prefers not to apply the treatment described above to a position, it must deduct that position from capital.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-9: Market Risk - Interest Rate Risk – (STA)</b>

## CA-9.2 Specific Risk Calculation (continued)

CA-9.2.11E A position subject to deduction according to Paragraphs CA-9.2.11B to CA-9.2.11D may be excluded from the calculation of the capital charge for general market risk whether the bank applies the standardised measurement method or the internal models method for the calculation of its general market risk capital charge.

### *Specific Risk Capital Charges for Positions Hedged by Credit Derivatives*

CA-9.2.12 Full allowance will be recognised when the values of two legs (i.e. long and short) always move in the opposite direction and broadly to the same extent. This would be the case in the following situations:

- (a) The two legs consist of completely identical instruments; or
- (b) A long cash position is hedged by a total rate of return swap (or vice versa) and there is an exact match between the reference obligation and the underlying exposure (i.e. the cash position).<sup>68</sup>

In these cases, no specific risk capital requirement applies to both sides of the position.

CA-9.2.13 An 80% offset will be recognised when the value of two legs (i.e. long and short) always moves in the opposite direction but not broadly to the same extent. This would be the case when a long cash position is hedged by a credit default swap or a credit linked note (or vice versa) and there is an exact match in terms of the reference obligation, the maturity of both the reference obligation and the credit derivative, and the currency to the underlying exposure. In addition, key features of the credit derivative contract (e.g. credit event definitions, settlement mechanisms) should not cause the price movement of the credit derivative to materially deviate from the price movements of the cash position. To the extent that the transaction transfers risk (i.e. taking account of restrictive payout provisions such as fixed payouts and materiality thresholds), an 80% specific risk offset will be applied to the side of the transaction with the higher capital charge, while the specific risk requirement on the other side will be zero.

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<sup>68</sup> The maturity of the swap itself may be different from that of the underlying exposure.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-9: Market Risk - Interest Rate Risk – (STA)</b>

## CA-9.2 Specific Risk Calculation (continued)

CA-9.2.14 Partial allowance will be recognised when the value of the two legs (i.e. long and short) usually moves in the opposite direction. This would be the case in the following situations:

- (a) The position is captured in Paragraph CA-9.2.12 under (b), but there is an asset mismatch between the reference obligation and the underlying exposure. Nonetheless, the position meets the requirements in Paragraph CA-4.5.3 (g);
- (b) The position is captured in Paragraph CA-9.2.12 under (a) or CA-9.2.13 but there is a currency or maturity mismatch<sup>69</sup> between the credit protection and the underlying asset; or
- (c) The position is captured in Paragraph CA-9.2.13 but there is an asset mismatch between the cash position and the credit derivative. However, the underlying asset is included in the (deliverable) obligations in the credit derivative documentation.

CA-9.2.15 In each of these cases in Paragraphs CA-9.2.12 to CA-9.2.14, the following rule applies. Rather than adding the specific risk capital requirements for each side of the transaction (i.e. the credit protection and the underlying asset) only the higher of the two capital requirements will apply.

### CA-9.2.16

**In cases not captured in Paragraphs CA-9.2.12 to CA-9.2.14, a specific risk capital charge will be assessed against both sides of the position.**

### CA-9.2.17

**An n-th-to-default credit derivative is a contract where the payoff is based on the n-th asset to default in a basket of underlying reference instruments. Once the n-th default occurs the transaction terminates and is settled:**

- (a) **The capital charge for specific risk for a first-to-default credit derivative is the lesser of (1) the sum of the specific risk capital charges for the individual reference credit instruments in the basket, and (2) the maximum possible credit event payment under the contract. Where a bank has a risk position in one of the reference credit instruments underlying a first-to-default credit derivative and this credit derivative hedges the bank's risk position, the bank is allowed to reduce with respect to the hedged amount both the capital charge for specific risk for the reference credit instrument and that part of the capital charge for specific risk for the credit derivative that relates to this particular reference credit instrument. Where a bank has multiple risk positions in reference credit instruments underlying a first-to-default credit derivative this offset is allowed only for that underlying reference credit instrument having the lowest specific risk capital charge;**

<sup>69</sup> Currency mismatches should feed into the normal reporting of foreign exchange risk.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-9: Market Risk - Interest Rate Risk – (STA)</b>

## CA-9.2 Specific Risk Calculation (continued)

- (b) The capital charge for specific risk for an n-th-to-default credit derivative with n greater than one is the lesser of (1) the sum of the specific risk capital charges for the individual reference credit instruments in the basket but disregarding the (n-1) obligations with the lowest specific risk capital charges; and (2) the maximum possible credit event payment under the contract. For n-th-to-default credit derivatives with n greater than 1 no offset of the capital charge for specific risk with any underlying reference credit instrument is allowed;
- (c) If a first or other n-th-to-default credit derivative is externally rated, then the protection seller must calculate the specific risk capital charge using the rating of the derivative and apply the respective securitisation risk weights as specified in Paragraphs CA-9.2.11B or CA-9.2.11C, as applicable; and
- (d) The capital charge against each net n-th-to-default credit derivative position applies irrespective of whether the bank has a long or short position, i.e. obtains or provides protection.



MODULE	CA: Capital Adequacy
CHAPTER	CA-9: Market Risk - Interest Rate Risk – (STA)

### CA-9.3 General Market Risk Calculation

#### CA-9.3.1

The capital requirements for general market risk are designed to capture the risk of loss arising from changes in market interest rates, i.e. the risk of parallel and non-parallel shifts in the yield curve. A choice between two principal methods of measuring the general market risk is permitted, a "maturity" method and a "duration" method. In each method, the capital charge is the sum of the following four components:

- (a) The net short or long position in the whole trading book;
- (b) A small proportion of the matched positions in each time-band (the "vertical disallowance");
- (c) A larger proportion of the matched positions across different time-bands (the "horizontal disallowance"); and
- (d) A net charge for positions in options, where appropriate (see Section CA-13).

#### CA-9.3.2

Separate maturity ladders should be used for each currency and capital charges should be calculated for each currency separately and then summed, by applying the prevailing foreign exchange spot rates, with no off-setting between positions of opposite sign.

#### CA-9.3.3

In the case of those currencies in which the value and volume of business is insignificant, separate maturity ladders for each currency are not required. Instead, the bank may construct a single maturity ladder and slot, within each appropriate time-band, the net long or short position for each currency. However, these individual net positions are to be summed within each time-band, irrespective of whether they are long or short positions, to arrive at the gross position figure for the time-band.

#### CA-9.3.4

A combination of the two methods (referred to under Paragraph CA-9.3.1) is not permitted. Any exceptions to this rule will require the prior written approval of the CBB. It is expected that such approval will only be given in cases where a bank clearly demonstrates to the CBB, the difficulty in applying, to a definite category of trading instruments, the method otherwise chosen by the bank as the normal method. It is further expected that the CBB may, in future years, consider recognising the duration method as the approved method, and the use of the maturity method may be discontinued.





<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-9: Market Risk - Interest Rate Risk – (STA)</b>

## CA-9.4 Maturity Method

CA-9.4.1 A worked example of the maturity method is included in **Appendix CA-11**. The various time-bands and their risk weights, relevant to the maturity method, are illustrated in Paragraph CA-9.4.2(a) below.

### CA-9.4.2

The steps in the calculation of the general market risk for interest rate positions, under this method, are set out below:

- (a) Individual long or short positions in interest-rate related instruments, including derivatives, are slotted into a maturity ladder comprising thirteen time-bands (or fifteen time-bands in the case of zero-coupon and deep-discount instruments, defined as those with a coupon of less than 3%), on the following basis:
- Fixed rate instruments are allocated according to their residual term to maturity (irrespective of embedded puts and calls), and whether their coupon is below 3%;
  - Floating rate instruments are allocated according to the residual term to the next repricing date;
  - Positions in derivatives, and all positions in repos, reverse repos and similar products are decomposed into their components within each time band. Derivative instruments are covered in greater detail in Sections CA-9.6 to CA-9.9;
  - Opposite positions of the same amount in the same issues (but not different issues by the same issuer), whether actual or notional, can be omitted from the interest rate maturity framework, as well as closely matched swaps, forwards, futures and FRAs which meet the conditions set out in Section CA-9.8. In other words, these positions are netted within their relevant time-bands; and
  - The CBB's advice must be sought on the treatment of instruments that deviate from the above structures, or which may be considered sufficiently complex to warrant the CBB's attention.





<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-9: Market Risk - Interest Rate Risk – (STA)</b>

#### CA-9.4 Maturity Method (continued)

*Maturity Method: Time-bands and Risk Weights*

	Coupon 3% or more	Coupon < 3%	Risk weight
<b>Zone 1</b>	1 month or less	1 month or less	0.00%
	1 to 3 months	1 to 3 months	0.20%
	3 to 6 months	3 to 6 months	0.40%
	6 to 12 months	6 to 12 months	0.70%
<b>Zone 2</b>	1 to 2 years	1 to 1.9 years	1.25%
	2 to 3 years	1.9 to 2.8 years	1.75%
	3 to 4 years	2.8 to 3.6 years	2.25%
<b>Zone 3</b>	4 to 5 years	3.6 to 4.3 years	2.75%
	5 to 7 years	4.3 to 5.7 years	3.25%
	7 to 10 years	5.7 to 7.3 years	3.75%
	10 to 15 years	7.3 to 9.3 years	4.50%
	15 to 20 years	9.3 to 10.6 years	5.25%
	> 20 years	10.6 to 12 years	6.00%
		12 to 20 years	8.00%
	> 20 years	12.50%	

- (b) The market values of the individual long and short net positions in each maturity band are multiplied by the respective risk weighting factors given in Paragraph CA-9.4.2(a) above;
- (c) Matching of positions within each maturity band (i.e. vertical matching) is done as follows:
- Where a maturity band has both weighted long and short positions, the extent to which the one offsets the other is called the matched weighted position. The remainder (i.e. the excess of the weighted long positions over the weighted short positions, or vice versa, within a band) is called the unmatched weighted position for that band.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-9: Market Risk - Interest Rate Risk – (STA)</b>

#### CA-9.4 Maturity Method (continued)

- (d) Matching of positions, across maturity bands, within each zone (i.e. horizontal matching - level 1), is done as follows:
- Where a zone has both unmatched weighted long and short positions for various bands, the extent to which the one offsets the other is called the matched weighted position for that zone. The remainder (i.e. the excess of the weighted long positions over the weighted short positions, or vice versa, within a zone) is called the unmatched weighted position for that zone.
- (e) Matching of positions, across zones (i.e. horizontal matching - level 2), is done as follows:
- (i) The unmatched weighted long or short position in zone 1 may be offset against the unmatched weighted short or long position in zone 2. The extent to which the unmatched weighted positions in zones 1 and 2 are offsetting is described as the matched weighted position between zones 1 and 2.
  - (ii) After step (i) above, any residual unmatched weighted long or short position in zone 2 may be matched by offsetting the unmatched weighted short or long position in zone 3. The extent to which the unmatched positions in zones 2 and 3 are offsetting is described as the matched weighted position between zones 2 and 3.
- The calculations in steps (i) and (ii) above may be carried out in reverse order (i.e. zones 2 and 3, followed by zones 1 and 2).
- (i) After steps (i) and (ii) above, any residual unmatched weighted long or short position in zone 1 may be matched by offsetting the unmatched weighted short or long position in zone 3. The extent to which the unmatched positions in zones 1 and 3 are offsetting is described as the matched weighted position between zones 1 and 3.
- (f) Any residual unmatched weighted positions, following the matching within and between maturity bands and zones as described above, will be summed.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-9: Market Risk - Interest Rate Risk – (STA)</b>

#### CA-9.4 Maturity Method (continued)

- (g) The general interest rate risk capital requirement is the sum of:
- (i) Matched weighted positions in all maturity bands x 10%
  - (ii) Matched weighted positions in zone 1 x 40%
  - (iii) Matched weighted positions in zone 2 x 30%
  - (iv) Matched weighted positions in zone 3 x 30%
  - (v) Matched weighted positions between zones 1 & 2 x 40%
  - (vi) Matched weighted positions between zones 2 & 3 x 40%
  - (vii) Matched weighted positions between zones 1 & 3 x 100%
  - (viii) Residual unmatched weighted positions x 100%
- Item (i) is referred to as the vertical disallowance, items (ii) through (iv) as the first set of horizontal disallowances, and items (v) through (vii) as the second set of horizontal disallowances.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-9: Market Risk - Interest Rate Risk – (STA)</b>

## CA-9.5 Duration Method

### CA-9.5.1

The duration method is an alternative approach to measuring the exposure to parallel and non-parallel shifts in the yield curve, and recognises the use of duration as an indicator of the sensitivity of individual positions to changes in market yields. Under this method, banks may use a duration-based system for determining their general interest rate risk capital requirements for traded debt instruments and other sources of interest rate exposures including derivatives. A worked example of the duration method is included in Appendix CA-12. The various time-bands and assumed changes in yield, relevant to the duration method, are illustrated below.

#### *Duration Method: Time-bands and Assumed Changes in Yield*

	<b>Time-band</b>	<b>Assumed change in yield</b>
<b>Zone 1</b>	1 month or less	1.00
	1 to 3 months	1.00
	3 to 6 months	1.00
	6 to 12 months	1.00
<b>Zone 2</b>	1 to 1.9 years	0.90
	1.9 to 2.8 years	0.80
	2.8 to 3.6 years	0.75
<b>Zone 3</b>	3.6 to 4.3 years	0.75
	4.3 to 5.7 years	0.70
	5.7 to 7.3 years	0.65
	7.3 to 9.3 years	0.60
	9.3 to 10.6 years	0.60
	10.6 to 12 years	0.60
	12 to 20 years	0.60
> 20 years	0.60	

### CA-9.5.2

Banks must notify the CBB of the circumstances in which they elect to use this method. Once chosen, the duration method must be consistently applied, in accordance with the requirements of Section CA-9.3.



MODULE	CA: Capital Adequacy
CHAPTER	CA-9: Market Risk - Interest Rate Risk – (STA)

## CA-9.5 Duration Method (continued)

### CA-9.5.3

Where a bank has chosen to use the duration method, it is possible that it will not be suitable for certain instruments. In such cases, the bank must seek the advice of the CBB or obtain approval for application of the maturity method to the specific category(ies) of instruments, in accordance with the provisions of Section CA-9.3.

### CA-9.5.4

The steps in the calculation of the general market risk for interest rate positions, under this method, are set out below:

- (a) The bank will determine the Yield-to-Maturity (YTM) for each individual net position in fixed rate and floating rate instruments, based on the current market value. The basis of arriving at individual net positions is explained in Section CA-9.4 above. The YTM for fixed rate instruments is determined without any regard to whether the instrument is coupon bearing, or whether the instrument has any embedded options. In all cases, YTM for fixed rate instruments is calculated with reference to the final maturity date and, for floating rate instruments, with reference to the next repricing date;
- (b) The bank will calculate, for each debt instrument, the modified duration (M) on the basis of the following formula:

$$M = \frac{D}{(1+r)}$$

where,

$$D \text{ (duration)} = \frac{\sum_{t=1}^m \frac{t \times C}{(1+r)^t}}{\sum_{t=1}^m \frac{C}{(1+r)^t}}$$

- r = YTM % per annum expressed as a decimal  
 C = Cash flow at time t  
 t = time at which cash flows occur, in years  
 m = time to maturity, in years

- (c) Individual net positions, at current market value, are allocated to the time-bands illustrated in Paragraph CA-9.5.1, based on their modified duration;



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-9: Market Risk - Interest Rate Risk – (STA)</b>

#### CA-9.5 Duration Method (continued)

- (d) The bank will then calculate the modified duration-weighted position for each individual net position by multiplying its current market value by the modified duration and the assumed change in yield;
- (e) Matching of positions within each time band (i.e. vertical matching) is done as follows:
- Where a time band has both weighted long and short positions, the extent to which the one offsets the other is called the matched weighted position. The remainder (i.e. the excess of the weighted long positions over the weighted short positions, or vice versa, within a band) is called the unmatched weighted position for that band.
- (f) Matching of positions, across time bands, within each zone (i.e. horizontal matching - level 1), is done as follows:
- Where a zone has both unmatched weighted long and short positions for various bands, the extent to which the one offsets the other is called the matched weighted position for that zone. The remainder (i.e. the excess of the weighted long positions over the weighted short positions, or vice versa, within a zone) is called the unmatched weighted position for that zone.
- (g) Matching of positions, across zones (i.e. horizontal matching - level 2), is done as follows:
- (i) The unmatched weighted long or short position in zone 1 may be offset against the unmatched weighted short or long position in zone 2. The extent to which the unmatched weighted positions in zones 1 and 2 are offsetting is described as the matched weighted position between zones 1 and 2.
- (ii) After step (i) above, any residual unmatched weighted long or short position in zone 2 may be matched by offsetting the unmatched weighted short or long position in zone 3. The extent to which the unmatched positions in zones 2 and 3 are offsetting is described as the matched weighted position between zones 2 and 3.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-9: Market Risk - Interest Rate Risk – (STA)</b>

### CA-9.5 Duration Method (continued)

The calculations in steps (i) and (ii) above may be carried out in reverse order (i.e. zones 2 and 3, followed by zones 1 and 2).

- (iii) After steps (a) and (b) above, any residual unmatched weighted long or short position in zone 1 may be matched by offsetting the unmatched weighted short or long position in zone 3. The extent to which the unmatched positions in zones 1 and 3 are offsetting is described as the matched weighted position between zones 1 and 3.
- (h) Any residual unmatched weighted positions, following the matching within and between maturity bands and zones as described above, will be summed; and
- (i) The general interest rate risk capital requirement is the sum of:
- (i) Matched weighted positions in all maturity bands x 5%
  - (ii) Matched weighted positions in zone 1 x 40%
  - (iii) Matched weighted positions in zone 2 x 30%
  - (iv) Matched weighted positions in zone 3 x 30%
  - (v) Matched weighted positions between zones 1 & 2 x 40%
  - (vi) Matched weighted positions between zones 2 & 3 x 40%
  - (vii) Matched weighted positions between zones 1 & 3 x 100%
  - (viii) Residual unmatched weighted positions x 100%
- Item (i) is referred to as the vertical disallowance, items (ii) through (iv) as the first set of horizontal disallowances, and items (v) through (vii) as the second set of horizontal disallowances.



MODULE	CA: Capital Adequacy
CHAPTER	CA-9: Market Risk - Interest Rate Risk – (STA)

## CA-9.6 Derivatives

### CA-9.6.1

Banks which propose to use internal models to measure the interest rate risk inherent in derivatives will seek the prior written approval of the CBB for applying those models. The use of internal models to measure market risk, and the CBB's rules applicable to them, are discussed in detail in chapter CA-14.

### CA-9.6.2

Where a bank, with the prior written approval of the CBB, uses an interest rate sensitivity model, the output of that model is used, by the duration method, to calculate the general market risk as described in Section CA-9.5.

### CA-9.6.3

Where a bank does not propose to use models, it must use the techniques described in the following Paragraphs, for measuring the market risk on interest rate derivatives. The measurement system should include all interest rate derivatives and off-balance-sheet instruments in the trading book which react to changes in interest rates (e.g. forward rate agreements, other forward contracts, bond futures, interest rate and cross-currency swaps, options and forward foreign exchange contracts). Where a bank has obtained the approval of the CBB for the use of non-interest rate derivatives models, the embedded interest rate exposures should be incorporated in the standardised measurement framework described in Sections CA-9.7 to CA-9.9.

### CA-9.6.4

Derivative positions will attract specific risk only when they are based on an underlying instrument or security. For instance, where the underlying exposure is an interest rate exposure, as in a swap based upon inter-bank rates, there will be no specific risk, but only counterparty risk. A similar treatment applies to FRAs, forward foreign exchange contracts and interest rate futures. However, for a swap based on a bond yield, or a futures contract based on a debt security or an index representing a basket of debt securities, the credit risk of the issuer of the underlying bond will generate a specific risk capital requirement. Future cash flows derived from positions in derivatives will generate counterparty risk requirements related to the counterparty in the trade, in addition to position risk requirements (specific and general market risk) related to the underlying security.

### CA-9.6.5

A summary of the rules for dealing with interest rate derivatives (other than options) is set out in Section CA-9.9. The treatment of options, being a complex issue, is dealt with in detail in chapter CA-13.





MODULE	CA: Capital Adequacy
CHAPTER	CA-9: Market Risk - Interest Rate Risk – (STA)

## CA-9.7 Calculation of Derivative Positions

### CA-9.7.1

The derivatives should be converted to positions in the relevant underlying and become subject to specific and general market risk charges as described in Sections CA-9.2 and CA-9.3, respectively. For the purpose of calculation by the standard formulae, the amounts reported are the market values of the principal amounts of the underlying or of the notional underlying. For instruments where the apparent notional amount differs from the effective notional amount, banks must use the latter.

### CA-9.7.2

The remaining Paragraphs in this Section include the guidelines for the calculation of positions in different categories of interest rate derivatives. Banks which need further assistance in the calculation, particularly in relation to complex instruments, should contact the CBB in writing.

#### *Forward Foreign Exchange Contracts*

### CA-9.7.3

A forward foreign exchange position is decomposed into legs representing the paying and receiving currencies. Each of the legs is treated as if it were a zero coupon bond, with zero specific risk, in the relevant currency and included in the measurement framework as follows:

- (a) If the maturity method is used, each leg is included at the notional amount; and
- (b) If the duration method is used, each leg is included at the present value of the notional zero coupon bond.

#### *Deposit Futures and FRAs*

### CA-9.7.4

Deposit futures, forward rate agreements and other instruments where the underlying is a money market exposure will be split into two legs as follows:

- (a) The first leg will represent the time to expiry of the futures contract, or settlement date of the FRA as the case may be;
- (b) The second leg will represent the time to expiry of the underlying instrument;
- (c) Each leg will be treated as a zero coupon bond with zero specific risk; and



MODULE	CA: Capital Adequacy
CHAPTER	CA-9: Market Risk - Interest Rate Risk – (STA)

## CA-9.7 Calculation of Derivative Positions (continued)

- (d) For deposit futures, the size of each leg is the notional amount of the underlying money market exposure. For FRAs, the size of each leg is the notional amount of the underlying money market exposure discounted to present value, although in the maturity method, the notional amount may be used without discounting. For example, under the maturity method, a single 3-month Euro\$ 1,000,000 deposit futures contract expiring in 3 months' time will have one leg of \$ 1,000,000 representing the 8 months to contract expiry, and another leg of \$ 1,000,000 in the 11 months' time-band representing the time to expiry of the deposit underlying the futures contract.

### *Bond futures and Forward Bond Transactions*

#### CA-9.7.5

Bond futures, forward bond transactions and the forward leg of repos, reverse repos and other similar transactions will use the two-legged approach. A forward bond transaction is one where the settlement is for a period other than the prevailing norm for the market:

- (a) The first leg is a zero coupon bond with zero specific risk. Its maturity is the time to expiry of the futures or forward contract. Its size is the cash flow on maturity discounted to present value, although in the maturity method, the cash flow on maturity may be used without discounting;
- (b) The second leg is the underlying bond. Its maturity is that of the underlying bond for fixed rate bonds, or the time to the next reset for floating rate bonds. Its size is as set out in (c) and (d) below;
- (c) For forward bond transactions, the underlying bond and amount is used at the present spot price;
- (d) For bond futures, the principal amounts for each of the two legs is reckoned as the futures price times the notional underlying bond amount;



MODULE	CA: Capital Adequacy
CHAPTER	CA-9: Market Risk - Interest Rate Risk – (STA)

### CA-9.7 Calculation of Derivative Positions (continued)

- (e) Where a range of deliverable instruments may be delivered to fulfil a futures contract (at the option of the "short"), then the following rules are used to determine the principal amount, taking account of any conversion factors defined by the exchange:
  - (i) The "long" may use one of the deliverable bonds, or the notional bond on which the contract is based, as the underlying instrument, but this notional long leg may not be offset against a short cash position in the same bond.
  - (ii) The "short" may treat the notional underlying bond as if it were one of the deliverable bonds, and it may be offset against a short cash position in the same bond.
- (f) For futures contracts based on a corporate bond index, the positions will be included at the market value of the notional underlying portfolio of securities;
- (g) A repo (or sell-buy or stock lending) involving exchange of a security for cash should be represented as a cash borrowing – i.e. a short position in a government bond with maturity equal to the repo and coupon equal to the repo rate. A reverse repo (or buy-sell or stock borrowing) should be represented as a cash loan – i.e. a long position in a government bond with maturity equal to the reverse repo and coupon equal to the repo rate. These positions are referred to as "cash legs"; and
- (h) It should be noted that, where a security owned by the bank (and included in its calculation of market risk) is repo'd, it continues to contribute to the bank's interest rate or equity position risk calculation.



MODULE	CA: Capital Adequacy
CHAPTER	CA-9: Market Risk - Interest Rate Risk – (STA)

## CA-9.7 Calculation of Derivative Positions (continued)

### Swaps

#### CA-9.7.6

Swaps are treated as two notional positions in government securities with the relevant maturities:

- (a) Interest rate swaps will be decomposed into two legs, and each leg will be allocated to the maturity band equating to the time remaining to repricing or maturity. For example, an interest rate swap in which a bank is receiving floating rate interest and paying fixed is treated as a long position in a floating rate instrument of maturity equivalent to the period until the next interest fixing and a short position in a fixed rate instrument of maturity equivalent to the residual life of the swap;
- (b) For swaps that pay or receive a fixed or floating interest rate against some other reference price, e.g. a stock index, the interest rate component should be slotted into the appropriate repricing or maturity category, with the equity component being included in the equity risk measurement framework as described in chapter CA-10;
- (c) For cross currency swaps, the separate legs are included in the interest rate risk measurement for the currencies concerned, as having a fixed/floating leg in each currency. Alternatively, the two parts of a currency swap transaction are split into forward foreign exchange contracts and treated accordingly;
- (d) Where a swap has a deferred start, and one or both legs have been fixed, then the fixed leg(s) will be sub-divided into the time to the commencement of the leg and the actual swap leg with fixed or floating rate. A swap is deemed to have a deferred start when the commencement of the interest rate calculation periods is more than two business days from the transaction date, and one or both legs have been fixed at the time of the commitment. However, when a swap has a deferred start and neither leg has been fixed, there is no interest rate exposure, albeit there will be counterparty exposure; and
- (e) Where a swap has a different structure from those discussed above, it may be necessary to adjust the underlying notional principal amount, or the notional maturity of one or both legs of the transaction.



MODULE	CA: Capital Adequacy
CHAPTER	CA-9: Market Risk - Interest Rate Risk – (STA)

## CA-9.7 Calculation of Derivative Positions (continued)

### CA-9.7.7

Banks with large swap books may use alternative formulae for these swaps to calculate the positions to be included in the maturity or duration ladder. One method would be to first convert the cash flows required by the swap into their present values. For this purpose, each cash flow should be discounted using the zero coupon yields, and a single net figure for the present value of the cash flows entered into the appropriate time-band using procedures that apply to zero or low coupon (less than 3%) instruments. An alternative method would be to calculate the sensitivity of the net present value implied by the change in yield used in the duration method (as set out in Section CA-9.5), and allocate these sensitivities into the appropriate time-bands.

### CA-9.7.8

Banks which propose to use the approaches described in Paragraph CA-9.7.7, or any other similar alternative formulae, should obtain the prior written approval of the CBB. The CBB will consider the following factors before approving any alternative methods for calculating the swap positions:

- (a) Whether the systems proposed to be used are accurate;
- (b) Whether the positions calculated fully reflect the sensitivity of the cash flows to interest rate changes and are entered into the appropriate time-bands; and
- (c) Whether the positions are denominated in the same currency.



MODULE	CA: Capital Adequacy
CHAPTER	CA-9: Market Risk - Interest Rate Risk – (STA)

## CA-9.8 Netting of Derivative Positions

### *Permissible Offsetting of Fully Matched Positions for Both Specific and General Market Risk*

#### CA-9.8.1

Banks may exclude from the interest rate risk calculation, altogether, the long and short positions (both actual and notional) in identical instruments with exactly the same issuer, coupon, currency and maturity. A matched position in a future or a forward and its corresponding underlying may also be fully offset, albeit the leg representing the time to expiry of the future is included in the calculation.

#### CA-9.8.2

When the future or the forward comprises a range of deliverable instruments, offsetting of positions in the futures or forward contract and its underlying is only permitted in cases where there is a readily identifiable underlying security which is most profitable for the trader with a short position to deliver. The price of this security, sometimes called the "cheapest-to-deliver", and the price of the future or forward contract should, in such cases, move in close alignment. No offsetting will be allowed between positions in different currencies. The separate legs of cross-currency swaps or forward foreign exchange contracts are treated as notional positions in the relevant instruments and included in the appropriate calculation for each currency.

### *Permissible Offsetting of Closely Matched Positions for General Market Risk Only*

#### CA-9.8.3

For the purpose of calculation of the general market risk, in addition to the permissible offsetting of fully matched positions as described in Paragraph CA-9.8.1 above, opposite positions giving rise to interest rate exposure can be offset if they relate to the same underlying instruments, are of the same nominal value and are denominated in the same currency and, in addition, fulfil the following conditions:

- (a) For futures:  
Offsetting positions in the notional or underlying instruments to which the futures contract relates should be for identical products and mature within seven days of each other.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-9: Market Risk - Interest Rate Risk – (STA)</b>

### CA-9.8 Netting of Derivative Positions (continued)

- (b) For swaps and FRAs:  
The reference rate (for floating rate positions) must be identical and the coupons must be within 15 basis points of each other.
- (c) For swaps, FRAs and forwards:  
The next interest fixing date or, for fixed coupon positions or forwards, the residual maturity must correspond within the following limits:
- Less than one month: same day;
  - Between one month and one year: within 7 days;
  - Over one year: within 30 days.



MODULE	CA: Capital Adequacy
CHAPTER	CA-9: Market Risk- Interest Rate Risk – (STA)

## CA-9.9 Calculation of Capital Charge for Derivatives

### CA-9.9.1

After calculating the derivatives positions, taking account of the permissible offsetting of matched positions, as explained in Section CA-9.8, the capital charges for specific and general market risk for interest rate derivatives are calculated in the same manner as for cash positions, as described earlier in this chapter.

#### *Summary of Treatment of Interest Rate Derivatives*

Instrument	Specific risk charge*	General market risk charge
<b>Exchange-traded futures</b>		
- Government** debt <u>security</u>	No	Yes, as two positions
- Corporate debt <u>security</u>	Yes	Yes, as two positions
- Index on interest rates (e.g. LIBOR)	No	Yes, as two positions
- Index on basket of debt <u>securities</u>	Yes	Yes, as two positions
<b>OTC forwards</b>		
- Government** debt <u>security</u>	No	Yes, as two positions
- Corporate debt <u>security</u>	Yes	Yes, as two positions
- Index on interest rates	No	Yes, as two positions
<b>FRAs</b>	No	Yes, as two positions
<b>Swaps</b>		
- Based on inter-bank rates	No	Yes, as two positions
- Based on Government** bond yields	No	Yes, as two positions
- Based on corporate bond yields	Yes	Yes, as two positions
<b>Forward foreign exchange</b>	No	Yes, as one position in each currency
<b>Options</b>		Either (a) or (b) as below (see chapter CA-13 for a detailed description):
- Government** debt <u>security</u>	No	(a) Carve out together with the associated <u>hedging</u> positions, and use:
- Corporate debt <u>security</u>	Yes	- simplified approach; or
- Index on interest rates	No	- scenario analysis; or
- FRAs, <u>swaps</u>	No	- internal models (see chapter CA-14).
		(b) General market risk charge according to the delta-plus method (gamma and vega should receive separate capital charges).

\* This is the specific risk charge relating to the issuer of the instrument. Under the credit risk rules, there remains a separate capital charge for the counterparty risk.

\*\* As defined in Section CA-9.2.





MODULE	CA: Capital Adequacy
CHAPTER	CA-10: Market Risk - Equity Position Risk – (STA)

## CA-10.1 Introduction

CA-10.1.1 This chapter sets out the minimum capital requirements to cover the risk of holding or taking positions in equities in the bank's trading book.

CA-10.1.2 For the guidance of the banks, and without being exhaustive, the following list includes financial instruments in the trading book, including forward positions, to which equity position risk capital requirements will apply:

- (a) Common stocks, whether voting or non-voting;
- (b) Depository receipts (which should be included in the measurement framework in terms of the underlying shares);
- (c) Convertible preference securities (non-convertible preference securities are treated as bonds);
- (d) Convertible debt securities which convert into equity instruments and are, therefore, treated as equities (see Paragraph CA-10.1.3 below);
- (e) Commitments to buy or sell equity securities; and
- (f) Derivatives based on the above instruments.

CA-10.1.3 Convertible debt securities must be treated as equities where:

- (a) The first date at which the conversion may take place is less than three months ahead, or the next such date (where the first date has passed) is less than a year ahead; and
- (b) The convertible is trading at a premium of less than 10%, where the premium is defined as the current marked-to-market value of the convertible less the marked-to-market value of the underlying equity, expressed as a percentage of the latter.

In other instances, convertibles should be treated as either equity or debt securities, based reasonably on their market behaviour.



MODULE	CA: Capital Adequacy
CHAPTER	CA-10: Market Risk - Equity Position Risk – (STA)

## CA-10.1 Introduction (continued)

### CA-10.1.4

For instruments that deviate from the structures described in Paragraphs CA-10.1.2 and CA-10.1.3 above, or which could be considered complex, each bank must agree on a written policy statement with the CBB about the intended treatment, on a case-by-case basis. In some circumstances, the treatment of an instrument may be uncertain, for example bonds whose coupon payments are linked to equity indices. The position risk of such instruments should be broken down into its components and allocated appropriately between the equity, interest rate and foreign exchange risk categories. Advice must be sought from the CBB in cases of doubt, particularly when a bank is trading an instrument for the first time.

### CA-10.1.5

Where equities are part of a forward contract, a future or an option (i.e. a quantity of equities to be received or delivered), any interest rate or foreign currency exposure from the other leg of the contract should be included in the measurement framework as described in chapters CA-9 and CA-11, respectively.

### CA-10.1.6

As with interest rate related instruments, the minimum capital requirement for equities is expressed in terms of two separately calculated charges, one applying to the "*specific risk*" of holding a long or short position in an individual equity, and the other to the "*general market risk*" of holding a long or short position in the market as a whole.

### CA-10.1.7

Banks which have the intention and capability to use internal models for the measurement of general and specific equity risk and, hence, for the calculation of the capital requirement, should seek the prior written approval of the CBB for those models. The CBB's detailed rules for the recognition and use of internal models are included in chapter CA-14. Banks which do not use internal models should adopt the standardised approach to calculate the equity position risk capital requirement, as set out in detail in this chapter.



MODULE	CA: Capital Adequacy
CHAPTER	CA-10: Market Risk - Equity Position Risk – (STA)

## CA-10.2 Calculation of Equity Positions

### CA-10.2.1

A bank may net long and short positions in the same equity instrument, arising either directly or through derivatives, to generate the individual net position in that instrument. For example, a future in a given equity may be offset against an opposite cash position in the same equity, albeit the interest rate risk arising out of the future should be calculated separately in accordance with the rules set out in chapter CA-9.

### CA-10.2.2

A bank may net long and short positions in one tranche of an equity instrument against another tranche only where the relevant tranches:

- (a) Rank *pari passu* in all respects; and
- (b) Become fungible within 180 days, and thereafter the equity instruments of one tranche can be delivered in settlement of the other tranche.

### CA-10.2.3

Positions in depository receipts may only be netted against positions in the underlying stock if the stock is freely deliverable against the depository receipt. If a bank takes a position in depository receipts against an opposite position in the underlying equity in different markets (i.e. arbitrage), it may offset the position provided that any costs on conversion are fully taken into account. Furthermore, the foreign exchange risk arising out of these positions should be included in the measurement framework as set out in chapter CA-11.

### CA-10.2.4

More detailed guidance on the treatment of equity derivatives is set out in Section CA-10.5.

### CA-10.2.5

Equity positions, arising either directly or through derivatives, should be allocated to the country in which each equity is listed. Where an equity is listed in more than one country, the bank must discuss the appropriate country allocation with the CBB.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-10: Market Risk - Equity Position Risk – (STA)</b>

### CA-10.3 Specific Risk Calculation

#### CA-10.3.1

Specific risk is defined as the bank's gross equity positions (i.e. the sum of all long equity positions and of all short equity positions), and is calculated for each country or equity market. For each national market in which the bank holds equities, it should sum the market values of its individual net positions as determined in accordance with Section CA-10.2, irrespective of whether they are long or short positions, to produce the overall gross equity position for that market.

#### CA-10.3.2

The capital charge for specific risk is 8%.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-10: Market Risk - Equity Position Risk – (STA)</b>

#### CA-10.4 General Risk Calculation

**CA-10.4.1** The general market risk is the difference between the sum of the long positions and the sum of the short positions (i.e. the overall net position) in each national equity market. In other words, to calculate the general market risk, the bank must sum the market value of its individual net positions for each national market, as determined in accordance with Section CA-10.2, taking into account whether the positions are long or short.

**CA-10.4.2** The general market equity risk measure is 8% of the overall net position in each national market.



MODULE	CA: Capital Adequacy
CHAPTER	CA-10: Market Risk - Equity Position Risk – (STA)

## CA-10.5 Equity Derivatives

### CA-10.5.1

For the purpose of calculating the specific and general market risk by the standardised approach, equity derivative positions should be converted into notional underlying equity positions, whether long or short. All equity derivatives and off-balance-sheet positions which are affected by changes in equity prices should be included in the measurement framework. This includes futures and swaps on both individual equities and on stock indices.

### CA-10.5.2

The following guidelines will apply to the calculation of positions in different categories of equity derivatives. Banks which need further assistance in the calculation, particularly in relation to complex instruments, should contact the CBB:

- (a) Futures and forward contracts relating to individual equities should, in principle, be included in the calculation at current market prices;
- (b) Futures relating to stock indices should be included in the calculation, at the marked-to-market value of the notional underlying equity portfolio, i.e. as a single position based on the sum of the current market values of the underlying instruments;
- (c) Equity swaps are treated as two notional positions. For example, an equity swap in which a bank is receiving an amount based on the change in value of one particular equity or stock index, and paying a different index is treated as a long position in the former and a short position in the latter. Where one of the swap legs involves receiving/paying a fixed or floating interest rate, that exposure should be slotted into the appropriate time-band for interest rate related instruments as set out in chapter CA-9. The stock index leg should be covered by the equity treatment as set out in this chapter; and
- (d) Equity options and stock index options are either "carved out" together with the associated underlying instruments, or are incorporated in the general market risk measurement framework, described in this chapter, based on the delta-plus method. The treatment of options, being a complex issue, is dealt with in detail in chapter CA-13.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-10: Market Risk - Equity Position Risk – (STA)</b>

## CA-10.5 Equity Derivatives (continued)

CA-10.5.3 A summary of the treatment of equity derivatives is set out in Paragraph CA-10.5.8.

### *Specific Risk on Positions in Equity Indices*

CA-10.5.4 Positions in highly liquid equity indices whether they arise directly or through derivatives, attract a 2% capital charge in addition to the general market risk, to cover factors such as execution risk.

CA-10.5.5 For positions in equity indices not regarded as highly liquid, the specific risk capital charge is the highest specific risk charge that would apply to any of its components, as set out in Section CA-10.3.

CA-10.5.6 In the case of the futures-related arbitrage strategies set out below, the specific risk capital charge described above may be applied to only one index with the opposite position exempt from a specific risk capital charge. The strategies are as follows:

- (a) Where a bank takes an opposite position in exactly the same index, at different dates or in different market centres; and
- (b) Where a bank takes opposite positions in contracts at the same date in different but similar indices, provided the two indices contain at least 90% common components.

CA-10.5.7 Where a bank engages in a deliberate arbitrage strategy, in which a futures contract on a broad-based index matches a basket of stocks, it will be allowed to carve out both positions from the standardised methodology on the following conditions:

- (a) The trade has been deliberately entered into, and separately controlled; and
- (b) The composition of the basket of stocks represents at least 90% of the index when broken down into its notional components.

In such a case, the minimum capital requirement is limited to 4% (i.e. 2% of the gross value of the positions on each side) to reflect divergence and execution risks. This applies even if all of the stocks comprising the index are held in identical proportions. Any excess value of the stocks comprising the basket over the value of the futures contract or vice versa is treated as an open long or short position.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-10: Market Risk - Equity Position Risk – (STA)</b>

## CA-10.5 Equity Derivatives (continued)

### *Counterparty Risk*

CA-10.5.8 Derivative positions may also generate counterparty risk exposure related to the counterparty in the trade, in addition to position risk requirements (specific and general) related to the underlying instrument, e.g. counterparty risk related to OTC trades through margin payments, fees payable or settlement exposures. The credit risk capital requirements will apply to such counterparty risk exposure.

### *Summary of Treatment of Equity Derivatives*

Instrument	Specific risk charge	General market risk charge
Exchange-traded or <u>OTC</u> futures		
- Individual equity	Yes	Yes, as underlying
- Index	Yes (see Section CA-10.5)	Yes, as underlying
Options		
- Individual equity	Yes	Either (a) or (b) as below (chapter CA-13 for a detailed description):
- Index	Yes	(a) Carve out together with the associated <u>hedging</u> positions, and use: - simplified approach; or - scenario analysis; or - internal models (chapter CA-15). (b) General market risk charge according to the delta-plus method (gamma and vega should receive separate capital charges).
* This is the specific risk charge relating to the issuer of the instrument. Under the credit risk rules, there remains a separate capital charge for the <u>counterparty risk</u> .		





<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-11: Market Risk - Foreign Exchange Risk – (STA)</b>

## CA-11.1 Introduction

CA-11.1.1 A bank which holds net open positions (whether long or short) in foreign currencies is exposed to the risk that exchange rates may move against it. The open positions may be either trading positions or, simply, exposures caused by the bank's overall assets and liabilities.

CA-11.1.2 This chapter describes the standardised method for calculation of the bank's foreign exchange risk, and the capital required against that risk. The measurement of the foreign exchange risk involves, as a first step, the calculation of the net open position in each individual currency including gold<sup>70</sup> and, as a second step, the measurement of the risks inherent in the bank's mix of long and short positions in different currencies.

CA-11.1.3 The open positions and the capital requirements are calculated with reference to the entire business, i.e. the banking and trading books combined.

CA-11.1.4 The open positions are calculated with reference to the bank's base currency, which will be either BD or US\$.

CA-11.1.5 Banks which have the intention and capability to use internal models for the measurement of their foreign exchange risk and, hence, for the calculation of the capital requirement, should seek the prior written approval of the CBB for those models. The CBB's detailed rules for the recognition and use of internal models are included in chapter CA-14. Banks which do not use internal models should adopt the standardised approach, as set out in detail in this chapter.

CA-11.1.6 In addition to foreign exchange risk, positions in foreign currencies may be subject to interest rate risk and credit risk which should be treated separately.

CA-11.1.7 For the purposes of calculating "Foreign Exchange Risk" only, positions in those GCC currencies which are pegged to US\$, will be treated as positions in US\$.

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<sup>70</sup> Positions in gold should be treated as if they were foreign currency positions, rather than as commodity positions, because the volatility of gold is more in line with that of foreign currencies and most banks manage it in similar manner to foreign currencies.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-11: Market Risk - Foreign Exchange Risk – (STA)</b>

## CA-11.2 De Minimis Exemptions

### CA-11.2.1

A bank doing negligible business in foreign currencies and which does not take foreign exchange positions for its own account may, at the discretion of the CBB evidenced by the CBB's prior written approval, be exempted from calculating the capital requirements on these positions. The CBB is likely to be guided by the following criteria in deciding to grant exemption to any bank:

- (a) The bank's holdings or taking of positions in foreign currencies, including gold, defined as the greater of the sum of the gross long positions and the sum of the gross short positions in all foreign currencies and gold, does not exceed 100% of its eligible capital; and
- (b) The bank's overall net open position, as defined in Paragraph CA-11.3.1, does not exceed 2% of its eligible capital as defined in chapter CA-2.

### CA-11.2.2

The criteria listed in Paragraph CA-11.2.1 above are only intended to be guidelines, and a bank will not automatically qualify for exemptions upon meeting them. The CBB may also, in its discretion, fix a minimum capital requirement for a bank which is exempted from calculating its foreign exchange risk capital requirement, to cover the risks inherent in its foreign currency business.

### CA-11.2.3

The CBB may, at a future date, revoke an exemption previously granted to a bank, if the CBB is convinced that the conditions on which the exemption was granted no longer exist.



MODULE	CA: Capital Adequacy
CHAPTER	CA-11: Market Risk - Foreign Exchange Risk – (STA)

### CA-11.3 Calculation of Net Open Positions

#### CA-11.3.1

A bank's exposure to foreign exchange risk in any currency is its net open position in that currency, which is calculated by summing the following items:

- (a) The net spot position in the currency (i.e. all asset items less all liability items, including accrued interest, other income and expenses, denominated in the currency in question, assets are included gross of provisions for bad and doubtful debts, except in cases where the provisions are maintained in the same currency as the underlying assets);
- (b) The net forward position in the currency (i.e. all amounts to be received less all amounts to be paid under forward foreign exchange contracts, in the concerned currency, including currency futures and the principal on currency swaps not included in the spot position);
- (c) Guarantees and similar off-balance-sheet contingent items that are certain to be called and are likely to be irrecoverable where the provisions, if any, are not maintained in the same currency;
- (d) Net future income/expenses not yet accrued but already fully hedged by forward foreign exchange contracts may be included provided that such anticipatory hedging is part of the bank's formal written policy and the items are included on a consistent basis;
- (e) Profits (i.e. the net value of income and expense accounts) held in the currency in question;
- (f) Specific provisions held in the currency in question where the underlying asset is in a different currency, net of assets held in the currency in question where a specific provision is held in a different currency; and
- (g) The net delta-based equivalent of the total book of foreign currency options (subject to a separately calculated capital charge for gamma and vega as described in chapter CA-13, alternatively, options and their associated underlying positions are dealt with by one of the other methods described in chapter CA-13).



MODULE	CA: Capital Adequacy
CHAPTER	CA-11: Market Risk - Foreign Exchange Risk – (STA)

### CA-11.3 Calculation of Net Open Positions (continued)

#### CA-11.3.2

All assets and liabilities, as described above, should be included at closing mid-market spot exchange rates. Marked-to-market items should be included on the basis of the current market value of the positions. However, banks which base their normal management accounting on net present values are expected to use the net present values of each position, discounted using current interest rates and valued at current spot rates, for measuring their forward currency and gold positions.

#### CA-11.3.3

Net positions in composite currencies, such as the SDR, may either be broken down into the component currencies according to the quotas in force and included in the net open position calculations for the individual currencies, or treated as a separate currency. In any case, the mechanism for treating composite currencies should be consistently applied.

#### CA-11.3.4

For calculating the net open position in gold, the bank will first express the net position (spot plus forward) in terms of the standard unit of measurement (i.e. ounces or grams) and, then, convert it at the current spot rate into the base currency.

#### CA-11.3.5

Forward currency and gold positions should be valued at current spot market exchange rates. Applying forward exchange rates is inappropriate as it will result in the measured positions reflecting current interest rate differentials, to some extent.

#### CA-11.3.6

Where gold is part of a forward contract (i.e. quantity of gold to be received or to be delivered), any interest rate or foreign currency exposure from the other leg of the contract should be reported as set out in chapter CA-9 or Section CA-11.1 above, respectively.



MODULE	CA: Capital Adequacy
CHAPTER	CA-11: Market Risk - Foreign Exchange Risk – (STA)

### CA-11.3 Calculation of Net Open Positions (continued)

#### *Structural Positions*

CA-11.3.7

Positions of a structural, i.e. non-dealing, nature as set out below, may be excluded from the calculation of the net open currency positions:

- (a) Positions are taken deliberately in order to hedge, partially or totally, against the adverse effects of exchange rate movements on the bank's CAR;
- (b) Positions related to items that are deducted from the bank's capital when calculating its capital base in accordance with the rules and guidelines in this module, such as investments in non-consolidated subsidiaries; and
- (c) Retained profits held for payout to parent, where the profits are held in the currency concerned.

The CBB will consider approving the exclusion of the above positions for the purpose of calculating the capital requirement, only if the following conditions are met:

- (i) The concerned bank provides adequate documentary evidence to the CBB which establishes the fact that the positions proposed to be excluded are, indeed, of a structural, i.e. non-dealing, nature and are merely intended to protect the bank's CAR. For this purpose, the CBB may ask for written representations from the bank's management or directors; and
- (ii) Any exclusion of a position is consistently applied, with the treatment of the hedge remaining the same for the life of the associated assets or other items.

#### *Derivatives*

CA-11.3.8

A currency swap is treated as a combination of a long position in one currency and a short position in the second currency.



MODULE	CA: Capital Adequacy
CHAPTER	CA-11: Market Risk - Foreign Exchange Risk – (STA)

### CA-11.3 Calculation of Net Open Positions (continued)

#### CA-11.3.9

There are a number of alternative approaches to the calculation of the foreign exchange risk in options. As stated in Section CA-11.1, with the CBB's prior written approval, a bank may choose to use internal models to measure the options risk. Extra capital charges will apply to those option risks that the bank's internal model does not capture. The standardised framework for the calculation of options risks and the resultant capital charges is described, in detail, in chapter CA-13. Where, as explained in Paragraph CA-11.3.1, the option delta value is incorporated in the net open position, the capital charges for the other option risks are calculated separately.



MODULE	CA: Capital Adequacy
CHAPTER	CA-11: Market Risk - Foreign Exchange Risk – (STA)

#### CA-11.4 Calculation of the Overall Net open Positions

##### CA-11.4.1

The net long or short position in each currency is converted, at the spot rate, into the reporting currency. The overall net open position is measured by aggregating the following:

- (a) The sum of the net short positions or the sum of the net long positions, whichever is greater; plus
- (b) The net position (short or long) in gold, regardless of sign.

##### CA-11.4.2

Where the bank is assessing its foreign exchange risk on a consolidated basis, it may be technically impractical in the case of some marginal operations to include the currency positions of a foreign branch or subsidiary of the bank. In such cases, the internal limit for that branch/subsidiary, in each currency, may be used as a proxy for the positions. The branch/subsidiary limits should be added, without regard to sign, to the net open position in each currency involved. When this simplified approach to the treatment of currencies with marginal operations is adopted, the bank must adequately monitor the actual positions of the branch/subsidiary against the limits, and revise the limits, if necessary, based on the results of the ex-post monitoring.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-11: Market Risk - Foreign Exchange Risk – (STA)</b>

**CA-11.5 Calculation of the Capital Charge**

**CA-11.5.1**

The capital charge is 8% of the overall net open position.

**CA-11.5.2**

The table below illustrates the calculation of the overall net open position and the capital charge:

*Example of the Calculation of the Foreign Exchange Overall Net Open Position and the Capital Charge*

<b>GBP</b>	<b>EURO</b>	<b>CA\$</b>	<b>US\$</b>	<b>JPY</b>	<b>Gold</b>
<b>+100</b>	<b>+150</b>	<b>+50</b>	<b>-180</b>	<b>-20</b>	<b>-20</b>
<b>+300</b>			<b>-200</b>		<b>20</b>

The capital charge is 8% of the higher of either the sum of the net long currency positions or the sum of the net short positions (i.e. 300) and of the net position in gold (i.e. 20) =  $320 \times 8\% = 25.6$





MODULE	CA: Capital Adequacy
CHAPTER	CA-12: Market Risk - Commodities Risk – (STA)

## CA-12.1 Introduction

CA-12.1.1 This chapter sets out the minimum capital requirements to cover the risk of holding or taking positions in commodities, including precious metals, but excluding gold (which is treated as a foreign currency according to the methodology explained in chapter CA-11).

### CA-12.1.2

The commodities position risk and the capital charges are calculated with reference to the entire business of a bank, i.e., the banking and trading books combined.

CA-12.1.3 The price risk in commodities is often more complex and volatile than that associated with currencies and interest rates. Commodity markets may also be less liquid than those for interest rates and currencies and, as a result, changes in supply and demand can have a more dramatic effect on price and volatility. Banks need also to guard against the risk that arises when a short position falls due before the long position. Owing to a shortage of liquidity in some markets, it might be difficult to close the short position and the bank might be "squeezed by the market". All these market characteristics, of commodities, can make price transparency and the effective hedging of risks more difficult.

CA-12.1.4 For spot or physical trading, the directional risk arising from a change in the spot price is the most important risk. However, banks applying portfolio strategies involving forward and derivative contracts are exposed to a variety of additional risks, which may well be larger than the risk of a change in spot prices (directional risk). These include:

- (a) 'Basis risk', i.e., the risk that the relationship between the prices of similar commodities alters through time;
- (b) 'Interest rate risk', i.e., the risk of a change in the cost of carry for forward positions and options; and
- (c) 'Forward gap risk', i.e., the risk that the forward price may change for reasons other than a change in interest rates.



MODULE	CA: Capital Adequacy
CHAPTER	CA-12: Market Risk - Commodities Risk – (STA)

## CA-12.1 Introduction (continued)

**CA-12.1.5** The capital charges for commodities risk envisaged by the rules within this chapter are intended to cover the risks identified in Paragraph CA-12.1.4. In addition, however, banks face credit counterparty risk on over-the-counter derivatives, which must be incorporated into their credit risk capital requirements. Furthermore, the funding of commodities positions may well open a bank to interest rate or foreign exchange risk which should be captured within the measurement framework set out in chapters CA-9 and CA-11, respectively.<sup>71</sup>

**CA-12.1.6** Banks which have the intention and capability to use internal models for the measurement of their commodities risks and, hence, for the calculation of the capital requirement, should seek the prior written approval of the CBB for those models. The CBB's detailed rules for the recognition and use of internal models are included in chapter CA-14. It is essential that the internal models methodology captures the directional risk, forward gap and interest rate risks, and the basis risk which are defined in Paragraph CA-12.1.4. It is also particularly important that models take proper account of market characteristics, notably the delivery dates and the scope provided to traders to close out positions.

**CA-12.1.7** Banks which do not propose to use internal models should adopt either the maturity ladder approach or the simplified approach to calculate their commodities risk and the resultant capital charges. Both these approaches are described in Sections CA-12.3 and CA-12.4, respectively.

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<sup>71</sup> Where a commodity is part of a forward contract (i.e., a quantity of commodity to be received or to be delivered), any interest rate or foreign exchange risk from the other leg of the contract should be captured, within the measurement framework set out in chapters CA-9 and CA-11, respectively. However, positions which are purely of a stock financing nature (i.e., a physical stock has been sold forward and the cost of funding has been locked in until the date of the forward sale) may be omitted from the commodities risk-calculation although they will be subject to the interest rate and counterparty risk capital requirements.



MODULE	CA: Capital Adequacy
CHAPTER	CA-12: Market Risk - Commodities Risk – (STA)

## CA-12.2 Calculation of Commodities Positions

### *Netting*

#### CA-12.2.1

Banks must first express each commodity position (spot plus forward) in terms of the standard unit of measurement (i.e., barrels, kilograms, grams etc.). Long and short positions in a commodity are reported on a net basis for the purpose of calculating the net open position in that commodity. For markets which have daily delivery dates, any contracts maturing within ten days of one another may be offset. The net position in each commodity is then converted, at spot rates, into the bank's reporting currency.

#### CA-12.2.2

Positions in different commodities cannot be offset for the purpose of calculating the open positions as described in Paragraph CA-12.2.1 above. However, where two or more sub-categories<sup>72</sup> of the same category are, in effect, deliverable against each other, netting between those sub-categories is permitted. Furthermore, if two or more sub-categories of the same category are considered as close substitutes for each other, and minimum correlation of 0.9 between their price movements is clearly established over a minimum period of one year, the bank may, with the prior written approval of the CBB, net positions in those sub-categories. Banks which wish to net positions based on correlations, in the manner discussed above, will need to satisfy the CBB of the accuracy of the method which it proposes to adopt.

### *Derivatives*

#### CA-12.2.3

All commodity derivatives and off-balance-sheet positions which are affected by changes in commodity prices should be included in the measurement framework for commodities risks. This includes commodity futures, commodity swaps, and options where the "delta plus" method is used<sup>73</sup>. In order to calculate the risks, commodity derivatives are converted into notional commodities positions and assigned to maturities as follows:

<sup>72</sup> Commodities can be grouped into clans, families, sub-groups and individual commodities. For example, a clan might be Energy Commodities, within which Hydro-Carbons is a family with Crude Oil being a sub-group and West Texas Intermediate, Arabian Light and Brent being individual commodities.

<sup>73</sup> For banks applying other approaches to measure options risks, all Options and the associated underlying instruments should be excluded from both the maturity ladder approach and the simplified approach. The treatment of options is described, in detail, in chapter CA-13.



MODULE	CA: Capital Adequacy
CHAPTER	CA-12: Market Risk - Commodities Risk – (STA)

## CA-12.2 Calculation of Commodities Positions (continued)

- (a) *Futures and forward contracts relating to individual commodities* should be incorporated in the measurement framework as notional amounts of barrels, kilograms etc., and should be assigned a maturity with reference to their expiry date;
- (b) *Commodity swaps* where one leg is a fixed price and the other one is the current market price, should be incorporated as a series of positions equal to the notional amount of the contract, with one position corresponding to each payment on the swap and slotted into the maturity time-bands accordingly. The positions would be long positions if the bank is paying fixed and receiving floating, and short positions if vice versa. (If one of the legs involves receiving/paying a fixed or floating interest rate, that exposure should be slotted into the appropriate repricing maturity band for the calculation of the interest rate risk, as described in chapter CA-9); and
- (c) *Commodity swaps* where the legs are in different commodities should be incorporated in the measurement framework of the respective commodities separately, without any offsetting. Offsetting will only be permitted if the conditions set out in Paragraphs CA-12.2.1 and CA-12.2.2 are met.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-12: Market Risk - Commodities Risk – (STA)</b>

### CA-12.3 Maturity Ladder Approach

#### CA-12.3.1

A worked example of the maturity ladder approach is set out in Appendix CA-13 and the table in Paragraph CA-12.3.2 illustrates the maturity time-bands of the maturity ladder for each commodity.

#### CA-12.3.2

The steps in the calculation of the commodities risk by the maturity ladder approach are:

- (a) The net positions in individual commodities, expressed in terms of the standard unit of measurement, are first slotted into the maturity ladder. Physical stocks are allocated to the first time-band. A separate maturity ladder is used for each commodity as defined in Section CA-12.2 earlier in this chapter. The net positions in commodities are calculated as explained in Section CA-12.2;
- (b) Long and short positions in each time-band are matched. The sum of the matched long and short positions is multiplied first by the spot price of the commodity, and then by a spread rate of 1.5% for each time-band as set out in the table below. This represents the capital charge in order to capture forward gap and interest rate risk within a time-band (which, together, are sometimes referred to as curvature/spread risk);

Time-bands <sup>74</sup>
0 – 1 months
1 – 3 months
3 – 6 months
6 – 12 months
1 – 2 years
2 – 3 years
over 3 years

<sup>74</sup> For instruments, the maturity of which is on the boundary of two maturity time-bands, the instrument should be placed into the earlier maturity band. For example, instruments with a maturity of exactly one year are placed into the 6 to 12 months time-band.



MODULE	CA: Capital Adequacy
CHAPTER	CA-12: Market Risk - Commodities Risk – (STA)

### CA-12.3 Maturity Ladder Approach (continued)

- (c) The residual (unmatched) net positions from nearer time-bands are then carried forward to offset opposite positions (i.e. long against short, and vice versa) in time-bands that are further out. However, a surcharge of 0.6% of the net position carried forward is added in respect of each time-band that the net position is carried forward, to recognise that such hedging of positions between different time-bands is imprecise. The surcharge is in addition to the capital charge for each matched amount created by carrying net positions forward, and is calculated as explained in step (b) above; and
- (d) At the end of step (c) above, there will be either only long or only short positions, to which a capital charge of 15% will apply. The CBB recognises that there are differences in volatility between different commodities, but has, nevertheless, decided that one uniform capital charge for open positions in all commodities shall apply in the interest of simplicity of the measurement, and given the fact that banks normally run rather small open positions in commodities. Banks must submit, in writing, details of their commodities business, to enable the CBB to evaluate whether the models approach should be adopted by the bank, to capture the market risk on this business.



MODULE	CA: Capital Adequacy
CHAPTER	CA-12: Market Risk - Commodities Risk – (STA)

#### CA-12.4 Simplified Approach

##### CA-12.4.1

By the simplified approach, the capital charge of 15% of the net position, long or short, in each commodity is applied to capture directional risk. Net positions in commodities are calculated as explained in Section CA-12.2.

##### CA-12.4.2

An additional capital charge equivalent to 3% of the bank's gross positions, long plus short, in each commodity is applied to protect the bank against basis risk, interest rate risk and forward gap risk. In valuing the gross positions in commodity derivatives for this purpose, banks must use the current spot price.



MODULE	CA: Capital Adequacy
CHAPTER	CA-13: Market Risk - Treatment of Options – (STA)

## CA-13.1 Introduction

### CA-13.1.1

It is recognised that the measurement of the price risk of options is inherently a difficult task, which is further complicated by the wide diversity of banks' activities in options. The CBB has decided that the following approaches should be adopted to the measurement of options risks:

- (a) Banks which solely use purchased options are permitted to use the *simplified (carve-out) approach* described later in this chapter; and
- (b) Banks which also write options should use either the *delta-plus (buffer) approach* or the *scenario approach*, or alternatively use a comprehensive risk management model. The CBB's detailed rules for the recognition and use of internal models are included in chapter CA-14.

### CA-13.1.2

The scenario approach and the internal models approach are generally regarded as more satisfactory for managing and measuring options risk, as they assess risk over a range of outcomes rather than focusing on the point estimate of the 'Greek' risk parameters as in the delta-plus approach. The more significant the level and/or complexity of the bank's options trading activities, the more the bank will be expected to use a sophisticated approach to the measurement of options risks. The CBB will monitor the banks' options trading activities, and the adequacy of the risk measurement framework adopted.

### CA-13.1.3

Where written option positions are hedged by perfectly matched long positions in exactly the same options, no capital charge for market risk is required in respect of those matched positions.





MODULE	CA: Capital Adequacy
CHAPTER	CA-13: Market Risk - Treatment of Options – (STA)

## CA-13.2 Simplified Approach (Carve-out)

### CA-13.2.1

In the simplified approach, positions for the options and the associated underlying (hedges), cash or forward, are entirely omitted from the calculation of capital charges by the standardised methodology and are, instead, "carved out" and subject to separately calculated capital charges that incorporate both general market risk and specific risk. The capital charges thus generated are then added to the capital charges for the relevant risk category, i.e., interest rate related instruments, equities, foreign exchange and commodities as described in chapters CA-9, CA-10, CA-11 and CA-12 respectively.

### CA-13.2.2

The capital charges for the carved out positions are as set out in the table below. As an example of how the calculation would work, if a bank holds 100 shares currently valued at \$ 10 each, and also holds an equivalent put option with a strike price of \$ 11, the capital charge would be as follows:

$$[\$ 1,000 \times 16\%^{75}] \text{ minus } [(\$ 11 - \$ 10)^{76} \times 100] = \$ 60$$

A similar methodology applies to options whose underlying is a foreign currency, an interest rate related instrument or a commodity.

<sup>75</sup> 8% specific risk plus 8% general market risk.

<sup>76</sup> The amount the option is "in the money".



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-13: Market Risk - Treatment of Options – (STA)</b>

## CA-13.2 Simplified Approach (Carve-out) (continued)

### *Simplified Approach: Capital Charges*

Position	Treatment
<p>Long cash and long put</p> <p>or</p> <p>Short cash and long call (i.e., <u>hedged</u> positions)</p>	<p>The capital charge is:</p> <p>[Market value of underlying instrument<sup>77</sup> x Sum of specific and general market risk charges<sup>78</sup> for the underlying] <i>minus</i> [Amount, if any, the <u>option</u> is in the money<sup>79</sup>]</p> <p>The capital charge calculated as above is bounded at zero, i.e., it cannot be a negative number.</p>
<p>Long call</p> <p>or</p> <p>Long put (i.e., naked <u>option</u> positions)</p>	<p>The capital charge is the lesser of:</p> <p>i) Market value of the underlying instrument x Sum of specific and general market risk charges for the underlying; and</p> <p>ii) Market value of the <u>option</u><sup>80</sup>.</p>

<sup>77</sup> In some cases such as foreign exchange, it may be unclear which side is the "underlying instrument"; this should be taken to be the asset which would be received if the option were exercised. In addition, the nominal value should be used for items where the market value of the underlying instrument could be zero, e.g., caps and floors, swaptions etc.

<sup>78</sup> Some options (e.g., where the underlying is an interest rate, a currency or a commodity) bear no specific risk, but specific risk is present in the case of options on certain interest rate related instruments (e.g., options on a corporate debt security or a corporate bond index - see chapter CA-9 for the relevant capital charges), and in the case of options on equities and stock indices (see chapter CA-10 for the relevant capital charges). The capital charge for currency options is 8% and for options on commodities is 15%.

<sup>79</sup> For options with a residual maturity of more than six months, the strike price should be compared with the forward, not the current, price. A bank unable to do this should take the "in the money" amount to be zero.

<sup>80</sup> Where the position does not fall within the trading book options on certain foreign exchange and commodities positions not belonging to the trading book), it is acceptable to use the book value instead of the market value.



MODULE	CA: Capital Adequacy
CHAPTER	CA-13: Market Risk - Treatment of Options – (STA)

### CA-13.3 Delta-plus Method (Buffer Approach)

**CA-13.3.1** Banks which write options are allowed to include delta-weighted option positions within the standardised methodology set out in chapters CA-9 through CA-12. Each option should be reported as a position equal to the market value of the underlying multiplied by the delta. The delta should be calculated by an adequate model with appropriate documentation of the process and controls, to enable the CBB to review such models, if considered necessary. A worked example of the delta-plus method is set out in Appendix CA-14.

**CA-13.3.2** Since delta does not sufficiently cover the risks associated with options positions, there will be additional capital buffers to cover gamma (which measures the rate of change of delta) and vega (which measures the sensitivity of the value of an option with respect to a change in volatility), in order to calculate the total capital charge. The gamma and vega buffers should be calculated by an adequate exchange model or the bank's proprietary options pricing model, with appropriate documentation of the process and controls, to enable the CBB to review such models, if considered necessary.

#### *Treatment of Delta*

**CA-13.3.3** The treatment of the delta-weighted positions, for the calculation of the capital charges arising from delta risk, is summarised in Paragraphs CA-13.3.4 to CA-13.3.9.

#### *Where the Underlying is a Debt Security or an Interest Rate*

**CA-13.3.4** The delta-weighted option positions are slotted into the interest rate time-bands as set out in chapter CA-9. A two-legged approach should be used as for other derivatives, as explained in chapter CA-9, requiring one entry at the time the underlying contract takes effect and a second at the time the underlying contract matures. A few examples to elucidate the two-legged treatment are set out below:

- (a) A bought call option on a June three-month interest rate future will, in April, be considered, on the basis of its delta-equivalent value, to be a long position with a maturity of five months and a short position with a maturity of two months;



MODULE	CA: Capital Adequacy
CHAPTER	CA-13: Market Risk - Treatment of Options – (STA)

### CA-13.3 Delta-plus Method (Buffer Approach) (continued)

- (b) A written option with the same underlying as in (a) above, will be included in the measurement framework as a long position with a maturity of two months and a short position with a maturity of five months; and
- (c) A two months call option on a bond future where delivery of the bond takes place in September will be considered in April, as being long the bond and short a five months deposit, both positions being delta-weighted.

CA-13.3.5 Floating rate instruments with caps or floors are treated as a combination of floating rate securities and a series of European-style options. For example, the holder of a three-year floating rate bond indexed to six month LIBOR with a cap of 10% will treat it as:

- (a) A debt security that reprices in six months; and
- (b) A series of five written call options on an FRA with a reference rate of 10%, each with a negative sign at the time the underlying FRA takes effect and a positive sign at the time the underlying FRA matures.

CA-13.3.6 The rules applying to closely matched positions, set out in Paragraph CA-9.8.2, will also apply in this respect.

#### *Where the Underlying is an Equity Instrument*

CA-13.3.7 The delta-weighted positions are incorporated in the measure of market risk described in chapter CA-10. For purposes of this calculation, each national market is treated as a separate underlying.

#### *Options on Foreign Exchange and Gold Positions*

CA-13.3.8 The net delta-based equivalent of the foreign currency and gold options are incorporated in the measurement of the exposure for the respective currency or gold position, as described in chapter CA-11.



MODULE	CA: Capital Adequacy
CHAPTER	CA-13: Market Risk - Treatment of Options – (STA)

### CA-13.3 Delta-plus Method (Buffer Approach) (continued)

#### *Options on Commodities*

CA-13.3.9

The delta-weighted positions are incorporated in the measurement of the commodities risk by the simplified approach or the maturity ladder approach, as described in chapter CA-12.

#### *Calculation of the Gamma and Vega Buffers*

CA-13.3.10

As explained in Paragraph CA-13.3.2, in addition to the above capital charges to cover delta risk, banks are required to calculate additional capital charges to cover the gamma and vega risks. The additional capital charges are calculated as follows:

##### *Gamma*

- (a) For each individual option position (including hedge positions), a gamma impact is calculated according to the following formula derived from the Taylor series expansion:

$$\text{Gamma impact} = 0.5 \times \text{Gamma} \times \text{VU}$$

where VU = variation of the underlying of the option, calculated as in (b) below

- (b) VU is calculated as follows:
- (i) For interest rate options<sup>81</sup>, where the underlying is a bond, the market value of the underlying is multiplied by the risk weights set out in Section CA-9.4. An equivalent calculation is carried out where the underlying is an interest rate, based on the assumed changes in yield as set out in the table in Section CA-9.5;
  - (ii) For options on equities and equity indices, the market value of the underlying is multiplied by 8%;
  - (iii) For foreign exchange and gold options, the market value of the underlying is multiplied by 8%;
  - (iv) For commodities options, the market value of the underlying is multiplied by 15%.

<sup>81</sup> For interest rate and equity options, the present set of rules do not attempt to capture specific risk when calculating gamma capital Charges. See Section CA-13.4 for an explanation of the CBB's views on this subject.



MODULE	CA: Capital Adequacy
CHAPTER	CA-13: Market Risk - Treatment of Options – (STA)

### CA-13.3 Delta-plus Method (Buffer Approach) (continued)

- (c) For the purpose of the calculation of the gamma buffer, the following positions are treated as the same underlying:
  - (i) For interest rates, each time-band as set out in the table in Section CA-9.4. Positions should be slotted into separate maturity ladders by currency. Banks using the duration method should use the time-bands as set out in the table in Section CA-9.5;
  - (ii) For equities and stock indices, each individual national market;
  - (iii) For foreign currencies and gold, each currency pair and gold; and
  - (iv) For commodities, each individual commodity as defined in Section CA-12.2.
- (d) Each option on the same underlying will have a gamma impact that is either positive or negative. These individual gamma impacts are summed, resulting in a net gamma impact for each underlying that is either positive or negative. Only those net gamma impacts that are negative are included in the capital calculation;
- (e) The total gamma capital charge is the sum of the absolute value of the net negative gamma impacts calculated for each underlying as explained in (d) above;

#### *Vega*

- (f) For volatility risk (vega), banks are required to calculate the capital charges by multiplying the sum of the vegas for all options on the same underlying, as defined above, by a proportional shift in volatility of  $\pm 25\%$ ; and
- (g) The total vega capital charge is the sum of the absolute value of the individual vega capital charges calculated for each underlying.

#### CA-13.3.11

The capital charges for delta, gamma and vega risks described in Paragraphs CA-13.3.1 through CA-13.3.10 are in addition to the specific risk capital charges which are determined separately by multiplying the delta-equivalent of each option position by the specific risk weights set out in chapters CA-9 through CA-12.



MODULE	CA: Capital Adequacy
CHAPTER	CA-13: Market Risk - Treatment of Options – (STA)

### CA-13.3 Delta-plus Method (Buffer Approach) (continued)

#### CA-13.3.12

To summarise, capital requirements for, say OTC options, applying the delta-plus method are as follows:

- (a) Counterparty risk capital charges (on purchased options only), calculated in accordance with the credit risk regulations; PLUS
- (b) Specific risk capital charges (calculated as explained in Paragraph CA-13.3.11); PLUS
- (c) Delta risk capital charges (calculated as explained in Paragraphs CA-13.3.3 through CA-13.3.9) PLUS
- (d) Gamma and vega capital buffers (calculated as explained in Paragraph CA-13.3.10).



MODULE	CA: Capital Adequacy
CHAPTER	CA-13: Market Risk - Treatment of Options – (STA)

#### CA-13.4 Scenario Approach

##### CA-13.4.1

As stated in Section CA-13.1, banks which have a significant level of options trading activities, or have complex options trading strategies, are expected to use more sophisticated methods for measuring and monitoring the options risks. Banks with the appropriate capability will be permitted, with the prior approval of the CBB, to base the market risk capital charge for options portfolios and associated hedging positions on scenario matrix analysis. Before giving its approval, the CBB will closely review the accuracy of the analysis that is constructed. Furthermore, like in the case of internal models, the banks' use of scenario analysis as part of the standardised methodology will also be subject to external validation, and to those of the qualitative standards listed in chapter CA-14 which are appropriate given the nature of the business.

##### CA-13.4.2

The scenario matrix analysis involves specifying a fixed range of changes in the option portfolio's risk factors and calculating changes in the value of the option portfolio at various points along this "grid" or "matrix". For the purpose of calculating the capital charge, the bank will revalue the option portfolio using matrices for simultaneous changes in the option's underlying rate or price and in the volatility of that rate or price. A different matrix is set up for each individual underlying as defined in Section CA-13.3 above. As an alternative, in respect of interest rate options, banks which are significant traders in such options are permitted to base the calculation on a minimum of six sets of time- bands. When applying this alternative method, not more than three of the time-bands as defined in chapter CA-9 should be combined into any one set.

##### CA-13.4.3

The first dimension of the matrix involves a specified range of changes in the option's underlying rate or price. The CBB has set the range, for each risk category, as follows:





MODULE	CA: Capital Adequacy
CHAPTER	CA -13: Market Risk - Treatment of Options – (STA)

#### CA-13.4 Scenario Approach (continued)

- (a) *Interest rate related instruments* – The range for interest rates is consistent with the assumed changes in yield set out in Section CA-9.5. Those banks applying the alternative method of grouping time-bands into sets, as explained in Paragraph CA-13.4.2, should use, for each set of time-bands, the highest of the assumed changes in yield applicable to the individual time-bands in that group. If, for example, the time-bands 3 to 4 years, 4 to 5 years and 5 to 7 years are combined, the highest assumed change in yield of these three bands would be 0.75 which would be applicable to that set;
- (b) For *equity instruments*, the range is  $\pm 8\%$ ;
- (c) For foreign exchange and gold, the range is  $\pm 8\%$ ; and
- (d) For *commodities*, the range is  $\pm 15\%$ ,

For all risk categories, at least seven observations (including the current observation) should be used to divide the range into equally spaced intervals.

CA-13.4.4

The second dimension of the matrix entails a change in the volatility of the underlying rate or price. A single change in the volatility of the underlying rate or price equal to a shift in volatility of  $\pm 25\%$  is applied.

CA-13.4.5

The CBB will closely monitor the need to reset the parameters for the amounts by which the price of the underlying instrument and volatility must be shifted to form the rows and columns of the scenario matrix. For the time being, the parameters set, as above, only reflect general market risk (see Paragraphs CA-13.4.10 to CA-13.4.12).

CA-13.4.6

After calculating the matrix, each cell contains the net profit or loss of the option and the underlying hedge instrument. The general market risk capital charge for each underlying is then calculated as the largest loss contained in the matrix.



MODULE	CA: Capital Adequacy
CHAPTER	CA-13: Market Risk - Treatment of Options – (STA)

#### CA-13.4 Scenario Approach (continued)

CA-13.4.7

In addition to the capital charge calculated as above, the specific risk capital charge is determined separately by multiplying the delta-equivalent of each option position by the specific risk weights set out in chapters CA-9 through CA-12.

CA-13.4.8

To summarise, capital requirements for, say OTC options, applying the scenario approach are as follows:

- (a) Counterparty risk capital charges (on purchased options only), calculated in accordance with the credit risk regulations; PLUS
- (b) Specific risk capital charges (calculated as explained in Paragraph CA-13.4.7); PLUS
- (c) Directional and volatility risk capital charges (i.e., the worst case loss from a given scenario matrix analysis).

CA-13.4.9

Banks doing business in certain classes of complex exotic options (e.g. barrier options involving discontinuities in deltas etc.), or in options at the money that are close to expiry, are required to use either the scenario approach or the internal models approach, both of which can accommodate more detailed revaluation approaches. The CBB expects the concerned banks to work with it closely to produce an agreed method, within the framework of these rules. If a bank uses scenario matrix analysis, it must be able to demonstrate that no substantially larger loss could fall between the nodes.

CA-13.4.10

In drawing up the delta-plus and the scenario approaches, the CBB's present set of rules do not attempt to capture specific risk other than the delta-related elements (which are captured as explained in Paragraphs CA-13.4.7 and CA-13.4.11). The CBB recognises that introduction of those other specific risk elements will make the measurement framework much more complex. On the other hand, the simplifying assumptions used in these rules will result in a relatively conservative treatment of certain options positions.



MODULE	CA: Capital Adequacy
CHAPTER	CA-13: Market Risk - Treatment of Options – (STA)

#### CA-13.4 Scenario Approach (continued)

##### CA-13.4.11

In addition to the options risks described earlier in this chapter, the CBB is conscious of the other risks also associated with options, e.g., rho or interest rate risk (the rate of change of the value of the option with respect to the interest rate) and theta (the rate of change of the value of the option with respect to time). While not proposing a measurement system for those risks at present, the CBB expects banks undertaking significant options business, at the very least, to monitor such risks closely. Additionally, banks will be permitted to incorporate rho into their capital calculations for interest rate risk, if they wish to do so.

##### CA-13.4.12

The CBB will closely review the treatment of options for the calculation of market risk capital charges, particularly in the light of the aspects described in Paragraphs CA-13.4.10 and CA-13.4.11.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-14: Market Risk - Use of Internal Models</b>

## CA-14.1 Introduction

### CA-14.1.1

As stated in chapter CA-1, as an alternative to the standardised approach to the measurement of market risks (which is described in chapters CA-9 through CA-13), and subject to the explicit prior approval of the CBB, banks will be allowed to use risk measures derived from their own internal models.

### CA-14.1.2

This chapter describes the seven sets of conditions that should be met before a bank is allowed to use the internal models approach, namely:

- (a) General criteria regarding the adequacy of the risk management system;
- (b) Qualitative standards for internal oversight of the use of models, notably by senior management;
- (c) Guidelines for specifying an appropriate set of market risk factors (i.e., the market rates and prices that affect the value of a bank's positions);
- (d) Quantitative standards setting out the use of common minimum statistical parameters for measuring risk;
- (e) Guidelines for stress testing;
- (f) Validation procedures for external oversight of the use of models; and
- (g) Rules for banks which use a mixture of the internal models approach and the standardised approach.

### CA-14.1.3

The standardised methodology, described in chapters CA-9 through CA-13, uses a "building-block" approach in which the specific risk and the general market risk arising from debt and equity positions are calculated separately. The focus of most internal models is a bank's general market risk exposure, typically leaving specific risk (i.e., exposures to specific issuers of debt securities and equities) to be measured largely through separate credit risk measurement systems. Banks applying models are subject to separate capital charges for the specific risk not captured by their models, which shall be calculated by the standardised methodology. The capital charge for banks which are modelling specific risk is set out in Section CA-14.10.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-14: Market Risk - Use of Internal Models</b>

## CA-14.1 Introduction (continued)

CA-14.1.4 While the models recognition criteria described in this chapter are primarily intended for comprehensive Value-at-Risk (VaR) models, nevertheless, the same set of criteria will be applied, to the extent that it is appropriate, to other pre-processing or valuation models the output of which is fed into the standardised measurement system, e.g., interest rate sensitivity models (from which the residual positions are fed into the duration ladders) and option pricing models (for the calculation of the delta, gamma and vega sensitivities).

**CA-14.1.5** As a number of strict conditions are required to be met before internal models can be recognised by the CBB, including external validation, banks which are contemplating applying internal models should submit their detailed written proposals for the CBB's approval, immediately upon receipt of these regulations.

CA-14.1.6 As the model approval process will encompass a review of both the model and its operating environment, it is not the case that a commercially produced model which is recognised for one bank will automatically be recognised for another bank.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-14: Market Risk - Use of Internal Models</b>

## CA-14.2 General Criteria

### CA-14.2.1

The CBB will give its approval for the use of internal models to measure market risks only if, in addition to the detailed requirements described later in this chapter, it is satisfied that the following general criteria are met:

- (a) That the bank's risk management system is conceptually sound and is implemented with integrity;
- (b) That the bank has, in the CBB's view, sufficient numbers of staff skilled in the use of sophisticated models not only in the trading area but also in the risk control, audit and the back office areas;
- (c) That the bank's models have, in the CBB's judgement, a proven track record of reasonable accuracy in measuring risk. The CBB recognises that the use of internal models is, for most banks in Bahrain, a relatively new development and, therefore, it is difficult to establish a track record of reasonable accuracy. The CBB, therefore, will require a period of initial monitoring and live testing of a bank's internal model before it is used for supervisory capital purposes; and
- (d) That the bank regularly conducts stress tests as outlined in Section CA-14.7 and conducts back-testing as described in Section CA-14.6.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-14: Market Risk - Use of Internal Models</b>

### CA-14.3 Qualitative Standards

#### CA-14.3.1

In order to ensure that banks using models have market risk management systems that are conceptually sound and implemented with integrity, the CBB has set the following qualitative criteria that banks are required to meet before they are permitted to use the models-based approach for calculating capital charge. Apart from influencing the CBB's decision to permit a bank to use internal models, where such permission is granted, the extent to which the bank meets the qualitative criteria will further influence the level at which the CBB will set the multiplication factor for that bank, referred to in Section CA-14.5. Only those banks whose models, in the CBB's judgement, are in full compliance with the qualitative criteria will be eligible for application of the minimum multiplication factor of 3. The qualitative criteria include the following:

- (a) The bank should have an independent risk management unit that is responsible for the design and implementation of the bank's risk management system. The unit should produce and analyse daily reports on the output of the bank's risk measurement model, including an evaluation of the relationship between the measures of risk exposure and the trading limits. This unit must be independent from the business trading units and should report directly to the senior management of the bank;
- (b) The independent risk management unit should conduct a regular back-testing programme, i.e. an ex-post comparison of the risk measure generated by the model against the actual daily changes in portfolio value over longer periods of time, as well as hypothetical changes based on static positions. See CA-14.5.1 (j);
- (c) The unit should also conduct the initial and on-going validation of the internal model. Further guidance on validation of internal models is given in Section CA-14.12;
- (d) The board of directors and senior management of the bank should be actively involved in the risk management process and must regard such process as an essential aspect of the business to which significant resources need to be devoted. In this regard, the daily reports prepared by the independent risk management unit must 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 bank's overall risk exposure;



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-14: Market Risk - Use of Internal Models</b>

### CA-14.3 Qualitative Standards (continued)

- (e) The bank's internal model must be closely integrated into the day-to-day risk management process of the bank. Its output should, accordingly, be an integral part of the process of planning, monitoring and controlling the bank's market risk profile;
- (f) The risk measurement system should be used in conjunction with the internal trading and exposure limits. In this regard, the trading limits should be related to the bank's risk measurement model in a manner that is consistent over time and that is well-understood by both traders and senior management;
- (g) A routine and rigorous programme of stress testing, along the general lines set out in Section CA-14.6, should be in place as a supplement to the risk analysis based on the day-to-day output of the bank's risk measurement model. The results of stress testing should be reviewed periodically by senior management and should be reflected in the policies and limits set by management and the board of directors. Where stress tests reveal particular vulnerability to a given set of circumstances, prompt steps should be taken to manage those risks appropriately (e.g., by hedging against that outcome or reducing the size of the bank's exposures);
- (h) The bank should have a routine in place for ensuring compliance with a documented set of internal policies, controls and procedures concerning the operation of the risk measurement system. The bank's risk measurement system must be well documented, for example, through a risk management manual that describes the basic principles of the risk management system and that provides an explanation of the empirical techniques used to measure market risk; and
- (i) An independent review of the risk measurement system should be carried out regularly in the bank's own internal auditing process. This review should include both the activities of the business trading units and of the independent risk management unit. A review, by the internal auditor, of the overall risk management process should take place at regular intervals (ideally not less than once every six months) and should specifically address, at a minimum:
  - The adequacy of the documentation of the risk management system and process;





<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-14: Market Risk - Use of Internal Models</b>

### CA-14.3 Qualitative Standards (continued)

- The organisation of the risk management unit;
- The integration of market risk measures into daily risk management;
- The approval process for risk pricing models and valuation systems used by front- and back-office personnel;
- The validation of any significant changes in the risk measurement process;
- The scope of market risks captured by the risk measurement model;
- The integrity of the management information system;
- The accuracy and completeness of position data;
- The verification of the consistency, timeliness and reliability of data sources used to run internal models, including the independence of such data sources;
- The accuracy and appropriateness of volatility and correlation assumptions;
- The accuracy of valuation and risk transformation calculations;
- The verification of the model's accuracy through frequent back-testing as described in (b) above and in the Appendix 15.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-14: Market Risk - Use of Internal Models</b>

#### CA-14.4 Specification of Market Risk Factors

##### CA-14.4.1

An important part of a bank's internal market risk measurement system is the specification of an appropriate set of market risk factors, i.e. the market rates and prices that affect the value of the bank's trading positions. The risk factors contained in a market risk measurement system should be sufficient to capture the risks inherent in the bank's portfolio of on- and off-balance-sheet trading positions. Banks should follow the CBB's guidelines, set out below, for specifying the risk factors for their internal models. Where a bank has difficulty in specifying the risk factors for any currency or market within a risk category, in accordance with the following guidelines, the bank should immediately contact the CBB. The CBB will review and discuss the specific circumstances of each such case with the concerned bank, and will decide alternative methods of calculating the risks which are not captured by the bank's model:

- (a) Factors that are deemed relevant for pricing should be included as risk factors in the value-at-risk model. Where a risk factor is incorporated in a pricing model but not in the value-at-risk model, the bank must justify this omission to the satisfaction of the CBB. In addition, the value-at-risk model must capture nonlinearities for options and other relevant products (e.g. mortgage backed securities, tranching exposures or n-th-to-default credit derivatives), as well as correlation risk and basis risk (e.g. between credit default swaps and bonds). Moreover, the CBB has to be satisfied that proxies are used which show a good track record for the actual position held (i.e. an equity index for a position in an individual stock).
- (b) For interest rates:
  - There should be a set of risk factors corresponding to interest rates in each currency in which the bank has interest-rate-sensitive on- or off-balance-sheet positions.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-14: Market Risk - Use of Internal Models</b>

#### CA-14.4 Specification of Market Risk Factors (continued)

- The risk measurement system should model the yield curve using one of a number of generally accepted approaches, for example, by estimating forward rates of zero coupon yields. The yield curve should be divided into various maturity segments in order to capture variation in the volatility of rates along the yield curve; there will typically be one risk factor corresponding to each maturity segment. For material exposures to interest rate movements in the major currencies and markets, banks must model the yield curve using a minimum of six factors. However, the number of risk factors used should ultimately be driven by the nature of the bank's trading strategies. For instance, a bank which has a portfolio of various types of securities across many points of the yield curve and which engages in complex arbitrage strategies would require a greater number of risk factors to capture interest rate risk accurately.
  - The risk measurement system must incorporate separate risk factors to capture spread risk (e.g. between bonds and swaps). A variety of approaches may be used to capture the spread risk arising from less than perfectly correlated movements between government and other fixed-income interest rates, such as specifying a completely separate yield curve for non-government fixed-income instruments (for instance, swaps or municipal securities) or estimating the spread over government rates at various points along the yield curve.
- (c) For exchange rates (which includes gold):
- The risk measurement system should incorporate risk factors corresponding to the individual foreign currencies in which the bank's positions are denominated. Since the value-at-risk figure calculated by the risk measurement system will be expressed in the bank's reporting currency, any net position denominated in a currency other than the reporting currency will introduce a foreign exchange risk. Thus, there must be risk factors corresponding to the exchange rate between the reporting currency and each other currency in which the bank has a significant exposure.
- (d) For equity prices:
- There should be risk factors corresponding to each of the equity markets in which the bank holds significant positions.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-14: Market Risk – Use of Internal Models</b>

#### CA-14.4 Specification of Market Risk Factors (continued)

- At a minimum, there should be a risk factor that is designed to capture 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 this market-wide index.
  - A somewhat more detailed approach would be to have risk factors corresponding to various sectors of the overall equity market (for instance, industry sectors or cyclical and non-cyclical sectors). As above, positions in individual stocks within each sector could be expressed in “beta-equivalents” relative to the sector index.
  - The most extensive approach would be to have risk factors corresponding to the volatility of individual equity issues.
  - The sophistication and nature of the modelling technique for a given market should correspond to the bank’s exposure to the overall market as well as its concentration in individual equity issues in that market.
- (e) For commodity prices:
- There should be risk factors corresponding to each of the commodity markets in which the bank holds significant positions (also see Section CA-12.1).
  - For banks with relatively limited positions in commodity-based instruments, a straight-forward specification of risk factors is acceptable. Such a specification would likely entail one risk factor for each commodity price to which the bank is exposed. In cases where the aggregate positions are reasonably small, it may be acceptable to use a single risk factor for a relatively broad sub-category of commodities (for instance, a single risk factor for all types of oil). However, banks which propose to use this simplified approach should obtain the prior written approval of the CBB.
  - For more active trading, the model should also take account of variation in the “convenience yield” between derivatives positions such as forwards and swaps and cash positions in the commodity.



MODULE	CA: Capital Adequacy
CHAPTER	CA-14: Market Risk - Use of Internal Models

## CA-14.5 Quantitative Standards

### CA-14.5.1

The following minimum quantitative standards will apply for the purpose of calculating the capital charge:

- (a) "Value-at-risk" must be computed on a daily basis;
- (b) In calculating the value-at-risk, a 99<sup>th</sup> percentile, one-tailed confidence interval is to be used;
- (c) In calculating the value-at-risk, an instantaneous price shock equivalent to a 10-day movement in prices is to be used, i.e., the minimum "holding period" will be ten trading days. Banks may use value-at-risk numbers calculated according to shorter holding periods scaled up to ten days, for example, by the square root of time (for the treatment of options, also see (h) below). A bank using this approach must justify the reasonableness of its approach to the satisfaction of the CBB during the annual model review process performed by the external auditor;
- (d) The minimum historical observation period (sample period) for calculating value-at-risk is one year. For banks which use a weighting scheme or other methods for the historical observation period, the "effective" observation period must be at least one year (i.e., the weighted average time lag of the individual observations cannot be less than 6 months), and the method results in a capital charge at least equivalent to a one year observation period.

The CBB may, as an exceptional case, require a bank to calculate its value-at-risk applying a shorter observation period if, in the CBB's judgement, this is justified by a significant upsurge in price volatility;

- (e) Banks must update their data sets no less frequently than once every week and should also reassess them whenever market prices are subject to material changes. The updating process must be flexible enough to allow for more frequent updates;
- (f) No particular type of model is prescribed by the CBB. So long as each model used captures all the material risks run by the bank, as set out in Section CA-14.4, banks will be free to use models based, for example, on variance-covariance matrices, historical simulations, or Monte Carlo simulations;



MODULE	CA: Capital Adequacy
CHAPTER	CA 14: Market Risk – Use of Internal Models

#### CA-14.5 Quantitative Standards (continued)

- (g) Banks shall have discretion to recognise empirical correlations within broad risk categories (i.e., interest rates, exchange rates, equity prices and commodity prices, including related options volatilities in each risk factor category). Banks are not permitted to recognise empirical correlations across broad risk categories without the prior approval of the CBB. Banks may apply, on a case-by-case basis, for empirical correlations across broad risk categories to be recognised by the CBB, subject to its satisfaction with the soundness and integrity of the bank's system for measuring those correlations;
- (h) Banks' models must accurately capture the unique risks associated with options within each of the broad risk categories. The following criteria shall apply to the measurement of options risk:
- Banks' models must capture the non-linear price characteristics of options positions;
  - Banks are expected to ultimately move towards the application of a full 10-day price shock to options positions or positions that display option-like characteristics. In the interim period, banks may adjust their capital measure for options risk through other methods, e.g., periodic simulations or stress testing;
  - Each bank's risk measurement system must have a set of risk factors that captures the volatilities of the rates and prices underlying the option positions, i.e., vega risk. Banks with relatively large and/or complex options portfolios should have detailed specifications of the relevant volatilities. This means that banks must measure the volatilities of options positions broken down by different maturities.



MODULE	CA: Capital Adequacy
CHAPTER	CA-14: Market Risk – Use of Internal Models

### CA-14.5 Quantitative Standards (continued)

- (i) In addition, a bank must calculate a ‘stressed value-at-risk’ measure. This measure is intended to replicate a value-at-risk calculation that would be generated on the bank’s current portfolio if the relevant market factors were experiencing a period of stress; and should therefore be based on the 10-day, 99<sup>th</sup> percentile, one-tailed confidence interval value-at-risk measure of the current portfolio, with model inputs calibrated to historical data from a continuous 12-month period of significant financial stress relevant to the bank’s portfolio. The period used must be approved by the CBB and regularly reviewed. As an example, for many portfolios, a 12-month period relating to significant losses in 2007/2008 would adequately reflect a period of such stress; although other periods relevant to the current portfolio must be considered by the bank.
- (j) As no particular model is prescribed under Paragraph (f) above, different techniques might need to be used to translate the model used for value-at-risk into one that delivers a stressed value-at-risk. For example, banks should consider applying anti-thetic data, or applying absolute rather than relative volatilities to deliver an appropriate stressed value-at-risk. The stressed value-at-risk should be calculated at least weekly.
- (k) Each bank must meet, on a daily basis, a capital requirement expressed as the sum of:
- The higher of (1) its previous day’s value-at-risk number measured according to the parameters specified in this Section ( $VaR_{t-1}$ ); and (2) an average of the daily value-at-risk measures on each of the preceding sixty business days ( $VaR_{avg}$ ), multiplied by a multiplication factor ( $m_c$ ); plus.
  - The higher of (1) its latest available stressed-value-at-risk number calculated according to (i) above ( ${}_sVaR_{t-1}$ ); and (2) an average of the stressed value-at-risk numbers calculated according to (i) above over the preceding sixty business days ( ${}_sVaR_{avg}$ ), multiplied by a multiplication factor ( $m_s$ ).



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-14: Market Risk – Use of Internal Models</b>

### CA-14.5 Quantitative standards (continued)

Therefore, the capital requirement (c) is calculated according to the following formula:

$$c = \max \{ \text{VaR}_{t-1}; m_c \cdot \text{VaR}_{\text{avg}} \} + \max \{ {}_s \text{VaR}_{t-1}; m_s \cdot {}_s \text{VaR}_{\text{avg}} \}$$

- (l) The multiplication factors  $m_c$  and  $m_s$  will be set by the CBB, separately for each individual bank, on the basis of the CBB's assessment of the quality of the bank's risk management system, subject to an absolute minimum of 3 for  $m_c$  and an absolute minimum of 3 for  $m_s$ . Banks must add to these factors set by the CBB, a "plus" directly related to the ex-post performance of the model, thereby introducing a built-in positive incentive to maintain the predictive quality of the model. The plus will range from 0 to 1 based on the outcome of the bank's back-testing. The back-testing results applicable for calculating the plus are based on value-at-risk only and not stressed value-at-risk. If the back-testing results are satisfactory and the bank meets all of the qualitative standards referred in Section CA-14.3 above, the plus factor could be zero. Appendix 15 presents in detail the approach to be followed for back-testing and the plus factor. Banks are expected to strictly comply with this approach.
- (m) As stated earlier in Section CA-14.1, banks applying models will also be subject to a capital charge to cover specific risk (as defined under the standardised approach) of interest rate related instruments and equity instruments. The manner in which the specific risk capital charge is to be calculated is set out in Section CA-14.10.





MODULE	CA: Capital Adequacy
CHAPTER	CA-14: Market Risk - Use of Internal Models

## CA-14.6 Back-testing

CA-14.6.1

The contents of this Section outline the key requirements as set out in Appendix 15. The appendix presents in detail the approach to be followed for back-testing by the banks.

### *Key Requirements*

CA-14.6.2

The contents of this Section lay down recommendations for carrying out back-testing procedures in order to determine the accuracy and robustness of bank's internal models for measuring market risk capital requirements. These back-testing procedures typically consist of a periodic comparison of the bank's daily value-at-risk measures with the subsequent daily profit or loss ("trading outcome"). The procedure involves calculating and identifying the number of times over the prior 250 business days that observed daily trading losses exceed the bank's one-day, 99% confidence level VaR estimate (so-called "exceptions").

CA-14.6.3

Based on the number of exceptions identified from the back-testing procedures, the banks will be classified into three exception categories for the determination of the "scaling factor" to be applied to the banks' market risk measure generated by its internal models. The three categories, termed as zones and distinguished by colours into a hierarchy of responses, are listed below:

- (a) Green zone;
- (b) Yellow zone; and
- (c) Red zone.

CA-14.6.4

The green zone corresponds to back-testing results that do not themselves suggest a problem with the quality or accuracy of a bank's internal model. The yellow zone encompasses results that do raise questions in this regard, but where such a conclusion is not definitive. The red zone indicates a back-testing result that almost certainly indicates a problem with a bank's risk model.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-14: Market Risk - Use of Internal Models</b>

### CA-14.6 Back-testing (continued)

**CA-14.6.5** The corresponding “scaling factors” applicable to banks falling into respective zones based on their back-testing results are shown in Table 2 of the Appendix 15.



MODULE	CA: Capital Adequacy
CHAPTER	CA-14: Market Risk - Use of Internal Models

## CA-14.7 Stress Testing

**CA-14.7.1** Banks that use the internal models approach for calculating market risk capital requirements must have in place a rigorous and comprehensive stress testing programme. Stress testing to identify events or influences that could greatly impact the bank is a key component of a bank's assessment of its capital position.

**CA-14.7.2** Banks' stress scenarios need to cover a range of factors that can create extraordinary losses or gains in trading portfolios, or make the control of risk in those portfolios very difficult. These factors include low-probability events in all major types of risks, including the various components of market, credit and operational risks. Stress scenarios need to shed light on the impact of such events on positions that display both linear and non-linear characteristics (i.e., options and instruments that have option-like characteristics).

**CA-14.7.3** Banks' stress tests should be both of a quantitative and qualitative nature, incorporating both market risk and liquidity aspects of market disturbances. Quantitative criteria should identify plausible stress scenarios to which banks could be exposed. Qualitative criteria should emphasise that two major goals of stress testing are to evaluate the capacity of the bank's capital to absorb potential large losses and to identify steps the bank can take to reduce its risk and conserve capital. This assessment is integral to setting and evaluating the bank's management strategy and the results of stress testing should be routinely communicated to senior management and, periodically, to the bank's board of directors.

**CA-14.7.4** Banks must combine the use of stress scenarios as advised under (a), (b) and (c) below by the CBB, with stress tests developed by the banks themselves to reflect their specific risk characteristics. The CBB may ask banks to provide information on stress testing in three broad areas, as discussed below:



MODULE	CA: Capital Adequacy
CHAPTER	CA-14: Market Risk - Use of Internal Models

#### CA-14.7 Stress Testing (continued)

(a) *Scenarios requiring no simulation by the bank:*

Banks must have information on the largest losses experienced during the reporting period available for review by the CBB. This loss information will be compared with the level of capital that results from a bank's internal measurement system. For example, it could provide the CBB with a picture of how many days of peak day losses would have been covered by a given value-at-risk estimate.

(b) *Scenarios requiring simulation by the bank:*

Banks must subject their portfolios to a series of simulated stress scenarios and provide the CBB with the results. These scenarios could include testing the current portfolio against past periods of significant disturbance, for example, the 9/11 attacks on the USA, the 1987 equity market crash, the Exchange Rate Mechanism crises of 1992 and 1993 or the fall in the international bond markets in the first quarter of 1994, the 1998 Russian financial crisis, the 2000 bursting of the technology stock bubble or the 2007/2008 sub-prime crisis, incorporating both the large price movements and the sharp reduction in liquidity associated with these events. A second type of scenario would evaluate the sensitivity of the bank'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 bank's current positions against the extreme values of the historical range. Due consideration should be given to the sharp variation that, at times, has occurred in a matter of days in periods of significant market disturbance. For example, the above-mentioned situations involved correlations within risk factors approaching the extreme values of 1 and -1 for several days at the height of the disturbance.



MODULE	CA: Capital Adequacy
CHAPTER	CA-14: Market Risk - Use of Internal Models

### CA-14.7 Stress Testing (continued)

- (c) *Scenarios developed by the bank to capture the specific characteristics of its portfolio:*

In addition to the general scenarios prescribed by the CBB under (a) and (b) above, each bank must also develop its own stress scenarios which it identifies as most adverse based on the characteristics of its portfolio (e.g., any significant political or economic developments that may result in a sharp move in oil prices). Banks must provide the CBB with a description of the methodology used to identify and carry out the scenarios as well as with a description of the results derived from these stress tests.

CA-14.7.5

Once a stress scenario has been identified, it should be used for conducting stress tests at least once every quarter, as long as the scenario continues to be relevant to the bank's portfolio.

CA-14.7.6

The results of all stress tests should be reviewed by senior management within 15 days from the time they are available, and should be promptly reflected in the policies and limits set by management and the board of directors. Moreover, if the testing reveals particular vulnerability to a given set of circumstances, the CBB would expect the bank to take prompt steps to manage those risks appropriately (e.g., by hedging against that outcome or reducing the size of its exposures).

CA-14.7.7

Banks must conduct, at least weekly, a set of pre-determined stress-tests for the correlation trading portfolio encompassing shocks to default rates, recovery rates, credit spreads, and correlations. Appendix CA-19 provides guidance on the stress testing that must be undertaken to satisfy this requirement.



MODULE	CA: Capital Adequacy
CHAPTER	CA-14: Market Risk - Use of Internal Models

## CA-14.8 External Validation of Models

**CA-14.8.1** Before granting its approval for the use of internal models by a bank, the CBB will require that the models are validated by both the internal and external auditors of the bank. The CBB will review the validation procedures performed by the internal and external auditors, and may independently carry out further validation procedures.

**CA-14.8.2** The internal validation procedures to be carried out by the internal auditors are set out in Section CA-14.3. As stated in that Section, the internal auditor's review of the overall risk management process should take place at regular intervals (not less than once every six months). The internal auditor shall make a report to senior management and the board of directors, in writing, of the results of the validation procedures. The report shall be made available to the CBB for its review.

**CA-14.8.3** The validation of the models by the external auditors should include, at a minimum, the following steps:

- (a) Verifying and ensuring that the internal validation processes described in Section CA-14.3 are operating satisfactorily;
- (b) Ensuring 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 trading area;
- (c) Checking and ensuring that the structure of the internal models is adequate with respect to the bank's activities and geographical coverage;
- (d) Checking the results of the bank's back-testing of its internal measurement system (i.e., comparing value-at-risk estimates with actual profits and losses) to ensure that the model provides a reliable measure of potential losses over time; and
- (e) Making sure that data flows and processes associated with the risk measurement system are transparent and accessible.



MODULE	CA: Capital Adequacy
CHAPTER	CA-14: Market Risk - Use of Internal Models

#### CA-14.8 External Validation of Models (continued)

CA-14.8.4 The external auditors should carry out their validation/review procedures, at a minimum, once every year. Based on the above procedures, the external auditors shall make a report, in writing, on the accuracy of the bank's models, including all significant findings of their work. The report shall be addressed to the senior management and/or the board of directors of the bank, and a copy of the report shall be made available to the CBB. The mandatory annual review by the external auditors shall be carried out during the third quarter of the calendar year, and the CBB expects to receive their final report by 30 September of each year. The results of additional validation procedures carried out by the external auditors at other times during the year, should be made available to the CBB promptly.

CA-14.8.5 Banks are required to ensure that external auditors and the CBB's representatives are in a position to have easy access, whenever they judge it necessary and under appropriate procedures, to the models' specifications and parameters as well as to the results of, and the underlying inputs to, their value-at-risk calculations.



MODULE	CA: Capital Adequacy
CHAPTER	CA-14: Market Risk - Use of Internal Models

## CA-14.9 Letter of Model Recognition

### CA-14.9.1

As stated in Section CA-14.1, banks which propose to use internal models for the calculation of their market risk capital requirements should submit their detailed proposals, in writing, to the CBB. The CBB will review these proposals, and upon ensuring that the bank's internal models meet all the criteria for recognition set out earlier in this chapter, and after satisfying itself with the results of validation procedures carried out by the internal and external auditors and/or by itself, will issue a letter of model recognition to the bank.

### CA-14.9.2

The letter of model recognition should be specific. It will set out the products covered, the method for calculating capital requirements on the products and the conditions of model recognition. In the case of pre-processing models, the bank will also be told how the output of recognised models should feed into the processing of other interest rate, equity, foreign exchange and commodities risk. The conditions of model recognition may include additional reporting requirements. The CBB's prior written approval should be obtained for any modifications proposed to be made to the models previously recognised by the CBB. In cases where a bank proposes to apply the model to new but similar products, there will be a requirement to obtain the CBB's prior approval. In some cases, the CBB may be able to give provisional approval for the model to be applied to a new class of products, in others it will be necessary to revisit the bank.

### CA-14.9.3

The CBB may withdraw its approval granted for any bank's model if it believes that the conditions based on which the approval was granted are no longer valid or have changed significantly.





<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-14: Market Risk - Use of Internal Models</b>

## CA-14.10 Combination of Internal Models and the Standardised Methodology

### CA-14.10.1

Unless a bank's exposure to a particular risk factor is insignificant, the internal models approach will, in principle, require banks to have an integrated risk measurement system that captures the broad risk factor categories (i.e., interest rates, exchange rates (which includes gold), equity prices and commodity prices, with related options volatilities being included in each risk factor category). Thus, banks which start to use models for one or more risk factor categories will, over a reasonable period of time, be expected to extend the models to all their market risks.

### CA-14.10.2

A bank which has obtained the CBB's approval for the use of one or more models will no longer be able to revert to measuring the risk measured by those models according to the standardised methodology (unless the CBB withdraws its approval for the model(s), as explained in Section CA-14.9). However, what constitutes a reasonable period of time for an individual bank which uses a combination of internal models and the standardised methodology to move to a comprehensive model, will be decided by the CBB after taking into account the relevant circumstances of the bank.

### CA-14.10.3

Notwithstanding the goal of moving to comprehensive internal models as set out in Paragraph CA-14.10.1 above, for banks which, for the time being, will be applying a combination of internal models and the standardised methodology, the following conditions will apply:

- (a) Each broad risk factor category must be assessed by applying a single approach (either internal models or the standardised approach), i.e., no combination of the two methods will, in principle, be permitted within a risk factor category or across a bank's different entities for the same type of risk (see, however, the transitional provisions in Section CA-A.4)<sup>82</sup>;
- (b) All of the criteria laid down in this chapter will apply to the models being used;

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<sup>82</sup> However, banks may incur risks in positions which are not captured by their models, for example, in minor currencies or in negligible business areas. Such risks should be measured according to the standard methodology.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-14: Market Risk - Use of Internal Models</b>

#### CA-14.10 Combination of Internal Models and the Standardised Methodology (continued)

- (c) Banks may not modify the combination of the two approaches which they are applying, without justifying to the CBB that they have a valid reason for doing so, and obtaining the CBB's prior written approval;
- (d) No element of market risk may escape measurement, i.e. the exposure for all the various risk factors, whether calculated according to the standardised approach or internal models, would have to be captured; and
- (e) The capital charges assessed under the standardised approach and under the models approach should be aggregated applying the simple sum method.



MODULE	CA: Capital Adequacy
CHAPTER	CA-14: Market Risk - Use of Internal Models

## CA-14.11 Treatment of Specific Risk

**CA-14.11.1** Where a bank has a VaR measure that incorporates specific risk from equity risk positions and where the CBB has determined that the bank meets all the qualitative and quantitative requirements for general market risk models, as well as the additional criteria and requirements set out in Paragraphs CA-14.11.1 to CA-14.11.6 below, the bank is not required to subject its equity positions to the capital charge according to the standardised measurement method as specified in Paragraphs CA-10.1.1 to CA-10.5.7.

**CA-14.11.1A** For interest rate risk positions other than securitisation exposures and n-th-to-default credit derivatives, the bank will not be required to subject these positions to the standardised capital charge for specific risk, as specified in Paragraphs CA-9.1.4 to CA-9.3.1, when all of the following conditions hold:

- (a) The bank has a value-at-risk measure that incorporates specific risk and the CBB has determined that the bank meets all the qualitative and quantitative requirements for general market risk models, as well as the additional criteria and requirements set out in Paragraphs CA-14.11.2 to CA-14.11.6 below; and
- (b) The CBB is satisfied that the bank's internally developed approach adequately captures incremental default and migration risks for positions subject to specific interest rate risk according to the standards laid out in Paragraphs CA-14.11.7 and CA-14.11.8 below.

The bank is allowed to include its securitisation exposures and n-th-to-default credit derivatives in its value-at-risk measure. Notwithstanding, it is still required to hold additional capital for these products according to the standardised measurement methodology, with the exceptions noted in Paragraphs CA-14.11.9 to CA-14.11.12 below.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-14: Market Risk - Use of Internal Models</b>

## CA-14.11 Treatment of Specific Risk (continued)

- CA-14.11.2 The criteria for supervisory recognition of banks' modelling of specific risk require that a bank's model must capture all material components of price risk<sup>83</sup> and be responsive to changes in market conditions and compositions of portfolios. In particular, the model must:
- (a) Explain the historical price variation in the portfolio<sup>84</sup>;
  - (b) Demonstrably capture concentration (magnitude and changes in composition)<sup>85</sup>;
  - (c) Be robust to an adverse environment<sup>86</sup>;
  - (d) Capture name-related basis risk<sup>87</sup>;
  - (e) Capture event risk<sup>88</sup>; and
  - (f) Be validated through back-testing<sup>89</sup> aimed at assessing whether specific risk is being accurately captured.

In addition, the bank must be able to demonstrate that it has methodologies in place which allow it to adequately capture event and default risk for its traded debt and equity positions.

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<sup>83</sup> Banks need not capture default and migration risks for positions subject to the incremental risk capital charge referred to in Paragraphs CA-14.11.7 and CA-14.11.8.

<sup>84</sup> The key measurement of model quality are "goodness-of-fit" measures which address the question of how much of the historical variation in price value is explained by the model. One measure of this type which can often be used is an R-squared measure from regression methodology. If this measure is to be used, the bank's model would be expected to be able to explain a high percentage, such as 90%, of the historical price variation or to explicitly include estimates of the residual variability not captured in the factors included in this regression. For some types of model, it may not be feasible to calculate a goodness-of-fit measure. In such an instance, a bank is expected to contact the CBB to define an acceptable alternative measure which would meet this regulatory objective.

<sup>85</sup> The bank should be expected to demonstrate that the model is sensitive to changes in portfolio construction and that higher capital charges are attracted for portfolios that have increasing concentrations.

<sup>86</sup> The bank should be able to demonstrate that the model will signal rising risk in an adverse environment. This could be achieved by incorporating in the historical estimation period of the model at least one full credit cycle and ensuring that the model would not have been inaccurate in model at least one full the downward portion of the cycle. Another approach for demonstrating this is through simulation of historical or plausible worst-case environments.

<sup>87</sup> Banks should be able to demonstrate that the model is sensitive to material idiosyncratic differences between similar but not identical positions, for example debt positions with different levels of subordination, maturity mismatches, or credit derivatives with different default events.

<sup>88</sup> For equity positions, events that are reflected in large changes or jumps in prices must be captured, e.g. merger break-ups/takeovers. In particular, firms must consider issues related to survivorship bias.

<sup>89</sup> Aimed at assessing whether specific risk, as well as general market risk, is being captured adequately.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-14: Market Risk - Use of Internal Models</b>

## CA-14.11 Treatment of Specific Risk (continued)

### CA-14.11.3

Banks which meet the criteria set out above for models but do not have methodologies in place to adequately capture event and default risk will be required to calculate their specific risk capital charge based on the internal model measurements plus an additional prudential surcharge as defined in Paragraph CA-14.11.4. The surcharge is designed to treat the modelling of specific risk on the same basis as a general market risk model that has proven deficient during back-testing. That is the equivalent of a scaling factor of four would apply to the estimate of specific risk until such time as a bank can demonstrate that the methodologies it uses adequately capture event and default risk. Once a bank is able to demonstrate this, the minimum multiplication factor of three can be applied. However, a higher multiplication factor of four on the modelling of specific risk would remain possible if future back-testing results were to indicate a serious deficiency in the model.

### CA-14.11.4

For banks applying the surcharge, the total market risk measure will equal a minimum of three times the internal model's general and specific risk measure plus a surcharge in the amount of either:

- (a) The specific risk portion of the value-at-risk measure which should be isolated<sup>90</sup>; or, at the bank's option: and
- (b) The value-at-risk measures of sub-portfolios of debt and equity positions that contain specific risk<sup>91</sup>.

<sup>90</sup> Techniques for separating general market risk and specific risk would include the following:

**Equities:**

The market should be identified with a single factor that is representative of the market as a whole, for example, a widely accepted broadly based stock index for the country concerned.

Banks that use factor models may assign one factor of their model, or a single linear combination of factors, as their general market risk factor.

**Bonds:**

The market should be identified with a reference curve for the currency concerned. For example, the curve might be a government bond yield curve or a swap curve; in any case, the curve should be based on a well-established and liquid underlying market and should be accepted by the market as a reference curve for the currency concerned.

Banks may select their own technique for identifying the specific risk component of the value-at-risk measure for purposes of applying the multiplier of 4. Techniques would include:

- Using the incremental increase in value-at-risk arising from the modelling of specific risk factors;
- Applying the difference between the value-at-risk measure and a measure calculated by substituting each individual equity position by a representative index; or
- Applying an analytic separation between general market risk and specific risk by a particular model.

<sup>91</sup> This would apply to sub-portfolios containing positions that would be subject to specific risk under the standardised approach.



MODULE	CA: Capital Adequacy
CHAPTER	CA-14: Market Risk - Use of Internal Models

### CA-14.11 Treatment of Specific Risk (continued)

Banks applying option (b) above are required to identify their sub-portfolios structure ahead of time and should not change it without the CBB's prior written consent.

**CA-14.11.4A** The bank's model must conservatively assess the risk arising from less liquid positions and/or positions with limited price transparency under realistic market scenarios. In addition, the model must meet minimum data standards. Proxies may be used only where available data is insufficient or is not reflective of the true volatility of a position or portfolio, and only where they are appropriately conservative.

**CA-14.11.4B** Further, as techniques and best practices evolve, banks should avail themselves of these advances.

**CA-14.11.5** Banks which apply modelled estimates of specific risk are required to conduct back-testing aimed at assessing whether specific risk is being accurately captured. The methodology a bank must use for validating its specific risk estimates is to perform separate back-tests on sub-portfolios using daily data on sub-portfolios subject to specific risk. The key sub-portfolios for this purpose are traded debt and equity positions. However, if a bank itself decomposes its trading portfolio into finer categories (e.g., emerging markets, traded corporate debt, etc.), it is appropriate to keep these distinctions for sub-portfolio back-testing purposes. Banks are required to commit to a sub-portfolio structure and stick to it unless it can be demonstrated to the CBB that it would make sense to change the structure.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-14: Market Risk - Use of Internal Models</b>

### CA-14.11 Treatment of Specific Risk (continued)

#### CA-14.11.6

Banks are required to have in place a process to analyse exceptions identified through the back-testing of specific risk. This process is intended to serve as the fundamental way in which banks correct their models of specific risk in the event they become inaccurate. There will be a presumption that models that incorporate specific risk are "unacceptable" if the results at the sub-portfolio level produce a number of exceptions commensurate with the Red Zone<sup>92</sup>. Banks with "unacceptable" specific risk models are expected to take immediate action to correct the problem in the model and to ensure that there is a sufficient capital buffer to absorb the risk that, the back-test showed, had not been adequately captured.

#### CA-14.11.7

In addition, the bank must have an approach in place to capture in its regulatory capital default risk and migration risk in positions subject to a capital charge for specific interest rate risk, with the exception of securitisation exposures and n-th-to-default credit derivatives, that are incremental to the risks captured by the VaR-based calculation as specified in Paragraph CA-14.11.2 above ("incremental risks"). No specific approach for capturing the incremental risks is prescribed. The Basel Committee provides guidelines to specify the positions and risks to be covered by this incremental risk capital charge which are incorporated in Section CA-14.13.

#### CA-14.11.8

The bank must demonstrate that the approach used to capture incremental risks meets a soundness standard comparable to that of the internal-ratings based approach for credit risk as set forth in this Framework, under the assumption of a constant level of risk, and adjusted where appropriate to reflect the impact of liquidity, concentrations, hedging, and optionality. A bank that does not capture the incremental risks through an internally developed approach must use the specific risk capital charges under the standardised measurement method as set out in Paragraphs CA-9.2.3 to CA-9.2.17 and CA-10.3.2.

#### CA-14.11.9

Subject to CBB approval, a bank may incorporate its correlation trading portfolio in an internally developed approach that adequately captures not only incremental default and migration risks, but all price risks ("comprehensive risk measure"). The value of such products is subject in particular to the following risks which must be adequately captured:

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<sup>92</sup> As defined in the Basel Committee's document titled "Supervisory framework for the use of back-testing in conjunction with the internal models approach to market risk capital requirements".





<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-14: Market Risk - Use of Internal Models</b>

### CA-14.11 Treatment of Specific Risk (continued)

- (a) The cumulative risk arising from multiple defaults, including the ordering of defaults, in tranching products;
- (b) Credit spread risk, including the gamma and cross-gamma effects;
- (c) Volatility of implied correlations, including the cross effect between spreads and correlations;
- (d) Basis risk, including both:
  - (i) The basis between the spread of an index and those of its constituent single names; and
  - (ii) The basis between the implied correlation of an index and that of bespoke portfolios;
- (e) Recovery rate volatility, as it relates to the propensity for recovery rates to affect tranche prices; and
- (f) To the extent the comprehensive risk measure incorporates benefits from dynamic hedging, the risk of hedge slippage and the potential costs of rebalancing such hedges.

The approach must meet all of the requirements specified in Paragraphs CA-14.11.8, CA-14.11.10 and CA-14.11.11. This exception only applies to banks that are active in buying and selling these products. For the exposures that the bank does incorporate in this internally developed approach, the bank will be required to subject them to the capital charge for specific risk according to the standardised measurement method or the treatment according to Paragraph CA-14.11.8, as applicable. It must, however, incorporate them in both the value-at-risk and stressed value-at-risk measures.

#### CA-14.11.10

For a bank to apply this exception, it must:

- (a) Have sufficient market data to ensure that it fully captures the salient risks of these exposures in its comprehensive risk measure in accordance with the standards set forth above;
- (b) Demonstrate (for example, through backtesting) that its risk measures can appropriately explain the historical price variation of these products; and
- (c) Ensure that it can separate the positions for which it holds approval to incorporate them in its comprehensive risk measure from those positions for which it does not hold this approval.





MODULE	CA: Capital Adequacy
CHAPTER	CA-14: Market Risk - Use of Internal Models

## CA-14.11 Treatment of Specific Risk (continued)

### CA-14.11.11

In addition to these data and modelling criteria, for a bank to apply this exception it must regularly apply a set of specific, predetermined stress scenarios to the portfolio that receives internal model regulatory capital treatment (i.e., the ‘correlation trading portfolio’). These stress scenarios will examine the implications of stresses to (i) default rates, (ii) recovery rates, (iii) credit spreads, and (iv) correlations on the correlation trading desk’s P&L. The bank must apply these stress scenarios at least weekly and report the results, including comparisons with the capital charges implied by the banks’ internal model for estimating comprehensive risks, at least quarterly to the CBB. Any instances where the stress tests indicate a material shortfall of the comprehensive risk measure must be reported to the CBB in a timely manner. Based on these stress testing results, the CBB may impose a supplemental capital charge against the correlation trading portfolio, to be added to the bank’s internally modelled capital requirement.

### CA-14.11.12

A bank must calculate the incremental risk measure according to Paragraph CA-14.11.7 and the comprehensive risk measure according to Paragraph CA-14.11.9 at least weekly, or more frequently as directed by its supervisor. The capital charge for incremental risk is given by a scaling factor of 1.0 times the maximum of (i) the average of the incremental risk measures over 12 weeks; and (ii) the most recent incremental risk measure. Likewise, the capital charge for comprehensive risk is given by a scaling factor of 1.0 times the maximum of (i) the average of the comprehensive risk measures over 12 weeks; and (ii) the most recent comprehensive risk measure. Both capital charges are added up. There will be no adjustment for double counting between the comprehensive risk measure and any other risk measures.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-14: Market Risk - Use of Internal Models</b>

## CA-14.12 Model Validation Standards

### CA-14.12.1

It is important that banks have processes in place to ensure that their internal models have been adequately validated by suitably qualified parties independent of the development process to ensure that they are conceptually sound and adequately capture all material risks. This validation should be conducted when the model is initially developed and when any significant changes are made to the model. The validation should also be conducted on a periodic basis but especially where there have been any significant structural changes in the market or changes to the composition of the portfolio which might lead to the model no longer being adequate. More extensive model validation is particularly important where specific risk is also modelled and is required to meet the further specific risk criteria. As techniques and best practices evolve, banks must avail themselves of these advances. Model validation should not be limited to back-testing, but should, at a minimum, also include the following:

- (a) Tests to demonstrate that any assumptions made within the internal model are appropriate and do not underestimate risk. This may include the assumption of the normal distribution, the use of the square root of time to scale from a one day holding period to a 10 day holding period or where extrapolation or interpolation techniques are used, or pricing models;
- (b) Further to the regulatory back-testing programmes, testing for model validation must use hypothetical changes in portfolio value that would occur were end-of-day positions to remain unchanged. It therefore excludes fees, commissions, bid-ask spreads, net interest income and intra-day trading. Moreover, additional tests are required, which may include, for instance:
  - (i) Testing carried out using hypothetical changes in portfolio value that would occur were end-of-day positions to remain unchanged. It therefore excludes fees, commissions, bid-ask spreads, net interest income and intra-day trading;
  - (ii) Testing carried out for longer periods than required for the regular back-testing programme (e.g. 3 years). The longer time period generally improves the power of the back-testing. A longer time period may not be desirable if the VaR model or market conditions have changed to the extent that historical data is no longer relevant;
  - (iii) Testing carried out using confidence intervals other than the 99 percent interval required under the quantitative standards;
  - (iv) Testing of portfolios below the overall bank level;



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-14: Market Risk – Use of Internal Models</b>

#### CA-14.12 Model Validation Standards (continued)

- (c) The use of hypothetical portfolios to ensure that the model is able to account for particular structural features that may arise, for example:
- (i) Where data histories for a particular instrument do not meet the quantitative standards and where the bank has to map these positions to proxies, then the bank must ensure that the proxies produce conservative results under relevant market scenarios;
  - (ii) Ensuring that material basis risks are adequately captured. This may include mismatches between long and short positions by maturity or by issuer;
  - (iii) Ensuring that the model captures concentration risk that may arise in an undiversified portfolio.



MODULE	CA: Capital Adequacy
CHAPTER	CA-14: Market Risk - Use of Internal Models

### CA-14.13 Principles for Calculating the Incremental Risk Charge (IRC)

#### *IRC-covered Positions and Risks*

CA-14.13.1 According to Paragraph CA-14.11.7, the IRC encompasses all positions subject to a capital charge for specific interest rate risk according to the internal models approach to specific market risk but not subject to the treatment outlined in Paragraphs CA-9.2.11A, and CA-9.2.11B and C, regardless of their perceived liquidity.

CA-14.13.2 With CBB approval, a bank can choose consistently to include all listed equity and derivatives positions based on listed equity of a desk in its incremental risk model when such inclusion is consistent with how the bank internally measures and manages this risk at the trading desk level. If equity securities are included in the computation of incremental risk, default is deemed to occur if the related debt defaults (as defined in Paragraphs CA-5.8.63 and CA-5.8.64).

**CA-14.13.3** However, when computing the IRC, a bank is not permitted to incorporate into its IRC model any securitisation positions, even when securitisation positions are viewed as hedging underlying credit instruments held in the trading account.

CA-14.13.4 For IRC-covered positions, the IRC captures:

- (a) Default risk. This means the potential for direct loss due to an obligor's default as well as the potential for indirect losses that may arise from a default event; and
- (b) Credit migration risk. This means the potential for direct loss due to an internal/external rating downgrade or upgrade as well as the potential for indirect losses that may arise from a credit migration event.

#### *Key Supervisory Parameters for Computing IRC*

##### *Soundness Standard Comparable to IRB*

CA-14.13.5 One of the underlying objectives of the IRB is to achieve broad consistency between capital charges for similar positions (adjusted for illiquidity) held in the banking and trading books. Since the Framework reflects a 99.9 percent soundness standard over a one-year capital horizon, the IRC is also described in these terms.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-14: Market Risk - Use of Internal Models</b>

**CA-14.13 Principles for Calculating the IRC (continued)**

**CA-14.13.6** Specifically, for all IRC-covered positions, a bank’s IRC model must measure losses due to default and migration at the 99.9 percent confidence interval over a capital horizon of one year, taking into account the liquidity horizons applicable to individual trading positions or sets of positions. Losses caused by broader market-wide events affecting multiple issues/issuers are encompassed by this definition.

**CA-14.13.7** As described immediately below, for each IRC-covered position the model must also capture the impact of rebalancing positions at the end of their liquidity horizons so as to achieve a constant level of risk over a one-year capital horizon. The model may incorporate correlation effects among the modeled risk factors, subject to validation standards set forth in Section III. The trading portfolio’s IRC equals the IRC model’s estimate of losses at the 99.9 percent confidence level.

*Constant Level of Risk over One-Year Capital Horizon*

**CA-14.13.8** An IRC model must be based on the assumption of a constant level of risk over the one-year capital horizon<sup>93</sup>.

CA-14.13.9 This constant level of risk assumption implies that a bank rebalances, or rolls over, its trading positions over the one-year capital horizon in a manner that maintains the initial risk level, as indicated by a metric such as VaR or the profile of exposure by credit rating and concentration. This means incorporating the effect of replacing positions whose credit characteristics have improved or deteriorated over the liquidity horizon with positions that have risk characteristics equivalent to those that the original position had at the start of the liquidity horizon. The frequency of the assumed rebalancing must be governed by the liquidity horizon for a given position.

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<sup>93</sup> This assumption is consistent with the capital computations in the IRB Framework. In all cases (loans, derivatives and repos), the IRB Framework defines EAD in a way that reflects a roll-over of existing exposures when they mature.

The combination of the constant level of risk assumption and the one-year capital horizon reflects supervisors’ assessment of the appropriate capital needed to support the risk in the trading portfolio. It also reflects the importance to the financial markets of banks having the capital capacity to continue providing liquidity to the financial markets in spite of trading losses. Consistent with a “going concern” view of a bank, this assumption is appropriate because a bank must continue to take risks to support its income-producing activities. For regulatory capital adequacy purposes, it is not appropriate to assume that a bank would reduce its VaR to zero at a short-term horizon in reaction to large trading losses. It also is not appropriate to rely on the prospect that a bank could raise additional Tier 1 capital during stressed market conditions.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-14: Market Risk - Use of Internal Models</b>

### CA-14.13 Principles for Calculating the IRC (continued)

CA-14.13.10 Rebalancing positions does not imply, as the IRB approach for the banking book does, that the same positions will be maintained throughout the capital horizon. Particularly for more liquid and more highly rated positions, this provides a benefit relative to the treatment under the IRB framework. However, a bank may elect to use a one-year constant position assumption, as long as it does so consistently across all portfolios.

#### *Liquidity Horizon*

CA-14.13.11 Stressed credit market events have shown that market participants cannot assume that markets remain liquid under those conditions. Banks experienced significant illiquidity in a wide range of credit products held in the trading book, including leveraged loans. Under these circumstances, liquidity in many parts of the securitisation markets dried up, forcing banks to retain exposures in securitisation pipelines for prolonged periods of time. The CBB therefore expects banks to pay particular attention to the appropriate liquidity horizon assumptions within their IRC models.

**CA-14.13.12** The liquidity horizon represents the time required to sell the position or to hedge all material risks covered by the IRC model in a stressed market. The liquidity horizon must be measured under conservative assumptions and should be sufficiently long that the act of selling or hedging, in itself, does not materially affect market prices. The determination of the appropriate liquidity horizon for a position or set of positions may take into account a bank's internal policies relating to, for example, prudent valuation (as per the prudent valuation guidance of Chapter CA-16), valuation adjustments<sup>94</sup> and the management of stale positions.

CA-14.13.13 The liquidity horizon for a position or set of positions has a floor of three months.

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<sup>94</sup> For establishing prudent valuation adjustments, see also Paragraphs CA-8.2.10 to CA-8.2.13.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-14: Market Risk - Use of Internal Models</b>

### CA-14.13 Principles for Calculating the IRC (continued)

- CA-14.13.14 In general, within a given product type a non-investment-grade position is expected to have a longer assumed liquidity horizon than an investment-grade position. Conservative assumptions regarding the liquidity horizon for non-investment-grade positions are warranted until further evidence is gained regarding the market's liquidity during systematic and idiosyncratic stress situations. Banks also need to apply conservative liquidity horizon assumptions for products, regardless of rating, where secondary market liquidity is not deep, particularly during periods of financial market volatility and investor risk aversion. The application of prudent liquidity assumptions is particularly important for rapidly growing product classes that have not been tested in a downturn.
- CA-14.13.15 A bank can assess liquidity by position or on an aggregated basis ("buckets"). If an aggregated basis is used (e.g. investment-grade European corporate exposures not part of a core CDS index), the aggregation criteria would be defined in a way that meaningfully reflect differences in liquidity.
- CA-14.13.16 The liquidity horizon is expected to be greater for positions that are concentrated, reflecting the longer period needed to liquidate such positions. This longer liquidity horizon for concentrated positions is necessary to provide adequate capital against two types of concentration: issuer concentration and market concentration.

#### *Correlations and Diversification*

##### *(a) Correlations between Defaults and Migrations*

- CA-14.13.17 Economic and financial dependence among obligors causes a clustering of default and migration events. Accordingly, the IRC charge includes the impact of correlations between default and migration events among obligors and a bank's IRC model must include the impact of such clustering of default and migration events.

##### *(b) Correlations between Default or Migration Risks and other Market Factors*

- CA-14.13.18 The impact of diversification between default or migration risks in the trading book and other risks in the trading book is not currently well understood. Therefore, for the time being, the impact of diversification between default or migration events and other market variables would not be reflected in the computation of capital for incremental risk. This is consistent with the IRB Framework, which does not allow for the benefit of diversification when combining capital requirements for credit risk and market risk. Accordingly, the capital charge for incremental default and migration losses is added to the VaR-based capital charge for market risk.





MODULE	CA: Capital Adequacy
CHAPTER	CA-14: Market Risk - Use of Internal Models

### CA-14.13 Principles for Calculating the IRC (continued)

#### *Concentration*

**CA-14.13.19** A bank's IRC model must appropriately reflect issuer and market concentrations. Thus, other things being equal, a concentrated portfolio should attract a higher capital charge than a more granular portfolio (see also Paragraph CA-14.13.23). Concentrations that can arise within and across product classes under stressed conditions must also be reflected.

#### *Risk Mitigation and Diversification Effects*

**CA-14.13.20** Within the IRC model, exposure amounts may be netted only when long and short positions refer to the same financial instrument. Otherwise, exposure amounts must be captured on a gross (i.e. non-netted) basis. Thus, hedging or diversification effects associated with long and short positions involving different instruments or different securities of the same obligor ("intra-obligor hedges"), as well as long and short positions in different issuers ("interobligor hedges"), may not be recognised through netting of exposure amounts. Rather, such effects may only be recognised by capturing and modelling separately the gross long and short positions in the different instruments or securities.

**CA-14.13.21** Significant basis risks by product, seniority in the capital structure, internal or external rating, maturity, vintage for offsetting positions as well as differences between offsetting instruments, such as different payout triggers and procedures, should be reflected in the IRC model.

**CA-14.13.22** If an instrument has a shorter maturity than the liquidity horizon or a maturity longer than the liquidity horizon is not contractually assured, the IRC must, where material, include the impact of potential risks that could occur during the interval between the maturity of the instrument and the liquidity horizon.





MODULE	CA: Capital Adequacy
CHAPTER	CA-14: Market Risk - Use of Internal Models

### CA-14.13 Principles for Calculating the IRC (continued)

**CA-14.13.23** For trading book risk positions that are typically hedged via dynamic hedging strategies, a rebalancing of the hedge within the liquidity horizon of the hedged position may also be recognised. Such recognition is only admissible if the bank (i) chooses to model rebalancing of the hedge consistently over the relevant set of trading book risk positions, (ii) demonstrates that the inclusion of rebalancing results in a better risk measurement, and (iii) demonstrates that the markets for the instruments serving as hedge are liquid enough to allow for this kind of rebalancing even during periods of stress. Any residual risks resulting from dynamic hedging strategies must be reflected in the capital charge. A bank must validate its approach to capture such residual risks to the satisfaction of the CBB.

#### *Optionality*

**CA-14.13.24** The IRC model must reflect the impact of optionality. Accordingly, banks' models should include the nonlinear impact of options and other positions with material nonlinear behaviour with respect to price changes. The bank should also have due regard to the amount of model risk inherent in the valuation and estimation of price risks associated with such products.



MODULE	CA: Capital Adequacy
CHAPTER	CA-14: Market Risk - Use of Internal Models

### CA-14.13 Principles for Calculating the IRC (continued)

#### *Validation*

##### CA-14.13.25

Banks must apply the validation principles (see Section CA-14.12) in designing, testing and maintaining their IRC models. This includes evaluating conceptual soundness, ongoing monitoring that includes process verification and benchmarking, and outcomes analysis. Some factors that should be considered in the validation process include:

- (a) Liquidity horizons should reflect actual practice and experience during periods of both systematic and idiosyncratic stresses;
- (b) The IRC model for measuring default and migration risks over the liquidity horizon should take into account objective data over the relevant horizon and include comparison of risk estimates for a rebalanced portfolio with that of a portfolio with fixed positions;
- (c) Correlation assumptions must be supported by analysis of objective data in a conceptually sound framework. If a bank uses a multi-period model to compute incremental risk, it should evaluate the implied annual correlations to ensure they are reasonable and in line with observed annual correlations. A bank must validate that its modelling approach for correlations is appropriate for its portfolio, including the choice and weights of its systematic risk factors. A bank must document its modelling approach so that its correlation and other modelling assumptions are transparent to the CBB;
- (d) Owing to the high confidence standard and long capital horizon of the IRC, robust direct validation of the IRC model through standard back-testing methods at the 99.9%/one-year soundness standard will not be possible. Accordingly, validation of an IRC model necessarily must 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 model's treatment of concentrations. Given the nature of the IRC soundness standard such tests must not be limited to the range of events experienced historically. The validation of an IRC model represents an ongoing process in which the CBB and banks jointly determine the exact set of validation procedures to be employed; and
- (e) Banks should strive to develop relevant internal modelling benchmarks to assess the overall accuracy of their IRC models.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-14: Market Risk - Use of Internal Models</b>

### CA-14.13 Principles for Calculating the IRC (continued)

#### *Use of Internal Risk Measurement Models to Compute the IRC*

CA-14.13.26 As noted above, these guidelines do not prescribe any specific modelling approach for capturing incremental risk. Because a consensus does not yet exist with respect to measuring risk for potentially illiquid trading positions, it is anticipated that banks will develop different IRC modelling approaches.

**CA-14.13.27** The approach that a bank uses to measure the IRC is subject to the “use test”. Specifically, the approach must be consistent with the bank’s internal risk management methodologies for identifying, measuring, and managing trading risks.

**CA-14.13.28** Ideally, the supervisory principles set forth in this document would be incorporated within a bank’s internal models for measuring trading book risks and assigning an internal capital charge to these risks. However, in practice a bank’s internal approach for measuring trading book risks may not map directly into the above supervisory principles in terms of capital horizon, constant level of risk, rollover assumptions or other factors. In this case, the bank must demonstrate that the resulting internal capital charge would deliver a charge at least as high as the charge produced by a model that directly applies the supervisory principles.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-15: Gearing Requirements</b>

## CA-15.1 Gearing

**CA-15.1.1** The content of this Chapter is applicable to all locally incorporated banks and retail bank branches of foreign banks.

**CA-15.1.2** The Gearing ratio is measured with reference to the ratio of deposit liabilities against the bank's capital and reserves as reported in the PIR.

**CA-15.1.3** For retail and wholesale bank licensees, deposit liabilities should not exceed 20 times the respective bank's capital and reserves.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-16: Prudent Valuation Guidance</b>

## CA-16.1 Prudent Valuation Guidance

CA-16.1.1 This Section provides banks with guidance on prudent valuation for positions that are accounted for at fair value, whether they are in the trading book or in the banking book. This guidance is especially important for positions without actual market prices or observable inputs to valuation, as well as less liquid positions which, although they will not be excluded from the trading book solely on grounds of lesser liquidity, raise supervisory concerns about prudent valuation. The valuation guidance set forth below is not intended to require banks to change valuation procedures for financial reporting purposes. The CBB will assess a bank's valuation procedures for consistency with this guidance. One factor in the CBB's assessment of whether a bank must take a valuation adjustment for regulatory purposes under Paragraphs CA-16.1.11A to CA-16.1.13 is the degree of consistency between the bank's valuation procedures and these guidelines.

### CA-16.1.2

**A framework for prudent valuation practices must at a minimum include the following:**

#### *Systems and Controls*

### CA-16.1.3

**Banks must establish and maintain adequate systems and controls sufficient to give management and CBB the confidence that their valuation estimates are prudent and reliable. These systems must be integrated with other risk management systems within the organisation (such as credit analysis). Such systems must include:**

- (a) **Documented policies and procedures for the process of valuation. This includes clearly defined responsibilities of the various areas involved in the determination of the valuation, sources of market information and review of their appropriateness, guidelines for the use of unobservable inputs reflecting the bank's assumptions of what market participants would use in pricing position, frequency of independent valuation, timing of closing prices, procedures for adjusting valuations, end of the month and ad-hoc verification procedures; and**
- (b) **Clear and independent (i.e. independent of front office) reporting lines for the department accountable for the valuation process. The reporting line should ultimately be to a main board executive director.**



MODULE	CA: Capital Adequacy
CHAPTER	CA-16: Prudent Valuation Guidance

## CA-16.1 Prudent Valuation Guidance (Continued)

### *Valuation Methodologies*

#### *Marking to Market*

CA-16.1.4 Marking-to-market is at least the daily valuation of positions at readily available close out prices that are sourced independently. Examples of readily available close out prices include exchange prices, screen prices, or quotes from several independent reputable brokers.

#### CA-16.1.5

Banks must mark-to-market as much as possible. The more prudent side of bid/offer must be used unless the institution is a significant market maker in a particular position type and it can close out at mid-market. Banks should maximise the use of relevant observable inputs and minimise the use of unobservable inputs when estimating fair value using a valuation technique. However, observable inputs or transactions may not be relevant, such as in a forced liquidation or distressed sale, or transactions may not be observable, such as when markets are inactive. In such cases, the observable data should be considered, but may not be determinative.

#### *Marking to Model*

#### CA-16.1.6

Only where marking-to-market is not possible should banks mark-to-model, but this must be demonstrated to be prudent. Marking-to-model is defined as any valuation which has to be benchmarked, extrapolated or otherwise calculated from a market input.



<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-16: Prudent Valuation Guidance</b>

## CA-16.1 Prudent Valuation Guidance (Continued)

CA-16.1.7 When marking to model, an extra degree of conservatism is appropriate. The CBB will consider the following in assessing whether a mark-to-model valuation is prudent:

- (a) Senior management should be aware of the elements of the trading book or of other fair-valued positions which are subject to mark to model and should understand the materiality of the uncertainty this creates in the reporting of the risk/performance of the business;
- (b) Market inputs should be sourced, to the extent possible, in line with market prices (as discussed above). The appropriateness of the market inputs for the particular position being valued should be reviewed regularly;
- (c) Where available, generally accepted valuation methodologies for particular products should be used as far as possible;
- (d) Where the model is developed by the institution itself, it should be based on appropriate assumptions, which have been assessed and challenged by suitably qualified parties independent of the development process. The model should be developed or approved independently of the front office. It should be independently tested. This includes validating the mathematics, the assumptions and the software implementation;
- (e) There should be formal change control procedures in place and a secure copy of the model should be held and periodically used to check valuations;
- (f) Risk management should be aware of the weaknesses of the models used and how best to reflect those in the valuation output;
- (g) The model should be subject to periodic review to determine the accuracy of its performance (e.g. assessing continued appropriateness of the assumptions, analysis of P&L versus risk factors, comparison of actual close out values to model outputs); and
- (h) Valuation adjustments should be made as appropriate, for example, to cover the uncertainty of the model valuation (see also valuation adjustments in Paragraphs CA-16.1.10 to CA-16.1.13).

### *Independent Price Verification*

#### CA-16.1.8

Independent price verification is distinct from daily mark-to-market. It is the process by which market prices or model inputs are regularly verified for accuracy. While daily marking-to-market may be performed by dealers, verification of market prices or model inputs must be performed by a unit independent of the dealing room, at least monthly (or, depending on the nature of the market/trading activity, more frequently). It need not be performed as frequently as daily mark-to-market, since the objective, i.e. independent, marking of positions, should reveal any error or bias in pricing, which should result in the elimination of inaccurate daily marks.



MODULE	CA: Capital Adequacy
CHAPTER	CA-16: Prudent Valuation Guidance

## CA-16.1 Prudent Valuation Guidance (continued)

CA-16.1.9 Independent price verification entails a higher standard of accuracy in that the market prices or model inputs are used to determine profit and loss figures, whereas daily marks are used primarily for management reporting in between reporting dates. For independent price verification, where pricing sources are more subjective, e.g. only one available broker quote, prudent measures such as valuation adjustments may be appropriate.

### *Valuation Adjustments*

**CA-16.1.10** As part of their procedures for marking to market, banks must establish and maintain procedures for considering valuation adjustments. CBB expects banks using third-party valuations to consider whether valuation adjustments are necessary. Such considerations are also necessary when marking to model.

**CA-16.1.11** The CBB expects the following valuation adjustments/reserves to be formally considered at a minimum: unearned credit spreads, close-out costs, operational risks, early termination, investing and funding costs, and future administrative costs and, where appropriate, model risk.

### *Adjustment to the Current Valuation of Less Liquid Positions for Regulatory Capital Purposes*

**CA-16.1.11A** Banks must establish and maintain procedures for judging the necessity of and calculating an adjustment to the current valuation of less liquid positions for regulatory capital purposes. This adjustment may be in addition to any changes to the value of the position required for financial reporting purposes and should be designed to reflect the illiquidity of the position. The CBB expects banks to consider the need for an adjustment to a position's valuation to reflect current illiquidity whether the position is marked to market using market prices or observable inputs, third-party valuations or marked to model.

CA-16.1.11B 'Less liquid positions' would generally involve positions in OTC financial instruments or commodities which are not listed or which are not traded through a central counterparties (such as NYSE Euronext or Chicago Mercantile Exchange) or which do not have readily available secondary market prices or observable inputs to valuation.





<b>MODULE</b>	<b>CA: Capital Adequacy</b>
<b>CHAPTER</b>	<b>CA-16: Prudent Valuation Guidance</b>

## CA-16.1 Prudent Valuation Guidance (continued)

### CA-16.1.12

Bearing in mind that the assumptions made about liquidity in the market risk capital charge may not be consistent with the bank's ability to sell or hedge out less liquid positions, where appropriate, banks must take an adjustment to the current valuation of these positions, and review their continued appropriateness on an on-going basis. Reduced liquidity may have arisen from market events. Additionally, close-out prices for concentrated positions and/or stale positions should be considered in establishing the adjustment. Banks must consider all relevant factors when determining the appropriateness of the adjustment for less liquid positions. These factors may include, but are not limited to, the amount of time it would take to hedge out the position/risks within the position, the average volatility of bid/offer spreads, the availability of independent market quotes (number and identity of market makers), the average and volatility of trading volumes (including trading volumes during periods of market stress), market concentrations, the aging of positions, the extent to which valuation relies on marking-to-model, and the impact of other model risks not included in Paragraph CA-16.1.11A.

### CA-16.1.12A

For complex products including, but not limited to, securitisation exposures and n-th-to-default credit derivatives, banks must explicitly assess the need for valuation adjustments to reflect two forms of model risk: the model risk associated with using a possibly incorrect valuation methodology; and the risk associated with using unobservable (and possibly incorrect) calibration parameters in the valuation model.

### CA-16.1.13

The adjustment to the current valuation of less liquid positions made under Paragraph CA-16.1.12 must impact Tier 1 regulatory capital and may exceed those valuation adjustments made under financial reporting standards and Paragraphs CA-16.1.10 and CA-16.1.11.