South African Reserve Bank
Prudential Authority

DRAFT FOR CONSULTATION – AUGUST 2022[1]

Banks Act, 1990 (Act No. 94 of 1990)

Financial Sector Regulation Act, 2017 (Act No. 9 of 2017)

Prudential Standard Market Risk

Objectives and key requirements of this Prudential Standard

This Standard sets out the principles and requirements for market risk, which banks must comply with, in line with sound practices and processes in managing risk.

It is the responsibility of the board of a bank to ensure that the bank meets the requirements set out in this Standard on a continuous basis.

This Standard details the foundational aspects for market risk, the simplified standardised approach, the standardised approach and the internal models approach.

Contents

[1] The BCBS – CRE framework (https://www.bis.org/basel_framework/standard/CRE.htm) references will be updated to the respective Regulations once the Regulations are updated.

1. Commencement

1.1 This Standard commences on 1 January 2024 (proposed)

Version number	Commencement date
1	1 January 2024 (proposed)

2. Legislative authority

2.1 This Standard is made under section 1A(3) of the Banks Act, 1990 (Act No. 94 of 1990) read with section 105 of the Financial Sector Regulation Act, 2017 (Act No. 9 of 2017).

3. Definitions and interpretation

3.1 In this Standard, **'the Act'** means the Banks Act, 1990 and any word or expression to which a meaning has been assigned bears the meaning so assigned to it by the Act or the Financial Sector Regulation Act, 2017 unless the context indicates otherwise-

'actual P&L (APL)' means the actual P&L derived from the daily P&L process. It includes intraday trading as well as time effects and new and modified deals but excludes fees and commissions as well as valuation adjustments for which separate regulatory capital approaches have been otherwise specified as part of the rules or which are deducted from Common Equity Tier 1. Any other valuation adjustments that are market risk-related must be included in the APL. As is the case for the hypothetical P&L, the APL should include FX and commodity risks from positions held in the banking book.

'backtesting' means the process of comparing daily actual and hypothetical profits and losses with model-generated VaR measures to assess the conservatism of risk measurement systems;

'banks' collectively means a bank, branch[2], branch of a bank, and a controlling company as defined in section 1 of the Act.

'basis risk' means the risk that prices of financial instruments in a hedging strategy are imperfectly correlated, reducing the effectiveness of the hedging strategy;

'commodities' also include non-tangible goods such as electric power;

'correlation trading portfolio' or 'CTP' means, for the purpose of calculating the CSR capital requirement under the sensitivities-based method and the default risk charge requirement, the correlation trading portfolio is defined as the set of instruments that meet the requirements of (a) or (b) below.

(a) The instrument is a securitisation position that meets the following requirements-

(i) The instrument is not a re-securitisation position, nor a derivative of securitisation exposures that does not provide a pro-rata share in the proceeds of a securitisation tranche, where the definition of

[2] Commonly referred to as a branch of a foreign institution

securitisation position is identical to that used in the credit risk framework.

(ii) All reference entities are single-name products, including single-name credit derivatives, for which a liquid two-way market exists[3] including traded indices on these reference entities.

(iii) The instrument does not reference an underlying that is treated as a retail exposure, a residential mortgage exposure, or a commercial mortgage exposure under the standardised approach to credit risk.

(iv) The instrument does not reference a claim on a special purpose entity.

(b) The instrument is a non-securitisation hedge to a position described above.

'credit valuation adjustment (CVA) means an adjustment to the valuation of a derivative transaction to account for the credit risk of contracting parties;

'curvature risk' means the additional potential loss beyond delta risk due to a change in a risk factor for financial instruments with optionality;

'CVA risk' means the risk of changes to CVA arising from changes in credit spreads of the contracting parties, compounded by changes to the value or variability in the value of the underlying of the derivative transaction;

'delta risk' means the linear estimate of the change in the value of a financial instrument due to a movement in the value of a risk factor. The risk factor could be the price of an equity or commodity, or a change in an interest rate, credit spread or FX rate;

'diversification' means the reduction in risk at a portfolio level due to holding risk positions in different instruments that are not perfectly correlated with one another;

'embedded derivative' means a component of a financial instrument that includes a non-derivative host;

'expected shortfall (ES)' means a measure of the average of all potential losses exceeding the VaR at a given confidence level;

'financial asset' means any asset that is cash, the right to receive cash or another financial asset or a commodity, or an equity instrument;

'financial instrument' means any contract that gives rise to both a financial asset of one entity and a financial liability or equity instrument of another entity. It includes both primary financial instruments (or cash instruments) and derivative financial instruments;

'financial liability' means the contractual obligation to deliver cash or another financial asset or a commodity;

'FX' means foreign exchange;

'hedge' means the process of counterbalancing risks from exposures to long and short risk positions in correlated instruments;

'IFRS' means the International Financial Reporting Standards issued by the International Accounting Standards Board;

'instrument' means financial instruments, instruments on foreign exchange (FX) and commodities;

[3] 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-ask quotes can be determined within one day and the transaction settled at such price within a relatively short time frame in conformity with trade custom.

'internal risk transfer' means an internal written record of a transfer of risk within the banking book, between the banking and the trading book or within the trading book (between different desks);

'hypothetical P&L (HPL) means the daily P&L produced by revaluing the positions held at the end of the previous day using the market data at the end of the current day. Commissions, fees, intraday trading and new/modified deals, valuation adjustments for which separate regulatory capital approaches have been otherwise specified as part of the rules and valuation adjustments that are deducted from CET1 are excluded from the HPL. Valuation adjustments updated daily should usually be included in the HPL. Time effects should be treated consistently in the HPL and risk-theoretical P&L;

'jump-to-default (JTD)' means the risk of a sudden default. JTD exposure refers to the loss that could be incurred from a JTD event;

'liquidity horizon' means the time assumed to be required to exit or hedge a risk position without materially affecting market prices in stressed market conditions;

'look-through approach' means an approach in which a bank determines the relevant capital requirements for a position that has underlyings (such as an index instrument, multi-underlying option, or an equity investment in a fund) as if the underlying positions were held directly by the bank;

'market risk' means the risk of losses in on- and off-balance sheet risk positions arising from movements in market prices. The risks subject to market risk capital requirements include but are not limited to-

(a) default risk, interest rate risk, credit spread risk (CSR), equity risk, FX risk and commodities risk for trading book instruments; and

(b) FX risk and commodities risk for banking book instruments;

'modellable risk factor' means risk factors that are deemed modellable, based on the number of representative real price observations and additional qualitative principles related to the data used for the calibration of the ES model. Risk factors that do not meet the requirements for the risk factor eligibility test are deemed as non-modellable risk factors;

'notional value of a derivative instrument' means a value that is equal to the number of units underlying the instrument multiplied by the current market value of each unit of the underlying;

'offset' means the process of netting exposures to long and short risk positions in the same risk factor;

'prepayment option' means a debt instrument that grants the debtor the right to repay part of or the entire principal amount before the contractual maturity without having to compensate for any foregone interest. The debtor may exercise this option with a financial gain to obtain funding over the remaining maturity of the instrument at a lower rate in other ways in the market;

'pricing model' means a model that is used to determine the value of an instrument (mark-to-market or mark-to-model) as a function of pricing parameters or to determine the change in the value of an instrument as a function of risk factors;

'real prices' means a term used for assessing whether risk factors pass the risk factor eligibility test. A price will be considered real if it is-

(a) a price from an actual transaction conducted by the bank,

(b) a price from an actual transaction between other arm's length parties (for example, at an exchange), or
(c) a price taken from a firm quote (a price at which the bank could transact with an arm's length party);

'profit and loss (P&L) attribution (PLA)' means a method for assessing the robustness of banks' risk management models by comparing the risk-theoretical P&L predicted by trading desk risk management models with the hypothetical P&L;

'Regulations' means the Regulations relating to banks issued under section 90 of the Act and published under Government Notice R1029 in Government Gazette 35950 of 12 December 2012, as amended;

'risk bucket' means a defined group of risk factors with similar characteristics;

'risk class' means a defined list of risks that are used as the basis for calculating market risk capital requirements- general interest rate risk, CSR (non-securitisation), CSR securitisation- non-CTP), CSR (securitisation-CTP), FX risk, equity risk and commodity risk;

'risk factor' means a principal determinant of the change in value of an instrument, such as an exchange rate or interest rate;

'risk position' means the portion of the current value of an instrument that may be subject to losses due to movements in a risk factor;

'risk-theoretical P&L (RTPL)' means the daily desk-level P&L that is predicted by the valuation engines in the trading desk risk management model using all risk factors used in the trading desk risk management model (including the non-modellable risk factors);

'sensitivity' means a bank's estimate of the change in value of an instrument due to a small change in one of its underlying risk factors;

'stand-alone' means being capitalised on 'a stand-alone basis' where risk positions are booked in a discrete, non-diversifiable trading book portfolio so that the risk associated with those risk positions cannot diversify, hedge or offset risk arising from other risk positions, nor be diversified, hedged or offset by them;

'trading desk' means a group of traders or trading accounts in a business line within a bank that follows defined trading strategies with the goal of generating revenues or maintaining market presence from assuming and managing risk;

'trading desk risk management model' means the trading desk risk management model (pertaining to in-scope desks) includes all risk factors that are included in the bank's ES model with supervisory parameters and any risk factors deemed not modellable, which are therefore not included in the ES model for calculating the respective regulatory capital requirement but are included in the non-modellable risk factors;

'trading-related repo-style transactions' means transactions entered into for the purposes of market-making, locking in arbitrage profits or creating short credit or equity positions;

'value at risk (VaR)' means a measure of the worst expected loss on a portfolio of instruments resulting from market movements over a given time horizon and a pre-defined confidence level; and

'vega risk' means the potential loss resulting from the change in value of a derivative due to a change in the implied volatility of its underlying.

4. Roles and responsibilities

4.1 The board is ultimately responsible for ensuring that the bank complies with the principles and requirements as set out in this Standard.

4.2 The board must ensure together with senior management that a sound and robust risk management framework is established and maintained for market risk.

4.3 The board must clearly define the roles and responsibilities of all management and oversight functions as well as committees established for the purposes of exercising oversight of market risk.

5. Application

5.1 This Standard applies to banks, branches[4], branches of banks and controlling companies.

5.2 This Standard sets out the principles and requirements for sound practices and processes of market risk management.

5.3 This Standard must be read in conjunction with the relevant financial sector laws.

5.4 Banks must ensure that any potential market risks from juristic persons, including all relevant subsidiaries approved in terms of section 52 of the Banks Act, 1990 (Act No. 94 of 1990), are catered for and mitigated in the application of the requirements of this Standard.

5.5 All transactions subject to market risk, including forward sales and purchases, must be included in the calculation of capital requirements as of the date on which they were entered.

5.6 Banks must manage their market risk in such a way that the capital requirements are being met on a continuous basis, including at the close of each business day.

5.7 The Prudential Authority has at its disposal several effective measures to ensure that banks do not window dress by showing significantly lower market risk positions[5] on reporting dates.

5.8 Banks must maintain strict risk management systems to ensure that intraday exposures are not excessive.

5.9 If a bank fails to meet the capital requirements at any time, the bank must take immediate measures to rectify the situation.

5.10 If a bank has its capital denominated in its domestic currency and has a portfolio of foreign currency assets and liabilities that is completely matched, its capital/asset ratio will fall if the domestic currency depreciates.

5.11 Banks may protect their capital adequacy ratio, by running a short risk position in the domestic currency and excluding certain currency risk positions from the calculation of net open currency risk positions, subject to meeting each of the following conditions-

(a) The risk position is taken or maintained for the purpose of hedging partially or totally against the potential that changes in exchange rates could have an adverse effect on its capital ratio;

[4] Commonly referred to as branches of foreign institutions.

[5] Risk position – an example - a bond denominated in a currency different to a bank's reporting currency has risk positions in general interest rate risk, CSR (non-securitisation) and FX risk, where the risk positions are the potential losses to the current value of the instrument that could occur due to a change in the relevant underlying risk factors (interest rates, credit spreads, or exchange rates).

(b) The risk position is of a structural (non-dealing) nature such as positions stemming from-
    (i) investments in affiliated but not consolidated entities denominated in foreign currencies; or
    (ii) investments in consolidated subsidiaries or branches denominated in foreign currencies.
(c) The exclusion is limited to the amount of the risk position that neutralises the sensitivity of the capital ratio to movements in exchange rates;
(d) The exclusion from the calculation is made for at least six months;
(e) The establishment of a structural FX position and any changes in its position must follow the bank's risk management policy for structural FX positions. This policy must be approved by the Prudential Authority prior to being implemented;
(f) Any exclusion of the risk position needs to be applied consistently, with the exclusionary treatment of the hedge remaining in place for the life of the assets or other items; and
(g) The bank must document and have available for supervisory review the positions and amounts to be excluded from market risk capital requirements.

5.12 No FX risk capital requirement needs to apply to positions related to items, that are deducted from a bank's capital when calculating its capital base.

5.13 Holdings of capital instruments that are deducted from a bank's capital or risk weighted at 1250% are not allowed to be included in the market risk framework. This includes-
(a) holdings of the bank's own eligible regulatory capital instruments;
(b) holdings of other banks', securities firms' and other financial entities' eligible regulatory capital instruments, as well as intangible assets, where the Prudential Authority requires that such assets are deducted from capital; and
(c) where a bank demonstrates that it is an active market-maker, the Prudential Authority may establish a dealer exception for holdings of other banks', securities firms', and other financial entities' capital instruments in the trading book. In order to qualify for the dealer exception, the bank must have adequate systems and controls surrounding the trading of banks' eligible regulatory capital instruments.

5.14 The capital requirements for market risk apply on a worldwide consolidated basis similar to credit and operational risks.

5.15 Banks running a global consolidated trading book and whose capital is being assessed on a global basis, may on application to the Prudential Authority and subject to such conditions specified in writing by the Prudential Authority, be permitted to include the net short and net long risk positions no matter where they are booked.[6]

5.16 The Prudential Authority may grant the approval referred to in paragraph 5.15 above, only when the standardised approach set out in paragraph 10 below, permits a full offset of the risk position (risk positions of the opposite sign do not attract a capital requirement).

[6] The positions of less than wholly owned subsidiaries would be subject to the generally accepted accounting principles in the country where the parent company is supervised.

5.17 Notwithstanding the provisions of paragraphs 5.15 and 5.16 above, the Prudential Authority may require that individual risk positions be taken into the measurement system without any offsetting or netting against risk positions in the remainder of the group.

5.18 Banks within a group must manage its market risks to ensure its capital adequacy on a solo basis. The Prudential Authority will continue to monitor the market risks of individual entities on a non-consolidated basis to ensure that significant imbalances within a group do not escape supervision.

6. Methodologies for calculating market risk capital requirements

6.1 In determining its market risk for regulatory capital requirements, a bank may be subject to one of the following approaches-

(a) the simplified alternative to the standardised approach (simplified standardised approach–SSA) for market risk described in paragraph 9 below;
(b) the standardised approach for market risk described in paragraph 10 below; and
(c) the internal models approach (IMA) for market risk described in paragraph 11 below.

6.2 Subject to the prior written approval of and such conditions as may be specified in writing by the Prudential Authority, banks that maintain smaller or simpler trading books may use the SSA.

6.3 To determine the appropriateness of the SSA for use by a bank for the purpose of its market risk capital requirements, the Prudential Authority will consider the following indicative criteria-the

(a) The bank must not be a global systemically important bank (G-SIB);
(b) The bank must not use the IMA for any of its trading desks; and
(c) The bank must not hold any correlation trading positions.

6.4 In addition to provisions of paragraph 6.3 above, the Prudential Authority may determine additional criteria for the use of the SSA.

6.5 The Prudential Authority may mandate that banks with relatively complex or sizeable risks in particular risk classes apply the full standardised approach instead of the SSA, even if the banks meet the indicative eligibility criteria referred to in paragraphs 6.3 and 6.4 above.

6.6 All banks, except for those that have approval, to use the SSA as set out in paragraph 6.2 above, must calculate the capital requirements using the standardised approach. Banks that are approved by the Prudential Authority to use the IMA for market risk capital requirements must also calculate and report the capital requirement values calculated as set out in paragraph 11 below.

6.7 A bank that uses the IMA, for any of its trading desks must also calculate the capital requirement under the standardised approach for all instruments across all trading desks, regardless of whether those trading desks are eligible for the IMA.

6.8 In addition, a bank that uses the IMA for any of its trading desks must calculate the standardised approach capital requirement for each trading desk that is eligible for the IMA as if that trading desk were a stand-alone regulatory portfolio (with no offsetting across trading desks). This will-

(a) serve as an indication of the fallback capital requirement for those desks that fail the eligibility criteria for inclusion in the bank's internal model as outlined in paragraph 11 below;
(b) generate information on the capital outcomes of the internal models relative to a consistent benchmark and facilitate comparison in implementation between banks and/or across jurisdictions;
(c) monitor over time the relative calibration of standardised and modelled approaches, facilitating adjustments as needed; and
(d) provide macroprudential insight in an ex-ante consistent format.

6.9 All banks must calculate the market risk capital requirement using the standardised approach for the following-
(a) securitisation exposures; and
(b) equity investments in funds that cannot be looked through but are assigned to the trading book in accordance with the conditions set out in paragraph 8.3.4(e)(ii) below.

7. Matters related to composition and management of trading desks

7.1 For the purposes of market risk capital calculations, a trading desk is a group of traders or trading accounts that implements a well-defined business strategy operating within a clear risk management structure.

7.2 Trading desks are defined by the bank but are subject to the regulatory approval of the Prudential Authority for capital purposes. In this regard-
(a) a bank is allowed to propose the trading desk structure per its organisational structure, consistent with the key attributes set out in paragraph 7.4 below.
(b) a bank must prepare a policy document for each trading desk it defines, documenting how the bank satisfies the key attributes in paragraph 7.4 below.
(c) the Prudential Authority will treat the definition of the trading desk as part of the initial model approval for the trading desk, as well as for ongoing approval and -
(i) may determine, based on the size of the bank's overall trading operations, whether the proposed trading desk definitions are sufficiently granular; and
(ii) will check that the bank's proposed definition of a trading desk meets the criteria listed in key attributes set out in paragraph 7.4 below.

7.3 Within this supervisory approved trading desk structure, banks may further define operational sub-desks without the need for the Prudential Authority's approval. These sub-desks would be for internal operational purposes only and would not be used in the market risk capital framework.

7.4 The key attributes of a trading desk are as follows-
(a) a trading desk for the purposes of the regulatory capital charge is an unambiguously defined group of traders or trading accounts;
(b) a trading account is an indisputable and unambiguous unit of observation in accounting for trading activity;
(c) the trading desk must have one head trader and may have up to two head traders provided their roles, responsibilities and authorities are either clearly separated or one has ultimate oversight over the other. In this regard-

(i) the head trader must have direct oversight of the group of traders or trading accounts; and
(ii) each trader or each trading account in the trading desk must have a clearly defined specialty or specialities

(d) Each trading account must only be assigned to a single trading desk.

(e) The desk must have a clearly defined risk scope consistent with its pre-established objectives. The scope must include specialities of the desk's overall risk class and permitted risk factors.

(f) As a general rule, the Prudential Authority requires that traders (as well as head traders) are allocated to one trading desk. A bank may deviate from this requirement and may assign an individual trader to work across several trading desks provided it is justified to the Prudential Authority on the basis of sound management, business and/or resource allocation reasons. Such assignments must not be made for the only purpose of avoiding other trading desk requirements (for example to optimise the likelihood of success in the backtesting and profit and loss attribution tests).

(g) The trading desk must have a clear reporting line to bank senior management and must have a clear and formal compensation policy clearly linked to the pre-established objectives of the trading desk.

7.5 A trading desk must have a well-defined and documented business strategy, including an annual budget and regular management information reports (including revenue, costs and risk-weighted assets). In this regard, there must be a clear description of the economics[7] of the business strategy for the trading desk, its primary activities[8] and trading or hedging strategies[9].

7.6 The management team at the trading desk (starting from the head trader) must have a clear annual plan for the budgeting and staffing of the trading desk.

7.7 A trading desk's documented business strategy must include regular Management Information reports, covering revenue, costs and risk-weighted assets for the trading desk.

7.8 A trading desk must have a clear risk management structure. In this regard, the bank must-

(a) in terms of risk management responsibilities, identify key groups and personnel responsible for overseeing the risk-taking activities at the trading desk;

(b) ensure that a trading desk has clearly defined trading limits based on the business strategy of the trading desk and these limits must be reviewed at least annually by senior management at the bank. In setting limits, the trading desk must have-

(i) well-defined trading limits or directional exposures at the trading desk level that are based on the appropriate market risk metric (for example, the sensitivity of CSR and/or jump-to-default for a credit trading desk), or just overall notional limits; and

[7] Economics- what is the economics behind the strategy (for example, trading on the shape of the yield curve)? How much of the activities are customer driven? Does it entail trade origination and structuring, or execution services, or both?

[8] Primary activities- what is the list of permissible instruments and, out of this list, which are the instruments most frequently traded?

[9] Trading or hedging strategies- how would these instruments be hedged, what are the expected slippages and mismatches of hedges, and what is the expected holding period for positions?

(ii) well-defined trader mandates; and

(c) ensure that the trading desk produces, at least weekly, appropriate risk management reports. This would include, at a minimum-

(i) profit and loss reports, which would be periodically reviewed, validated and modified (if necessary) by Product Control; and

(ii) internal and regulatory risk measure reports, including trading desk VaR or ES, trading desk VaR or ES sensitivities to risk factors, backtesting and p-value.

7.9 The bank must prepare, evaluate, and have available for the Prudential Authority the following for all trading desks-

(a) inventory aging reports;

(b) daily limit reports including exposures, limit breaches, and follow-up action;

(c) reports on intraday limits and respective utilisation and breaches for banks with active intraday trading; and

(d) reports on the assessment of market liquidity.

7.10 Any FX commodity positions held in the banking book must be included in the market risk capital requirement as set out in the definition of market risk in paragraph 3 above. For regulatory capital calculation purposes, these positions will be treated as if they were held on notional trading desks within the trading book.

7.11 A 'notional trading desk' referred to in paragraph 7.10 above, is a trading desk that need not have traders or trading accounts assigned to it and need not meet the qualitative trading desk requirements set out in paragraph 7.1 to 7.10 above. Banks that wish to use the IMA to measure the FX or commodity risk of such notional trading desks must take either or both of the following actions-

(a) transfer all or part of banking book FX and commodity risks to another trading desk via intra-trading book internal risk transfers (where trading desk requirements would continue to apply as appropriate for that desk), and/or

(b) apply for IMA approval for the notional trading desk. In this case, the notional desk only needs to meet the quantitative trading desk requirements.

8. Boundary between the banking book and the trading book

8.1 Scope of the trading book

8.1.1 A trading book consists of all instruments that meet the specifications for trading book instruments set out in paragraphs 8.1.2 to 8.4.3 below. All other instruments must be included in the banking book.

8.1.2 Banks may only include a financial instrument, instruments[10] on FX or a commodity in the trading book when there is no legal impediment against selling or fully hedging it.

8.2 Banks must fair value daily any trading book instrument11 and recognise any valuation change in the profit and loss (P&L) account.

8.3 Standards for assigning instruments to the regulatory books

8.3.1 Any instrument a bank holds for one or more of the following purposes must, when it is first recognised on its books, be designated as a trading book instrument, unless specifically otherwise provided for in paragraph 8.1.2 above or paragraph 8.3.4 below-

(a) short-term resale, where periodic sale activity on its own is insufficient to consider a position as held for short-term resale;
(b) profiting from short-term price movements;
(c) locking in arbitrage profits; or
(d) hedging risks that arise from instruments meeting the purposes of sub-paragraphs (a), (b) or (c) above.

8.3.2 Any of the following instruments is seen as being held for at least one of the purposes listed in paragraph 8.3.1 above and must therefore be included in the trading book, unless specifically otherwise provided for in paragraph 8.1.2 above or paragraph 8.3.4 below-

(a) instruments in the CTP;
(b) instruments that would give rise to a net short credit or equity position in the banking book[12]; or
(c) instruments resulting from underwriting commitments, where underwriting commitments refer only to securities underwriting and relate only to securities that are expected to be actually purchased by the bank on the settlement date.

8.3.3 Any instrument which is not held for any of the purposes listed in paragraph 8.3.1 above at inception, nor seen as being held for these purposes according to paragraph 8.3.2 above, must be assigned to the banking book.

8.3.4 The following instruments must be assigned to the banking book-

(a) unlisted equities;
(b) instruments designated for securitisation warehousing;
(c) real estate holdings, where in the context of assigning instruments to the trading book, real estate holdings relate only to direct holdings of real estate as well as derivatives on direct holdings;
(d) retail and small or medium-sized enterprise credit and lending commitments;
(e) equity investments in a fund, unless the bank meets at least one of the following conditions-

[10] In terms of money market instruments (for example, bank bills with a tenor of less than one year and interbank placements), the CSR capital requirement applies, to the extent that such instruments are covered instruments, that is, they meet definition of instruments to be included in the trading book as specified paragraphs 8.1.2 to 8.3.3.
[11] Instruments designated under the fair value option may be allocated to the trading book, only if they comply with all the relevant requirements for trading book instruments set out in paragraphs 8.1.2 to 8.3.3.
[12] A bank will have a net short risk position for equity risk or credit risk in the banking book if the present value of the banking book increases when an equity price decreases or when a credit spread on an issuer or group of issuers of debt increases.

(i) the bank is able to look through the fund to its individual components and there is sufficient and frequent information, verified by an independent third party, provided to the bank regarding the fund's composition; or

(ii) the bank obtains daily price quotes for the fund and it has access to the information contained in the fund's mandate or in the relevant regulations governing such investment funds from time to time;

(f) hedge funds;

(g) derivative instruments and funds that have the above instrument types as underlying assets; or

(h) instruments held for the purpose of hedging a particular risk of a position in the types of instrument listed in sub-paragraphs (a) to (g) above.

8.3.5 There is a general presumption[13]- that any of the following instruments are being held for at least one of the purposes listed in paragraph 8.3.1 above and therefore are trading book instruments, unless specifically otherwise provided for in paragraphs 8.1.2 or paragraph 8.3.4 above-

(a) instruments held as accounting trading assets or liabilities;[14]

(b) instruments resulting from market-making activities;

(c) equity investments in a fund excluding those assigned to the banking book in accordance with paragraph 8.2.4(e) above;

(d) listed equities;

(e) trading-related repo-style transaction; or

(f) options including embedded derivatives[15] from instruments that the bank issued out of its own banking book and that relate to credit or equity risk.

8.3.6 In consideration of paragraph 8.3.5(f) above-

(a) a floor to an equity-linked bond is an embedded option with an equity as part of the underlying, and therefore the embedded option must be bifurcated and included in the trading book;

(b) liabilities issued out of the bank's own banking book that contains embedded derivatives and meets the criteria set out in paragraph 8.3.5 (f) above, must be bifurcated. Banks must split the liability into two components-

(i) the embedded derivative, which is assigned to the trading book; and

(ii) the residual liability, which is retained in the banking book. No internal risk transfers are necessary for this bifurcation.

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[13] The presumptions for the designation of an instrument to the trading book or banking book set out in this Standard will be used where a designation of an instrument to the trading book or banking book is not otherwise specified in this Standard.

[14] Under IFRS (IAS 39) and US GAAP, these instruments would be designated as held for trading. Under IFRS 9, these instruments would be held within a trading business model. These instruments would be fair valued through the P&L account.

[15] An embedded derivative is a component of a hybrid contract that includes a non-derivative host such as liabilities issued out of the bank's own banking book that contains embedded derivatives. The embedded derivative associated with the issued instrument (host) must be bifurcated and separately recognised on the bank's balance sheet for accounting purposes. Liabilities issued out of the bank's own banking book that contains embedded derivatives and thereby meet the criteria of 8.2.5 (f) above, should be bifurcated. This means that banks should split the liability into two components- (i) the embedded derivative, which is assigned to the trading book; and (ii) the residual liability, which is retained in the banking book. No internal risk transfers are necessary for this bifurcation. Likewise, where such a liability is unwound, or where an embedded option is exercised, both the trading and banking book components are conceptually unwound simultaneously and instantly retired; no transfers between trading and banking books are necessary.

(c) where such a liability as described in subparagraph (b) above is unwound, or where an embedded option is exercised, both the trading and banking book components are conceptually unwound simultaneously and instantly retired. In this regard, no transfers between trading and banking books are necessary.

8.3.7 Repo-style transactions that are entered for liquidity management and valued at accrual for accounting purposes are not part of the presumptive list referred to in paragraph 8.3.5 above.

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

8.3.9 Banks are allowed to deviate from the presumptive list specified in paragraph 8.3.5 above, if the bank submits a request to the Prudential Authority and receives written prior approval. In its request, the bank must provide evidence that the instrument is not held for any of the purposes mentioned in paragraph 8.3.1 above. When such written approval is granted by the Prudential Authority, banks must document all deviations from the presumptive list, in detail, on an on-going basis.

8.3.10 In cases where the approval, referred to in paragraph 8.3.9 above, is not granted by the Prudential Authority, the instrument must be designated as a trading book instrument.

8.3.11 Notwithstanding the provisions of paragraphs 8.3.9 and 8.3.10 above for instruments on the presumptive list, banks must provide evidence when required by the Prudential Authority, that an instrument in the trading book is held for at least one of the purposes mentioned in paragraph 8.3.1 above. If the Prudential Authority is of the view that a bank has not provided sufficient/satisfactory evidence or if the Prudential Authority believes the instrument customarily would belong in the banking book, it may require the bank to reassign the instrument to the banking book, except if it is an instrument listed under paragraph 8.3.2 above.

8.3.12 Banks must provide sufficient/satisfactory evidence, when required by the Prudential Authority, that an instrument in the banking book is not held for any of the purposes of paragraph 8.3.1 above. If the Prudential Authority is of the view that a bank has not provide sufficient/satisfactory evidence, or if the Prudential Authority believes such instruments would customarily belong in the trading book, it may require the bank to reassign the instrument to the trading book, except if it is an instrument listed under paragraph 8.3.4 above.

8.4 Documentation of instrument designation

8.4.1 A bank must have clearly defined policies, procedures and documented practices for determining which instruments to include in or exclude from the trading book for the purposes of-

(a) calculating their regulatory capital;

(b) ensuring compliance with the criteria outline paragraph 8, and
(c) taking into account the bank's risk management capabilities and practices.

8.4.2 The bank's internal control functions must conduct an ongoing evaluation of instruments both in and out of the trading book to assess whether its instruments are being properly designated initially as trading or non-trading instruments in the context of the bank's trading activities.

8.4.3 Compliance with the policies and procedures must be fully documented and subject to periodic, but at least annually, internal audits and the results must be available for review by the Prudential Authority.

8.5 Restrictions on moving instruments between the trading book and banking book

8.5.1 Apart from moves required in paragraphs 8.3.1 to 8.3.10 above, there is a strict limit on the ability of banks to move instruments between the trading book and the banking book at their own discretion after initial designation, which is subject to the process in paragraphs 8.5.3 and 8.5.4 below. Switching instruments for regulatory arbitrage is strictly prohibited. In practice, switching must be rare and will be allowed by the Prudential Authority only in extraordinary circumstances.[16].

8.5.2 When switching positions, banks must ensure that the standards described in paragraphs 8.2.1 to 8.2.10 above are always strictly observed.

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

8.5.4 Any reassignment between books -
(a) must be approved by senior management of the bank and thoroughly documented;
(b) must be determined by internal review to be in compliance with the bank's policies;
(c) is subject to prior written approval by the Prudential Authority based on supporting documentation provided by the bank;
(d) must be publicly disclosed; and
(e) is irrevocable unless required by changes in the characteristics of a position;

[16] Examples are a major publicly announced event, such as a bank restructuring that results in the permanent closure of trading desks, requiring termination of the business activity applicable to the instrument or portfolio or a change in accounting standards that allows an item to be fair-valued through P&L. Market events, changes in the liquidity of a financial instrument, or a change of trading intent alone are not valid reasons for reassigning an instrument to a different book. 'A change in accounting standards' refers to the accounting standards themselves changing, rather than the accounting classification of an instrument changing.

8.5.5 Where an instrument is reclassified to be an accounting trading asset or liability, there is a presumption that this instrument is in the trading book, as described in paragraph 8.3.5 above. Accordingly, in this case, an automatic switch without the approval of the Prudential Authority is acceptable.

8.5.6 Any reallocation of securities between the trading book and banking book, including outright sales at arm's length, must be considered a reassignment of securities and is governed by requirements of paragraph 8.5.4 above.

8.5.7 A bank must adopt relevant policies that must be updated at least annually.

8.5.8 The policies referred to in paragraph 8.5.7 above must-

(a) when updated, be based on an analysis of all the reassignments referred to in paragraph 8.5.4 above that occurred during the previous year;

(b) include the reassignment restriction requirements in paragraphs 8.5.1 to 8.5.6 above, especially the restriction that re-designation between the trading book and banking book may only be allowed in extraordinary circumstances, and a description of the circumstances or criteria where such a switch may be considered;

(c) include the process for obtaining senior management and Prudential Authority approval for reassignment as required in paragraph 8.4.4 above;

(d) describe how to identify an extraordinary event or circumstance that leads to the reassignment of an instrument;

(e) prescribe the public disclosure of the reassignment at the earliest reporting date; and

(f) when updated, be provided to the Prudential Authority with a highlight of the updates.

8.6 Treatment of internal risk transfer

8.6.1 There will be no regulatory capital recognition for internal risk transfers[17] from the trading book to the banking book. Thus, if a bank engages in an internal risk transfer from the trading book to the banking book (for example, for economic reasons) this internal risk transfer would not be taken into account when the regulatory capital requirements are determined.

8.6.2 For internal risk transfers from the banking book to the trading book, paragraphs 8.7.1 to 8.7.4 below apply.

8.7 Internal risk transfer of credit and equity risk from banking book to trading book

8.7.1 When a bank hedges a banking book credit risk exposure or equity risk exposure using a hedging instrument purchased through its trading book (using an internal risk transfer) -

(a) The credit exposure in the banking book is deemed to be hedged for capital requirement purposes if and only if-

(i) the trading book enters into an external hedge with an eligible third-par protection provider that exactly matches the internal risk transfer; and

[17] The treatment specified for internal risk transfers applies only to risk transfers done via internal derivatives trades, accordingly the reallocation of securities between trading and banking book should be considered a reassignment of securities and is governed by the requirements of paragraph 8.4.4 above.

(ii) the external hedge meets the requirements of CRE22.74 to CRE22.75 and CRE22.77 to CRE22.78 vis-à-vis the banking book exposure[18].

(b) The equity exposure in the banking book is deemed to be hedged for capital requirement purposes if and only if-

(i) the trading book enters into an external hedge from an eligible third-party protection provider that exactly matches the internal risk transfer; and

(ii) the external hedge is recognised as a hedge of a banking book equity exposure.

(c) External hedges for the purposes of subparagraph (a) above may be made up of multiple transactions with multiple counterparties as long as the aggregate external hedge exactly matches the internal risk transfer, and the internal risk transfer exactly matches the aggregate external hedge.

8.7.2 Where the requirements in paragraph 8.7.1 above are fulfilled, the banking book exposure is deemed to be hedged by the banking book leg of the internal risk transfer for capital purposes in the banking book. In addition, both the trading book leg of the internal risk transfer and the external hedge must be included in the market risk capital requirements.

8.7.3 Where the requirements in paragraph 8.7.1 above are not fulfilled, the third-party external hedge must be fully included in the market risk capital requirements and the trading book leg of the internal risk transfer must be fully excluded from the market risk capital requirements.

8.7.4 A banking book short credit position or a banking book short equity position created by an internal risk transfer[19] and not capitalised under banking book rules must be capitalised under the market risk rules together with the trading book exposure.

8.8 Internal risk transfer of general interest rate risk from banking book to trading book

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

(a) is documented with respect to the banking book interest rate risk being hedged and the sources of such risk;

(b) is conducted with a dedicated internal risk transfer trading desk which has been specifically approved by the Prudential Authority for this purpose; and

(c) must be subject to trading book capital requirements under the market risk framework on a stand-alone basis for the dedicated internal risk transfer desk, separate from any other general interest rate risk (GIRR) or other market risks generated by activities in the trading book.

[18] With respect to CRE22.75, the cap of 60% on a credit derivative without a restructuring obligation only applies with regard to recognition of credit risk mitigation of the banking book instrument for regulatory capital purposes and not with regard to the amount of the internal risk transfer.

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

8.8.2 The GIRR internal risk transfer trading desk referred to in paragraph 8.8.1(b) above-

(a) need not have traders or trading accounts assigned to it;
(b) is not subject to the qualitative trading desk requirements set out paragraphs 7.4 to 7.8 above;
(c) is subject to the quantitative trading desk requirements (PLA test and backtesting) set out in paragraph 11 below; and
(d) must not have any trading book positions allocated to it, except GIRR internal risk transfers between the trading book and the banking book as well as any external hedges that meet the conditions specified in paragraph 8.8.4.

8.8.3 Where the requirements in paragraphs 8.8.1 and 8.8.2 above are fulfilled, the banking book leg of the internal risk transfer must be included in the banking book's measure of interest rate risk exposures for regulatory capital purposes.

8.8.4 The internal risk transfer desk approved by Prudential Authority and mentioned in paragraph 8.7.1(b) may include instruments purchased from the market. Such transactions may be executed -

(a) directly between the internal risk transfer desk and the market or;
(b) via a separate non-internal risk transfer trading desk acting as an agent.

8.8.5 In the case the internal risk transfer desk obtains the external hedge as in paragraph 8.8.4 (b) above-

(a) the GIRR internal risk transfer entered into with the non-internal risk transfer trading desk must exactly match the external hedge from the market; and
(b) the respective legs of the GIRR internal risk transfer must be included in the internal risk transfer desk and the non-internal risk transfer desk.

8.9 Internal risk transfers within the scope of application of the market risk capital requirement

8.9.1 Internal risk transfers between trading desks within the scope of application of the market risk capital requirements (including FX risk and commodities risk in the banking book) will generally receive regulatory capital recognition. Internal risk transfers between the internal risk transfer desk and other trading desks will only receive regulatory capital recognition if the constraints in paragraphs 8.8.1 to 8.8.5 above are fulfilled.

8.9.2 The trading book leg of internal risk transfers must fulfil the same requirements under this paragraph 8 as instruments in the trading book transacted with external counterparties.

8.10 Eligible hedges for the CVA capital requirement

8.10.1 Eligible external hedges that are included in the credit valuation adjustment (CVA) capital requirement must be removed from the bank's market risk capital requirement calculation.

8.10.2 Banks may enter into internal risk transfers between the CVA portfolio and the trading book. Such an internal risk transfer consists of a CVA portfolio side and a non-CVA portfolio side. Where the CVA portfolio side of an internal risk transfer is recognised in the CVA risk capital requirement, the CVA portfolio side must be excluded from the market risk capital requirement, while the non-CVA portfolio side must be included in the market risk capital requirement.

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

8.10.4 Internal CVA risk transfers that are subject to curvature, default risk or residual risk add-on as set out in paragraph 10 below, may be recognised in the CVA portfolio capital requirement and market risk capital requirement only if the trading book additionally enters into an external hedge with an eligible third-party protection provider that exactly matches the internal risk transfer.

8.11 Independent from the treatment in the CVA risk capital requirement and the market risk capital requirement, internal risk transfers between the CVA portfolio and the trading book may be used to hedge the counterparty credit risk exposure of a derivative instrument in the trading or banking book as long as the requirements of paragraph 8.7.1 above are met.

9. Simplified standardised approach

9.1 Banks mentioned in paragraph 6.2 above may use the simplified standardised approach (SSA) for calculating the capital requirement for market risk, if approved by the Prudential Authority.

9.2 The market risk capital requirement calculated under the SSA (CR_{SSA}) is the simple sum of 4 components multiplied by their scaling factors-

$$\mathrm{CR}_{\mathrm{SSA}} = CR_{IRR} * 1.3 + CR_{EQ} * 3.5 + CR_{FX} * 1.2 + CR_{COM} * 1.9$$

where-

(a) CR_{IRR} is the capital requirement for interest rate risk, considering additional requirements for option risks from debt instruments;

(b) CR_{EQ} is the capital requirement for equity risk, considering additional requirements for option risks from equity instruments;

(c) CR_{FX} is the capital requirement for FX risk, considering additional requirements for option risks from foreign exchange instruments; and

(d) CR_{COM} is the capital requirement for commodities risk, considering additional requirements for option risks from commodities instruments.

9.3 The risk-weighted assets for market risk under the SSA (RWA_{MR_SSA}) are determined by multiplying the CR_{SSA} by 12.5.

9.4 Debt securities and other interest rate related instruments in the trading book are subject to interest rate risk (IRR) capital requirements, such as-

(a) all fixed-rate and floating-rate debt securities; and

(b) instruments that behave as the ones in sub-paragraph (a) above, including non-convertible preference shares.

9.5 Banks envisaging prospective trade in mortgage securities and mortgage derivative products must engage with the Prudential Authority in writing prior to entering into such transactions. These risk positions may be subject to further requirements as may be determined by the Prudential Authority.

9.6 Convertible bonds, which are debt issues or preference shares that are convertible, at a stated price, into common shares of the issuer, will be treated as debt securities if they trade like debt securities and as equities if they trade like equities.

9.7 A security that 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, which means that it will be treated in the same manner as other securities positions.

9.8 The CR_{IRR} is composed by the "specific risk" of each instrument and by the "general market risk".

9.9 Specific risk – Interest rate risk

9.9.1 The capital requirement for specific risk is designed to protect against an adverse movement in the price of an individual security owing to factors related to the individual issuer.

9.9.2 In measuring the risk, offsetting will be restricted to matched positions in the identical issue (including positions in derivatives). Even if the issuer is the same, no offsetting will be permitted between different issues since differences in coupon rates, liquidity, call features, etc. mean that prices may diverge in the short run.

9.9.3 The risk factors specified in Table 1 below apply for calculating the specific risk capital requirement for instruments classified in "government", "qualifying" and "other" categories-

(a) the government category includes all forms of government paper, such as bonds, treasury bills and other short-term instruments;

(b) the qualifying category includes securities issued by public sector entities and multilateral development banks, plus other securities that are-

(i) rated investment grade (IG) by at least two credit rating agencies specified by the Prudential Authority;

(ii) rated IG by one rating agency and not less than IG by any other rating agency specified by the Prudential Authority;

(iii) subject to Prudential Authority approval, unrated, but deemed to be of comparable investment quality by the reporting bank, if the issuer has securities listed on a recognised stock exchange; or

(iv) issued by banks deemed to be equivalent to IG quality and subject to supervisory and regulatory arrangements comparable to those under this Standard.

(c) the other category includes instruments that are not in the "government" or "qualifying" categories.

Table 1

Specific risk capital requirements for issuer risk Government and "other" categories		
Categories	External credit assessment	Specific risk capital requirement
Government	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	BB+ to BB–	8.00%
	Below BB–	12.00%
	Unrated	8.00%

9.9.4 When the government paper referred in paragraph 9.9.3(a) above, is denominated in the domestic currency and funded by the bank in the same currency, at national discretion, a lower specific risk capital requirement may be applied, as in CRE20.

9.9.5 The Prudential Authority will monitor the application of the criteria pertaining to the classification of instruments in the "qualifying" category. The qualifying category is subject to such conditions as may be specified in writing by the Prudential Authority and may include any other unrated or other instrument specified in writing by the Prudential Authority.

9.9.6 Banks using the internal ratings-based (IRB) approach may include unrated securities in the qualifying category defined in paragraph 9.9.3(b) above if both of the following conditions are met-

(a) the securities are rated equivalent to IG under the reporting bank's internal rating system, which the Prudential Authority has confirmed complies with the requirements for an IRB approach; and

(b) the issuer has securities listed on a recognised stock exchange.

(i) The equivalence in sub-paragraph (a) above means that the debt security has a one-year probability of default (PD) equal to or less than the one-year PD implied by the long-run average one-year PD of a security rated IG or better by a qualifying rating agency.

(ii) A bank that has adopted the simplified standardised approach for the measurement of the bank's exposure to market risk shall base its calculation of the required amount of capital and reserve funds on the absolute amount of all relevant calculated positions. Unless otherwise provided, the reporting bank shall not apply offsetting between calculated positions or requirements. The Prudential Authority may also disallow offsetting of the relevant position against other relevant positions even when such provisions are prescribed for the bank to offset the said positions in respect of any debt instrument with a high yield to redemption.

9.9.7 The specific risk capital requirement of securitisation positions as defined in CRE40.1 to CRE40.6 that are held in the trading book is to be calculated according to the revised method for such positions in the banking book as set out in CRE40 to CRE45. A bank shall calculate the specific risk capital requirement applicable to each net securitisation position by dividing the risk weight calculated as if it were held in the banking book by 12.5.

9.9.8 Banks may limit the capital requirement for an individual position in a credit derivative or securitisation instrument to the maximum possible loss. For a short risk position, this limit must be calculated as a change in value due to the underlying names immediately becoming default risk-free. For a long risk position, the maximum possible loss must be calculated as the change in value in the event that all the underlying names were to default with zero recoveries. The maximum possible loss must be calculated for each individual position.

9.9.9 No specific risk capital requirement applies for positions hedged by credit derivatives when the values of two legs (long and short) always move in the opposite direction and broadly to the same extent, in the following situations-

(a) the two legs consist of completely identical instruments; or

(b) a long cash position (or credit derivative) 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 (the cash position).

9.9.10 When the maturity of the swap itself is different from that of the underlying exposure paragraph 9.9.9(b) above still applies.

9.9.11 An 80 percent offset is recognised when the value of two legs (long and short) always moves in the opposite direction but not broadly to the same extent, in situations such as-

(a) when a long cash position or credit derivative is hedged by a credit default swap (CDS) 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 of the underlying exposure;

(b) when key features of the credit derivative contract (for example credit event definitions, settlement mechanisms) do not cause the price movement of the credit derivative to materially deviate from the price movements of the cash position.

9.9.12 When the transaction transfers risk (taking account of restrictive payout provisions such as fixed payouts and materiality thresholds), an 80 percent specific risk offset is applied to the side of the transaction with the higher capital requirement, while the specific risk requirement on the other side is zero.

9.9.13 Partial allowance is recognised when the value of the two legs (long and short) usually moves in the opposite direction, in situations such as-

(a) the position is captured in paragraph 9.9.9 (b) above, but there is an asset mismatch between the reference obligation and the underlying exposure. Nonetheless, the position meets the requirements in CRE22.74.

(b) the position is captured in paragraph 9.9.9(a) or in paragraphs 9.9.11 and 9.9.12 above, but there is a currency or maturity mismatch between the credit protection and the underlying asset.

(c) the position is captured in paragraphs 9.9.11 and 9.9.12 above but there is an asset mismatch between the cash position (or credit derivative) and the credit derivative hedge. However, the underlying asset is included in the (deliverable) obligations in the credit derivative documentation.

9.9.14 In the cases referred to in paragraphs 9.9.9 to 9.9.13 above, rather than adding the specific risk capital requirements for each side of the transaction (the credit protection and the underlying asset) only the higher of the two capital requirements applies.

9.9.15 In the cases not captured in paragraphs 9.9.9 to 9.9.13 above, a specific risk capital requirement applies in both sides of the position.

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

9.9.17 The capital requirement for specific risk for a first-to-default credit derivative is the lesser of-

(a) the sum of the specific risk capital requirements for the individual reference credit instruments in the basket; and

(b) the maximum possible credit event payment under the contract.

9.9.18 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 requirement for specific risk for the reference credit instrument and that part of the capital requirement for specific risk for the credit derivative that relates to this particular reference credit instrument.

9.9.19 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 requirement.

9.9.20 The capital requirement for specific risk for an nth-to-default credit derivative, with n greater than one, is the lesser of-

(a) the sum of the specific risk capital requirements for the individual reference credit instruments in the basket but disregarding the (n-1) obligations with the lowest specific risk capital requirements; and

(b) the maximum possible credit event payment under the contract. For nth-to-default credit derivatives with n greater than 1, no offset of the capital requirement for specific risk with any underlying reference credit instrument is allowed.

9.9.21 If a first or other nth-to-default credit derivative is externally rated, then the protection seller must calculate the specific risk capital requirement using the rating of the derivative and apply the respective securitisation risk weights as specified in paragraph 9.9.7 above, as applicable.

9.9.22 The capital requirement against each net nth-to-default credit derivative position applies irrespective of whether the bank has a long or short position.

9.9.23 The specific risk capital requirement for CTP is the larger of the following amounts-

(a) the total specific risk capital requirements that would apply just to the net long positions from the net long correlation trading exposures combined; and

(b) the total specific risk capital requirements that would apply just to the net short positions from the net short correlation trading exposures combined.

9.10 Interest rate risk- General market risk

9.10.1 The capital requirement for general market risk is designed to capture the risk of loss arising from changes in market interest rates.

9.10.2 A bank may choose between two methods of measuring the risk-

(a) the maturity method; and

(b) the duration method.

9.10.3 In each of the methods referred to in paragraph 9.10.2 above, the general market risk capital requirement is the sum of four components-

(a) the net short or long position in the whole trading book;

(b) the vertical disallowance in each time band;

(c) the horizontal disallowance across different time bands; and

(d) a net charge for positions in options, where appropriate. Refer to paragraphs 9.15.22 and 9.15.23.

9.10.4 Separate maturity ladders must be used for each currency-

(a) capital requirement must be calculated for each currency separately; and

(b) summed up, with no offsetting between positions of the opposite sign.

9.10.5 In the case of those currencies in which business is insignificant-

(a) separate maturity ladders for each currency are not required and the bank may construct a single maturity ladder and slot, within each appropriate time band, the net long or short position for each currency; and

(b) the absolute value of individual net positions for each currency must be summed within each time band, to produce a gross position figure.

9.10.6 In the maturity method-

(a) long or short positions in debt securities and other sources of interest rate exposures including derivative instruments, are slotted into a maturity ladder comprising 13-time bands or 15-time bands in the case of low coupon instruments;

(b) fixed rate instruments must be allocated according to the residual term to maturity and floating-rate instruments according to the residual term to the next repricing date;

(c) opposite positions of the same amount in the same issues (but not different issues by the same issuer), whether actual or notional, may be omitted from the interest rate maturity framework, as well as closely matched swaps, forwards, futures and forward rate agreements (FRAs) which meet the conditions set out in paragraphs 9.11.9 to 9.11.16 below.

9.10.7 In calculating the capital requirement under the maturity method-

(a) positions allocated in each time band are multiplied by their respective risk factors, set in Table 2 below;

(b) weighted longs and shorts positions are offset in each time band, resulting in a single short or long position for each band;

(c) the vertical disallowance is calculated for each time band- 10 percent of the smaller absolute value of the offsetting positions, long or short;

(d) the horizontal disallowance is calculated.

9.10.8 Zero-coupon bonds and deep-discount bonds, defined as bonds with a coupon of less than 3 percent, must be slotted according to the time bands set out in the second column of Table 2 below-

Table 2

Maturity method- time bands and weights			
Coupon 3% or more	Coupon less than 3%	Risk weight	Assumed changes in yield
1 month or less	1 month or less	0.00%	1.00
1 to 3 months	1 to 3 months	0.20%	1.00
3 to 6 months	3 to 6 months	0.40%	1.00
6 to 12 months	6 to 12 months	0.70%	1.00
1 to 2 years	1.0 to 1.9 years	1.25%	0.90
2 to 3 years	1.9 to 2.8 years	1.75%	0.80
3 to 4 years	2.8 to 3.6 years	2.25%	0.75
4 to 5 years	3.6 to 4.3 years	2.75%	0.75
5 to 7 years	4.3 to 5.7 years	3.25%	0.70
7 to 10 years	5.7 to 7.3 years	3.75%	0.65
10 to 15 years	7.3 to 9.3 years	4.50%	0.60
15 to 20 years	9.3 to 10.6 years	5.25%	0.60
Over 20 years	10.6 to 12 years	6.00%	0.60
	12 to 20 years	8.00%	0.60
	Over 20 years	12.50%	0.60

9.10.9 The result of the above calculations is to produce two sets of weighted positions, the net long or short positions in each time band and the vertical disallowances, which have no sign.

9.10.10 In addition, however, banks will be allowed to conduct two rounds of horizontal offsetting-

(a) first between the net positions in each of three zones, where zone 1 is set as zero to one year, zone 2 is set as one year to four years, and zone 3 is set as four years and over (however, for coupons less than 3 percent, zone 2 is set as one year to 3.6 years and zone 3 is set as 3.6 years and over); and

(b) subsequently between the net positions in the three different zones.

The offsetting will be subject to a scale of disallowances expressed as a fraction of the matched positions, as set out in Table 3 below. The weighted long and short positions in each of three zones may be offset, subject to the matched portion attracting a disallowance factor that is part of the capital requirement. The residual net position in each zone may be carried over and offset against opposite positions in other zones, subject to a second set of disallowance factors.

Table 3

Horizontal disallowances				
Zones	Time band[7]	Within the zone	Between adjacent zones	Between zones 1 and 3
Zone 1	0-1 month 1-3 months 3-6 months 6-12 months	40%	40%	100%
Zone 2	1-2 years 2-3 years 3-4 years 4-5 years	30%	40%	
Zone 3	5-7 years 7-10 years 10-15 years 15-20 years Over 20 years	30%		

9.10.11 The use of the duration method is subject to the Prudential Authority's approval, which is based on the calculation of the price sensitivity of each position separately.

9.10.12 Banks must use the duration method on a continuous basis, unless a change in method is approved by the Prudential Authority and are subject to supervisory monitoring of the systems used.

9.10.13 The duration method is calculated as follows-

(a) calculate the price sensitivity of each instrument in terms of a change in interest rates of between 0.6 and 1.0 percentage points depending on the maturity of the instrument, according to Table 3 above;

(b) slot the resulting sensitivity measures into a duration-based ladder with the 15-time bands set out in Table 3 above;

(c) subject long and short positions in each time band to a 5 percent vertical disallowance designed to capture basis risk; and

(d) carry forward the net positions in each time band for horizontal offsetting subject to the disallowances set out in Table 2 above.

Table 4

Duration method- time bands and assumed changes in yield			
	Assumed change in yield		Assumed change in yield
Zone 1-		Zone 3-	
1 month or less	1.00	3.6 to 4.3 years	0.75
1 to 3 months	1.00	4.3 to 5.7 years	0.70
3 to 6 months	1.00	5.7 to 7.3 years	0.65
6 to 12 months	1.00	7.3 to 9.3 years	0.60
Zone 2-		9.3 to 10.6 years	0.60
1.0 to 1.9 years	0.90	10.6 to 12 years	0.60
1.9 to 2.8 years	0.80	12 to 20 years	0.60
2.8 to 3.6 years	0.75	Over 20 years	0.60

9.10.14 In case of residual currencies as in paragraph 9.10.4, the gross positions in each time band will be subject to either the risk weightings set out in Table 2 above, if positions are reported using the maturity method, or the assumed change in yield set out in Table 4 above, if positions are reported using the duration method, with no further offsets.

9.11 Interest rate derivative

9.11.1 The CRIRR must include all interest-rate derivatives and off-balance sheet instruments in the trading book which react to changes in interest rates, such as FRAs, other forward contracts, bond futures, interest rate swaps, cross-currency swaps and forward foreign exchange positions.

9.11.2 The derivatives must be converted into positions in the relevant underlying and become subject to specific and general market risk charges as described above.

9.11.3 The amounts must be the market value of the principal amount of the underlying or of the notional underlying resulting from the prudent valuation requirements set out in regulation 39(13) of the Regulations, considering that for instruments where the apparent notional amount differs from the effective notional amount, banks must use the effective notional amount.

9.11.4 Futures and forward contracts (including FRAs) are treated as a combination of a long and a short position in a notional government security.

9.11.5 The maturity of a future or a FRA will be the period until delivery or exercise of the contract, plus, where applicable, the life of the underlying instrument.

9.11.6 Where a range of deliverable instruments may be delivered to fulfil the contract, the bank has flexibility to elect which deliverable security goes into the maturity or duration ladder but must take account of any conversion factor defined by the exchange.

9.11.7 In the case of a future on a corporate bond index, positions are included at the market value of the notional underlying portfolio of securities.

9.11.8 Swaps are treated as two notional positions in government securities with relevant maturities- for example, an interest rate swap under 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. For swaps that pay or receive a fixed or floating interest rate against some other reference price, such as a stock index, the interest rate component must be slotted into the appropriate repricing maturity category, with the equity component being included in the equity framework. The separate legs of cross-currency swaps are to be reported in the relevant maturity ladders for the currencies concerned.

9.11.9 Banks may exclude from the interest rate maturity framework altogether, for both specific and general market risk, long and short positions (both actual and notional) in identical instruments with exactly the same issuer, coupon, currency and maturity.

9.11.10 A matched position in a future or forward and its corresponding underlying may also be fully offset and thus excluded from the calculation. However, the leg representing the time to expiry of the future must be reported.

9.11.11 When the future or the forward comprises a range of deliverable instruments offsetting of positions in the future or forward contract and its underlying, offsetting is only permissible in cases where there is a readily identifiable underlying security that 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 must, in such cases, move in close alignment.

9.11.12 No offsetting is allowed between positions in different currencies. The separate legs of cross-currency swaps or forward FX deals must be treated as notional positions in the relevant instruments and included in the appropriate calculation for each currency.

9.11.13 Opposite positions in the same category of instruments, including the delta-equivalent value of options, may in certain circumstances be regarded as matched and allowed to offset fully.

9.11.14 The delta equivalent of the legs arising out of the treatment of caps and floors as set out in paragraph 9.15.13 below may also be offset against each other under paragraph 9.11.13 above and paragraph 9.11.15 below.

9.11.15 To qualify for the treatment in paragraph 9.11.13 above, the positions must relate to the same underlying instruments, be of the same nominal value and be denominated in the same currency. In addition-

(a) for futures- offsetting positions in the notional or underlying instruments to which the futures contract relates must be for identical products and mature within seven days of each other;

(b) for swaps and FRAs- the reference rate (for floating rate positions) must be identical and the coupon closely matched (within 15 basis points); and

(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-

(i) less than one month hence- same day;

(ii) between one month and one year hence- within seven days; and

(iii) over one year hence- within 30 days.

9.11.16 The separate legs of different swaps may also be matched subject to the same conditions established in paragraph 9.11.15 above.

9.11.17 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.

9.11.18 One method is to first convert the payments required by the swap into their present values. For that purpose, each payment must be discounted using 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 bonds; these figures must be slotted into the general market risk framework as set out above.

9.11.19 An alternative method is to calculate the sensitivity of the net present value implied by the change in yield used in the maturity or duration method and allocate these sensitivities into the time bands set out in Table 2 or Table 4 above.

9.11.20 Other methods which produce similar results may be used if-

(a) the Prudential Authority is fully satisfied with the accuracy of the systems being used;

(b) 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) the positions are denominated in the same currency.

9.11.21 Interest rate and currency swaps, FRAs, forward FX contracts and interest rate futures are not subject to a specific risk charge. This exemption also applies to futures on an interest rate index.

9.11.22 In the case of futures contracts where the underlying is a debt security, or an index representing a basket of debt securities, a specific risk charge applies according to the credit risk of the issuer as set out in paragraphs 9.9.1 to 9.9.24 above.

9.11.23 General market risk applies to positions in all derivative products in the same manner as for cash positions, subject only to an exemption for fully or very closely matched positions in identical instruments as defined in paragraphs 9.11.9 to 9.11.15 above.

9.11.24 The CRIRR must include all interest-rate derivatives and off-balance sheet instruments in the trading book which react to changes in interest rates, such as FRAs, other forward contracts, bond futures, interest rate swaps, cross-currency swaps and forward foreign exchange positions.

9.11.25 The derivatives must be converted into positions in the relevant underlying and become subject to specific and general market risk charges as described above.

9.11.26 The amounts must be the market value of the principal amount of the underlying or of the notional underlying resulting from the prudent valuation guidance set out in regulation 39(13) of the Regulations, considering that for instruments where the apparent notional amount differs from the effective notional amount, banks must use the effective notional amount.

9.11.27 Futures and forward contracts (including FRAs) are treated as a combination of a long and a short position in a notional government security.

9.11.28 The maturity of a future or a FRA will be the period until delivery or exercise of the contract, plus, where applicable, the life of the underlying instrument.[20].

9.11.29 Where a range of deliverable instruments may be delivered to fulfil the contract, the bank has flexibility to elect which deliverable security goes into the maturity or duration ladder but must take account of any conversion factor defined by the exchange.

9.11.30 In the case of a future on a corporate bond index, positions are included at the market value of the notional underlying portfolio of securities.

9.11.31 Swaps are treated as two notional positions in government securities with relevant maturities- for example, an interest rate swap under 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. For swaps that pay or receive a fixed or floating interest rate against some other reference price, such as a stock index, the interest rate component must be slotted into the appropriate repricing maturity category, with the equity component being included in the equity framework. The separate legs of cross-currency swaps are to be reported in the relevant maturity ladders for the currencies concerned.

9.11.32 Banks may exclude from the interest rate maturity framework altogether, for both specific and general market risk, long and short positions (both actual and notional) in identical instruments with exactly the same issuer, coupon, currency and maturity.

9.11.33 A matched position in a future or forward and its corresponding underlying may also be fully offset and thus excluded from the calculation. However, the leg representing the time to expiry of the future must be reported.

9.11.34 When the future or the forward comprises a range of deliverable instruments offsetting of positions in the future or forward contract and its underlying, offsetting is only permissible in cases where there is a readily identifiable underlying security that 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 must, in such cases, move in close alignment.

9.11.35 No offsetting is allowed between positions in different currencies. The separate legs of cross-currency swaps or forward FX deals must be treated as notional positions in the relevant instruments and included in the appropriate calculation for each currency.

9.11.36 Opposite positions in the same category of instruments, including the delta-equivalent value of options, may in certain circumstances be regarded as matched and allowed to offset fully.

9.11.37 The delta equivalent of the legs arising out of the treatment of caps and floors as set out in paragraph 9.15.13 below may also be offset against each other under paragraph 9.11.36 above and paragraph 9.11.38 below.

9.11.38 To qualify for the treatment in paragraph 9.11.36 above, the positions must relate to the same underlying instruments, be of the same nominal value and be denominated in the same currency. In addition-

(a) for futures- offsetting positions in the notional or underlying instruments to which the futures contract relates must be for identical products and mature within seven days of each other;

(b) for swaps and FRAs- the reference rate (for floating rate positions) must be identical and the coupon closely matched (within 15 basis points); and

(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-

(i) less than one month hence - same day;

(ii) between one month and one year hence - within seven days; and

(iii) over one year hence - within 30 days.

9.11.39 The separate legs of different swaps may also be matched subject to the same conditions established in paragraph 9.11.38 above.

9.11.40 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.

9.11.41 One method is to first convert the payments required by the swap into their present values. For that purpose, each payment must be discounted using 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 bonds; these figures must be slotted into the general market risk framework as set out above.

9.11.42 An alternative method is to calculate the sensitivity of the net present value implied by the change in yield used in the maturity or duration method and allocate these sensitivities into the time bands set out in Table 2 or Table 4 above.

9.11.43 Other methods which produce similar results may be used if-

(a) the Prudential Authority is fully satisfied with the accuracy of the systems being used;

(b) 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) the positions are denominated in the same currency.

9.11.44 Interest rate and currency swaps, FRAs, forward FX contracts and interest rate futures are not subject to a specific risk charge. This exemption also applies to futures on an interest rate index.

9.11.45 In the case of futures contracts where the underlying is a debt security, or an index representing a basket of debt securities, a specific risk charge applies according to the credit risk of the issuer as set out in paragraphs 9.9.1 to 9.9.22 above.

9.11.46 General market risk applies to positions in all derivative products in the same manner as for cash positions, subject only to an exemption for fully or very closely matched positions in identical instruments as defined in paragraphs 9.11.32 to 9.11.38 above.

[20] For example, a long position in a June three-month interest rate future (taken in April) is to be reported as a long position in a government security with a five-month maturity and a short position in a government security with a two-month maturity.

9.12 Equity risk

9.12.1 The minimum capital standard to cover the risk of holding or taking positions in equities in the trading book (CR_{EQ}) applies to long and short positions in all instruments that exhibit market behaviour similar to equities, but not to non-convertible preference shares, which are covered by the interest rate risk requirements described in paragraphs 9.11.24 to 9.11.46 above.

9.12.2 Long and short positions in the same issue may be reported on a net basis.

9.12.3 The instruments covered include common stocks, whether voting or non-voting, convertible securities that behave like equities, and commitments to buy or sell equity securities.

9.12.4 The CR_{EQ} is the sum of three separately calculated components-

(a) the specific risk of holding a long or short position in an individual equity;

(b) the general market risk of holding a long or short position in the market as a whole; and

(c) the risk of holding a net long or short position in an index contract comprising a diversified portfolio of equities.

9.12.5 Specific risk is the bank's gross equity positions- the sum of all long equity positions and of the absolute value of all short equity positions.

9.12.6 General market risk is the difference between the sum of the longs and the sum of the shorts- the overall net position in an equity market.

9.12.7 The long or short position in the market must be calculated on a market-by-market basis- a separate calculation must be carried out for each national market in which the bank holds equities.

9.12.8 The capital requirement factors are-

(a) 8 percent, applied to the specific risk and to the general market risk components; and

(b) 2 percent, applied to the net long or short position in an index contract comprising a diversified portfolio of equities. This capital requirement is intended to cover factors such as execution risk and must apply only to well-diversified indices and not sectoral indices.

9.12.9 Except for options, which are dealt with in paragraphs 9.15.1 to 9.15.25, the following must be included in the calculation set in paragraphs 9.12.12 to 9.12.18 below-

(a) equity derivatives, including futures and swaps on individual equities and on stock indices; and

(b) off-balance sheet positions that are affected by changes in equity prices. This includes futures and swaps on both individual equities and on stock indices.

9.12.10 The equity derivatives in paragraph 9.12.9 above must be converted into positions in the relevant underlying.

9.12.11 Where equities are part of a forward contract, a future or an option (quantity of equities to be received or to be delivered), any interest rate or foreign currency exposure from the other leg of the contract must have the capital requirement for interest rate (CR_{IRR}) and foreign currency exposure (CR_{FX}) calculated.

9.12.12 To calculate the specific and general market risk requirements, positions in derivatives must be converted into notional equity positions-

(a) futures and forward contracts relating to individual equities must in principle be reported at current market prices;

(b) futures relating to stock indices must be reported as the marked-to-market value of the notional underlying equity portfolio;
(c) equity swaps must be treated as two notional positions;
(d) equity options and stock index options must be either carved out together with the associated underlying or be incorporated in the measure of general market risk according to the delta-plus method.

9.12.13 Matched positions in each identical equity or stock index in each market may be fully offset, resulting in a single net short or long position to which the specific and general market risk charges will apply for example, a future in a given equity may be offset against an opposite cash position in the same equity.

9.12.14 In the case of the futures-related arbitrage strategies described below, the additional 2 percent capital requirement described in paragraph 9.12.8 above may be applied to only one index, with the opposite position exempt from a capital requirement-

(a) when the bank takes an opposite position in exactly the same index at different dates or in different market centres; and
(b) when the bank has an opposite position in contracts at the same date in different but similar indices, subject to Prudential Authority oversight that the two indices contain sufficient common components to justify offsetting.

9.12.15 Where a bank engages in a deliberate arbitrage strategy, in which a futures contract on a broadly based index matches a basket of stocks, it will be allowed to carve out both positions from the simplified standardised approach on condition that-

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

9.12.16 In such a case as set out in paragraph 9.12.15 above, the minimum capital requirement will be 4 percent (2 percent of the gross value of the positions on each side) to reflect divergence and execution risks.

9.12.17 This requirement in paragraph 9.12.16 above 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 excess value of the futures contract over the value of the basket must be treated as an open long or short position.

9.12.18 If a bank takes a position in depository receipts against an opposite position in the underlying equity or identical equities in different markets, it may offset the position (bear no capital requirement), on the condition that any costs on conversion are fully taken into account.

9.13 Foreign exchange risk

9.13.1 The minimum capital requirement for foreign exchange risk (CR_{FX}) applies when the bank holds or takes positions in foreign currencies, including gold.

9.13.2 The CR_{FX} is calculated in two steps-

(a) first, measure the exposure in a single currency position, calculating the net open position as set out in paragraphs 9.13.3 to 9.13.9 below; and

(b) second, measure the risks inherent in a bank's portfolio of long and short positions in different currencies, using the shorthand method as set out in paragraphs to 9.13.3 to 9.13.14 below.

9.13.3 The net open position in each currency must be calculated by summing-

(a) the net spot position- all asset items less all liability items, including accrued interest, denominated in a given currency;

(b) the net forward position- all amounts to be received less all amounts to be paid under forward FX transactions, including currency futures and the principal on currency swaps not included in the spot position;

(c) guarantees and similar instruments that are certain to be called and are likely to be irrecoverable;

(d) net future income or expenses not yet accrued but already fully hedged, at the discretion of the bank;

(e) any other item representing a profit or loss in foreign currencies; and

(f) the net delta-based equivalent of the total book of foreign currency options.

9.13.4 For calculating the net open position, positions in composite currencies may be either treated as a currency in their own right or split into their component parts, on a consistent basis.

9.13.5 Positions in gold must be measured in the same manner as described in paragraph 9.14.10 below.

9.13.6 Where gold is part of a forward contract (quantity of gold to be received or to be delivered), any interest rate or foreign currency exposure from the other leg of the contract must have the capital requirement for interest rate risk (CR_{IRR}) and foreign currency risk (CR_{FX}) calculated.

9.13.7 Interest, other income and expenses must be treated as follows-

(a) interest accrued (i earned but not yet received) and accrued expenses must be included;

(b) unearned but expected future interest and anticipated expenses may be excluded unless the amounts are certain and banks have taken the opportunity to hedge them.

9.13.8 The treatment of future income or expenses must be consistent, and banks must not include only those expected future flows which reduce their position.

9.13.9 Forward currency and gold positions must be measured as follows-

(a) forward currency and gold positions are normally to be valued at current spot market exchange rates. Using forward exchange rates is inappropriate since it results in the measured positions reflecting current interest rate differentials to some extent; and

(b) banks that 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.

9.13.10 The FX risk in a portfolio of foreign currency positions and gold as in paragraph 9.13.2(b) above, must be measured by the shorthand method, which treats all currencies equally, unless written approval has been obtained from the Prudential Authority to deviate from this requirement.

9.13.11 Under the shorthand method-

(a) the nominal amount, or net present value, of the net position in each foreign currency and in gold is converted at spot rates into the reporting currency;

(b) the overall net open position is measured by aggregating-

(i) the sum of the absolute value of net short positions or the sum of the net long positions, whichever is the greater, plus;
(ii) the absolute value of the net position (short or long) in gold.

9.13.12 Where the bank is assessing its FX risk on a consolidated basis and it is technically impractical in the case of some marginal operations to include the currency positions of a foreign branch or subsidiary of the bank, the internal limit in each currency may be used as a proxy for the positions. Provided there is adequate ex post monitoring of actual positions against such limits, the limits must be added, without regard to sign, to the net open position in each currency. An alternative calculation, which produces an identical result, is to include the reporting currency as a residual and to take the sum of all the short (or long) positions.

9.13.13 The CR_{FX} is 8 percent of the overall net open position calculated according to the shorthand method.

9.13.14 A bank which has an insignificant business in foreign currency and which does not take FX positions for its own account may be exempted from capital requirements on these positions provided that-

(a) its foreign currency business, defined as the greater of the sum of its gross long positions and the sum of its gross short positions in all foreign currencies, does not exceed 100 percent of eligible capital as defined in regulation 38 of the Regulations; and
(b) its overall net open position as defined in paragraph 9.13.10 above does not exceed 2 percent of its eligible capital as defined in regulation 38 of the Regulation.

9.14 Commodities risk

9.14.1 The minimum capital requirement for commodities risk (CR_{COM}) applies when the bank holds or takes positions in commodities, including precious metals, but excluding gold.

9.14.2 A commodity is defined as a physical product which is or may be traded on a secondary market, for example agricultural products, minerals (including oil) and precious metals.

9.14.3 The risks associated with commodities[21] include the following-

(a) for spot or physical trading, the directional risk arising from a change in the spot price is the most important risk;
(b) banks using 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, including-
    (i) basis risk- the risk that the relationship between the prices of similar commodities alters through time;
    (ii) interest rate risk- the risk of a change in the cost of carry for forward positions and options; and
    (iii) forward gap risk- the risk that the forward price may change for reasons other than a change in interest rates;

[21] Banks also need to guard against the risk that arises when the 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.

(c) banks may also face counterparty credit risk on over-the-counter derivatives, which are set out in regulation 23 in the Regulations relating to Banks and the Prudential Standard on CVA;
(d) where the funding of commodities positions leads to interest rate or FX exposure, the bank must calculate the capital requirement for interest rate (CR_{IRR}) and foreign currency risk (CR_{FX}).

9.14.4 Where a commodity is part of a forward contract (quantity of commodities to be received or to be delivered), any interest rate or foreign currency exposure from the other leg of the contract must have the capital requirement for interest rate risk (CR_{IRR}) and foreign currency risk (CR_{FX}) calculated.

9.14.5 Positions which are purely stock financing (. a physical stock has been sold forward and the cost of funding has been locked in until the date of the forward sale) are omitted from the CR_{COM}, but they are subject to interest rate and counterparty risk requirements.

9.14.6 Two alternative methodologies may be used to calculate the CR_{COM}, appropriate for banks that, in relative terms, conduct only a limited amount of commodities business-
(a) the maturity ladder approach, which is a measurement system that captures forward gap and interest rate risk separately by basing the methodology on seven-time bands as described in paragraphs 9.14.10 to 9.14.18 below; or
(b) the simplified approach as described in paragraphs 9.14.19 to 9.14.21 below.

9.14.7 For the maturity ladder approach and the simplified approach-
(a) long and short positions in each commodity are reported on a net basis for the purposes of calculating open positions; and
(b) as a general rule, positions in different commodities must not offset.

9.14.8 Commodities may be grouped into clans, families, subgroups and individual commodities.

9.14.9 Netting between different subcategories of the same commodity may be permitted subject to the prior written approval of the Prudential Authority and subject to conditions specified in writing by the Prudential Authority.

9.14.10 In calculating the CR_{COM} under the maturity ladder approach, banks must-
(a) express each commodity position (spot plus forward) in terms of the standard unit of measurement (such as, but not limited to, barrels, kilos, grams);
(b) convert the net position in each commodity at current spot rates into the national currency;
(c) enter the positions in the separate commodities, expressed in terms of the standard unit of measurement, into a maturity ladder composed of the following time bands-
(i) 0 - 1 month;
(ii) 1 - 3 months;
(iii) 3 – 6 months;
(iv) 6-12 months;
(v) 1 – 2 years;
(vi) 2 – 3 years; and
(vii) over 3 years;
(d) multiply the converted net position in each commodity by the spread rate of 1.5 percent against each of the time bands outlined in sub-paragraph (c) above.

9.14.11 Physical commodities stocks must be allocated to the first time band.

9.14.12 For markets that have daily delivery dates, any contracts maturing within 10 days of one another may be offset.

9.14.13 The residual net positions from nearer time bands must then be carried forward to offset exposures in time bands that are further out, and a surcharge equal to 0.6 percent of the net position carried forward must be added in respect of each time band that the net position is carried forward.

9.14.14 The capital requirement for each matched amount created by carrying net positions forward must be calculated as in paragraphs 9.14.10 to 9.14.12 above.

9.14.15 At the end of the process in paragraph 9.14.14 above, a bank will have either only long or only short positions, to which a capital requirement of 15 percent must be applied.

9.14.16 All commodity derivatives and off-balance sheet positions that are affected by changes in commodity prices must be included in this measurement framework, including commodity futures, commodity swaps, and options where the delta-plus method is used.

9.14.17 Commodity derivatives must be converted into notional commodities positions and assigned to maturities as follows-

(a) futures and forward contracts relating to individual commodities must be incorporated as notional amounts of the standard unit of measurement (such as, but not limited to, barrels, kilos, grams.) and must be assigned a maturity with reference to expiry date;

(b) commodity swaps where one leg is a fixed price and the other the current market price must be incorporated as a series of positions equal to the notional amount of the contract, with one position corresponding with each payment on the swap and slotted into the maturity ladder accordingly. The positions must be long positions if the bank is paying fixed and receiving floating, and short positions if it is receiving fixed and paying floating;

(c) commodity swaps where the legs are in different commodities must be incorporated in the relevant maturity ladder time band. No offsetting is allowed in this regard, except where the commodities belong to the same subcategory and prior approval has been granted by the Prudential Authority in terms of paragraph 9.14.9 above.

9.14.18 If one of the legs in paragraph 9.14.17(b) above involves receiving/paying a fixed or floating interest rate, that exposure must be slotted into the appropriate repricing maturity band in the maturity ladder of the CR_{IRR}.

9.14.19 In calculating the CR_{COM} under the simplified approach, banks must follow the procedures in paragraphs 9.14.10 (a) and (b) as well as paragraphs 9.14.16 to 9.14.18 above;

9.14.20 The capital requirement in the simplified approach is equal to-

(a) 15 percent of the absolute value of the net positions, long or short, in each commodity; plus

(b) 3 percent of the gross positions, equal to the sum of long and of the absolute value of short positions, in each commodity.

9.14.21 In valuing the gross positions in commodity derivatives, banks must use the current spot price.

9.15 Treatment of options

9.15.1 The following alternative approaches for options are allowed under the SSA subject to the approval required in terms of paragraph 6.2 above- -

(a) banks which solely use purchased options may use the simplified approach as described in paragraph 9.15.8 to 9.15.11 below;

(b) banks which also write options are expected to use the delta-plus method or scenario approach as described in paragraph 19.

9.15.2 The more significant its option trading activity is, the more the bank is expected to use a sophisticated approach. A bank with highly significant trading activity is not expected to use the SSA.

9.15.3 If banks in paragraph 9.15.1(a) have all their written option positions hedged by perfectly matched long positions in exactly the same options, no capital requirement for market risk for these positions is required.

9.15.4 In the simplified approach for options, the positions for the options and the associated underlying, cash or forward, are not subject to the standardised methodology but rather are carved-out and subject to separately calculated capital requirements that incorporate both general market risk and specific risk. The risk numbers generated are added to the capital requirements for the relevant category, that is interest rate related instruments, equities, FX and commodities.

9.15.5 The delta-plus method uses the sensitivity parameters or Greek letters associated with options to measure their market risk and capital requirements-

(a) the delta-equivalent position of each option becomes part of the SSA, with the delta-equivalent amount subject to the applicable general market risk charges; and

(b) separate capital requirements are applied to the gamma and vega risks of the option positions.

9.15.6 The scenario approach uses simulation techniques to calculate changes in the value of an options portfolio for changes in the level and volatility of its associated underlyings. Under this approach the general market risk charge is determined by the scenario grid (that is the specified combination of underlying and volatility changes) that produces the largest loss.

9.15.7 For the delta-plus method and the scenario approach, the specific risk capital requirements are determined separately by multiplying the delta-equivalent of each option by the specific risk weights set out in paragraphs 9.4 to 9.12.18 above.

9.15.8 The calculation of the capital requirement according to the simplified approach for options is as follows-

(a) the capital requirement is the market value of the underlying security multiplied by the sum of specific and general market risk charges for the underlying less the amount by which the option is in the money (if any) bounded at zero, when the option position is-

(i) long cash and long put, or

(ii) short cash and long call;

(b) the capital requirement is the lesser of- (1) the market value of the underlying security multiplied by the sum of specific and general market risk charges for the underlying and (2) the market value of the option, when the option position is-

(i) long call; or

(ii) long put.

9.15.9 In some cases such as FX, when it is unclear which side is the underlying security; this must be taken to be the asset that would be received if the option were exercised. In addition, the nominal value must be used for items where the market value of the underlying instrument could be zero, such as, but not limited to caps and floors as well as swaptions.

9.15.10 Some options (such as, but not limited to, where the underlying is an interest rate, a currency or a commodity) bear no specific risk but specific risk will be present in the case of options on certain interest rate related instruments (such as, but not limited to, options on a corporate debt security or corporate bond index) and for options on equities and stock indices. The charge under this measure for currency options is 8 percent and for options on commodities it is 15 percent.

9.15.11 For paragraph 9.15.8(b) above, where the position does not fall within the trading book (such as, but not limited to, options on certain FX or commodities positions not belonging to the trading book), it is acceptable to use the book value instead of the market value subject to the prior written approval of the Prudential Authority and such conditions as may be imposed.

9.15.12 In the delta-plus method-

(a) options must be reported as a position equal to the market value of the underlying multiplied by the delta;

(b) it is also required to measure 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) sensitivities in order to calculate the total capital requirement. These sensitivities are calculated according to the following models which must be approved by the Prudential Authority-

(i) an exchange model; or

9.15.13 the bank's proprietary options pricing model. Delta-weighted positions with debt securities or interest rates as the underlying are slotted into the interest rate time bands, as in paragraphs 9.4 to 9.11.46 above, under the following procedure-

(a) a two-legged approach must be used as for other derivatives, requiring one entry at the time the underlying contract takes effect and a second at the time the underlying contract matures. For instance, 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 five-month maturity and a short position with a two-month maturity. The written option will be similarly slotted as a long position with a two-month maturity and a short position with a five-month maturity.

(b) floating rate instruments with caps or floors must be 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 15 percent will treat it as-

(i) a debt security that reprices in six months; and

(ii) a series of five written call options on an FRA with a reference rate of 15 percent, each with a negative sign at the time the underlying FRA takes effect and a positive sign at the time the underlying FRA matures.

9.15.14 The capital requirement for options with equities as the underlying must also be based on the delta-weighted positions that must be incorporated in the measure of equity risk described in paragraph 9.12 above. Each national market must be treated as a separate underlying.

9.15.15 The capital requirement for options on FX and gold positions must be based on the method for FX rate risk as set out in paragraph 9.13 above- the net delta-based equivalent of the foreign currency and gold options must be incorporated into the measurement of the exposure for the respective currency or gold position.

9.15.16 The capital requirement for options on commodities must be based on the simplified or the maturity ladder approach for commodities risk as set out in paragraph 9.14 above. The delta-weighted positions must be incorporated in one of the measures described in paragraph 9.14 above.

9.15.17 The capital requirements for gamma and vega for each option position, including hedge positions, must be calculated in the following way-

(a) for each individual option, a gamma impact must be calculated according to a Taylor series expansion as follows, where VU is the variation of the underlying of the option-

(b) $Gamma\ impact = \frac{1}{2} * Gamma * VU^2$ VU is calculated as follows-

(i) for interest rate options, if the underlying is a bond, the market value of the underlying must be multiplied by the risk weights set out in Table 2. An equivalent calculation must be carried out where the underlying is an interest rate, again based on the assumed changes in the corresponding yield in Table 2;

(ii) for options on equities and equity indices- the market value of the underlying must be multiplied by 8 percent;

(ii) for FX and gold options- the market value of the underlying must be multiplied by 8 percent.

(iii) for options on commodities- the market value of the underlying must be multiplied by 15 percent.

(c) the following positions must be treated as the same underlying-

(i) for interest rates, with positions slotted into separate maturity ladders by currency, each time band as set out in Table 2.Banks using the duration method should due the time bands set as out in Table 3;

(ii) for equities and stock indices, each national market;

(iii) for foreign currencies and gold, each currency pair and gold; and

(iv) for commodities, each individual commodity as defined in paragraphs 9.14.7 to 9.14.9 above.

(d) each option on the same underlying will have a gamma impact that is either positive or negative-

(i) these individual gamma impacts must be summed, resulting in a net gamma impact for each underlying that is either positive or negative;

(ii) only net gamma impacts that are negative must be included in the capital requirement calculation;

(e) the total gamma risk capital requirement must be the sum of the absolute value of the net negative gamma impacts as calculated above;

(f) for volatility risk, banks must calculate the capital requirements by multiplying the sum of the vega risks for all options on the same

underlying, as defined above, by a proportional shift in volatility of ± 25 percent;

(g) the total vega risk capital requirement must be the sum of the absolute value of the individual capital requirements that have been calculated for vega risk.

9.15.18 The scenario approach requires 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.

9.15.19 For the purpose of calculating the capital requirement under the scenario approach, the bank must 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) a different matrix must be set up for each individual underlying as defined in paragraph 9.15.17 above; or

(b) as an alternative to sub-paragraph (a) above , subject to the prior written approval of and such conditions as may be specified in writing by the Prudential Authority, a bank that conducts significant business in options may in respect of its interest rate options base the relevant required calculations on a minimum of six sets of time bands, provided that in no case shall the bank combine more than three of the time bands as defined in Table 3 and Table 4 into any one set.

9.15.20 Under the scenario approach, the options and related hedging positions must be evaluated over a specified range above and below the current value of the underlying-

(a) the range for interest rates must be consistent with the assumed changes in yield in Table 3;

(b) banks using the alternative method for interest rate options set out in paragraph 9.15.19(b) above, must use, for each set of time bands, the highest of the assumed changes in yield applicable to the group to which the time bands belong;

(c) the other ranges are-

(i) ± 8 percent for equities;

(ii) ± 8 percent for FX and gold; and

(iii) ± 15 percent for commodities;

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

9.15.21 The second dimension of the matrix in the scenario approach entails a change in the volatility of the underlying rate or price-

(a) a single change in the volatility of the underlying rate or price equal to a shift in volatility of + 25 percent and – 25 percent is expected to be sufficient in most cases;

(b) as circumstances warrant, the Prudential Authority may choose to require that a different change in volatility be used and/or that intermediate points on the grid be calculated.

9.15.22 After calculating the matrix, each cell contains the net profit or loss of the option and the underlying hedge instrument.

9.15.23 The capital requirement under the scenario approach for each underlying must then be calculated as the largest loss contained in the matrix.

9.15.24 The use of the scenario analysis by any specific bank is subject to the Prudential Authority's prior written approval, particularly with regard to the precise way that the analysis is constructed. Banks' use of scenario analysis as part of the SSA, is subject to validation by the Prudential Authority, and to those of the qualitative standards for internal models as set out in paragraph 11.1 below.

9.15.25 Banks undertaking significant options business must closely monitor other risks also associated with options, such as rho (rate of change of the value of the option with respect to the interest rate) and theta (rate of change of the value of the option with respect to time). Additionally, banks may incorporate rho into their capital calculations for interest rate risk, if they wish to do so.

10. Standardised approach

10.1 General provisions

10.1.1 The market risk standardised approach capital requirement (MR_{SA}) is the simple sum of three components-

$$\mathrm{MR_{SA}} = \mathrm{DRC} + \mathrm{SbM} + \mathrm{RRAO}$$

where-

(i) DRC is the default risk capital;
(ii) SbM is the capital requirement under the sensitivities-based method; and
(iii) RRAO is the residual risk add-on.

10.1.2 The risk-weighted assets for market risk under the standardised approach (RWA_{MR_SA}) are determined by multiplying the MR_{SA} by 12.5.

10.1.3 The risk-weighted assets for each component of the MR_{SA} is determined by multiplying the component by 12.5, in such a way that-

$$\mathrm{RWA_{MR\_SA}} = \mathrm{RWA_{DRC}} + \mathrm{RWA_{SbM}} + \mathrm{RWA_{RRAO}}$$

where-

(a) RWA_{DRC} is the risk weighted assets from DRC calculation;
(b) RWA_{SbM} is the risk weighted assets from the SbM calculation; and
(c) RWA_{RRAO} is the risk weighted assets from the RRAO calculation.

10.1.4 The MR_{SA} must be calculated and reported to the Prudential Authority on a monthly basis, observing that-

(a) the MR_{SA} arising from non-banking subsidiaries of banks, on the prior written approval of the Prudential Authority and subject to such conditions as may be imposed by the Prudential Authority, may be permitted to calculate and report to the Prudential Authority on a quarterly basis; and
(b) banks must calculate its regulatory capital requirements for MR_{SA} at the request of the Prudential Authority, which may include at an increased frequency.

10.2 Default risk capital (DRC) requirements

10.2.1 The DRC requirement captures jump-to-default (JTD) risk of instruments in the trading book, in which-

(a) offsetting refers to the netting of exposures to the same obligor;

(b) hedging refers to the application of a partial hedge benefit from the short exposures, where the risk of long and short exposures in distinct obligors do not fully offset due to basis or correlation risks.

10.2.2 The DRC requirement must be calculated for instruments subject to default risk, according to the formula below-

$$\mathrm{DRC} = \mathrm{DRC_{NSEC}} + \mathrm{DRC_{SEC}} + \mathrm{DRC_{CTP}}$$

DRC = DRC_{NSEC} + DRC_{SEC} + DRC_{CTP}

where-

(a) DRC_{NSEC} is the DRC requirement for non-securitisation portfolios;

(b) DRC_{SEC} is the DRC requirement for securitisation portfolios;

(c) DRC_{CTP} is the DRC requirement for the CTP as defined in paragraph 3.1 above.

10.2.3 The following step-by-step approach must be followed for each risk class subject to default risk. The specific definition of gross JTD risk, net JTD risk, bucket, risk weight and the method for aggregation of DRC requirement across buckets are separately set out per each risk class in paragraph 10.3 below.

(a) The gross JTD risk of each exposure is computed separately.

(b) With respect to the same obligator, the JTD amounts of long and short exposures are offset (where permissible) to produce net long and/or net short exposure amounts per distinct obligor.

(c) Net JTD risk positions are then allocated to buckets.

(d) Within a bucket, a hedge benefit ratio is calculated using net long and short JTD risk positions. This acts as a discount factor that reduces the amount of net short positions to be netted against net long positions within a bucket. A prescribed risk weight is applied to the net positions which are then aggregated.

(e) Bucket level DRC requirements are aggregated as a simple sum across buckets to give the overall DRC requirement.

10.2.4 No diversification benefit is recognised between the DRC requirements for-

(a) non-securitisations;

(b) securitisations (non-CTP); and

(c) securitisations (CTP).

10.3 DRC requirement for non-securitisations (DRC_{NSEC})

10.3.1 The gross JTD risk position (JTD) must be computed exposure by exposure, according to the following formulas-

$$JTD(long) = max(LGD \times notional + P\&L, 0)$$
$$JTD(short) = \min(LGD \times notional + P\&L, 0)$$

where-

(a) LGD is the loss given default of a position;
(b) Notional is the bond-equivalent notional amount or face value of the position; and
(c) P&L is the cumulative mark-to-market loss or gain already taken on the exposure. P&L is equal to the market value minus the notional amount, where the market value is the current market value of the position.

10.3.2 The notional amount is used to determine the loss of principal at default, and the mark-to-market loss is used to determine the net loss so as to not double-count the mark-to-market loss already recorded in the market value of the position.

10.3.3 For all instruments, the notional amount is the notional amount of the instrument relative to which the loss of principal is determined. For a bond, the notional amount is the face value. For credit derivatives, the notional amount of a credit default swap (CDS) contract or a put option on a bond is the notional amount of the derivative contract. In the case of a call option on a bond, the notional amount to be used in the JTD calculation is zero (since, in the event of default, the call option will not be exercised). In this case, a JTD would extinguish the call option's value and this loss would be captured through the mark-to-market P&L term in the JTD calculation.

10.3.4 For traded non-securitisation credit and equity derivatives, JTD risk positions by individual constituent issuer legal entity must be determined by applying a look-through approach.

10.3.5 When decomposing multiple underlying positions of a single security or product for purposes of the DRC computation, the JTD equivalent must be calculated.

10.3.6 The JTD equivalent is defined as the difference between the value of the security or product assuming that each single name referenced by the security or product, separately from the others, defaults with zero recovery, and the value of the security or product assuming that none of the names referenced by the security or product default.

10.3.7 The notional amount is used to determine the loss of principal at default, and the mark-to-market loss is used to determine the net loss so as to not double-count the mark-to-market loss already recorded in the market value of the position.

10.3.8 For all instruments, the notional amount is the notional amount of the instrument relative to which the loss of principal is determined. For a bond, the notional amount is the face value. For credit derivatives, the notional amount of a credit default swap (CDS) contract or a put option on a bond is the notional amount of the derivative contract. In the case of a call option on a bond, the notional amount to be used in the JTD calculation is zero (since, in the event of default, the call option will not be exercised). In this case, a JTD would extinguish the call option's value and this loss would be captured through the mark-to-market P&L term in the JTD calculation.

10.3.9 For traded non-securitisation credit and equity derivatives, JTD risk positions by individual constituent issuer legal entity must be determined by applying a look-through approach.

10.3.10 When decomposing multiple underlying positions of a single security or product for purposes of the DRC computation, the JTD equivalent must be calculated.

10.3.11 The JTD equivalent is defined as the difference between the value of the security or product assuming that each single name referenced by the security or product, separately from the others, defaults with zero recovery, and the value of the security or product assuming that none of the names referenced by the security or product default.

10.3.12 For the purpose of DRC requirements, the determination of the long/short direction of positions must be on the basis of long or short with respect to whether the credit exposure results in a loss or gain in the case of a default, where-

(a) a long exposure is defined as a credit exposure that results in a loss in the case of a default; and
(b) a short exposure is defined as a credit exposure that results in a gain in the case of a default.

10.3.13 In calculating the JTD as set out in paragraph 10.3.1 above-

(a) The notional amount that gives rise to a long exposure is recorded as a positive value;
(b) The notional amount that gives rise to a short exposure is recorded as a negative value;
(c) The P&L loss is recorded as a negative value;
(d) The P&L gain is recorded as a positive value; and
(e) If the contractual terms of the instrument allow for its unwinding with no exposure to default risk, then the JTD is equal to zero.

10.3.14 To account for defaults within the one-year capital horizon, the JTD for all exposures of maturity less than one year and their hedges are scaled by a fraction of a year. No scaling is applied to the JTD for exposures of one year or greater. For example, the JTD for a position with a six-month maturity would be weighted by one-half, while the JTD for a position with a one year maturity would have no scaling applied to the JTD. The maturity weighting applied to the JTD for any sort of product with a maturity of less than three months (such as short-term lending) is floored at a weighting factor of one-fourth or, equivalently, three months (that means that the positions having shorter-than-three months remaining maturity would be regarded as having a remaining maturity of three months for the purpose of the DRC requirement).

10.3.15 Cash equity positions (stocks) are assigned to a maturity of either more than one year or three months, at banks' discretion.

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

10.3.17 For calculating the JTD as in paragraph 10.3.1 above, the value of LGD is-

(a) 100% for equity instruments and non-senior debt instruments;
(b) 75% for senior debt instruments;
(c) 25% for covered bonds[22], as defined within paragraph 10.8 below; and
(d) zero for instruments whose price is not linked to the recovery rate of the defaulter.

[22] Subject to the provisions of the regulatory framework related to covered bonds

10.3.18 Net JTD (NJTD)

(a) Exposures to the same obligator may be offset as follows-

(i) The gross JTD risk positions of long and short exposures to the same obligor may be offset where the short exposure has the same or lower seniority relative to the long exposure.

(ii) For the purposes of determining whether a guaranteed bond is an exposure to the underlying obligor or an exposure to the guarantor, the credit risk mitigation requirements set out in CRE22.71 and CRE22.73 apply.

(iii) Exposures of different maturities that meet this offsetting criterion may be offset as follows.

(b) Exposures with maturities longer than the capital horizon (one year) may be fully offset.

(c) An exposure to an obligor comprising a mix of long and short exposures with a maturity less than the capital horizon (equal to one year) must be weighted by the ratio of the exposure's maturity relative to the capital horizon.

(d) In the case of long and short offsetting exposures where both have a maturity under one year, the scaling may be applied to both the long and short exposures.

(e) The offsetting may result in net long JTD risk positions and net short JTD risk positions. The net long and net short JTD risk positions are aggregated separately as described below.

10.3.19 The NJTDs of the DRC_{NSEC}, calculated as in paragraph 10.3.18 above, must be classified in one of the following buckets, according to the obligor-

(a) Corporates;

(b) Sovereigns; and

(c) Local governments and municipalities.

10.3.20 A hedge benefit ratio (HBR) must be computed, according to the following formula-

$$\boldsymbol{HBR_{BKT}} = \frac{\Sigma\, \boldsymbol{NJTD_{long}}}{\Sigma \boldsymbol{NJTD_{long}} + \Sigma \boldsymbol{Abs}(\boldsymbol{NJTD_{short}})}$$

where-

(a) BKT corresponds to each bucket referred in paragraph 10.3.14 above;

(b) $NJTD_{long}$ corresponds to the long NJTD risk positions (not risk-weighted), classified in bucket BKT; and

(c) $NJTD_{short}$ corresponds to the short NJTD risk positions (not risk-weighted), classified in bucket BKT.

10.3.21 The sum of the NJTDs in paragraph 10.3.20 above, is across the credit quality categories.

10.3.22 The following default risk weights (DRW) must be applied to the NJTDs, regardless of the bucket classification referred in paragraph 10.3.14 above and taking into account the credit quality category of the obligor-

(a) 0.5%, for exposures classified as AAA, or equivalent classification;

(b) 2%, for exposures classified as AA, or equivalent classification;

(c) 3%, for exposures classified as A, or equivalent classification;

(d) 6%, for exposures classified as BBB, or equivalent classification;

(e) 15%, for exposures classified as BB, or equivalent classification;

(f) 30%, for exposures classified as B, or equivalent classification;

(g) 50%, for exposures classified as CCC, or equivalent classification;

(h) 15%, for unrated exposures; and
(i) 100%, for defaulted exposures.

10.3.23 The Prudential Authority may, in consideration of CRE20.7 to CRE20.15, determine sovereigns, public sector entities and multilateral development banks where a DRW of 0 percent may be applied. In addition, the Prudential Authority may determine a non-zero risk weight to securities issued by certain foreign governments, including to securities denominated in a currency other than that of the issuing government.

10.3.24 Claims on an equity investment in a fund treated as an unrated "other sector" equity must be treated as an unrated equity instrument. Claims on a fund with a mandate that allows the fund to invest in primarily high-yield or distressed names, are subject to the maximum DRW defined in paragraph 10.3.22 above, that is achievable under the fund's mandate, by calculating the effective average risk weight of the fund when assuming that the fund invests first in defaulted instruments to the maximum possible extent allowed under its mandate, and then in CCC-rated names to the maximum possible extent, and then B-rated, and then BB-rated. In calculating the NJTD, the exposures generated in are not allowed to offset or to benefit from any diversification.

10.3.25 The capital requirement for each bucket defined in paragraph 10.3.19 above is calculated according to the following formula-

$$DRC_{NSEC\_BKT} = Max\left[\left(\sum_{i \in Long} DRW_i * NJTD_i\right) - HBR * \left(\sum_{i \in Short} DRW_i * |NJTD_i|\right);\ 0\right]$$

where-

(a) BKT corresponds to each bucket referred in paragraph 10.3.19 above;
(b) DRW corresponds to the default risk weight, determined as in paragraphs 10.3.22 to 10.3.24 above; and

10.3.26 The total capital requirement for DRC_{NSEC} is the simple sum of the bucket level capital requirements, calculated as in paragraph 10.3.25 above.

10.4 DRC requirement for securitisations – Non CTP

10.4.1 The gross JTD risk position (JTD) of each DRC securitisation (DRC_{SEC}) position corresponds to its market value.

10.4.2 In calculating the JTD for the DRC_{SEC}-
(a) Long exposures, as defined in paragraph 10.3.12(a) above, are recorded as positive values; and
(b) Short exposures, as defined in paragraph 10.3.12(b) above, are recorded as negative values.

10.4.3 Securitisation exposures that are otherwise identical except for maturity may be offset. The same offsetting rules for non-securitisations including scaling down positions of less than one year as set out in paragraphs 10.3.14 to 10.3.17 above, apply to JTD risk positions for securitisations (non-CTP).

10.4.4 Positions in underlying names and non-tranched index positions may be considered in the DRC_{SEC}, for the purposes of offsetting and hedging recognition, if they are decomposed proportionately into the equivalent replicating tranches that span the entire tranche structure.

10.4.5 If the positions referred in paragraph 10.4.4 above, are considered in the DRC_{SEC}, they must be removed from the calculation of the DRC_{NSEC}.

10.4.6 Net JTD (NJTD)

(a) In computing the NJTD of the DRC_{SEC}, offsetting long JTD and short JTD is permitted if-

(i) The tranches have the same underlying asset pool; and

(ii) The tranches are the same.

(b) Offsetting as in sub-paragraph (a) above, is allowed for long and short JTDs regardless of their maturity.

(c) The following exposures are also allowed to offset as in sub-paragraph (a) above-

(i) Securitisation exposures that may be perfectly replicated through decomposition; and

(ii) Securitisation exposures that may be replicated by a collection of securitisation exposures with different securitized portfolios.

10.4.7 The NJTDs of the DRCSEC, calculated as in paragraph 10.4.6 above, must be classified in one of the following buckets (BKT_SEC)-

(a) Corporates, excluding small and medium enterprises and considering all regions;

(b) Other, defined along two dimensions-

(i) 11 different asset classes- asset-backed commercial paper; auto loans/leases; residential mortgage-backed securities (MBS); credit cards; commercial MBS; collateralised loan obligations; collateralised debt obligation (CDO)-squared; small and medium enterprises; student loans; other retail; and other wholesale;

(ii) 5 different regions- South Africa; Asia; Europe; North America; and all other.

10.4.8 Financial institutions must assign-

(a) Each securitisation exposure to one and only one of the buckets defined in paragraph 10.4.7 above; and

(b) All securitisations with the same type and region of underlying to the same bucket.

10.4.9 Financial institutions must rely on a classification that is commonly used in the market for grouping securitisation exposures in the buckets referred in paragraph 10.4.7 above.

10.4.10 A hedge benefit ratio (HBR_{BKT_SEC}) must be computed according to the following formula-

$$HBR_{BKT\_SEC} = \frac{\Sigma\, NJTD_{long}}{\Sigma NJTD_{long} + \Sigma Abs(NJTD_{short})}$$

where-

(a) BKT_SEC corresponds to each bucket referred in paragraph 10.4.7 above;

(b) $NJTD_{long}$ corresponds to the long NJTD risk positions, classified in bucket BKT_SEC; and

(c) $NJTD_{short}$ corresponds to the short NJTD risk positions, classified in bucket BKT_SEC.

10.4.11 The sum of the NJTDs in paragraph 10.4.10 above, is across the credit quality categories, considering the risk positions not risk-weighted.

10.4.12 For calculating the weighted NJTD, the risk weights of securitisation exposures are defined by the tranche instead of the credit quality. The risk weight for securitisations (non-CTP) is applied as follows-

(a) The default risk weights for securitisation exposures are based on the corresponding risk weights for banking book instruments as set out in CRE40 to CRE44, with the following modification- the maturity component in the banking book securitisation framework is set to zero (a one-year maturity is assumed) to avoid double-counting of risks in the maturity adjustment (of the banking book approach) since migration risk in the trading book will be captured in the credit spread capital requirement.

(b) Following the corresponding treatment in the banking book, the hierarchy of approaches in determining the risk weights must be applied at the underlying pool level.

(c) The capital requirement under the standardised approach for an individual cash securitisation position may be capped at the fair value of the transaction.

10.4.13 The capital requirement for each bucket defined in paragraph 10.4.7 above, is calculated according to the following formula-

$$DRC_{SEC\_BKT} = Max\left[\left(\sum_{i \in Long} DRW_i * NJTD_i\right) - HBR * \left(\sum_{i \in Short} DRW_i * |NJTD_i|\right);\ 0\right]$$

where-

(a) BKT corresponds to each bucket referred in paragraph 10.3.19 above; and

(b) DRW corresponds to the default risk weight, determined as in paragraphs 10.3.22 to 10.3.24 above.

10.4.14 The total capital requirement for DRC_{SEC} is the simple sum of the bucket level capital requirements, calculated as in paragraphs 10.4.17 and 10.4.18 above.

10.5 DRC requirement for securitisations – CTP

10.5.1 The gross JTD risk position (JTD) of each DRC securitisation - CTP (DRC_{CTP}) position corresponds to its market value.

10.5.2 In calculating the JTD for the DRC_{CTP}-

(a) Long exposures, as defined in paragraph 10.3.12(a) above, are recorded as positive values;

(b) Short exposures, as defined in paragraph 10.3.12(b) above, are recorded as negative values.

10.5.3 When calculating the JTD on securitisations (CTP), the same approach must be followed as for default risk securitisations (non-CTP), calculated as in paragraphs 10.4.1 above.

10.5.4 In calculating the JTD referred in paragraph 10.5.1 above, the CTP default risk for non-securitisation hedges must be included and removed from the calculation of DRC_{NSEC}.

10.5.5 In calculating the JTD referred in paragraph 10.5.1 above, nth-to-default products must be treated as tranched products with-

(a) Attachment point computed as the division between-
  (i) number of default events minus 1; and
  (ii) total number of names in the underlying basket or pool;
(b) Detachment point computed as the division between-
  (i) number of default events; and
  (ii) total number of names in the underlying basket or pool.

10.5.6 Net JTD (NJTD)

(a) In computing the NJTD of the DRC_{CTP}, offsetting long JTD and short JTD is permitted if the exposures are otherwise identical, except for maturity. The same offsetting rules for non-securitisations including scaling down positions of less than one year as set out in paragraphs 10.3.14 to 10.3.17 above, apply to JTD risk positions for securitisations (CTP).
(b) Considering that -
  (i) For index products, securitisation exposures may be offset when they have the exact same index family, series and tranche.
  (ii) Long and short exposures that are perfect replications through decomposition may be offset as in sub-paragraph (a) above, when offsetting involves decomposing single name equivalent exposures.
  (iii) When the offsetting involves decomposing single name equivalent exposures, decomposition using a valuation model is allowed if-
    (aa) It is the sensitivity of the security's value to the default of the underlying single name obligor
    (bb) It accounts for the effect of marginal defaults of the single names in the securitisation, where in particular the sum of the decomposed single name amounts must be consistent with the undecomposed value of the securitisation; and
    (cc) It is restricted to vanilla securitisations (for example vanilla CDOs, index tranches or bespokes), which means that the decomposition of exotic securitisations (for example CDO squared) is prohibited.

10.5.7 Decomposition with a valuation model is defined as follows- a single name equivalent constituent of a securitisation (for example tranched position) is the difference between the unconditional value of the securitisation and the conditional value of the securitisation assuming that the single name defaults, with zero recovery, where the value is determined by a valuation model.

10.5.8 Offsetting in calculating the DRCCTP NJTD is allowed by replication and decomposition for long and short positions in index tranches, and non-tranched indices, if the exposures are to the exact same series of the index.

10.5.9 The DRC_{CTP} NJTDs, calculated as in paragraph 10.5.6, 10.5.7, 10.5.8 and 10.5.10 above, must be classified to a bucket corresponding to the underlying index.

10.5.10 Bespoke securitisation exposures must be allocated to the index bucket of the index of which it is a bespoke tranche.

10.5.11 The default risk weights for securitisations applied to tranches are based on the corresponding risk weights for the banking book instruments, which is defined in separate Basel Committee publication - Revisions to the Securitisations framework of 2014, 2016 and 2018, with the following modification- the maturity component in the banking book securitisation framework is set to zero, that is a one year maturity is assumed to avoid double-counting of risks in the maturity adjustment (of the banking book approach) since migration risk in the trading book will be captured in the credit spread capital requirement.

10.5.12 For the non-tranched products, the same risk weights for non-securitisations as set out in paragraph 10.3.22 above apply. For the tranched products, banks must derive the risk weight using the banking book treatment as set out in paragraph 10.5.11 above.

10.5.13 Within a bucket (for each index) at an index level, the capital requirement of DRC_{CTP} is determined in a similar approach to that of DRC_{NSEC}. In this regard -

(a) The HBR, as defined in paragraph 10.3.20 above, is modified and applied to net short positions in that bucket as in the formula below, where the subscript CTP for the term HBRCTP indicates that the HBR is determined using the combined long and short positions across all indices in the CTP (not only the long and short positions of the bucket by itself). The summation of risk-weighted amounts in the formula spans all exposures relating to the index (index tranche, bespoke, non-tranche index or single name);

(b) A deviation from the approach for non-securitisations is that no floor at zero applies at the bucket level, and consequently, the DRC requirement at the index level DRC_b may be negative.

$$DRC_b = \left(\sum_{i \in Long} DRW_i * NJTD_i\right) - HBR_{CTP} * \left(\sum_{i \in Short} DRW_i * |NJTD_i|\right)$$

10.5.14 The total capital requirement for DRC_{CTP} is calculated according to the following formula-

$$DRC_{CTP} = max\left[\sum_b (max[DRC_b, 0] + 0{,}5 * min[DRC_b, 0]), 0\right]$$

10.6 SbM- sensitivities-based method

10.6.1 In applying the sensitivities-based method, all instruments held in trading desks as set out in paragraph 7 above and subject to the sensitivities-based method (excluding instruments where the value at any point in time is purely driven by an exotic underlying as set out in paragraph 10.17.2 below), are subject to delta risk capital requirements.

10.6.2 Additionally, the instruments below are subject to vega and curvature risk[23] capital requirements-

(a) any instrument with optionality such as an instrument that is an option or that includes an option;

(b) any instrument with an embedded prepayment option, according to sub-paragraph (a) above.

(c) instruments whose cash flows cannot be written as a linear function of underlying notional. It must be noted that instruments whose cash flows may be written as a linear function of underlying notional are instruments without optionality and are not subject to vega risk nor curvature risk capital requirements.

10.6.3 In terms of paragraph 10.6.2(b)) above-

(a) the embedded option -

(i) is subject to vega and curvature risk with respect to interest rate risk and CSR (non-securitisation and securitisation) risk classes; and

(ii) when the prepayment option is a behavioural option, the instrument may also be subject to the residual risk add-on (RRAO) as per paragraph 10.17 below.

(b) the pricing model of the bank must reflect behavioural patterns where relevant.

(c) for securitisation tranches, instruments in the securitised portfolio may have embedded prepayment options, which may be subject to the RRAO.

10.6.4 Curvature risks may be calculated for all instruments subject to delta risk, not limited to those subject to vega risk as specified in paragraphs 10.6.2 above.

10.6.5 Where a bank manages the non-linear risk of instruments with optionality and other instruments holistically, it may choose to include instruments without optionality in the calculation of curvature risk, which is allowed subject to the following restrictions-

(a) use of this approach shall be applied consistently through time; and

(b) curvature risk must be calculated for all instruments subject to the SbM.

10.6.6 The sensitivities of financial instruments to a prescribed list of risk factors are used to calculate the delta, vega and curvature risk capital requirements.

10.6.7 The sensitivities are risk-weighted and then aggregated, first within risk buckets and then across buckets within the same risk class as set out in paragraphs to 10.7 to 10.14 below.

10.6.8 The following seven risk classes are defined-

(a) GIRR;

(b) CSR- non-securitisations;

(c) CSR- securitisations (non-CTP);

[23] In the standardised approach, curvature risk is based on two stress scenarios involving an upward shock and a downward shock to each regulatory risk factor.

(d) CSR- securitisations (CTP);
(e) Equity risk;
(f) Commodity risk; and
(g) FX risk.

10.6.9 Risk factors are variables, such as an equity price or a tenor of an interest rate curve, that affect the value of an instrument as defined in paragraphs 10.7 to 10.14 below.

10.6.10 A bucket is a set of risk factors that are grouped together by common characteristics, such as all tenors of interest rate curves for the same currency, as defined in paragraphs 10.8 to 10.14.4 below.

10.6.11 Risk position is the portion of the risk of an instrument that relates to a risk factor-

(a) For delta and vega risks, the risk position is a sensitivity to a risk factor; and
(b) For curvature risk, the risk position is based on losses from two stress scenarios.

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

10.6.13 For each risk class, a bank must determine its instruments' sensitivity to a set of prescribed risk factors, risk weight those sensitivities, and aggregate the resulting risk-weighted sensitivities separately for delta and vega risk using the following step-by-step approach-

(a) for each risk factor, a sensitivity is determined, as set out in paragraphs 10.7.37 to 10.7.63 below;
(b) sensitivities to the same risk factor must be netted to give a net sensitivity s_k across all instruments in the portfolio to each risk factor k. In calculating the net sensitivity, all sensitivities to the same given risk factor from instruments of opposite direction must offset, irrespective of the instrument from which they derive.
(c) the weighted sensitivity WS_k is the product of the net sensitivity s_k and the corresponding risk weight RW_k as defined in paragraphs 10.8.1 to 10.15.7 below-

$$WS_k = RW_k s_k$$

(d) the risk position for delta (respectively vega) bucket b, K_b, must be determined by aggregating the weighted sensitivities to risk factors within the same bucket using the prescribed correlation ρ_{kl} set out in the following formula, where the quantity within the square root function is floored at zero-

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

(e) the delta (respectively vega) risk capital requirement is calculated by aggregating the risk positions across the delta (respectively vega) buckets within each risk class, using the corresponding prescribed correlations γ_{bc} as set out in the following formula-

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

where

(a) $S_b = \sum_k WS_k$ for all risk factors in bucket b;

(b) $S_c = \sum_k WS_k$ in bucket c;

(c) if the values for S_b and S_c described in sub-paragraphs (a) and (b) above, produce a negative number for the overall sum of $\sum_b K_b^2 + \sum_b \sum_{c \neq b} \gamma_{bc} S_b S_c$, the bank must calculate the delta (respectively vega) risk capital requirement using an alternative specification whereby-

(i) $S_b = max[min(\sum_k WS_k\ , K_b), -K_b]$ for all risk factors in bucket b; and

(ii) $S_c = max[min(\sum_k WS_k\ , K_c), -K_c]$ for all risk factors in bucket c.

10.6.14 For each risk class, to calculate curvature risk capital requirements, a bank must apply an upward shock and a downward shock to each prescribed risk factor and calculate the incremental loss for instruments sensitive to that risk factor, above that which was already captured by the delta risk capital requirement, using the following step-by-step approach-

(a) for each instrument sensitive to curvature risk factor k, an upward shock and a downward shock must be applied to k, observing that-

(i) the size of shock (risk weight) is set out in paragraphs 10.16.2 and 10.16.3 above.

(ii) if the price of an instrument depends on several risk factors, the curvature risk must be determined separately for each risk factor.

(b) the net curvature risk capital requirement, determined by the values CVR_k^+ and CVR_k^- for a financial institution's portfolio for risk factor k is calculated by the formulas-

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

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

where-

(i) i is an instrument subject to curvature risks associated with risk factor k;

(ii) x_k is the current level of risk factor k;

(iii) $V_i(x_k)$ is the price of instrument i at the current level of risk factor k;

(iv) $V_i\left(x_k^{(RW^{(curvature)}+)}\right)$ and $V_i\left(x_k^{(RW^{(curvature)}-)}\right)$ denote the price of instrument i after x_k is shifted ("shocked") upward and downward, respectively;

(v) $RW^{(curvature)}$ is the risk weight for curvature risk factor k for instrument i; and

(vi) s_{ik} is the delta sensitivity of instrument i with respect to the delta risk factor that corresponds to curvature risk factor k, where-

(aa) for the FX and equity risk classes, s_{ik} is the delta sensitivity of instrument i; and

(bb) for the GIRR, CSR and commodity risk classes, s_{ik} is the sum of delta sensitivities to all tenors of the relevant curve of instrument i with respect to curvature risk factor k.

(c) Within bucket aggregation, the curvature risk exposure must be aggregated within each bucket using the corresponding prescribed correlation ρ_{kl} as set out in the following formula-

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

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

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

where-

(i) The bucket level capital requirement (K_b) is determined as the greater of the capital requirement under the upward scenario (K_b^+) and the capital requirement under the downward scenario (K_b^-). Notably, the selection of upward and downward scenarios is not necessarily the same across the high, medium and low correlations scenarios specified in paragraph 10.6.16 below.

(aa) Where $K_b = K_b^+$, this shall be termed "selecting the upward scenario".

(bb) Where $K_b = K_b^-$, this shall be termed "selecting the downward scenario".

(cc) In the specific case where $K_b^+ = K_b^-$, if $\sum_k CVR_k^+ > \sum_k CVR_k^-$,it is deemed that the upward scenario is selected; otherwise the downward scenario is selected.

(ii) $\Psi(CVR_k, CVR_l)$ takes the value 0 if CVR_k and CVR_l both have negative signs and the value 1 otherwise.

(d) Across bucket aggregation, curvature risk positions must then be aggregated across buckets within each risk class, using the corresponding prescribed correlations γ_{bc}, as set out in the following formula-

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

where-

(a) $S_b = \sum_k CVR_k^+$ for all risk factors in bucket b, when the upward scenario has been selected for bucket b in sub-paragraph (c)(i) above, and $S_b = \sum_k CVR_k^-$ otherwise; and

(b) $\Psi(S_b, S_c)$ takes the value 0 if S_b and S_c both have negative signs, and 1 otherwise.

10.6.15 The delta used for the calculation of the curvature risk capital requirement must be the same as that used for calculating the delta risk capital requirement. The assumptions that are used for the calculation of the delta must also be used for calculating the shifted or shocked price of the instrument.

10.6.16 In order to address the risk that correlations increase or decrease in periods of financial stress, the aggregation of bucket level capital requirements and risk class level capital requirements per each risk class for delta, vega, and curvature risks as specified in paragraphs 10.6.13 and 10.6.14 above must be repeated, corresponding to three different scenarios on the specified values for the correlation parameter ρ_{kl} (correlation between risk factors within a bucket) and γ_{bc} (correlation across buckets within a risk class), as specified in paragraphs 10.8.1 to 10.16.7 below-

(a) under the "medium correlations" scenario, the correlation parameters ρ_{kl} and γ_{bc} apply;

(b) under the "high correlations" scenario, the correlation parameters ρ_{kl} and γ_{bc} are uniformly multiplied by 1.25, with ρ_{kl} and γ_{bc} and subject to a cap at 100%;

(c) under the "low correlations" scenario, the correlation parameters ρ_{kl} and γ_{bc} are replaced by $\rho_{kl}^{low} = \max(2 * \rho_{kl} - 100\%; 75\% * \rho_{kl})$ and $\gamma_{bc}^{low} = \max(2 * \gamma_{bc} - 100\%; 75\% * \gamma_{bc})$

10.6.17 The total capital requirement under the SbM is aggregated as follows-

(a) for each of three correlation scenarios, the bank must simply sum up the separately calculated delta, vega and curvature capital requirements for all risk classes to determine the overall capital requirement for that scenario;

(b) the sensitivities-based method capital requirement is the largest capital requirement from the three scenarios.

10.7 Risk factor and sensitivity definitions- Risk factor definitions for delta, vega and curvature risks

10.7.1 The GIRR delta risk factors are defined along two dimensions-

(a) a risk-free yield curve for each currency in which interest rate-sensitive instruments are denominated; and

(b) the following tenors- 0.25 years, 0.5 years, 1 year, 2 years, 3 years, 5 years, 10 years, 15 years, 20 years and 30 years, to which delta risk factors are assigned.

10.7.2 The assignment of risk factors to the specified tenors must be performed by linear interpolation or a method that is most consistent with the pricing functions used by the independent risk control function of a bank to report market risks or P&L to senior management.

10.7.3 The risk-free yield curve per currency must be constructed using money market instruments held in the trading book that have the lowest credit risk, such as overnight index swaps (OIS). Alternatively, the risk-free yield curve must be based on one or more market-implied swap curves used by the bank to mark positions to market. For example, interbank offered rate (BOR) swap curves.

10.7.4 When data on market-implied swap curves described in 10.7.3 above are insufficient, the risk-free yield curve may be derived from the most appropriate sovereign bond curve for a given currency. In such cases the sensitivities related to sovereign bonds are not exempt from the CSR capital requirement- when a bank cannot perform the decomposition $y = r + cs$, any sensitivity to y is allocated both to the GIRR and to CSR classes as appropriate with the risk factor and sensitivity definitions in the standardised approach. Applying swap curves to bond-derived sensitivities for GIRR will not change the requirement for basis risk to be captured between bond and credit default swap (CDS) curves in the CSR class.

10.7.5 For the purpose of constructing the risk-free yield curve per currency-

(a) an OIS curve (such as Eonia or a new benchmark rate) and a BOR swap curve (such as three-month Euribor or other benchmark rates) must be considered two different curves;

(b) two BOR curves at different maturities (example three-month Euribor and six-month Euribor) must be considered two different curves;

(c) an onshore and an offshore currency curve (example onshore Indian rupee and offshore Indian rupee) must be considered two different curves.

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

(a) the sensitivity to the inflation rate from the exposure to implied coupons in an inflation instrument gives rise to a specific capital requirement. All inflation risks for a currency must be aggregated to one number via simple sum.

(b) this risk factor is only relevant for an instrument when a cash flow is functionally dependent on a measure of inflation (example the notional amount or an interest payment depending on a consumer price index).

(c) inflation rate risk is considered in addition to the sensitivity to interest rates from the same instrument, which must be allocated, according to the GIRR framework, in the term structure of the relevant risk-free yield curve in the same currency.

10.7.7 The GIRR delta risk factors also include one of two possible cross-currency basis risk factors for each currency (each GIRR bucket) with the term structure not recognised as a risk factor (both cross-currency basis curves are flat)-

(a) the two cross-currency basis risk factors are basis of each currency over USD or basis of each currency over EUR. For instance, an AUD denominated bank trading a JPY/USD cross-currency basis swap would have a sensitivity to the JPY/USD basis but not to the JPY/EUR basis.

(b) cross-currency bases that do not relate to either basis over USD or basis over EUR must be computed either on “basis over USD” or “basis over EUR” but not both.

(c) cross-currency basis risk is considered in addition to the sensitivity to interest rates from the same instrument, which must be allocated, according to the GIRR framework, in the term structure of the relevant risk-free yield curve in the same currency.

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

10.7.9 The GIRR vega risk factors are the implied volatilities of options that reference GIRR-sensitive underlyings, defined along two dimensions-

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

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

10.7.10 Inflation and cross-currency bases must be included in the GIRR vega risk capital requirement. As no maturity dimension is specified for the delta capital requirement for inflation or cross-currency bases (the possible underlying of the option), the vega risk for inflation and cross-currency bases must be considered only along the single dimension of the maturity of the option.

10.7.11 The GIRR curvature risk factors are defined along only one dimension- the constructed risk-free yield curve per currency with no term structure decomposition-

(a) for example, the euro, Eonia, three-month Euribor and six-month Euribor curves must be shifted at the same time in order to compute the euro-relevant risk-free yield curve curvature risk capital requirement;

(b) for the calculation of sensitivities, all tenors (as defined for delta GIRR) are to be shifted in parallel;

(c) there is no curvature risk capital requirement for inflation and cross currency basis risks.

10.7.12 The treatment described in paragraph 10.7.4 above for delta GIRR also applies to vega GIRR and curvature GIRR risk factors.

10.7.13 The CSR non-securitisation delta risk factors are defined along two dimensions-

(a) the relevant issuer credit spread curves (bond and CDS); and

(b) the following tenors- 0.5 years, 1 year, 3 years, 5 years and 10 years.

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

10.7.15 The CSR non-securitisation curvature risk factors are defined along one dimension- the relevant issuer credit spread curves (bond and CDS). For instance, the bond-inferred spread curve of an issuer and the CDS-inferred spread curve of that same issuer must be considered a single spread curve. For the calculation of sensitivities, all tenors (as defined for CSR) are to be shifted in parallel.

10.7.16 The CSR securitisation non-CTP delta risk factors are defined along two dimensions-

(a) tranche credit spread curves; and

(b) the following tenors- 0.5 years, 1 year, 3 years, 5 years and 10 years to which delta risk factors are assigned.

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

10.7.18 The CSR securitisation non-CTP curvature risk factors are defined along one dimension, the relevant tranche credit spread curves (bond and CDS). For instance, the bond-inferred spread curve of a given Spanish residential mortgage-backed security (RMBS) tranche and the CDS-inferred spread curve of that given Spanish RMBS tranche would be considered a single spread curve. For the calculation of sensitivities, all the tenors are to be shifted in parallel.

10.7.19 For securitisation instruments that do not meet the definition of CTP, the sensitivities of delta risk factors (CS01) must be calculated with respect to the spread of the tranche rather than the spread of the underlying of the instruments.

10.7.20 The equity delta risk factors are-

(a) all the equity spot prices; and

(b) all the equity repurchase agreement rates (equity repo rates).

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

10.7.22 The equity curvature risk factors are all the equity spot prices. There is no curvature risk capital requirement for equity repo rates.

10.7.23 The commodity delta risk factors are all the commodity spot prices, defined along two dimensions-

(a) the delivery location of the commodity; and

(b) time to maturity of the traded instrument at the following tenors- 0 years, 0.25 years, 0.5 years, 1 year, 2 years, 3 years, 5 years, 10 years, 15 years, 20 years and 30 years.

10.7.24 For some commodities such as electricity, the relevant risk factor may either be the spot or the forward price.

10.7.25 Regarding the definition of the delivery location referred in sub-paragraph (a) above, a contract that may be delivered in five ports may be considered having the same delivery location as another contract if and only if it may be delivered in the same five ports. However, it cannot be considered having the same delivery location as another contract that may be delivered in only four (or less) of those five ports.

10.7.26 The current prices for futures and forward contracts must be used to compute the commodity delta risk factors. Commodity delta must be allocated to the relevant tenor based on the tenor of the futures and forward contract and given that spot commodity price positions must be slotted into the first tenor (0 years).

10.7.27 The commodity vega risk factors are the implied volatilities of options that reference commodity spot prices as underlyings, defined along one dimension- the maturity of the option. The implied volatility of the option must be as mapped to one or several of the following maturity tenors- 0.5 years, 1 year, 3 years, 5 years and 10 years. No differentiation between commodity spot prices by the maturity of the underlying or delivery location is required.

10.7.28 The commodity curvature risk factors are defined along only one dimension, the constructed curve (i.e. no term structure decomposition) per commodity spot prices. For the calculation of sensitivities, all tenors (as defined for delta commodity) are to be shifted in parallel.

10.7.29 The FX delta risk factors are all the exchange rates between the currency in which an instrument is denominated and the reporting currency. For transactions that reference an exchange rate between a pair of non-reporting currencies, the FX delta risk factors are all the exchange rates between-

(i) the reporting currency; and
(ii) both the currency in which an instrument is denominated and any other currencies referenced by the instrument.

10.7.30 Subject to the approval of the Prudential Authority, FX risk may alternatively be calculated relative to a base currency instead of the reporting currency. In such case the bank must account for-

(a) the FX risk against the base currency; and
(b) the FX risk between the reporting currency and the base currency (translation risk).

10.7.31 The resulting FX risk calculated relative to the base currency as set out in sub-paragraph (b) above is converted to the capital requirements in the reporting currency using the spot reporting/base exchange rate reflecting the FX risk between the base currency and the reporting currency.

10.7.32 The FX base currency approach defined in paragraph 10.7.31 above may be allowed under the following conditions-

(a) a bank must only consider a single currency as its base currency; and
(b) the bank must demonstrate to the Prudential Authority that calculating FX risk relative to their proposed base currency provides an appropriate risk representation for their portfolio (for example, by demonstrating that it does not inappropriately reduce capital requirements relate to those that would have been calculated without the base currency approach) and that the translation risk between the base currency and the reporting currency is taken into account.

10.7.33 The FX- vega risk factors are the implied volatilities of options that reference exchange rates between currency pairs as defined along one dimension- the maturity of the option. This is defined as the implied volatility of the option as mapped to one or several of the following maturity tenors- 0.5 years, 1 year, 3 years, 5 years and 10 years.

10.7.34 The FX curvature risk factors are all the exchange rates between the currency in which an instrument is denominated and the reporting currency. For transactions that reference an exchange rate between a pair of non-reporting currencies, the FX risk factors are all the exchange rates between-

(a) the reporting currency; and
(b) both the currency in which an instrument is denominated and any other currencies referenced by the instrument.

10.7.35 Where the Prudential Authority's approval for the base currency approach has been granted for delta risks, FX curvature risks must also be calculated relative to a base currency instead of the reporting currency, and then converted to the capital requirements in the reporting currency using the spot reporting/base exchange rate.

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

10.7.37 Sensitivities for each risk class must be expressed in the reporting currency of the bank.

10.7.38 For each risk factor defined in paragraphs 10.7.1 to 10.7.33, sensitivities are calculated as the change in the market value of the instrument as a result of applying a specified shift to each risk factor, assuming all the other relevant risk factors are held at the current level.

10.7.39 In calculating the capital requirement under the SbM, the bank must determine each delta and vega sensitivity and curvature scenario based on instrument prices or pricing models that an independent risk control unit within a bank uses to report market risks or actual profits and losses to senior management. Banks must use zero rate or market rate sensitivities consistent with the pricing models. The bank must demonstrate to the Prudential Authority that the alternative formulations of sensitivities yield results very close to the prescribed formulations.

10.7.40 A key assumption of the standardised approach for market risk is that a bank's pricing models used in actual profit and loss reporting provide an appropriate basis for the determination of regulatory capital requirements for all market risks. To ensure such adequacy, banks at a minimum must satisfy the requirements as set out in regulation 39(13) of the Regulations pertaining to prudent valuation practices.

10.7.41 The delta GIRR sensitivity is defined as the PV01, measured by changing the interest rate r at tenor t (r_t) of the risk-free yield curve in a given currency by 1 basis point (0.0001 in absolute terms) and dividing the resulting change in the market value of the instrument (V_i) by 0.0001 (0.01%), according to the following formula-

$$s_{k,r_t} = \frac{V_i(r_t + 0.0001, cs_t) - V_i(r_t, cs_t)}{0.0001}$$

where-

(a) s_{k,r_t} is the sensitivity s of risk factor k, considering r_t;

(b) r_t is the risk-free yield curve at tenor t;

(c) cs_t is the credit spread curve at tenor t; and

(d) V_i is the market value of the instrument i as a function of the risk-free interest rate curve and credit spread curve.

10.7.42 The delta CSR non-securitisation, securitisation (non-CTP) and securitisation (CTP) sensitivity is defined as CS01, measured by changing a credit spread cs at tenor t (cs_t) by 1 basis point (0.0001 in absolute terms) and dividing the resulting change in the market value of the instrument (V_i) by 0.0001 (0.01%), according to the following formula-

$$s_{k,cs_t} = \frac{V_i(r_t, cs_t + 0.0001) - V_i(r_t, cs_t)}{0.0001}$$

where-

(a) s_{k,cs_t} is the sensitivity s of risk factor k, considering cs_t;
(b) r_t is the risk-free yield curve at tenor t;
(c) cs_t is the credit spread curve at tenor t; and
(d) V_i is the market value of the instrument i as a function of the risk-free interest rate curve and credit spread curve.
(e) In cases where the bank does not have counterparty-specific money market curves, proxying PV01 to CS01 is permitted for such money market instruments.

10.7.43 The delta equity spot sensitivity is measured by changing the equity spot price by 1 percentage point (0.01 in relative terms) and dividing the resulting change in the market value of the instrument (V_i) by 0.01 (1%), according to the following formula-

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

where-
(a) s_k is the sensitivity s of equity k;
(b) EQ_k is the market value of equity k; and
(c) V_i is the market value of the instrument i as a function of the price of equity k.

10.7.44 The delta equity repo rates sensitivity is measured by applying a parallel shift to the equity repo rate term structure by 1 basis point (0.0001 in absolute terms) and dividing the resulting change in the market value of the instrument (V_i) by 0.0001 (0.01%), according to the following formula-

$$s_k = \frac{V_i(RTS_k + 0{,}0001) - V_i(RTS_k)}{0.0001}$$

where-
(a) s_k is the sensitivity s of equity k;
(b) RTS_k is the repo term structure of equity k; and
(c) V_i is the market value of the instrument i as a function of the repo term structure of equity k.

10.7.45 The delta commodity sensitivity is measured by changing the commodity spot price by 1 percentage point (0.01 in relative terms) and dividing the resulting change in the market value of the instrument (V_i) by 0.01 (1%), according to the following formula-

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

where-
(a) s_k is the sensitivity s of commodity k;
(b) CTY_k is the market value of commodity k; and
(c) V_i is the market value of the instrument i as a function of the spot price of commodity k.

10.7.46 The delta FX sensitivity is measured by changing the exchange rate by 1 percentage point (0.01 in relative terms) and dividing the resulting change in the market value of the instrument (V_i) by 0.01 (1%), according to the following formula-

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

where-

(a) s_k is the sensitivity s of the exchange rate k;
(b) FX_k is the exchange rate between a given currency and a bank's reporting currency or base currency, where the FX spot rate is the current market price of one unit of another currency expressed in the units of the bank's reporting currency or base currency; and
(c) V_i is the market value of the instrument i as a function of the exchange rate k.

10.7.47 The option-level vega risk sensitivity to a given risk factor is measured by multiplying vega by the implied volatility of the option, according to the following formula-

$$s_k = vega\ x\ implied\ volatility$$

where-
(a) s_k is the sensitivity s of the risk factor k;
(b) vega, $\frac{\partial V_i}{\partial \sigma_i}$, is defined as the change in the market value of the option V_i as a result of a small amount of change to the implied volatility σ_i; and
(c) the instrument's vega and implied volatility used in the calculation of vega sensitivities must be sourced from pricing models used by the independent risk control unit of the bank.

10.7.48 In the specific case below, the vega risk sensitivities are derived as follows-
(a) options that do not have a maturity, are assigned to the longest prescribed maturity tenor, and these options are also assigned to the RRAO.
(b) options that do not have a strike or barrier and options that have multiple strikes, are mapped to strikes and maturity used internally to price the option, and these options are also assigned to the RRAO.
(c) CTP securitisation tranches that do not have an implied volatility, are not subject to vega risk capital requirement. Such instruments may not, however, be exempt from delta and curvature risk capital requirements.

10.7.49 When computing a first-order sensitivity for instruments subject to optionality, banks must assume that the implied volatility either-
(a) remains constant, consistent with a "sticky strike" approach; or
(b) follows a "sticky delta" approach, such that implied volatility does not vary with respect to a given level of delta.

10.7.50 For the calculation of vega sensitivities, the distribution assumptions for pricing models are applied as follows-
(a) for the computation of a vega GIRR or CSR sensitivity, banks must use either the log-normal or normal assumptions. The bank may choose a mix of log-normal and normal assumptions for different currencies; and
(b) for the computation of a vega equity, commodity or FX sensitivity, banks must use the log-normal assumption.

10.7.51 If, for internal risk management, a bank computes vega sensitivities using different definitions than the definitions set out in this standard, it must transform the sensitivities computed for internal risk management purposes to deduce the sensitivities to be used for the calculation of the vega risk measure.

10.7.52 All vega sensitivities must be computed ignoring the impact of credit valuation adjustments (CVA).

10.7.53 In calculating the delta and curvature risk, for index instruments and multi-underlying options, a look-through approach must be used.

10.7.54 A bank may opt not to apply the look-through approach for instruments referencing any listed and widely recognised and accepted equity or credit index, where-

(a) it is possible to look-through the index (i.e. the constituents and their respective weightings are known);

(b) the index contains at least 20 constituents;

(c) no single constituent contained within the index represents more than 25 percent of the total index;

(d) the largest 10 percent of constituents represents less than 60 percent of the total index; and

(e) the total market capitalisation of all the constituents of the index is no less than such an amount determined in writing from time to time by the Prudential Authority.

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

10.7.56 Where a bank opts not to apply the look-through approach in accordance with paragraph 10.7.54 above, a single sensitivity shall be calculated to each widely recognised and accepted index that an instrument references. The sensitivity to the index must be assigned to the relevant delta risk bucket defined in paragraph 10.9.4 and 10.11.13 below as follows-

(a) where more than 75 percent of constituents in that index (taking into account the weightings of that index) would be mapped to a specific sector bucket, the sensitivity to the index shall be mapped to that single specific sector bucket and treated like any other single-name sensitivity in that bucket.

(b) in all other cases, the sensitivity may be mapped to an "index" bucket (i.e. bucket 12 or bucket 13 for equity risk; or bucket 17 or bucket 18 for CSR). The same principle set out in sub-paragraph (a) above applies when allocating sensitivities to a specific index bucket.

(i) for equity risk, an equity index must be mapped to the large market cap and advanced economy indices bucket if at least 75 percent of the constituents in that index, taking into account the weightings of that index, are both large cap and advanced economy equities. Otherwise, it must be mapped to the other equity indices bucket.

(ii) for CSR, a credit index must be mapped to the investment grade indices bucket if at least 75 percent of the constituents in that index, taking into account the weightings of that index, are investment grade. Otherwise, it must be mapped to the high yield indices bucket.

10.7.57 A look-through approach must always be used for indices that do not meet the criteria set out in paragraph 10.7.54(b) to (e) above, and for any multi-underlying instruments that reference a bespoke set of equities or credit positions-

(a) where a look-through approach is adopted, for index instruments and multi-underlying options other than the CTP, the sensitivities to

constituent risk factors from those instruments or options are allowed to net with sensitivities to single-name instruments without restriction.

(b) index CTP instruments cannot be broken down into its constituents (the index CTP must be considered a risk factor as a whole) and the above-mentioned netting at the issuer level does not apply either.

(c) where a look-through approach is adopted, it shall be applied consistently through time, and shall be used for all identical instruments that reference the same index.

10.7.58 Once a look-through approach is applied (for a certain type of instrument referencing a particular index), the bank will require the prior approval of the Prudential Authority to revert to a “no look-through” approach.

10.7.59 For equity investments in funds that may be looked through as set out in paragraph 8.3.4(e)(i) above, banks must apply a look-through approach and treat the underlying positions of the fund as if the positions were held directly by the bank, taking into account the bank’s share of the equity of the fund, and any leverage in the fund structure, except for the funds that meet the following conditions-

(a) for funds that hold an index instrument that meets the criteria set out under paragraph 10.7.51 above, the banks must still apply a look-through and treat the underlying positions of the fund as if the positions were held directly by the bank, but the bank may choose to apply the “no look-through” approach for the index holdings of the fund as set out in paragraph 10.7.56 above.

(b) for funds that track an index benchmark, a bank may opt not to apply the look-through approach and opt to measure the risk assuming the fund is a position in the tracked index only where-

(i) the fund has an absolute value of a tracking difference (ignoring fees and commissions) of less than 1 percent; and

(ii) the tracking difference is checked at least annually and is defined as the annualised return difference between the fund and its tracked benchmark over the last 12 months of available data (or a shorter period in the absence of a full 12 months of data).

10.7.60 For equity investments in funds that cannot be looked through (do not meet the criterion set out in paragraph 8.2.4(e)(i) above, but where the bank has access to daily price quotes and knowledge of the mandate of the fund (i.e. meet both the criteria set out in paragraph 8.2.4(e)(ii) above, banks must calculate capital requirements for the fund in one of three ways-

(a) if the fund tracks an index benchmark and meets the requirement set out in paragraph 10.7.59(b)(i) and (ii) above, the bank may assume that the fund is a position in the tracked index, and may assign the sensitivity to the fund to relevant sector specific buckets or index buckets as set out in paragraph 10.7.56 above;

(b) subject to Prudential Authority approval, the bank may consider the fund as a hypothetical portfolio in which the fund invests to the maximum extent allowed under the fund’s mandate in those assets attracting the highest capital requirements under the SbM, and then progressively in those other assets implying lower capital requirements. If more than one risk weight may be applied to a given exposure under the sensitivities-based method, the maximum risk weight applicable must be used.

(i) this hypothetical portfolio must be subject to market risk capital requirements on a stand-alone basis for all positions in that fund, separate from any other positions subject to market risk capital requirements.

(ii) the counterparty credit and CVA risks of the derivatives of this hypothetical portfolio must be calculated using the simplified methodology set out in accordance with regulation 31(7) of the Regulations, of the banking book equity investment in funds treatment.

(c) consider their equity investment in the fund as an unrated equity exposure to be allocated to the "other sector" bucket. In applying this treatment, banks must also consider whether, given the mandate of the fund, the DRC requirement risk weight prescribed to the fund is sufficiently prudent (as set out in paragraph 10.7.1 above), and whether the RRAO must apply (as set out in paragraph 10.17 below).

10.7.61 Net long equity investments in a given fund in which the bank cannot look through or does not meet the requirements of paragraph 8.2.4(e) above for the fund must be assigned to the banking book.

10.7.62 Net short positions in funds, where the bank cannot look through or does not meet the requirements of paragraph 8.2.4(e) above, must be excluded from any trading book capital requirements under the market risk framework, with the net position instead subjected to a 100 percent capital requirement.

10.7.63 In calculating the vega risk-

(a) multi-underlying options, including index options, are usually priced based on the implied volatility of the option, rather than the implied volatility of its underlying constituents and a look-through approach may not need to be applied, regardless of the approach applied to the delta and curvature risk calculation as set out in paragraphs 10.7.51 to 10.7.57 above;

(b) for indices, the vega risk with respect to the implied volatility of the multi-underlying options must be calculated using a sector specific bucket or an index bucket defined in paragraphs 10.9.4 and 10.12 below as follows-

(i) where more than 75 percent of constituents in that index (taking into account the weighting of that index) would be mapped to a single specific sector bucket, the sensitivity to the index must be mapped to that single specific sector bucket and treated like any other single-name sensitivity in that bucket;

(ii) in all other cases, the sensitivity may be mapped to an "index" bucket.

10.8 Definition of delta risk buckets, risk weights and correlations- Delta GIRR buckets, risk weights and correlations

10.8.1 Paragraphs 10.8.3 to 10.14.4 below set out buckets, risk weights and correlation parameters for each risk class to calculate delta risk capital requirement as set out in paragraph 10.6.13 above.

10.8.2 The prescribed risk weights and correlations in paragraphs 10.8.3 to 10.14.4 below have been calibrated to the liquidity adjusted time horizon related to each risk class.

10.8.3 Each currency is a separate delta GIRR bucket, therefore all risk factors in risk-free yield curves for the same currency in which interest rate-sensitive instruments are denominated are grouped into the same bucket.

10.8.4 The risk weights (RWs) for each tenor in risk-free yield curves are-

(a) RW is 1.7% for 0.25 year;
(b) RW is 1.7% for 0.5 year;
(c) RW is 1.6% for 1 year;
(d) RW is 1.3% for 2 years;
(e) RW is 1.2% for 3 years;
(f) RW is 1.1% for 5 years;
(g) RW is 1.1% for 10 years;
(h) RW is 1.1% for 15 years;
(i) RW is 1.1% for 20 years; and
(j) RW is 1.1% for 30 years.

10.8.5 The RWs for the inflation risk factor and the cross-currency basis risk factors are set at 1.6%.

10.8.6 For the currencies EUR, USD, GBP, AUD, JPY, SEK, CAD as well as the domestic reporting currency of a bank, the RWs defined in paragraphs 10.8.2 and 10.8.3 above may, at the discretion of the bank, be divided by the square root of 2.

10.8.7 The delta GIRR correlation parameter ρ_{kl} between weighted sensitivities WS_k and WS_l within the same bucket, same assigned tenor, but different curves is set at 99.90%.

10.8.8 In aggregating delta risk positions for cross-currency basis risk for onshore and offshore curves, which must be considered two different curves as set out in paragraph 10.7.5(c) above, a bank may choose to aggregate all cross-currency basis risk for a currency for both onshore and offshore curves by a simple sum of weighted sensitivities.

10.8.9 The delta risk correlation ρ_{kl} between weighted sensitivities WS_k and WS_l within the same bucket with different tenor and same curve is set in Table 5 below-

Table 5

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

10 year	40.0%	56.6%	76.3%	88.7%	93.2%	97.0%	100.0%	98.5%	97.0%	94.2%
15 year	40.0%	41.9%	65.7%	82.3%	88.7%	94.2%	98.5%	100.0%	99.0%	97.0%
20 year	40.0%	40.0%	56.6%	76.3%	84.4%	91.4%	97.0%	99.0%	100.0%	98.5%
30 year	40.0%	40.0%	41.9%	65.7%	76.3%	86.1%	94.2%	97.0%	98.5%	100.0%

10.8.10 Between two weighted sensitivities WS_k and WS_l within the same bucket with different tenor and different curves, the correlation ρ_{kl} is equal to the correlation parameter specified in paragraph 10.8.9 above, multiplied by 99.90%.

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

10.8.12 The delta risk correlation ρ_{kl} between a weighted sensitivity WS_k to a cross-currency basis curve and a weighted sensitivity WS_l to each of the following curves is 0%-

(a) a given tenor of the relevant yield curve;
(b) the inflation curve; or
(c) another cross-currency basis curve, if relevant.

10.8.13 For aggregating GIRR risk positions across different buckets, the correlation parameter γ_{bc} is set at 50%.

10.9 Delta CSR non-securitisations buckets, risk weights and correlations

10.9.1 Delta CSR non-securitisation buckets are set along two dimensions- credit quality and sector, as in Table 6 below.

Table 6

Buckets for delta CSR non-securitisations		
Bucket number	Credit quality	Sector
1	Investment grade (IG)	Sovereigns including central banks, multilateral development banks
2		Local government, government-backed non-financials, education, public administration
3		Financials including government-backed financials
4		Basic materials, energy, industrials, agriculture, manufacturing, mining and quarrying
5		Consumer goods and services, transportation and storage, administrative and support service activities
6		Technology, telecommunications
7		Health care, utilities, professional and technical activities
8		Covered bonds (Covered bonds must meet the definition provided in the large exposures framework)
9	High yield (HY) & non-rated (NR)	Sovereigns including central banks, multilateral development banks
10		Local government, government-backed non-financials, education, public administration

11		Financials including government-backed financials
12		Basic materials, energy, industrials, agriculture, manufacturing, mining and quarrying
13		Consumer goods and services, transportation and storage, administrative and support service activities
14		Technology, telecommunications
15		Health care, utilities, professional and technical activities
16	Other sector (Credit quality is not a differentiating consideration for this bucket.)	
17	IG indices	
18	HY indices	

10.9.2 The CSR non-securitisation sensitivities must first be assigned to a bucket before calculating weighted sensitivities by applying a risk weight.

10.9.3 To assign a risk position to a sector, banks must rely on a classification that is commonly used in the market for grouping issuers by industry sector-

(a) each issuer must be assigned to one and only one of the sector buckets in;

(b) risk positions from any issuer that cannot be assigned to a sector defined in Table 6 above must be assigned to the other sector that is bucket 16.

10.9.4 The RWs for buckets 1 to 18 are-

(a) RW is 0.5% for bucket number 1;
(b) RW is 1.0% for bucket number 2;
(c) RW is 5.0% for bucket number 3;
(d) RW is 3.0% for bucket number 4;
(e) RW is 3.0% for bucket number 5;
(f) RW is 2.0% for bucket number 6;
(g) RW is 1.5% for bucket number 7;
(h) RW is 2.5% for bucket number 8;
(i) RW is 2.0% for bucket number 9;
(j) RW is 4.0%for bucket number 10;
(k) RW is 12.0% for bucket number 11;
(l) RW is 7.0% for bucket number 12;
(m) RW is 8.5% for bucket number 13;
(n) RW is 5.5% for bucket number 14;
(o) RW is 5.0% for bucket number 15;
(p) RW is 12.0%for bucket number 16;
(q) RW is 1.5% for bucket number 17; and
(r) RW is 5.0% for bucket number 18.

10.9.5 Risk weights are the same for all tenors (0.5 years, 1 year, 3 years, 5 years, 10 years) within each bucket.

10.9.6 For covered bonds that are rated AA- or higher, the applicable RW may, at the discretion of the bank, be 1.5%, instead of the RW defined in paragraph 10.9.4(h) above.

10.9.7 The delta CSR non-securitisations correlation parameter ρ_{kl} between two weighted sensitivities WS_k and WS_l within the same bucket, for buckets 1 to 15, is set as follows-

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

where-

(a) $\rho_{kl}^{(name)}$ is equal to 1 where the two names of sensitivities k and l are identical, and 35% otherwise;

(b) $\rho_{kl}^{(tenor)}$ is equal to 1 if the two tenors of the sensitivities k and l are identical, and to 65% otherwise; and

(c) $\rho_{kl}^{(basis)}$ is equal to 1 if the two sensitivities are related to same curves, and 99.90% otherwise.

10.9.8 The delta CSR non-securitisations correlation parameter ρ_{kl} between two weighted sensitivities WS_k and WS_l within the same bucket, for buckets 17 and 18, is set as follows-

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

where-

(a) $\rho_{kl}^{(name)}$ is equal to 1 where the two names of sensitivities k and l are identical, and 80% otherwise;

(b) $\rho_{kl}^{(tenor)}$ is equal to 1 if the two tenors of the sensitivities k and l are identical, and to 65% otherwise; and

(c) $\rho_{kl}^{(basis)}$ is equal to 1 if the two sensitivities are related to same curves, and 99.90% otherwise.

10.9.9 The aggregation of delta CSR non-securitisation risk positions within the other sector bucket 16, is equal to the simple sum of the absolute values of the net weighted sensitivities allocated to this bucket-

$$K_{b(other\ bucket)} = \sum_k |WS_k|$$

10.9.10 The method in paragraph 10.11.9 below, applies to the aggregation of vega risk positions.

10.9.11 The aggregation of curvature CSR non-securitisation risk positions within the other sector bucket 16, is calculated by the formula-

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

10.9.12 The delta CSR non-securitisation correlation parameter γ_{bc} for aggregating the risk position across buckets 1 to 18 is set as follows-

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

where-

(a) $\gamma_{bc}^{(rating)}$ is equal to 50% where the two buckets b and c are both in buckets 1 to 15 and have a different rating category (either IG or HY/NR), and 1 otherwise; and

(b) $\gamma_{bc}^{(sector)}$ is equal to 1 if the two buckets belong to the same sector, and to the specified numbers in Table 7 below otherwise.

Table 7

Values of $\gamma_{bc}^{(sector)}$ where the buckets do not belong to the same sector

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

10.10 Delta CSR securitisation (CTP) buckets, risk weights and correlations

10.10.1 The buckets, RWs and correlations for the CSR securitisations (CTP) apply as follows-

(a) the same bucket structure and correlation structure apply to the CSR securitisations (CTP) as those for the CSR non-securitisation framework as set out in paragraphs 10.6.6 and 10.6.12 above, with an exception of index buckets 17 and 18; and

(b) the RWs and correlation parameters of the delta CSR non-securitisations are modified to reflect longer liquidity horizons and larger basis risk, as specified in paragraphs 10.10.2 and 10.10.5 below.

10.10.2 The RWs for buckets 1 to 16 are-

(a) RW is 4.0% for bucket number 1;
(b) RW is 4.0% for bucket number 2;
(c) RW is 8.0% for bucket number 3;
(d) RW is 5.0% for bucket number 4;
(e) RW is 4.0% for bucket number 5;
(f) RW is 3.0% for bucket number 6;
(g) RW is 2.0% for bucket number 7;
(h) RW is 6.0% for bucket number 8;
(i) RW is 13.0% for bucket number 9;
(j) RW is 13.0%for bucket number 10;
(k) RW is 16.0% for bucket number 11;
(l) RW is 10.0% for bucket number 12;
(m) RW is 12.0% for bucket number 13;
(n) RW is 12.0% for bucket number 14;
(o) RW is 12.0% for bucket number 15; and
(p) RW is 13.0%for bucket number 16.

10.10.3 Risk weights are the same for all tenors (i.e. 0.5 years, 1 year, 3 years, 5 years, 10 years) within each bucket.

10.10.4 The delta CSR securitisations (CTP) correlation ρ_{kl} is derived the same way as in paragraphs 10.9.7 and 10.9.8 above, except that the correlation parameter applying when the sensitivities are not related to same curves, $\rho_{kl}^{(basis)}$ is equal to 1 if the two sensitivities are related to same curves, and 99.00% otherwise.

10.10.5 The delta CSR securitisations (CTP) correlation parameters γ_{bc} for aggregating the risk positions across buckets are identical to CSR non-securitisation as set out in paragraph 10.9.12 above.

10.11 Delta CSR securitisation (non-CTP) buckets, risk weights and correlations

10.11.1 Delta CSR securitisation (non-CTP) buckets are set along two dimensions- credit quality and sector, as in Table 8 below.

Table 8

Buckets for delta CSR securitisations (non-CTP)		
Bucket number	Credit quality	Sector
1	Senior investment grade (IG)	RMBS – Prime
2		RMBS – Mid-prime
3		RMBS – Sub-prime
4		CMBS
5		Asset-backed securities (ABS) – Student loans
6		ABS – Credit cards
7		ABS – Auto
8		Collateralised loan obligation (CLO) non-CTP
9	Non-senior IG	RMBS – Prime
10		RMBS – Mid-prime
11		RMBS – Sub-prime
12		Commercial mortgage-backed securities (CMBS)
13		ABS – Student loans
14		ABS – Credit cards
15		ABS – Auto
16		CLO non-CTP
17	High yield & non-rated	RMBS – Prime
18		RMBS – Mid-prime
19		RMBS – Sub-prime
20		CMBS
21		ABS – Student loans
22		ABS – Credit cards
23		ABS – Auto
24		CLO non-CTP
25	Other sector (Credit quality is not a differentiating consideration for this bucket)	

10.11.2 The delta CSR securitisation (non-CTP) sensitivities must first be assigned to a bucket before calculating weighted sensitivities by applying a risk weight.

10.11.3 To assign a risk position to a sector, banks must rely on a classification that is commonly used in the market for grouping tranches by type-

(a) each tranche must be assigned to one of the sector buckets in Table 8;

(b) risk positions from any tranche that a bank cannot be assigned to a sector defined in Table 8 must be assigned to the other sector bucket 25.

10.11.4 The RWs for buckets 1 to 8 (senior IG) are-

(a) RW is 0.9% for bucket number 1;

(b) RW is 1.5% for bucket number 2;

(c) RW is 2.0% for bucket number 3;

(d) RW is 2.0% for bucket number 4;

(e) RW is 0.8% for bucket number 5;

(f) RW is 1.2% for bucket number 6;

(g) RW is 1.2% for bucket number 7; and

(h) RW is 1.4% for bucket number 8.

10.11.5 The RWs for buckets 9 to 16 (non-senior investment grade) are equal to the corresponding risk weights for buckets 1 to 8 scaled up by a multiplication by 1.25.

10.11.6 The risk weights for buckets 17 to 24 (high yield and non-rated) are equal to the corresponding risk weights for buckets 1 to 8 scaled up by a multiplication by 1.75.

10.11.7 The risk weight for bucket 25 is 3.5%.

10.11.8 The delta CSR securitisations (non-CTP) correlation parameter ρ_{kl} between two weighted sensitivities WS_k and WS_l within the same bucket is set as follows-

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

where-

(a) $\rho_{kl}^{(tranche)}$ is equal to 1 where the two names of sensitivities k and l are within the same bucket and related to the same securitisation tranche (more than 80% overlap in notional terms), and 40% otherwise;

(b) $\rho_{kl}^{(tenor)}$ is equal to 1 if the two tenors of the sensitivities k and l are identical, and to 80% otherwise; and

(c) $\rho_{kl}^{(basis)}$ is equal to 1 if the two sensitivities are related to same curves, and 99.90% otherwise.

10.11.9 The aggregation of delta CSR securitisations (non-CTP) risk positions within the other sector bucket is equal to the simple sum of the absolute values of the net weighted sensitivities allocated to this bucket-

$$K_{b(other\ bucket)} = \sum_k |WS_k|$$

10.11.10 The method also applies to the aggregation of vega risk positions.

10.11.11 The aggregation of curvature CSR risk positions within the other sector bucket (that is bucket 16) is calculated by the formula-

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

10.11.12 The delta CSR securitisation (non-CTP) correlation parameter γ_{bc} for aggregating the risk positions across buckets 1 to 24 is 0%.

10.11.13 For aggregating delta CSR securitisations (non-CTP) risk positions between the other sector bucket 25 and buckets 1 to 24, the capital requirements for bucket 25 and the aggregated capital requirements for buckets 1 to 24 will be simply summed up to the overall risk class level capital requirements, with no diversification or hedging effects recognised.

10.12 Delta equity risk buckets, risk weights and correlations

10.12.1 Delta equity risk buckets are set along three dimensions- market capitalisation, economy and sector, as set out in Table 9 below.

Table 9

Buckets for delta sensitivities to equity risk			
Bucket number	Market cap	Economy	Sector
1	Large	Emerging market economy	Consumer goods and services, transportation and storage, administrative and support service activities, healthcare, utilities
2			Telecommunications, industrials
3			Basic materials, energy, agriculture, manufacturing, mining and quarrying
4			Financials including government-backed financials, real estate activities, technology
5		Advanced economy	Consumer goods and services, transportation and storage, administrative and support service activities, healthcare, utilities
6			Telecommunications, industrials
7			Basic materials, energy, agriculture, manufacturing, mining and quarrying
8			Financials including government-backed financials, real estate activities, technology
9	Small	Emerging market economy	All sectors described under bucket numbers 1, 2, 3 and 4
10		Advanced economy	All sectors described under bucket numbers 5, 6, 7 and 8
11	Other sector		

12	Large market cap, advanced economy equity indices (non-sector specific)
13	Other equity indices (non-sector specific)

10.12.2 The equity risk sensitivities must first be assigned to a bucket before calculating weighted sensitivities by applying a risk weight.

10.12.3 Market capitalisation (market cap) is defined as the sum of the market capitalisations based on the market value of the total outstanding shares issued by the same listed legal entity or a group of legal entities across all stock markets globally, where the total outstanding shares issued by the group of legal entities refer to cases where the listed entity is a parent company of a group of legal entities. Under no circumstances must the sum of the market capitalisations of multiple related listed entities be used to determine whether a listed entity is “large market cap” or “small market cap”.

10.12.4 Large market cap is defined as a market capitalisation equal to or greater than an amount determined by the Prudential Authority from time to time and small market cap is defined as a market capitalisation of less than an amount determined by the Prudential Authority from time to time.

10.12.5 The following are considered advanced economies for delta equity risk bucketing-

(a) Canada;
(b) the United States;
(c) Mexico,
(d) the euro area,
(e) the non-euro area western European countries (the United Kingdom, Norway, Sweden, Denmark and Switzerland);
(f) Japan;
(g) Oceania (Australia and New Zealand);
(h) Singapore; and
(i) Hong Kong SAR.

10.12.6 To assign a risk position to a sector, banks must rely on a classification that is commonly used in the market for grouping issuers by industry sector-

(a) each issuer must be assigned to one of the sector buckets in Table 5;
(b) all issuers from the same industry must be assigned to the same sector;
(c) risk positions from any issuer that a bank cannot assign to a sector defined in Table 5 must be assigned to the other sector bucket 11; and.
(d) for multinational multi-sector equity issuers, the allocation to a particular bucket must be done according to the most material region and sector in which the issuer operates.

10.12.7 The RWs for sensitivities to equity spot price and equity repo rates for buckets 1 to 13 are-

(a) RW is 55% for equity spot price and 0.55% for equity repo rates in bucket number 1;
(b) RW is 60% for equity spot price and 0.60% for equity repo rates in bucket number 2;
(c) RW is 45% for equity spot price and 0.45% for equity repo rates in bucket number 3;
(d) RW is 55% for equity spot price and 0.55% for equity repo rates in bucket number 4;
(e) RW is 30% for equity spot price and 0.30% for equity repo rates in bucket number 5;

(f) RW is 35% for equity spot price and 0.35% for equity repo rates in bucket number 6;
(g) RW is 40% for equity spot price and 0.40% for equity repo rates in bucket number 7;
(h) RW is 50% for equity spot price and 0.50% for equity repo rates in bucket number 8;
(i) RW is 70% for equity spot price and 0.70% for equity repo rates in bucket number 9;
(j) RW is 50% for equity spot price and 0.50% for equity repo rates in bucket number 10;
(k) RW is 70% for equity spot price and 0.70% for equity repo rates in bucket number 11;
(l) RW is 15% for equity spot price and 0.15% for equity repo rates in bucket number 12; and
(m) RW is 25% for equity spot price and 0.25% for equity repo rates in bucket number 13.

10.12.8 The delta equity risk correlation parameter ρ_{kl} between two weighted sensitivities WS_k and WS_l within the same bucket is set at as follows-

(a) ρ_{kl} is 99.90%, where-
  (i) one is a sensitivity to an equity spot price and the other a sensitivity to an equity repo rates; and
  (ii) both are related to the same equity issuer name.
(b) where both sensitivities are to equity spot price, ρ_{kl} is-
  (i) 15% between two sensitivities within the same bucket that fall under large market cap, emerging market economy (bucket number 1, 2, 3 or 4).
  (ii) 25% between two sensitivities within the same bucket that fall under large market cap, advanced economy (bucket number 5, 6, 7 or 8).
  (iii) 7.5% between two sensitivities within the same bucket that fall under small market cap, emerging market economy (bucket number 9).
  (iv) 12.5% between two sensitivities within the same bucket that fall under small market cap, advanced economy (bucket number 10).
  (v) 80% between two sensitivities within the same bucket that fall under either index bucket (bucket number 12 or 13).
(c) the same ρ_{kl} as set out in sub-paragraph(b)(i) to (v) above apply, where both sensitivities are to equity repo rates.
(d) ρ_{kl} is set as each parameter specified in sub-paragraph (b)(i) to (v) above multiplied by 99.90%, where-
  (i) one is a sensitivity to an equity spot price and the other a sensitivity to an equity repo rate; and
  (ii) Each sensitivity is related to a different equity issuer name.

10.12.9 The aggregation of delta equity risk positions within the other sector bucket 11 is equal to the simple sum of the absolute values of the net weighted sensitivities allocated to this bucket-

$$K_{b(other\ bucket)} = \sum_k |WS_k|$$

10.12.10 The same method applies to the aggregation of vega risk positions.

10.12.11 The aggregation of curvature CSR risk positions within the other sector bucket 11 is calculated by the formula-

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

10.12.12 The delta equity risk correlation parameter γ_{bc} for aggregating the risk position across buckets 1 to 13 is-

(a) 15% if bucket b and bucket c fall within bucket numbers 1 to 10;

(b) 0% if either of bucket b and bucket c is bucket 11;

(c) 75% if bucket b and bucket c are bucket numbers 12 and 13 (one is bucket 12, one is bucket 13); and

(d) 45% otherwise.

10.13 Delta commodity risk buckets, risk weights and correlations

10.13.1 Delta commodity risk buckets are set along the type of the commodity, as set out in Table 10 below.

Table 10

Delta commodity buckets and risk weights			
Bucket number	Commodity bucket	Examples of commodities allocated to each commodity bucket (non-exhaustive)	Risk weight
1	Energy - solid combustibles	Coal, charcoal, wood pellets , uranium	30%
2	Energy - liquid combustibles	Light-sweet crude oil; heavy crude oil; West Texas Intermediate (WTI) crude; Brent crude; etc (i.e. various types of crude oil) Bioethanol; biodiesel ; etc (i.e. various biofuels) Propane; ethane; gasoline; methanol; butane; etc (i.e. various petrochemicals) Jet fuel; kerosene; gasoil; fuel oil; naphtha; heating oil; diesel etc (i.e. various refined fuels)	35%
3	Energy - electricity and carbon trading	Spot electricity; day-ahead electricity; peak electricity; off-peak electricity (i.e. various electricity types) Certified emissions reductions; in-delivery month EU allowance; Regional Greenhouse Gas Initiative CO2 allowance; renewable energy certificates; etc (i.e. various carbon trading emissions)	60%
4	Freight	Capesize; Panamax; Handysize; Supramax (ie various types of dry-bulk route) Suezmax; Aframax; very large crude carriers (i.e., various liquid-bulk/gas shipping route)	80%
5	Metals – non-precious	Aluminium; copper; lead; nickel; tin; zinc (ie various base metals) Steel billet ; steel wire; steel coil ; steel scrap; steel rebar; iron ore; tungsten; vanadium; titanium; tantalum (ie steel raw materials) Cobalt; manganese; molybdenum (ie various minor metals)	40%
6	Gaseous combustibles	Natural gas; liquefied natural gas	45%
7	Precious metals (including gold)	Gold; silver; platinum; palladium	20%
8	Grains and oilseed	Corn; wheat; soybean seed; soybean oil; soybean meal; oats; palm oil; canola; barley; rapeseed seed; rapeseed oil; rapeseed meal; red bean; sorghum; coconut oil; olive oil; peanut oil; sunflower oil; rice	35%
9	Livestock and dairy	Live cattle; feeder cattle; hog; poultry; lamb; fish; shrimp; milk; whey; eggs; butter; cheese	25%
10	Softs and other agriculturals	Cocoa; arabica coffee; robusta coffee; tea; citrus juice; orange juice; potatoes; sugar; cotton; wool; lumber; pulp; rubber	35%
11	Other commodity	Potash; fertilizer; phosphate rocks (ie various industrial materials) Rare earths; terephthalic acid; flat glass	50%

10.13.2 The commodity risk sensitivities must first be assigned to a bucket before calculating weighted sensitivities by applying a risk weight.

10.13.3 The delta commodity risk correlation parameter ρ_{kl} between two weighted sensitivities WS_k and WS_l within the same bucket is set at as follows-

$$\rho_{kl} = \rho_{kl}^{(cty)} * \rho_{kl}^{(tenor)} * \rho_{kl}^{(basis)}$$

where-

(a) $\rho_{kl}^{(cty)}$ is equal to 1, if the two commodities of sensitivities k and l are identical, and to the intra-bucket correlations below otherwise-

(i) $\rho_{kl}^{(cty)}$is equal to 55%, for bucket number 1;

(ii) $\rho_{kl}^{(cty)}$ is equal to 95%, for bucket number 2;

(iii) $\rho_{kl}^{(cty)}$ is equal to 40% for bucket number 3;

(iv) $\rho_{kl}^{(cty)}$ is equal to 80% for bucket number 4;

(v) $\rho_{kl}^{(cty)}$ is equal to 60% for bucket number 5;

(vi) $\rho_{kl}^{(cty)}$ is equal to 65% for bucket number 6;

(vii) $\rho_{kl}^{(cty)}$ is equal to 55% for bucket number 7;

(viii) $\rho_{kl}^{(cty)}$ is equal to 45% for bucket number 8;

(ix) $\rho_{kl}^{(cty)}$ is equal to 15% for bucket number 9;

(x) $\rho_{kl}^{(cty)}$ is equal to 40% for bucket number 10;

(xi) $\rho_{kl}^{(cty)}$ is equal to 15% for bucket number 11;

(b) $\rho_{kl}^{(tenor)}$ is equal to 1 if the two tenors of the sensitivities k and l are identical, and to 99.00% otherwise; and

(c) $\rho_{kl}^{(basis)}$ is equal to 1 if the two sensitivities are identical in the delivery location of a commodity, and 99.90% otherwise

10.13.4 Regarding paragraph 10.13.3 (a) above, any two commodities are considered distinct commodities if in the market two contracts are considered distinct when the only difference between each other is the underlying commodity to be delivered. For example, WTI and Brent in bucket 2 (i.e. energy - liquid combustibles) would typically be treated as distinct commodities.

10.13.5 In addition to paragraph 10.13.4 above, for determining whether the commodity correlation parameter ($\rho_{kl}^{(cty)}$) set out in paragraph 10.12.4 (a)(i) to (xi) above must apply, below are non-exhaustive examples of further definitions of distinct commodities-

(a) for bucket 3 (energy – electricity and carbon trading)-

(i) each time interval at which the electricity may be delivered and that is specified in a contract that is made on a financial market is considered a distinct electricity commodity (example peak and off-peak);

(ii) electricity produced in a specific region (example Electricity NE, Electricity SE or Electricity North) is considered a distinct electricity commodity.

(b) for bucket 4 (freight)-

(i) each combination of freight type and route is considered a distinct commodity.

(ii) each week at which a good has to be delivered is considered a distinct commodity

10.13.6 The delta commodity risk correlation parameter γ_{bc} for aggregating the risk positions across buckets is set as follows-

(a) 20% if bucket b and bucket c fall within bucket numbers 1 to 10; and

(b) 0% if either bucket b or bucket c is bucket number 11.

10.14 Delta FX risk buckets, risk weights and correlations

10.14.1 An FX risk bucket is set for each exchange rate between the currency in which an instrument is denominated and the reporting currency.

10.14.2 The RWs for FX delta buckets is 15%, which must be applied to all the FX sensitivities.

10.14.3 The RW defined in paragraph 10.14.2 above may, at the discretion of the bank, be divided by the square root of 2 for-

(a) the currency pairs USD/EUR, USD /JPY, USD/GBP, USD/AUD, USD/CAD, USD/CHF, USD/MXN, USD/CNY, USD/NZD, USD/RUB, USD/HKD, USD/SGD, USD/TRY, USD/KRW, USD /SEK, USD/ZAR, USD/INR, USD/NOK, USD/BRL.

(b) currency pairs forming first-order crosses across these specified currency pairs. For example, EUR/AUD is not among sub-paragraph (a) above, but is a first-order cross of USD/EUR and USD/AUD.

10.14.4 The delta FX risk correlation parameter γ_{bc} for aggregating the risk positions across buckets is uniformly set as equal to 60%.

10.15 Definition of vega risk buckets, risk weights and correlations

10.15.1 The buckets for vega risk are the same for delta risk, for all risk classes.

10.15.2 The risk of market illiquidity is incorporated into the determination of vega risk, by assigning a liquidity horizon ($LH_{risk\ class}$) for each risk class.

10.15.3 The LHs and RWs for each risk class are-

(ii) LH is 60 days and the RW is 100% for GIRR;

(iii) LH is 120 days and the RW is 100% for CSR non-securitisations;

(iv) LH is 120 days and the RW is 100% for CSR securitisations (CTP);

(v) LH is 120 days and the RW is 100% for CSR securitisations (non-CTP);

(vi) LH is 20 days and the RW is 77.78% for equity, large cap or indices;

(vii) LH is 60 days and the RW is 100% for equity, small cap or other sector;

(viii) LH is 120 days and the RW is 100% for commodity; and

(ix) LH is 40 days and the RW is 100% for FX.

10.15.4 The vega GIRR correlation parameter ρ_{kl} between two weighted sensitivities WS_k and WS_l within the same bucket, which is not bucket for the "other" risk factor, is set at as follows-

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

where-

(a) $\rho_{kl}^{(option\ maturity)}$ is equal to $e^{-\alpha * \frac{|T_k - T_l|}{min\{T_k; T_l\}}}$, where-

(i) α is set at 1%;

(ii) T_k (respectively T_l) is the maturity of the option from which the vega sensitivity s_k (respectively s_l) is derived, expressed as a number of years; and

(b) $\rho_{kl}^{(underlying\ maturity)}$ is equal to $e^{-\alpha * \frac{\left|T_k^U - T_l^U\right|}{min\left\{T_k^U; T_l^U\right\}}}$, where-

(i) α is set at 1%; and

(ii) T_k^U (respectively T_l^U) is the maturity of the underlying of the option from which the sensitivity s_k (respectively s_l) is derived, expressed as a number of years after the maturity of the option.

10.15.5 The vega GIRR correlation parameter ρ_{kl} between two weighted sensitivities WS_k and WS_l within a bucket for the "other" risk factor is set at as follows-

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

where-

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

(b) $\rho_{kl}^{(option\ maturity)}$ is defined as in 10.15.4(a) above.

10.15.6 Where the vega risk factors are defined for a smaller number of dimensions than are defined for delta risk factors, only the dimensions that are defined both as a vega risk factor dimension and as a delta risk factor dimension for the relevant risk class need to be considered as a correlation based on delta risk factors ($\rho_{kl}^{(DELTA)}$ in the calculation of vega risk as in paragraph 10.15.5 above.

10.15.7 The vega correlation parameter γ_{bc} for aggregating the risk positions across different buckets within a risk class is the same as specified for delta correlations for each risk class in paragraphs 10.8 to 10.14.4 above.

10.16 Definition of curvature risk buckets, risk weights and correlations

10.16.1 The delta buckets are replicated for the calculation of curvature risk capital requirement, unless specified otherwise in the preceding paragraphs within paragraphs 10.7.1 to 10.14.4 above.

10.16.2 For GIRR, CSR and commodity risk classes, the curvature RW is the parallel shift of all the tenors for each curve based on the highest prescribed delta risk weight for each bucket.

10.16.3 For FX and equity risk classes, the curvature RW is a relative shift equal to the respective delta risk weight-

(a) for calculating FX curvature for options that do not reference a bank's reporting currency (as set out in paragraph 10.7.32) as an underlying, net curvature risk charges (CVR_k^+ and CVR_k^-) may be divided by a scalar of 1.5;

(b) alternatively, and subject to the prior approval of and such conditions as may be specified in writing by the Prudential Authority, a bank may apply the scalar of 1.5 consistently to all FX instruments provided curvature sensitivities are calculated for all currencies, including

sensitivities determined by shocking the reporting currency (or base currency where used) relative to all other currencies.

10.16.4 The curvature risk correlation ρ_{kl}, for aggregating curvature risk positions within a bucket, is determined by squaring the corresponding delta correlation parameter ρ_{kl}. In a case where a curvature risk factor is defined differently than the corresponding delta risk factor for a given risk class, banks do not need to consider this delta risk factor dimension.

10.16.5 In applying the high and low correlations scenario set out in paragraphs 10.6.16 above, the curvature risk capital requirements are calculated by applying the curvature correlation parameters ρ_{kl} determined in paragraph 10.16.4 above.

10.16.6 The curvature risk correlation parameter γ_{bc} for aggregating curvature risk positions across buckets, is determined by squaring the corresponding delta correlation parameter γ_{bc}.

10.16.7 In applying the high and low correlations scenario set out in paragraph 10.6.17 above, the curvature risk capital requirements are calculated by applying the curvature correlation parameters γ_{bc} determined in paragraph 10.16.6 above.

10.17 RRAO- residual risk add-on

10.17.1 The residual risk add-on (RRAO) is to be calculated for all instruments with an exotic underlying and bearing residual risk, in addition to the calculation of other components of the capital requirement under the standardised approach, as outlined in paragraph 10.1 above.

10.17.2 Instruments with an exotic underlying are trading book instruments with an underlying exposure that is not within the scope of delta, vega or curvature risk treatment in any risk class under the SbM or DRC requirements in the standardised approach, such as-

(a) longevity risk, weather, natural disasters and future realised volatility.

10.17.3 Instruments bearing other residual risks are those that meet the following criteria-

(a) instruments subject to vega or curvature risk capital requirements in the trading book and with pay-offs that cannot be written or perfectly replicated as a finite linear combination of vanilla options with a single underlying equity price, commodity price, exchange rate, bond price, credit default swap price or interest rate swap; or

(b) instruments which fall under the definition of CTP, except for those instruments that are recognized in the market risk framework as eligible hedges of risks within the CTP.

10.17.4 A non-exhaustive list of other residual risks types and instruments that may fall within the criteria set out in paragraph 10.17.3 above include-

(a) Gap risk- risk of a significant change in vega parameters in options due to small movements in the underlying, which results in hedge slippage. Relevant instruments subject to gap risk include all path dependent options, such as barrier options, Asian options, instruments with multiple call dates, and all digital options;

(b) Correlation risk- risk of a change in a correlation parameter necessary for determining the value of an instrument with multiple underlyings. Relevant instruments subject to correlation risk include all basket

options, best-of-options, spread options, basis options, Bermudan options and quanto options;

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

10.17.5 The following risk types do not make an instrument subject to the RRAO-

(a) Risk from a cheapest-to-deliver option;

(b) Smile risk- the risk of a change in an implied volatility parameter necessary for determining the value of an instrument with optionality relative to the implied volatility of other instruments optionality with the same underlying and maturity, but different moneyness;

(c) Correlation risk arising from multi-underlying European or American plain vanilla options, and from any options that may be written as a linear combination of such options. This exemption applies in particular to the relevant index options;

(d) Dividend risk arising from a derivative instrument whose underlying does not consist solely of dividend payments; and

(e) Index instruments and multi-underlying options of which treatment for delta, vega or curvature risk are set out in paragraphs 10.7.53 to 10.7.55 above. These are subject to the RRAO if they fall within the definitions set out in this paragraph10.17. For funds that are subject to the treatment specified in paragraph 10.7.60(c) (treated as an unrated “other sector” equity), banks must assume the fund is exposed to exotic underlying exposures, and to other residual risks, to the maximum possible extent allowed under the fund’s mandate.

10.17.6 Other examples are as follows-

(a) must be excluded from the RRAO capital requirement-

(i) instruments in a transaction that exactly matches with a third-party transaction (a back-to-back transaction), which applies to the instruments used in both transactions;

(ii) any instrument that is listed and/or eligible for central clearing;

(b) must be included in the RRAO capital requirement-

(i) any instrument that is listed and/or eligible for central clearing with an exotic underlying;

(ii) hedges, including dividend swaps, that do not fulfill the criterion in sub-paragraph (a)(i) above;

(iii) total return swaps that do not fulfill the criterion in sub-paragraph (a)(i) above.

10.17.7 The RRAO applies to instruments additionally to any other requirement in the SbM or DRC. However, in practice, the SbM cannot, by definition, be applied to instruments with exotic underlyings SbM, given that the risk factors listed do not include exotic underlyings.

10.17.8 The RRAO must be calculated as follows-

(a) the simple sum of the gross notional amounts of the instruments subject to the requirement multiplied by a RW;

(b) the RW for instruments with an exotic underlying as in 12.2 is 1.0%;

(c) the RW for instruments bearing other residual risks specified in paragraph 10.17.3 above, is 0.1%.

10.17.9 Where the bank is unable to satisfy the Prudential Authority that the RRAO provides a sufficiently prudent capital charge, the Prudential Authority will address any potentially under-capitalised risks by imposing a conservative additional capital charge under Pillar 2.

11. Internal models approach

11.1 Approval by the Prudential Authority and general requirements

11.1.1 The use of the internal-models approach (IMA) for the purposes of determining market risk capital requirements is subject to explicit, prior written approval of the Prudential Authority subject to the bank meeting all the general, qualitative and internal validation requirements.

11.1.2 The general requirements for the approval by the Prudential Authority for the use of the IMA, at a minimum, are the following-

(a) banks' risk-management systems must be conceptually sound and is implemented with integrity;

(b) banks' organisational infrastructure, including the definition and structure of trading desks, and their internal risk management models must meet the qualitative evaluation criteria, as set out in paragraph 11.2 below.

(c) the amount of staff working in the internal models function, the trading function, the internal audit function, the risk-management function and the back-office functions and their qualification and skillset must be adequate and sufficient for the tasks involved.

(d) banks' trading desk risk management model has a proven track record of reasonable accuracy in measuring risk.

(e) banks must regularly conduct stress tests following the recommendations set out in paragraph 11.5 below.

(f) the positions included in banks' IMA are held in trading desks that have been approved for the use of those models and that have passed the required validation tests as described in paragraph 11.3 below.

11.1.3 The Prudential Authority may request a period of initial monitoring and live testing of a bank's internal trading desks risk management model being contemplated for IMA approval before it is used to determine the bank's market risk capital requirements.

11.1.4 The IMA will be applied to banks' trading portfolio on a desk-by desk basis and subject to Prudential Authority approval according to the following-

(a) In their application, banks will select the individual trading desks for which they seek IMA approval and those for which they do not, which must be justified in both cases. It must also specify the set of risk factors included in the IMA. Given that unselected desks will be subject to the standardised approach, potentially lower capital requirements according to the latter must not be a reason to scope out a trading desk from the IMA approval application.

(b) Trading desks which have been scoped out cannot be included in the IMA for a period of one year after the Prudential Authority's initial approval has been granted.

(c) In its approval and ongoing supervisory review processes, the Prudential Authority will specify which trading desks may be included in the banks' IMA, according to the following-

(i) Each trading desk must satisfy profit and loss attribution (PLA) test on an ongoing basis, taking into account the risk factors which have been included in the model.
(ii) Each trading desk must satisfy backtesting requirements on an ongoing basis
(iii) Banks must conduct PLA tests and backtesting on a quarterly basis to update the eligibility of trading desks in-scope of the IMA.

11.1.5 In its approval, the Prudential Authority will specify which risk factors may be included in the banks' IMA, and, in particular-

(a) Which risk factors satisfy the risk factor eligibility test (RFET) as set out in paragraph 11.7 below, whose capital requirements must be determined using the ES models as specified in paragraphs 11.18 and 11.19 below.
(b) Which risk factors do not satisfy the RFET, whose capital requirements must be determined using stressed expected shortfall (SES) models for non-modellable risk factors as specified in paragraph 11.20 below.

11.2 Qualitative requirements

11.2.1 Banks must meet the following minimum qualitative requirements to receive initial approval by the Prudential Authority. These requirements must be met on an ongoing basis in order to be able to use the IMA.

11.2.2 The banks must have an independent risk control unit that-

(a) is responsible for the design and implementation of the banks' risk management system;
(b) produces and analyses daily reports on the output of the banks' IMA, including an evaluation of the relationship between measures of risk exposure and trading limits;
(c) must be independent from business trading units;
(d) must report directly to the senior management of banks.
(e) must conduct regular backtesting and PLA assessments at the trading desk level. Banks must also conduct regular backtesting of their IMA.

11.2.3 A banks' distinct unit that is separate from the unit that designs and implements the internal models must conduct the initial and ongoing validation of the IMA.

11.2.4 The model validation unit must validate all internal models used for purposes of the IMA on at least an annual basis.

11.2.5 The Board and senior management of the bank must be actively involved in the risk control process and must regard risk control as an essential aspect of the business to which significant resources need to be devoted.

11.2.6 The daily reports prepared by the independent risk control unit must be reviewed by management with sufficient seniority and authority to enforce both reductions of positions taken by individual traders and reductions in banks' overall risk exposure.

11.2.7 A banks' distinct unit that is separate from the unit that designs and implements the internal models must conduct the initial and ongoing validation of the IMA.

11.2.8 The model validation unit must validate all internal models used for purposes of the IMA on at least an annual basis.

11.2.9 The Board and senior management of the bank must be actively involved in the risk control process and must regard risk control as an essential aspect of the business to which significant resources need to be devoted.

11.2.10 The daily reports prepared by the independent risk control unit must be reviewed by management with sufficient seniority and authority to enforce both reductions of positions taken by individual traders and reductions in banks' overall risk exposure.

11.2.11 Internal models used to determine market risk capital requirements are likely to differ from those used by a bank in its day-to-day internal risk management functions. Nevertheless, the core design elements of both the market risk capital requirement model and the internal risk management model should be the same and must include -

(a) Valuation models that are a feature of both models must be similar and constitute an integral part of the internal identification, measurement, management and internal reporting of price risks within the banks' trading desks.

(b) Internal risk management models must, at a minimum, be used to assess the risk of positions that are included in the IMA, although they may assess a broader set of positions.

(c) Banks' IMA must be based on the same methodologies used by internal risk-management model with regard to risk factor identification, parameter estimation and proxy concepts and deviate only if this is needed due to regulatory requirements.

(d) A bank's IMA and its internal risk management model must address an identical set of risk factors.

(e) A routine and rigorous programme of stress testing must be in place, must be reviewed at least monthly by senior management and must be considered for-

(i) internal assessment of capital adequacy; and

(ii) trading book's policies and limits set by the banks' management and its board.

11.2.12 Where stress tests reveal particular vulnerability to a given set of circumstances, banks must take prompt action to mitigate those risks appropriately, including hedging against that outcome, reducing the size of the banks' exposures or increasing capital).

11.2.13 Banks must have a routine in place for ensuring compliance with a documented set of internal policies, controls and procedures concerning the operation of the risk management model. The bank's risk management model must be well documented. Such documentation may include a comprehensive risk management manual that describes the basic principles of the risk management model and that provides a detailed explanation of the empirical techniques used to measure market risk.

11.2.14 The bank must receive explicit prior approval from the Prudential Authority prior to implementing any significant changes to its internal models used to determine market risk capital requirements.

11.2.15 The banks' IMA for determining market risk capital requirements must address the full set of positions that are in scope of application of the model. All models' measurements of risk must be based on a sound theoretical basis, calculated correctly, and reported accurately.

11.2.16 An independent review of the risk management system must be carried out regularly in the banks' own internal auditing external process or external audit, including both the activities of the business trading units and of the independent risk control unit.

11.2.17 The independent review must be sufficiently detailed to determine which trading desks are impacted by any failings of the risk-management system.

11.2.18 The independent review of the overall risk management process must take place at regular intervals, ideally not less than once a year, and must specifically address, at a minimum-

(a) both the activities of the business trading units and the activities of the risk control unit;
(b) sufficient details to determine which trading desks are impacted by any failures;
(c) the organisation of the risk control unit;
(d) the adequacy of the documentation of the risk management model and process;
(e) the accuracy and appropriateness of the internal market risk management models;
(f) the verification of the consistency, timeliness and reliability of data sources used to run risk management models, including the independence of such data sources;
(g) the approval process for pricing models and valuation systems used by the banks' front- and back-office personnel;
(h) the scope of market risks reflected in the risk management models;
(i) the integrity of the management information system;
(j) the accuracy and completeness of position data;
(k) the accuracy and appropriateness of volatility and correlation assumptions;
(l) the accuracy of valuation and risk transformation calculations;
(m) the verification of trading desk risk management model accuracy through frequent backtesting and PLA assessments; and
(n) the general alignment between banks' IMA and internal risk-management model.

11.3 Internal validation

11.3.1 Banks must have an internal validation process of their IMA carried out by staff members or departments independent from those involved in the model development to ensure that each model is conceptually sound and adequately reflects all material risks.

11.3.2 The internal validation must be conducted periodically and also every time a new model is developed, significant changes to the model are implemented or significant changes in the composition of the trading portfolio take place.

11.3.3 Model validation must include, at minimum-

(a) A review of model assumptions and underlying pricing models;
(b) Backtesting;
(c) Profit and Loss attribution;
(d) Hypothetical P&L calculation methodology;
(e) The ability to account for particular structural features that may arise by using hypothetical portfolios.

11.3.4 Banks must use hypothetical portfolios to ensure that internal models are able to account for particular structural features that may arise. In particular, where the data history for some instruments does not meet the quantitative standards detailed in and the banks map these positions to proxies, the banks must ensure that the proxies produce conservative results under relevant market scenarios, with sufficient consideration given to ensuring-

(a) that material basis risks are adequately reflected, including mismatches between long and short positions by maturity or by issuer; and
(b) that the models reflect concentration risk that may arise in an undiversified portfolio.

11.4 External validation

11.4.1 The review of the internal model by the external auditors and/or the Prudential Authority must include at least-

(a) Verification that the internal validation processes described in paragraph 11.3 above are operating in a satisfactory manner;
(b) Confirmation that the formulae used in the calculation process, as well as for the pricing of options and other complex instruments, are validated by a qualified unit, which in all cases must be independent from the banks' trading area;
(c) Confirmation that the structure of internal models is adequate with respect to the banks' activities and geographical coverage;
(d) Review of the results of both the banks' backtesting of its IMA and its PLA process to ensure that the models provide a reliable measure of potential losses over time. On request, the banks must make available to the PA the results as well as the underlying inputs to ES calculations and details of the PLA exercise; and
(e) Confirmation that data flows and processes associated with the risk management system are transparent and accessible. On request and in accordance with procedures, the banks must provide the Prudential Authority and their external auditors access to the models' specifications and parameters.

11.5 Stress testing

11.5.1 Banks that use the IMA for determining market risk capital requirements must have in place a rigorous and comprehensive stress testing programme both at the trading desk level and at the bank-wide level.

11.5.2 Banks' stress scenarios must cover a range of factors that-
(i) may create extraordinary losses or gains in trading portfolios, or
(ii) make the control of risk in those portfolios very difficult.

11.5.3 The factors mentioned in paragraph 11.5.2 above include low-probability events in all major types of risk, including the various components of market, credit and operational risks.

11.5.4 A bank must design stress scenarios to assess the impact of such factors on positions that feature both linear and non-linear price characteristics (. options and instruments that have option-like characteristics).

11.5.5 Banks' stress tests must be of a quantitative and qualitative nature, incorporating both market risk and liquidity risk aspects of market disturbances.

(a) Quantitative elements must identify plausible stress scenarios to which banks could be exposed.

(b) Qualitatively, a bank's stress testing programme must evaluate the capacity of the bank's capital to absorb potential significant losses and identify steps the bank may take to reduce its risk and conserve capital.

11.5.6 Banks must routinely communicate results of stress testing to senior management and must periodically communicate those results to the bank's board.

11.5.7 Banks must combine the use of supervisory stress scenarios with stress tests developed by the bank itself to reflect its specific risk characteristics. Stress scenarios may include the following-

(a) Supervisory scenarios requiring no simulations by the bank.

(i) A bank must have information on the largest losses experienced during the reporting period and may be required to make this available for supervisory review.

(ii) The Prudential Authority may compare this loss information to the level of capital requirements that would result from a bank's internal measurement system.

(b) Scenarios requiring a simulation by the bank.

(i) Banks must subject their portfolios to a series of simulated stress scenarios and provide the Prudential Authority with the results.

(ii) These scenarios could include testing the current portfolio against past periods of significant disturbance incorporating both the significant price movements and the sharp reduction in liquidity associated with these events.

(iii) 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.

(iv) Due consideration must be given to the sharp variation that at times has occurred in a matter of days in periods of significant market disturbance.

(c) Bank-developed stress scenarios.

(i) In addition to the scenarios prescribed by the Prudential Authority a bank must also develop its own stress tests that it identifies as most adverse based on the characteristics of its portfolio.

(ii) A bank must provide the Prudential Authority 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 scenarios.

11.6 Specification of market risk factors

11.6.1 The bank must define for each trading desk a set of risk factors that affect the value of their trading positions and are sufficient to represent the risks inherent in the bank's portfolio of on- and off-balance- sheet trading positions. The selection of risk factors must meet, at least the following requirements-

(a) It must include all risk factors that are used for pricing. In the event a risk factor is incorporated in a pricing model but not in the trading desk IMA, the bank must justify this omission to the satisfaction of the Prudential Authority;

(b) It must include all risk factors that are specified in the standardised approach for the corresponding risk class. In the event a risk factor is specified in the standardised approach but is not selected for the trading desk IMA, the bank must justify this omission to the satisfaction of the Prudential Authority;

(c) It must not include risk factors relating to securitised products, banks are prohibited to internal models to determine market risk capital requirements. Banks must use the standardised approach to determine the market risk capital requirements for securitised products. Accordingly, a bank's market risk capital requirement model must not specify risk factors for securitisations as defined;

(d) A bank's model and any stress scenarios calculated for non-modellable risk factors must address non-linearities for options and other relevant instruments, as well as correlation risk and relevant basis risks;

(e) A bank may use a proxy for a risk factor provided it justifies its use to the Prudential Authorities and demonstrates an appropriate track record for their representation of a position; and

(f) For general interest rate risk, a bank must use a set of risk factors that corresponds to the interest rates associated with each currency in which the bank has interest rate sensitive on- or off-balance sheet trading positions. In particular-

(i) The trading desk risk management model must model the yield curve by estimating forward rates from zero coupon yields or using another generally accepted market practice.

(ii) The yield curve must be divided into maturity segments in order to capture variation in the volatility of rates along the yield curve.

(iii) For material exposures to interest rate movements in the major currencies and markets, banks must model the yield curve using a minimum of six risk factors.

(iv) The number of risk factors used ultimately must be driven by the nature of the bank's trading strategies. A bank with a portfolio of various types of securities across many points of the yield curve and that engages in complex arbitrage strategies would require the use of a greater number of risk factors than a bank with less complex portfolios.

(v) The trading desk risk management model must incorporate separate risk factors to capture CSR A variety of approaches may be used to reflect the CSR arising from less-than

perfectly correlated movements between government and other fixed income instruments, such as specifying a completely separate yield curve for non-government fixed income instruments or estimating the spread over government rates at various points along the yield curve.

11.6.2 For exchange rate risk, the trading desk risk management model must incorporate risk factors that correspond to the individual currencies in which the bank's positions are denominated that are different from the bank's reporting currency.

11.6.3 For equity risk, a bank must use risk factors that correspond to each of the equity positions which the bank holds. The sophistication and nature of the modelling technique for a given market must correspond to the bank's exposure to the overall market as well as the bank's concentration in individual equities in that market.

(a) At a minimum, a bank must use risk factors that reflect market-wide movements in equity prices, such as indices. Positions in individual securities or in sector indices may be expressed in beta-equivalents relative to a market-wide index.

(b) A bank may use risk factors that correspond to a given or various sector, such as sectorial indices. Positions in individual securities within each sector may be expressed in beta-equivalents relative to a sector index.

(c) A bank may also use risk factors that correspond to the volatility of individual equities.

(d) The sophistication and nature of the modelling technique for a given market must correspond to the bank's exposure to the overall market as well as the bank's concentration in individual equities in that market.

11.6.4 For commodity risk, a bank must use risk factors that correspond to each of the commodity markets in which the bank holds significant positions.

(a) For banks with relatively limited positions in commodity-based instruments, the bank may use a straightforward specification of risk factors, including using one single risk factor to represent positions in the same commodity type but in different jurisdictions.

(b) For a bank with active trading in commodities, the bank's IMA must account for variation in the convenience yield between derivatives positions such as forwards and swaps and cash positions in the commodity.

11.6.5 For the risks associated with equity investments in funds-

(a) For funds that may be looked-through according to the criteria set out in paragraph 8.3.4(e)(i) above, banks must consider the risks of the fund, and of any associated hedges, as if the fund's positions were held directly by the bank. The bank must assign these positions to the trading desk to which the fund is assigned.

(b) For funds that do not meet the criterion set out in paragraph 8.3.4(e)(i) above, but meet both the criteria set out in 8.3.4(e)(ii) above, banks must use the standardised approach to calculate capital requirements for the fund.

11.7 Model eligibility of risk factors

11.7.1 A bank must determine which risk factors within its trading desks that have received approval to use the IMA are eligible to be included in the bank's internal expected shortfall model (ES model). A risk factor may be classified as modellable by a bank if it passes the Risk-Factor Eligibility Test (RFET).

11.7.2 The RFET requires identification of a sufficient number of real prices that are representative of the risk factor.

11.7.3 In order to pass the RFET, a risk factor must meet either of the following conditions below on a quarterly basis-

(a) There are at least 24 real price observations per year included in the period used to calibrate the current ES model, with no more than one real price observation per day to be included in this count. Moreover, over the previous 12 months there must be no 90-day period in which fewer than 4 real price observations are identified for the risk factor, with no more than one real price observation per day to be included in this count. The above criteria must be monitored on a monthly basis; or

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

11.7.4 In terms of paragraph 11.7.3 above, any real price that is observed for a transaction must be counted as an observation for all of the risk factors for which it is representative.

11.7.5 A price will be considered real if it meets at least one of the following criteria-

(a) It is a price at which the bank has conducted a transaction;

(b) It is a verifiable price for an actual transaction between other arms-length parties;

(c) It is a price obtained from a committed quote made by (i) the bank itself or (ii) another party. The committed quote must be collected and verified through a third-party vendor, a trading platform or an exchange; or

(d) It is a price that is obtained from a third-party vendor, where all the following conditions are met-

(i) the transaction or committed quote has been processed through the vendor;

(ii) the vendor agrees to provide evidence of the transaction or committed quote to the Prudential Authority upon request; or

(iii) the price meets at least one of the conditions in sub-paragraphs (a), (b) or (c) above on a quarterly basis. Collateral reconciliations or valuations cannot be considered real prices to meet the RFET.

(iv) The vendor communicates to the bank the number of corresponding real prices observed and the dates at which they have been observed.

(v) The vendor provides, individually, a minimum necessary set of identifier information to enable banks to map real prices observed to risk factors.

(vi) The vendor is subject to an audit regarding the validity of its pricing information whose results must be made available on request to the Prudential Authority and to banks. If the audit of a third-party vendor is not satisfactory to the Prudential Authority, the

Prudential Authority may decide to prevent the bank from using data from this vendor.

11.7.6 A real price is representative for a risk factor of a bank where the bank is able to extract the value of the risk factor from the value of the real price. The bank must have policies and procedures that describe its mapping of real price observations to risk factors. The bank must provide sufficient information to the Prudential Authority in order to determine if the methodologies the bank uses are appropriate.

11.8 Bucketing approach for the RFET

11.8.1 Where a risk factor is a single, unidimensional data point, in order to count real price observations for the RFET, banks may choose from the following bucketing approaches -

(a) The own bucketing approach. Under this approach, the bank must define the buckets it will use and meet the following requirements-
   (i) Each bucket must include only one risk factor, and all risk factors must correspond to the risk factors that are part of the risk-theoretical profit and loss (RTPL) of the bank for the purpose of the profit and loss attribution (PLA) test.
   (ii) The buckets must be non-overlapping.

(b) The regulatory bucketing approach. Under this approach, the bank must use the following set of standard buckets as set out in Table 11.
   (i) For interest rate, foreign exchange and commodity risk factors with one maturity dimension (t), where t is measured in years, with the exception of implied volatilities, the buckets in row (A) below must be used.
   (ii) For interest rate, foreign exchange and commodity risk factors with several maturity dimensions (t), where t is measured in years, with the exception of implied volatilities, the buckets in row (B) below must be used.
   (iii) For credit spread and equity risk factors with one or several maturity dimensions (t), where t is measured in years, with the exception of implied volatilities, the buckets in row (C) below must be used.
   (iv) For any risk factors with one or several moneyness dimensions, as expressed using the delta ('δ') convention, the buckets in row (D) below must be used.
   (v) For expiry and moneyness dimensions of implied volatility risk factors (excluding those of interest rate swaptions), only the buckets in rows (C) and (D) below must be used.
   (vi) For maturity, expiry and moneyness dimensions of implied volatility risk factors from interest rate swaptions, only the buckets in row (B), (C) and (D) below must be used.

Table 11

Standard buckets for the regulatory bucketing approach									
Row	Bucket								
	1	2	3	4	5	6	7	8	9
(A)	0≤t<0.75	0.75≤t<1.5	1.5≤t<4	4≤t<7	7≤t<12	12≤t<18	18≤t<25	25≤t<35	35≤t<∞
(B)	0≤t<0.75	0.75≤t<4	4≤t<10	10≤t<18	18≤t<30	30≤t<∞			
(C)	0≤t<1.5	1.5≤t<3.5	3.5≤t<7.5	7.5≤t<15	15≤t<∞				
(D)	0≤δ<0.05	0.05≤δ<0.3	0.3≤δ<0.7	0.7≤δ<0.95	0.95≤δ<1.00				

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

11.8.3 As debt instruments mature, real price observations for those products that have been identified within the prior 12 months are usually still counted in the maturity bucket to which they were initially allocated. When banks no longer need to model a CSR factor belonging to a given maturity bucket, banks are allowed to re-allocate the real price observations of this bucket to the adjacent (shorter) maturity bucket. A real price observation may only be allocated to a single maturity bucket for the purposes of the RFET.

11.8.4 Where a bank uses a parametric function to represent a curve/surface and defines the function's parameters as the risk factors in its risk measurement system, the RFET must be passed at the level of the market data used to calibrate the function's parameters and not be passed directly at the level of these risk factor parameters (due to the fact that real price observations may not exist that are directly representative of these risk factors).

11.8.5 A bank may use systematic credit or equity risk factors within its models in order to capture market-wide movements for a given economy, region or sector but not the idiosyncratic risk of a specific issuer (the idiosyncratic risk of a specific issuer would be a non-modellable risk factor (NMRF) unless there are sufficient real price observations of that issuer). Real price observations of market indices or instruments of individual issuers may be considered representative for a systematic risk factor as long as they share the same attributes as the systematic risk factor.

11.8.6 Where systematic risk factors of credit or equity risk factors include a maturity dimension (for example a credit spread curve), one of the bucketing approaches set out above must be used for this maturity dimension to count "real" price observations for the RFET.

11.8.7 Once a risk factor has passed the RFET, the bank must choose the most appropriate data to calibrate its model. The data used for calibration of the model does not need to be the same data used to pass the RFET. The bank must demonstrate that the data used to calibrate its ES model are appropriate based on the principles contained in paragraph 11.9 below. Where a bank has not met these principles for a particular risk factor, the PA may choose to deem the data unsuitable for use to calibrate the model and, in such case, the risk factor must be excluded from the ES model and subject to capital requirements as an NMRF.

11.8.8 Under the most extraordinary, systemic circumstances, the Prudential Authority may consider modellable a risk factor that used to, but no longer, passes the RFET. However, such a response will not facilitate a decrease in capital requirements.

11.9 Principles for the modellability of risk factors that pass the RFET

11.9.1 Banks use many different types of models to determine the risks resulting from trading positions. The data sources needed to model each risk factor may be different, depending on the risk-factor and the model chosen. In all cases, data sources shall be able to yield real price observations meeting the conditions in paragraph 11.7 above.

11.9.2 Banks must apply the principles below to determine whether a risk factor that passed the RFET may be modelled using the ES model or must be subject to capital requirements as an NMRF. The Prudential Authority will enforce compliance with the following principles and may determine risk factors to be non-modellable in the event these principles are not applied -

(a) Principle one. The data used may include combinations of modellable risk factors. Generally, risk factors derived solely from a combination of modellable risk factors are modellable. A risk factor derived from a combination of modellable risk factors that are mapped to distinct buckets of a given curve/surface must also pass the RFET.

(i) Interpolation based on combinations of modellable risk factors must be consistent with mappings used for PLA testing to determine the RTPL and must not be based on alternative, and potentially broader, bucketing approaches. Banks may compress risk factors into a smaller dimension of orthogonal risk factors and/or derive parameters from observations of modellable risk factors, such as in models of stochastic implied volatility, without the parameters being directly observable in the market.

(ii) Subject to the approval of the PA, banks may extrapolate up to a reasonable distance from the closest modellable risk factor. The extrapolation must not rely solely on the closest modellable risk factor but on more than one modellable risk factor. In the event that a bank uses extrapolation, the extrapolation must be considered in the determination of the RTPL.

(b) Principle two. The data used must allow the model to capture both idiosyncratic and systematic market risk components. General market risk is the tendency of an instrument's value to change with the change in the value of the broader market, as represented by an appropriate index or indices. Idiosyncratic risk is the variability in the price of an instrument that cannot be explained by general market risk but only by the specific features of that instrument. If the data used in the model do not reflect either idiosyncratic or general market risk, the bank must apply an NMRF charge for those aspects that are not adequately captured in its model.

(c) Principle three. The data used must allow the model to accurately reflect volatility and correlation of the risk positions in a way that they are not underestimated. Different data sources may provide dramatically different volatility and correlation estimates for asset prices. Data sources used must ensure that-

(i) the data are representative of real price observations;
(ii) price volatility is not understated by the choice of data;
(iii) correlations are reasonable approximations of correlations among real price observations; and
(iv) transformations made to the data must not understate or distort the volatility from or the correlation among risk factors.

(d) Principle four. The data used must be reflective of prices observed and/or quoted in the market. Where data used are not derived from real price observations, the bank must demonstrate that the data used are reasonably representative of real price observations. To that end, the bank must periodically reconcile price data used in a risk model with front office and back office prices, where possible, consisting of real price observations. Banks must document their approaches to deriving risk factors from market prices.

(e) Principle five. The data used must be updated by the bank at a sufficient frequency to account for frequent turnover of positions in the trading portfolio and changing market conditions. Banks must update data at a minimum on a monthly basis, but preferably daily. Furthermore, where the bank uses regressions to estimate risk factor parameters, these must be re-estimated on a regular basis, generally no less frequently than every two weeks. Calibration of pricing models to current market prices must also be sufficiently frequent, ideally no less frequent than the calibration of front office pricing models. Where appropriate, banks must have clear policies for backfilling and/or gap-filling missing data.

(f) Principle six. The data used to determine stressed expected shortfall ($ES_{R,S}$) must be reflective of market prices observed and/or quoted in a period of stress. The data for the $ES_{R,S}$ model must be sourced directly from the historical period of stress whenever possible. There are cases where the characteristics of current instruments in the market differ from those in the stress period. Nevertheless, banks must empirically justify any instances where the market prices used for the stress period are different from the market prices actually observed during that period. In cases where instruments that are currently traded did not exist during a period of significant financial stress or the characteristics of current instruments in the market differ from those in that period, banks must justify that the prices used reflect changes in prices or spreads of similar instruments during the stress period. If the justification is not considered sufficient by the Prudential Authority, the bank must omit the risk factor for the stressed period and still meet the requirement in paragraph 11.18.1(i)(ii) that the reduced set of risk factors explain 75% of the fully specified ES model. Moreover, if name-specific risk factors are used to calculate the ES in the actual period and these names were not available in the stressed period, there is a presumption that the idiosyncratic part of these risk factors are not in the reduced set of risk factors. Exposures for risk factors that are included in the current set but not in the reduced set need to be mapped to the most suitable risk factor of the reduced set for the purposes of calculating ES measures in the stressed period.

(g) Principle seven. The use of proxies must be limited, and proxies must have sufficiently similar characteristics to the transactions they

represent. Proxies must be appropriate for the region, quality and type of instrument they are intended to represent. The Prudential Authority will assess whether methods for combining risk factors are conceptually and empirically sound. In particular-

(i) The use of indices in a multifactor model must capture the correlated risk of the assets represented by the indices, and the remaining idiosyncratic risk must be demonstrably uncorrelated across different issuers. A multifactor model must have significant explanatory power for the price movements of assets and must provide an assessment of the uncertainty in the final outcome due to the use of a proxy. The coefficients (betas) of a multifactor model must be empirically based and must not be determined based on judgment. Instances where coefficients are set by judgment generally must be considered as NMRFs.

(ii) If risk factors are represented by proxy data in the current period ES model, the proxy data representation of the risk factor – not the risk factor itself – must be used in the RTPL unless the bank has identified the basis between the proxy and the actual risk factor and properly capitalised the basis either by including the basis in the ES model, if the risk factor is a modellable, or capturing the basis as a NMRF. If the capital requirement for the basis is properly determined, then the bank may choose to include in the RTPL either-

(aa) the proxy risk factor and the basis; or

(bb) the actual risk factor itself.

11.10 General validation requirements

11.10.1 A bank that intends to use the IMA to determine market risk capital requirements for a trading desk must conduct and successfully pass backtesting at the bank-wide level and both the backtesting and profit and loss (P&L) attribution (PLA) test at the trading desk level.

11.10.2 For a bank to remain eligible to use the IMA to determine market risk capital requirements, a minimum of 10% of the bank's aggregated market risk capital requirement must be based on positions held in trading desks that qualify for the use of the IMA by satisfying the backtesting and PLA test as set out in this Standard. This 10% criterion must be assessed by the bank on a quarterly basis when calculating the aggregate capital requirement for market risk according to paragraph 11.23 below.

11.10.3 The implementation of the backtesting programme and the PLA test must begin on the date that the IMA becomes effective to calculate capital requirements.

(a) For the initial approval of the IMA, the bank must provide at least a one-year backtesting and PLA test report to confirm the quality of the model, although the Prudential Authority may require backtesting and PLA test results prior to that date.

(b) Any Prudential Authority supervisory response will be commensurate to the number of exceptions generated by the bank's model to the backtesting and PLA over the course of 12 months (250 trading days) and will encompass the following actions, from less to more severe-

(i) initiating a dialogue with the bank to determine if there is a problem with a bank's model;
(ii) imposing an increase in the bank's capital requirement; or
(iii) disallowing the use of the model.

11.11 Backtesting requirements

11.11.1 General requirements

(a) Backtesting must be performed both at bank-wide and at trading-desk level. Requirements in this paragraph apply to both cases.
(b) Backtesting requirements compare the value-at-risk (VaR) measure calibrated to a one-day holding period against each of the actual P&L (APL) and hypothetical P&L (HPL) over the prior 12 months.
(c) An exception or an outlier occurs when either the actual loss or the hypothetical loss registered in a day of the backtesting period exceeds the corresponding daily VaR measure given by the model. Exceptions for actual losses are counted additionally to exceptions for hypothetical losses
(d) In the event that either the P&L or the daily VaR measure is not available or impossible to compute on a specific day, it will count as an exception.
(e) In the event an exception may be shown by the bank to relate to a non-modellable risk factor, and the capital requirement for that non-modellable risk factor exceeds the actual or hypothetical loss for that day, it may be disregarded for the purpose of the overall backtesting process if the Prudnetial Authority is notified accordingly and does not object to this treatment. In these cases, the bank must document the history of the movement of the value of the relevant non-modellable risk factor and have supporting evidence that the non-modellable risk factor has caused the relevant loss.

11.11.2 Backtesting at the bank-wide level

(a) The calculation of the VaR to be applied at the bank-wide level will follow the following requirements-
    (i) Backtesting of the bank-wide risk model must be based on a VaR measure calibrated at a 99th percentile confidence level.
    (ii) The scope of the portfolio subject to bank-wide backtesting must be updated quarterly based on the results of the latest trading desk-level backtesting, RFET and PLA tests.
(b) According to the number of exceptions, three backtesting zones are defined-
    (i) Green zone. This corresponds to results that do not themselves suggest a problem with the quality or accuracy of a bank's IMA.
    (ii) Amber zone. This encompasses results that do raise questions about the quality or accuracy of a bank's IMA, though such conclusion is not definitive.
    (iii) Red zone. This indicates almost certainly a problem with a bank's IMA.
(c) As established in paragraph 11.10.3(b) above, the possible Prudential Authority's supervisory actions will be commensurate to the number of backtesting exceptions. Table 12 below sets out the boundaries for these 3 zones and the presumptive supervisory response.

11.11.3 Backtesting zones

Table 12

Backtesting zones		
Backtesting zone	Number of exceptions	Backtesting dependent multiplier (to be added to any qualitative add-on per paragraph 11.25.4)
Green	0	1.50
	1	1.50
	2	1.50
	3	1.50
	4	1.50
Amber	5	1.70
	6	1.76
	7	1.83
	8	1.88
	9	1.92
Red	10 or more	2.00

(a) The backtesting green zone generally would not initiate a supervisory increase in capital requirements for backtesting.

(b) Within the backtesting amber zone-

(i) The bank must document all of the exceptions generated from its ongoing backtesting programme, including an explanation for each exception.

(ii) The Prudential Authority will impose a higher capital requirement in the form of a backtesting add-on. The number of exceptions must generally inform the size of any backtesting add-on, as set out in Table 10.

(iii) In the case severe problems with the basic integrity of the model are identified, the Prudential Authority may also consider disallowing the bank's use of the IMA altogether. In addition to that the Prudential Authority may also require the bank to implement backtesting for confidence intervals other than the 99th percentile, or perform other statistical tests not set out in this standard.

(c) If a bank's model falls into the backtesting red zone, the Prudential Authority will automatically either increase the multiplication factor applicable to the bank's model or disallow use of the IMA.

11.11.4 Backtesting at the trading-desk level

(a) The performance of a trading desk's risk management model will be tested through daily backtesting.

(b) The backtesting assessment at the trading-desk level is considered to be complementary to the PLA assessment when determining the eligibility of a trading desk for the IMA.

(c) At the trading desk level, backtesting must compare each desk's one-day VaR measure (calibrated to the most recent 12 months' data, equally weighted) at both the 97.5th percentile and the 99th percentile,

using at least one year of current observations of the desk's one-day P&L.

(d) The capital requirement for all of the positions in the trading desk must be determined using the standardised approach, if any given trading desk experiences in the most recent 12-month period a number of exceptions equal or higher than-
  (i) 12 exceptions at the 99th percentile or;
  (ii) 30 exceptions at the 97.5th percentile.

11.12 Profit and Loss Attribution (PLA) test requirements

11.12.1 The purpose of the PLA requirement is to ensure that the theoretical changes in the value of a trading desk's portfolio, based on the bank's trading desk internal risk-management model are sufficiently close to the hypothetical changes in the value of the trading desk's portfolio, based on the bank's pricing model.

11.12.2 To that end, the bank must perform a desk level PLA test, which compares the daily risk-theoretical P&L (RTPL) with the daily Hypothetical P&L (HPL) for each trading desk.

11.12.3 The Hypothetical P&L (HPL) is the daily P&L produced by revaluing the positions held at the end of the previous day using the market data at the end of the current day. The HPL used for the PLA test must be identical to the HPL used for backtesting purposes.

11.12.4 Actual P&L (APL) is the one derived from the daily P&L process. It includes intraday trading as well as time effects and new and modified deals.

11.12.5 The Risk-theoretical P&L (RTPL) is the daily desk-level P&L that is predicted by the valuation engines in the trading desk risk management model using all risk factors used in the trading desk risk management model (ie including the NMRFs). The RTPL must not take into account any risk factors that the bank does not include in its trading desk's risk-management model. The requirements applicable to the internal risk management model are further specified in paragraph 11.2.11 above.

11.12.6 HPL, APL and RTPL must be calculated according to the following-

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

(b) Fees and commissions must be excluded from both APL and HPL.

(c) Valuation adjustments for which separate regulatory capital requirements have been specified as part of the rules (for example, credit valuation adjustment) must be excluded.

(d) Valuation adjustments that are deducted from Common Equity Tier 1 must be excluded.

(e) Any other market risk-related valuation adjustment different from those explicitly mentioned, irrespective of the frequency by which it is updated, must be included in the APL.

(f) Any other market risk-related valuation adjustment different from those explicitly mentioned must be included in the HPL only as long as it is updated daily and unless the Prudential Authority has given explicit permission to exclude it.

(g) Smoothing of valuation adjustments that are not calculated daily is not allowed.

(h) P&L due to the passage of time must be included in the APL and must be treated consistently in both HPL and RTPL.

(i) Valuation adjustments that the bank is unable to calculate at the trading desk level because they are assessed in terms of the bank's overall positions risks or because of other constraints may not be included in the HPL and APL for backtesting at the trading desk level at the bank's discretion but must be included for bank-wide backtesting. The bank must notify the Prudential Authority of these exclusions and the justification for the inability to calculate the adjustments at trading desk level.

11.13 PLA test data input alignment

11.13.1 General requirements

(a) For the sole purpose of the PLA assessment, banks are allowed to replace the value of the input data of a risk factor used in the calculation of the RTPL value with the value of an input data of the same nature used for the same risk factor in the calculation of the changes in the trading desk portfolio's HPL in the following cases-

(i) data for a given risk differs due to different providers of market data sources;

(ii) data for a given risk differs due to different time fixing of market data sources; or

(iii) data for a given risk differs due to transformations of market data into input data suitable for the risk factors.

(b) Banks are not permitted to replace HPL input data for risk factors with input data used in RTPL.

(c) The replacement may be done in the following ways-

(i) By direct replacement of the RTPL input data with the HPL input; or

(ii) By using the HPL input data as a basis to calculate the risk factor data needed in the RTPL/ES model.

(d) If the HPL uses market data in a different manner to RTPL to calculate risk parameters that are essential to the valuation engine, these differences must be visible when performing the PLA test and, therefore, must be reflected, in the calculation of HPL and RTPL. In particular, HPL and RTPL are allowed to use the same market data only as a basis but must use their respective methods (which may differ) to calculate the respective valuation engine parameters.

(e) Adjustments to RTPL or HPL to address residual operational noise are not permitted. Residual operational noise arises from computing HPL and RTPL in two different systems at two different points in time. It may originate from transitioning large portions of data across systems, and potential data aggregations may result in minor reconciliation gaps below tolerance levels for intervention; or from small differences in static/reference data and configuration.

(f) Adjustments to RTPL input data will be allowed when the input data for a given risk factor that is included in both the RTPL and the HPL differs due to different providers of market data sources or time fixing of market

data sources, or transformations of market data into input data suitable for the risk factors of the underlying pricing models. These adjustments may be done either-

(i) by direct replacement of the RTPL input data (for example, par rate tenor x, provider a) with the HPL input data (for example, par rate tenor x, provider b); or

(ii) by using the HPL input data (for example par rate tenor x, provider b) as a basis to calculate the risk factor data needed in the RTPL/ES model (for example zero rate tenor x).

11.13.2 Documentation and operational requirements

(a) Banks must demonstrate that HPL input data may be appropriately used for RTPL purposes, and that no risk factor differences or valuation engine differences are omitted when transforming HPL input data into a format which may be applied to the risk factors used in RTPL calculation.

(b) Any adjustment of RTPL input data must be properly documented, validated and justified to the Prudential Authority.

(c) Banks must have procedures in place to identify changes with regard to the adjustments of RTPL input data. Banks must notify the Prudential Authority of any such changes.

(d) Banks must provide assessments on the effect these input data alignments would have on the RTPL and the PLA test. To do so, they must compare RTPL based on HPL-aligned market data with the RTPL based on market data without alignment. This comparison must be performed when designing or changing the input data alignment process and at any time upon the request of the Prudential Authority.

11.14 PLA test metrics

11.14.1 The PLA requirements are based on two test metrics-

(a) the Spearman correlation metric to assess the correlation between RTPL and HPL; and

(b) the Kolmogorov-Smirnov (KS) test metric to assess similarity of the distributions of RTPL and HPL.

11.14.2 To calculate each test metric for a trading desk, the bank must use the time series of the most recent 250 trading days of observations of RTPL and HPL.

11.14.3 Process for determining the Spearman correlation metric -

(a) For a time series of HPL, banks must produce a corresponding time series of ranks based on the size of the P&L (R_{HPL}). That is, the lowest value in the HPL time series receives a rank of 1, the next lowest value receives a rank of 2 and so on.

(b) Similarly, for a time series of RTPL, banks must produce a corresponding time series of ranks based on size (R_{RTPL}).

(c) Banks must calculate the Spearman correlation coefficient of the two time series of rank values R_{RTPL} and R_{HPL} based on size using the following formula, where $\sigma RRTPL$ and $\sigma RHPL$ are the standard deviations of R_{RTPL} and R_{HPL}.

$$r_s = \frac{COV(R_{HPL}, R_{RTPL})}{\sigma_{R_{HPL}} \times \sigma_{R_{RTPL}}}$$

11.15 Process for determining Kolmogorov-Smirnov test metrics

11.15.1 The bank must calculate the empirical cumulative distribution function of RTPL. For any value of RTPL, the empirical cumulative distribution is the product of 0.004 and the number of RTPL observations that are less than or equal to the specified RTPL.

11.15.2 The bank must calculate the empirical cumulative distribution function of HPL. For any value of HPL, the empirical cumulative distribution is the product of 0.004 and number of HPL observations that are less than or equal to the specified HPL.

11.15.3 The KS test metric is the largest absolute difference observed between these two empirical cumulative distribution functions at any P&L value.

11.16 PLA test metrics evaluation

11.16.1 Based on the outcome of the metrics, a trading desk is allocated to a PLA test red zone, an amber zone or a green zone as set out in Table 11 above.

11.16.2 A trading desk is in the PLA test green zone if both -

(a) the correlation metric is above 0.80; and

(b) the KS distributional test metric is below 0.09 (p-value = 0.264).

11.16.3 A trading desk is in the PLA test red zone if the correlation metric is less than 0.7 or if the KS distributional test metric is above 0.12 (p-value = 0.055).

11.16.4 A trading desk is in the PLA amber zone if it is allocated neither to the green zone nor to the red zone.

Table 13

PLA test thresholds		
Zone	Spearman correlation	KS test
Amber zone thresholds	0.80	0.09 (p-value = 0.264)
Red zone thresholds	0.70	0.12 (p-value = 0.055)

11.16.5 If a trading desk is in the PLA test red zone, it is ineligible to use the IMA to determine market risk capital requirements and must use the standardised approach.

11.16.6 Risk exposures held by these ineligible trading desks must be included with the out-of-scope trading desks for purposes of determining capital requirement per the standardised approach.

11.16.7 A trading desk deemed ineligible to use the IMA due to the PLA must remain out-of-scope to use the IMA until-

(a) the trading desk produces outcomes in the PLA test green zone; and

(b) the trading desk has satisfied the backtesting exceptions requirements over the past 12 months.

11.16.8 If a trading desk is in the PLA test amber zone, it is not considered an out-of-scope trading desk for use of the IMA.

11.16.9 If a trading desk is in the PLA test amber zone, it cannot return to the PLA test green zone until-

(a) the trading desk produces outcomes in the PLA test green zone; and

(b) the trading desk has satisfied its backtesting exceptions requirements over the prior 12 months.

11.16.10 Trading desks in the PLA test amber zone are subject to a capital surcharge as specified in paragraphs 11.23.3 and11.23.4 below.

11.17 Exceptional treatment of exceptions to the backtesting and PLA

11.17.1 Under a systemic event, such as during periods of significant cross-border financial market stress affecting several banks or when financial markets are subjected to a major regime shift, the Prudential Authority may ignore some of the exceptions which, under the backtesting and PLA test, would otherwise have led to either higher capital requirements or to disallow the use of the IMA.

11.17.2 This is subject to an explicit decision of the PA, which will be used restrictively.

11.18 Calculation of expected shortfall

11.18.1 The following general principles will apply for the purpose of calculating the ES model for market risk capital requirements.

(a) A bank-wide ES must be computed on a daily basis for all bank's positions under the IMA;

(b) A trading desk ES must also be computed on a daily basis for each trading desk that uses IMA;

(c) No particular type of ES model is prescribed, provided that each model used captures all the material risks run by the bank, as confirmed through the profit and loss (P&L) attribution (PLA) tests and backtesting, and conforms to each of the requirements set out above and below. Models based on either historical simulation, Monte Carlo simulation, or other appropriate analytical methods are allowed.

(d) Banks will have discretion to recognise empirical correlations within broad regulatory risk factor classes (interest rate risk, equity risk, FXrisk, commodity risk and credit risk, including related options volatilities in each risk factor category).

(e) Empirical correlations across broad risk factor categories will be constrained by the supervisory aggregation scheme, as described in paragraph 11.21.3 below, and must be calculated and used in a manner consistent with the applicable liquidity horizons, clearly documented and able to be explained to the Prudential Authority on request.

(f) Banks' models must accurately capture the risks associated with options within each of the broad risk categories. The following criteria apply to the measurement of options risk-

(i) Banks' models must capture the non-linear price characteristics of options positions.

(ii) Banks' risk measurement systems must have a set of risk factors that captures the volatilities of the rates and prices underlying option positions, ie vega risk. Banks with relatively large and/or complex options portfolios must have detailed specifications of the relevant volatilities.

(iii) Banks must model the volatility surface across both strike price and vertex (tenor).

(g) In calculating ES, a bank must use a 97.5th percentile, one-tailed confidence level.

(h) The ES measure must replicate an ES outcome that would be generated on the bank's current portfolio if the relevant risk factors were experiencing a period of stress. To this end an assessment across all relevant risk factors must be done, which will capture stressed correlation measures.

(i) This calibration is to be based on an indirect approach using a reduced set of risk factors $ES_{R,S}$ (t). Banks must specify a reduced set of risk factors that are relevant for their portfolio and for which there is a sufficiently long history of observations.

(i) This reduced set of risk factors is subject to Prudential Authority approval and must meet the data quality requirements for a modellable risk factor as outlined in paragraph 11.7 above.

(ii) The identified reduced set of risk factors must be able to explain a minimum of 75% of the variation of the full ES model

11.18.2 For the determination of the stress period for the calibration of $ES_{R,S}$ (t) -

(a) the bank must identify the 12-month period containing the most severe loss since, at least, to 2007. Observations within this period must be equally weighted.

(b) Banks must update their 12-month stressed periods at least quarterly, or whenever there are material changes in the risk factors in the portfolio.

(c) Whenever a bank updates its 12-month stressed periods it must also update the reduced set of risk factors.

11.18.3 Rescaling the initial ES calculation

(a) The initial calculation of the $ES_{R,S}(T)$ using a reduced set of risk factors must be made for a base time horizon t=T of 10 days and then re-scaled by using the formula below-

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

Where-

(i) $ES_{R,S}$ is the regulatory liquidity-adjusted ES;

(ii) T is the length of the base horizon, i.e. 10 days;

(iii) $ES_T(P)$ is the ES at horizon T of a portfolio with positions P = (pi) with respect to shocks to all risk factors within the reduced set of risk factors established in paragraph 11.18.1(i) above that the positions P are exposed to;

(iv) $ES_T(P,j)$ is the ES at horizon T of a portfolio with positions P = (pi) with respect to shocks to the specific risk factors Q(pi , j) within the reduced set of risk factors established in11.18.1(i)), with all other risk factors in the reduced sect of risk factors held constant;

(v) the ES at horizon T, EST(P) must be calculated for changes in the risk factors, and EST(P, j) must be calculated for changes in the relevant subset Q(pi , j) of risk factors, over the time interval T without scaling from a shorter horizon;

(vi) Q(pi , j) is the subset of risk factors within the reduced set of risk factors established in paragraph 11.18.1(i) which have associated

liquidity horizons (n) equal or longer than LH_j according to the table below;

(vii) the time series of changes in risk factors over the base time interval T may be determined by overlapping observations; and

(viii) LH_j is the liquidity horizon bucket to which all risk factors with a liquidity horizon n equal or higher than LH_j must be allocated.

Table 14

Liquidity horizons, j	
J	LH_j
1	10
2	20
3	40
4	60
5	120

11.18.4 Allocation of risk factors to risk-factor categories -

(a) Banks must map each risk factor on to one of the risk factor categories shown below using consistent and clearly documented procedures.

(b) Each risk factor category has an associated liquidity horizon n.

(c) The mapping of risk factors must be-

(i) set out in writing;

(ii) validated by the bank's risk management;

(iii) made available to the Prudential Authority; and

(iv) subject to internal audit.

11.18.5 On a desk-by-desk basis, banks may increase n relative to the values in the table below (i.e. the liquidity horizon specified below may be treated as a floor). Where n is increased, the increased horizon must be 20, 40, 60 or 120 days and the rationale must be documented and be subject to Prudential Authority approval. Furthermore, liquidity horizons must be capped at the maturity of the related instrument.

Table 15

Liquidity horizon n by risk factor				
Risk factor category	*n*		Risk factor category	*N*
Interest rate- specified currencies - EUR, USD, GBP, AUD, JPY, SEK, CAD and domestic currency of a bank	10		Equity price (small cap)- volatility	60
Interest rate- unspecified currencies	20		Equity- other types	60
Interest rate- volatility	60		Foreign exchange (FX) rate- specified currency pairs[1]	10
Interest rate- other types	60		FX rate- currency pairs	20
Credit spread- sovereign (investment grade, or IG)	20		FX- volatility	40
Credit spread- sovereign (high yield, or HY)	40		FX- other types	40
Credit spread- corporate (IG)	40		Energy and carbon emissions trading price	20
Credit spread- corporate (HY)	60		Precious metals and non-ferrous metals price	20
Credit spread- volatility	120		Other commodities price	60
Credit spread- other types	120		Energy and carbon emissions trading price- volatility	60
			Precious metals and non-ferrous metals price- volatility	60
Equity price (large cap)	10		Other commodities price- volatility	120
Equity price (small cap)	20		Commodity- other types	120
Equity price (large cap)- volatility	20			

11.19 Calculation of capital requirement based on the expected shortfall

11.19.1 For those trading desks that are permitted to use the IMA, all risk factors that are deemed to be modellable must be included in the bank's internal, bank-wide ES model.

11.19.2 The bank must calculate its internally modelled capital requirement (IMCC) at the bank-wide level using this model, with no supervisory constraints on cross-risk class correlations, according to the formulation below-

$$IMCC = p\big(IMCC(C)\big) + (1-p)\left(\sum_{i=1}^{B} IMCC(C_i)\right)$$

where

$$IMCC(C) = ES_{R,S}\frac{ES_{F,C}}{ES_{R,C}}$$

and

$$IMCC(C_i) = ES_{R,S,i}\frac{ES_{F,C,i}}{ES_{R,C,i}}$$

where-

(a) The ES for the portfolio for any time horizon t using a reduced set of risk factors ($ES_{R,S}$), is calculated based on the most severe 12-month period of stress available over the observation horizon.

(b) $ES_{R,S}(t)$ is then scaled up by the ratio of (i) the current ES using the full set of risk factors to (ii) the current ES measure using the reduced set of factors. For the purpose of this calculation, this ratio is floored at 1;

(c) $ES_{F,C}$ is the ES measure based on the current (most recent) 12-month observation period with the full set of risk factors;

(d) $ES_{R,C}$ is the ES measure based on the current period with a reduced set of risk factors;

(e) Rho (ρ) is the relative weight assigned to the firm's internal model. The value of ρ is 0.5;

(f) i stands for each broad category of risk classes (i) (interest rate risk, equity risk, FX risk, commodity risk and CSR), in a way that all other risk factors outside this category must be held constant;

(g) B stands for the total number of broad regulatory risk classes (5 - risk classes mentioned in sub-paragraph (f) above))

(h) The stress period used in each of the 5 IMCC(Ci) must be the same as that used to calculate the portfolio-wide $ES_{R,S}$ (t).

11.19.3 For the calculation of ESF,C ESR,C, the same methodology for re-scaling described in paragraph 11.20.3 below, must be used, after calculating the ES for an initial base period of 10 days (T).

11.19.4 For the determination of the current period for the calibration of ESF,C ESR,C-

(a) Banks must update their data sets no less frequently than once every three months and must also reassess data sets whenever market prices are subject to material changes. This updating process must be flexible enough to allow for more frequent updates.

(b) The PA may also require a bank to calculate its ES using a shorter observation period if this is justified by a significant upsurge in price volatility. However, the period must be no shorter than six months.

11.20 Calculation of capital requirement for non-modellable risk factors

11.20.1 Capital requirements for each non-modellable risk factor (NMRF) are to be determined using a stress scenario that is calibrated to be at least as prudent as the ES calibration.

11.20.2 In determining that period of stress, a bank must determine a common 12-month period of stress across all NMRFs in the same risk class.

11.20.3 Subject to Prudential Authority approval, a bank may be permitted to calculate stress scenario capital requirements at the bucket level by using the same buckets that the bank uses in the RFET for risk factors that belong to curves, surfaces or cubes and a single stress scenario capital requirement for all the NMRFs that belong to the same bucket.

11.20.4 Stress scenarios-

(a) For each NMRF, the liquidity horizon of the stress scenario must be the one assigned to that risk factor floored at 20 days. The PA may require a higher liquidity horizon.

(b) For NMRFs arising from idiosyncratic CSR, banks may apply a common 12-month stress period.

(c) For NMRFs arising from idiosyncratic equity risk arising from spot, futures and forward prices, equity repo rates, dividends and volatilities, banks may apply a common 12-month stress scenario.

11.20.5 The aggregate regulatory capital measure for NMRF is-

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

Where-

(a) $ISES_{NM,i}$ is the stress scenario capital requirement for idiosyncratic credit spread non-modellable risk i from the I risk factors aggregated with zero correlation;

(b) $ISES_{NM,j}$ is the stress scenario capital requirement for idiosyncratic equity non-modellable risk j from the J risk factors aggregated with zero correlation;

(c) $SES_{NM,k}$ is the stress scenario capital requirement for non-modellable risk k from all the remaining K risk factors; Correlation or diversification effects between other non-idiosyncratic NMRFs are recognised through Rh, which is equal to 0.6.

11.20.6 The zero correlation assumption for idiosyncratic credit and equity risk factors may be used when the bank conducts analysis to demonstrate to the Prudential Authority that this is appropriate.

11.20.7 In the event that a bank cannot provide a stress scenario which is acceptable for the Prudential Authority, the bank will have to use the maximum possible loss as the stress scenario.

11.21 Calculation of default risk capital requirement

11.21.1 Banks must have a separate internal model to measure the default risk of trading book positions. The general criteria and the qualitative in paragraph 11.1 above, also apply to the default risk model.

11.21.2 Default risk is the risk of a direct loss due to an obligor's default as well as the potential for indirect losses that may arise from a default event. All positions in the scope of the IMA that have default risk are subject to the DRC requirement model.

(a) Sovereign exposures (including those denominated in the sovereign's domestic currency), equity positions and defaulted debt positions must be included in the model.

(b) For equity positions, the default of an issuer must be modelled as resulting in the equity price dropping to zero.

11.21.3 Default risk must be measured using a value-at-risk (VaR) model.

(a) Banks must use a default simulation model with two types of systematic risk factors.

(b) Default correlations must be based on credit spreads or on listed equity prices. Correlations must be based on data covering a period of 10 years that includes a period of stress as defined in paragraph 10.20.2 above and based on a one-year liquidity horizon.

(c) Banks must have clear policies and procedures that describe the correlation calibration process, documenting in particular in which cases credit spreads or equity prices are used.

(d) Banks have the discretion to apply a minimum liquidity horizon of 60 days to the determination of default risk capital (DRC) requirement for equity sub-portfolios.

(e) The VaR calculation must be conducted weekly and be based on a one-year time horizon at a one-tail, 99.9 percentile confidence level.

11.21.4 The DRC requirement IMA capital requirement is the greater of-

(a) the average of the DRC requirement model measures over the previous 12 weeks; or

(b) the most recent DRC requirement model measure.

11.21.5 A bank must assume constant positions over the one-year horizon, or 60 days in the context of designated equity sub-portfolios.

11.21.6 Default risk must be measured for each obligor.

(a) Probabilities of default (PDs) implied from market prices are not acceptable unless they are corrected to obtain an objective probability of default

(b) PDs are subject to a floor of 0.03%.

11.21.7 A bank's model may reflect netting of long and short exposures to the same obligor. If such exposures span different instruments with exposure to the same obligor, the effect of the netting must account for different losses in the different instruments (for example differences in seniority).

11.21.8 The basis risk between long and short exposures of different obligors must be modelled explicitly. The potential for offsetting default risk among long and short exposures across different obligors must be included through the modelling of defaults. The pre-netting of positions before input into the model other than as described in paragraph 11.21.7 above is not allowed.

11.21.9 The DRC requirement model must recognise the impact of correlations between defaults among obligors, including the effect on correlations of periods of stress as described below.

(a) These correlations must be based on objective data and not chosen in an opportunistic way where a higher correlation is used for portfolios with a mix of long and short positions and a low correlation used for portfolios with long only exposures.

(b) A bank must validate that its modelling approach for these correlations is appropriate for its portfolio, including the choice and weights of its systematic risk factors. A bank must document its modelling approach and the period of time used to calibrate the model.

(c) These correlations must be measured over a liquidity horizon of one year.

11.21.10 These correlations must be calibrated over a period of at least 10 years. Banks must reflect all significant basis risks in recognising these correlations, including, for example, maturity mismatches, internal or external ratings, vintage etc. The bank's model must capture any material mismatch between a position and its hedge. With respect to default risk within the one-year capital horizon, the model must account for the risk in the timing of defaults to capture the relative risk from the maturity mismatch of long and short positions of less than one-year maturity.

11.21.11 The bank's model must reflect the effect of issuer and market concentrations, as well as concentrations that may arise within and across product classes during stressed conditions.

11.21.12 As part of this DRC requirement model, the bank must calculate, for each and every position subjected to the model, an incremental loss amount relative to the current valuation that the bank would incur in the event that the obligor of the position defaults

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

11.21.14 The bank's model must reflect the non-linear impact of options and other positions with material non-linear behaviour with respect to default. In the case of equity derivatives positions with multiple underlyings, simplified modelling approaches (for example modelling approaches that rely solely on individual jump-to-default sensitivities to estimate losses when multiple underlyings default) may be applied, subject to Prudential Authority approval.

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

11.21.16 Owing to the high confidence standard and long capital horizon of the DRC requirement, robust direct validation of the DRC model through standard backtesting methods at the 99.9%/one-year soundness standard will not be possible.

11.21.17 Validation of a DRC 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.

11.21.18 Given the nature of the DRC soundness standard, such tests must not be limited to the range of events experienced historically.

11.21.19 The validation of a DRC model represents an ongoing process in which the Prudential Authority and firms jointly determine the exact set of validation procedures to be employed.

11.21.20 Banks must strive to develop relevant internal modelling benchmarks to assess the overall accuracy of their DRC models.

11.21.21 Due to the unique relationship between credit spread and default risk, banks must seek approval for each trading desk with exposure to these risks, both for CSR and default risk. Trading desks which do not receive approval will be deemed ineligible for internal modelling standards and be subject to the standardised capital framework.

11.21.22 Where a bank has approved PD estimates as part of the internal ratings-based (IRB) approach, this data must be used. Where such estimates do not exist, or the Prudential Authority determines that they are not sufficiently robust, PDs must be computed using a methodology consistent with the IRB methodology and satisfy the following conditions.

(a) Risk-neutral PDs must not be used as estimates of observed (historical) PDs.

(b) PDs must be measured based on historical default data including both formal default events and price declines equivalent to default losses. Where possible, this data must be based on publicly traded securities over a complete economic cycle. The minimum historical observation period for calibration purposes is five years.

(c) PDs must be estimated based on historical data of default frequency over a one-year period. The PD may also be calculated on a theoretical basis (eg geometric scaling) provided that the bank is able to demonstrate that such theoretical derivations are in line with historical default experience.

(d) PDs provided by external sources may also be used by banks, provided they may be shown to be relevant for the bank's portfolio.

11.21.23 Where a bank has approved loss-given-default (LGD) estimates as part of the IRB approach, this data must be used. Where such estimates do not exist, or the Prudential Authority determines that they are not sufficiently robust, LGDs must be computed using a methodology consistent with the IRB methodology and satisfy the following conditions.

(a) LGDs must be determined from a market perspective, based on a position's current market value less the position's expected market value subsequent to default. The LGD must reflect the type and seniority of the position and cannot be less than zero.

(b) LGDs must be based on an amount of historical data that is sufficient to derive robust, accurate estimates.

(c) LGDs provided by external sources may also be used by banks, provided they may be shown to be relevant for the bank's portfolio.

(d) Banks must establish a hierarchy ranking their preferred sources for PDs and LGDs, in order to avoid the cherry-picking of parameters.

11.22 Calculation of capital requirement for model-ineligible trading desks

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

11.23 Aggregation of capital requirements

11.23.1 The aggregate (non-DRC) capital requirement for those trading desks approved and eligible for the IMA (C_A) is equal to the maximum of the most recent observation and a weighted average of the previous 60 days scaled by a multiplier m_c and is calculated as follows-

$$C_A = max\{IMCC_{t-1} + SES_{t-1}; m_c \cdot IMCC_{avg} + SES_{avg}\}$$

where-

(a) $IMCC_{avg}$ and SES_{avg} are calculated as an arithmetic average over the previous 60 days.

(b) m_c is a multiplier whose value is fixed at 1.5 unless it is set at a higher level by the Prudential Authority to reflect the addition of a qualitative add on and/or a backtesting add-on.

11.23.2 The backtesting add-on to the multiplication factor mc-

(a) Is determined based on the maximum of the exceptions generated by the backtesting results against actual P&L (APL) and hypothetical P&L (HPL) as described paragraph 11.1 above; and

(b) will range from 0 to 0.5 based on the outcome of the backtesting of the bank's daily VaR at the 99th percentile based on current observations on the full set of risk factors

11.23.3 The aggregate capital requirement for market risk (ACR_{total}) is equal to the aggregate capital requirement for approved and eligible trading desks ($IMA_{G,A}$ =CA + DRC) plus the standardised approach capital requirement for trading desks that are either out-of-scope for model approval or that have been deemed ineligible to use the internal models approach (C_u). If at least one eligible trading desk is in the PLA test amber zone, a capital surcharge is added. The impact of the capital surcharge is limited by the formula-

$$ACR_{total} = min\{IMA_{G,A} + Capital\ surcharge + C_U; SA_{all\ desk}\} + max\{0; IMA_{G,A} - SA_{G,A}\}$$

where-

(a) $IMA_{G,A} = C_A + DRC$

(b) $SA_{all\ desk}$ = Capital requirements according to the Standardised Approach if applied to all desks.

(c) $SA_{G,A}$ = standardised approach capital requirement for those trading desks not approved or eligible for the IMA

(d) Capital Surcharge = $k * max[0, (SA_{G,A} - IMA_{G,A})]$

$$k = 0.5 \times \frac{\sum_{i \in A} SA_i}{\sum_{i \in G,A} SA_i}$$

(e) SA_i denotes the standardised capital requirement for all the positions of trading desk "i";

(f) i€A denotes the indices of all the approved trading desks in the amber zone; and

(g) i€A,G denotes the indices of all the approved trading desks in the green zone or amber zone

11.23.4 For the purposes of calculating the capital requirement, the frequency of calculation of the relevant inputs is the following-

(a) The risk factor eligibility test, the PLA test and the trading desk-level backtesting are applied on a quarterly basis to update the modellability of risk factors and desk classification to the PLA test green zone, amber zone, or red zone.

(b) The stressed period and the reduced set of risk factors (ER,C and ER,S) must be updated on a quarterly basis. The reference dates to perform the tests and to update the stress period and selection of the reduced set of risk factors must be consistent. Banks must reflect updates to the stressed period and to the reduced set of risk factors as well as the test results in calculating capital requirements in a timely manner.

(c) The averages of the previous 60 days (IMCC, SES) and or respectively 12 weeks (DRC) only have to be calculated at the end of the quarter for the purpose of calculating the capital requirement.

11.23.5 The risk-weighted assets for market risk under the IMA are determined by multiplying the capital requirements calculated as set out in this paragraph by 12.5.

12. Regulatory action

For the purposes of this Prudential Standard, the Prudential Authority may apply the provisions of regulation 38(4) of the Regulations in the circumstances outlined in the regulation.

13. Applications to the Prudential Authority

The Prudential Authority may determine the form and manner of the applications required in this Standard.

14. Reporting requirements

14.1 The Prudential Authority may determine the form, manner and period for regulatory reporting for this Prudential Standard, where such requirements have not been specified in this Standard.

14.2 The determination referred to paragraph 14.1 above will be published on the website of the Prudential Authority.

15. Transitional arrangements

15.1 The Prudential Authority will determine the following:

(a) date for the commencement of banks' profit and loss (P&L) attribution (PLA) tests as referred to in paragraph 11.10.3 above;

(b) date for the commencement of the outcomes of the PLA tests to be used for pillar 2 purposes; and

15.2 The pillar 1 capital requirement consequences of assignment to the PLA test amber zone or PLA test red zone, as set out in paragraphs 11.16.5 to 11.16.10 and paragraph 11.23.3 above, will apply one year after the date determined in paragraph 15.1(b) above.