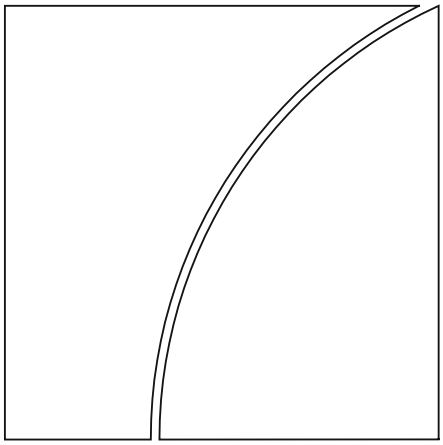
Basel Committee
on Banking Supervision

# Consultative Document



# Fundamental review of the trading book: A revised market risk framework

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# Fundamental review of the trading book: A revised market risk framework

## Executive summary

This is the Basel Committee's ("the Committee")[1] second consultative paper on the fundamental review of trading book capital requirements.[2] The revisions to the capital framework set out in this paper aim to contribute to a more resilient banking sector by strengthening capital standards for market risks. They form part of the Committee's broader agenda to reform regulatory standards for banks in response to the financial crisis. The revisions in this paper also reflect the Committee's increased focus on achieving a regulatory framework that can be implemented consistently by supervisors across jurisdictions. As such, they incorporate the lessons learned from the Committee's recent investigations into the variability of market risk-weighted assets.[3]

## Background

The financial crisis exposed material weaknesses in the overall design of the framework for capitalising trading activities. The level of capital required against trading book exposures proved insufficient to absorb losses. As an important response to the crisis, the Committee introduced a set of revisions to the market risk framework in July 2009 (part of the "Basel 2.5" package of reforms). At the time, the Committee recognised that the Basel 2.5 revisions did not fully address the shortcomings of the framework. In response, the Committee initiated a fundamental review of the trading book regime, beginning with an assessment of "what went wrong". The Committee published the first consultative paper in May 2012. Having reflected on comments received, this paper sets out more detailed proposals for reforming the trading book regime, including draft text for the Basel Accord.

## Key areas of Committee focus

The Committee has focused on the following key areas as part of its review:

[1] The Basel Committee on Banking Supervision provides a forum for regular cooperation on banking supervisory matters. It seeks to promote and to strengthen supervisory and risk management practices globally. The Committee comprises representatives from Argentina, Australia, Belgium, Brazil, Canada, China, France, Germany, Hong Kong SAR, India, Indonesia, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, Russia, Saudi Arabia, Singapore, South Africa, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. Observers on the Basel Committee are: the European Banking Authority, the European Central Bank, the European Commission, the Financial Stability Institute and the International Monetary Fund.

[2] To view the first consultative paper, see Basel Committee on Banking Supervision, *Fundamental review of the trading book*, May 2012 (www.bis.org/publ/bcbs219.pdf). It is intended that this second consultative paper can be read as a standalone document, without the need for cross reference with the first consultative paper.

[3] See Basel Committee on Banking Supervision, *Regulatory consistency assessment programme (RCAP) – Analysis of risk-weighted assets for market risk*, January 2013 (revised February 2013), www.bis.org/publ/bcbs240.pdf.

## The trading book/banking book boundary

The Committee believes that the definition of the regulatory boundary between the trading book and banking book has been a source of weakness in the design of the current regime. A key determinant of the boundary has been banks' self-determined intent to trade. Trading intent has proven to be an inherently subjective criterion that is difficult to police and insufficiently restrictive from a prudential perspective in some jurisdictions. Coupled with large differences in capital requirements against similar types of risk on either side of the boundary, the overall capital framework proved susceptible to arbitrage before and during the crisis.

In May 2012, the Committee put forward for consideration two alternative definitions for the boundary: a trading evidence-based approach and a valuation-based approach. Having reflected on feedback from the first consultative paper, the Committee has developed a revised boundary that retains the link between the regulatory trading book and the set of instruments that banks deem to hold for trading purposes, but seeks to address weaknesses in the boundary by reducing the possibility of arbitrage and by providing more supervisory tools. As such, this boundary is more likely to be aligned with banks' own risk management practices relative to the valuation-based approach.

The Committee is seeking to deliver more consistent implementation of the boundary across banks. Based on the new definition, the Committee provides example instruments which have to be assigned either to the banking book or to the trading book. For certain instrument types, there will be a presumption that they are included in the trading book. This will facilitate the development of a common understanding among supervisors regarding the types of instrument that would typically be included in the different books. The Committee has also agreed on a range of documentation that banks would need to make available to supervisors, as part of new valuation and evidence-based reporting requirements for all trading book positions. This will facilitate a better understanding of the types of activity that are within the scope of trading book capital requirements, and increase the supervisability of the boundary.

The Committee remains concerned about the risk of arbitrage. To reduce the incentives for arbitrage, the Committee is seeking a less permeable boundary with stricter limits on switching between books and measures to prevent "capital benefit" in instances where switching is permitted. The Committee is also aiming to reduce the materiality of differences in capital requirements against similar types of risk on either side of the boundary. For example, the Committee has decided that the calibration of capital charges against default risk in the trading book will be closely aligned to the banking book treatment, especially for securitisations. The Committee is also investigating the development of Pillar 1 charges for interest rate and credit spread risk in the banking book.

Reflecting the revised boundary's focus on contributing to reducing arbitrage rather than on quantitative evidence as a condition for inclusion in the trading book, the Committee is referring to the new boundary simply as "the revised boundary" (rather than "the evidence-based boundary"). Section 1 sets out the main changes to the boundary, and provides a proposed "presumptive list" of instruments presumed to be included in the trading book as well as a list of instruments that does not meet the revised definition of the trading book.

## Treatment of credit

Credit-related products were a key source of losses during the crisis and the treatment of these positions proved particularly flawed. In responding to the lessons from the crisis, the Committee has agreed, as a general principle, to bring trading book requirements closer to those of the banking book. More specifically, the Committee has agreed a differential approach to securitisation and non-securitisation exposures:

- Securitisation exposures: The Committee remains sceptical that existing internal models-based risk measurement methodologies used by banks can adequately capture the risks associated with securitised products. As a result, capital charges for securitisation positions in the trading book – including correlation trading activities – will be based on the revised standardised approach. This also simplifies the framework by obviating the need for a specific "correlation trading portfolio" (CTP).

- Non-securitisation exposures: Internal modelling will continue to be allowed for non-securitisation positions. But the Committee has decided that joint modelling of the discrete (default risk) and continuous (spread risk) components of credit risk is likely to involve particular practical challenges. It could also make a more consistent capital treatment of credit risk across the balance sheet more difficult to achieve. As a result, the Committee has agreed that non-securitisation credit positions in the trading book will be subject to a separate Incremental Default Risk (IDR) charge.

- Credit Valuation Adjustments (CVA) charges: Basel III introduced a new set of capital charges to capture the risk of changes to CVA, collectively known as the CVA risk capital charge. The first consultative document discussed whether CVA should be captured in an integrated fashion with other forms of market risk within the market risk framework or continue to be calculated as a standalone capital charge. For the time being, the Committee has decided that it is not appropriate for CVA to be fully integrated into the market risk framework. The Committee believes that CVA must be treated separately given the complexity and model risk in an integrated model and that allowing full integration may lead to significant variation in results. A limited number of changes to the CVA calculation are being introduced to maintain consistency with the revised market risk requirements set out in this paper.

## Approach to risk measurement

In considering the overall approach to risk measurement for minimum capital requirements, the Committee has confirmed its intention to pursue two key reforms outlined in the first consultative paper:

- Stressed calibration: The Committee recognises the importance of ensuring that regulatory capital will be sufficient in periods of significant market stress. As the crisis showed, it is precisely during stress periods that capital is most critical to absorb losses. Furthermore, a reduction in the cyclicality of market risk capital charges remains a key objective of the Committee. Consistent with the direction taken in Basel 2.5, the Committee will address both issues by moving to a capital framework that is calibrated to a period of significant financial market stress in both the internal models-based and standardised approaches. The Committee is aware that similar care is needed in selecting appropriate periods of stress, recognising that in general not all asset classes or exposures are subject to market stress at the same time.

- Move from Value-at-Risk (VaR) to Expected Shortfall (ES): A number of weaknesses have been identified with using VaR for determining regulatory capital requirements, including its inability to capture "tail risk". For this reason, the Committee proposed in May 2012 to replace VaR with ES. ES measures the riskiness of a position by considering both the size and the likelihood of losses above a certain confidence level. The Committee has agreed to use a 97.5% ES for the internal models-based approach and has also used that approach to calibrate capital requirements under the revised market risk standardised approach.

Overall, the Committee believes these changes represent a rationalisation of the framework with the internal models-based approach moving to a single, stressed metric.

## A comprehensive incorporation of the risk of market illiquidity

In the 2012 consultative paper, the Committee recognised the importance of incorporating the concept of relative liquidity and the risk of market illiquidity in banks' regulatory capital requirements for trading portfolios. Before the introduction of the Basel 2.5 changes, the market risk framework was based on an assumption that trading book risk positions were all liquid, ie that banks could exit or hedge these positions over a 10-day horizon. The recent crisis proved this assumption to be false. As liquidity conditions deteriorated during the crisis, banks were forced to hold risk positions for much longer than expected and incurred large losses from changes in values due to fluctuations in liquidity premia.

The Committee's approach to address the risks posed by varying market liquidity consists of two elements:

- First, incorporating "liquidity horizons" in the market risk metric. This is broadly in line with the direction taken under Basel 2.5, which introduced varying liquidity horizons as part of the Incremental Risk Charge (IRC) and the Comprehensive Risk Measure (CRM). A liquidity horizon is defined as "the time required to execute transactions that extinguish an exposure to a risk factor, without moving the price of the hedging instruments, in stressed market conditions". Banks' risk factors will be assigned five liquidity horizon categories, ranging from 10 days to one year. To ensure consistency in capital outcomes, and in balancing the trade-off between simplicity and risk sensitivity, the Committee has agreed to assign liquidity horizons at the level of broad categories of risk factors. This regulatory assessment of liquidity has also been incorporated in the calibration of the standardised approach.
- Second, in May 2012, the Committee had proposed introducing capital add-ons against the risk of jumps in liquidity premia. The objective was to identify instruments where historical price data used in the regulatory market risk metric would not sufficiently reflect this risk, as was the case with some structured credit products in the run-up to the crisis. Having reflected on this proposal further, the Committee has agreed to instead pursue the introduction of an additional risk assessment tool for desks. This will not depend on internal models, reflecting the Committee's broader concerns around excessive reliance on market risk models that use historical price volatility to deliver capital charges. The assessment will seek to identify desks that trade particularly illiquid, complex products and to form part of the requirements for allowing model permission for these desks.

## Treatment of hedging and diversification

Hedging and diversification are intrinsic to the active management of trading portfolios. Hedging, while generally risk-reducing, also gives rise to basis risk (and creates counterparty risk). And portfolio diversification benefits can disappear in times of stress. Currently, banks using the internal models-based approach are allowed generous recognition on the risk-reducing benefits of hedging and diversification, while recognition of such benefits is strictly limited under the standardised approach. The Committee is proposing to more closely align the recognition of hedging and diversification between the two approaches. For the internal models-based approach, this will be achieved by imposing some constraints on recognising diversification benefits. For the revised standardised approach, the recognition of hedging and diversification will be significantly increased relative to the current approach.

## Relationship between internal models-based and standardised approaches

As set out in May 2012, the Committee considers the current regulatory capital framework for the trading book to have become too reliant on banks' internal models that reflect a private view of risk. In addition, the potential for very large differences between standardised and internal models-based

capital requirements for a given portfolio can leave supervisors without a credible option of removing model permission when model performance is poor.

The Committee is taking a number of steps to strengthen the relationship between models-based and standardised approaches. First, it is establishing a closer link between capital charges resulting from the two approaches. Second, it will require mandatory calculation of the standardised approach by all banks. Third, it will require mandatory public disclosure of standardised capital charges by all banks on a desk-by-desk basis. Finally, the Committee is also considering the merits of introducing the standardised approach as a floor or surcharge to the models-based approach.

## Revised models-based approach

As stated in the first consultative paper, the Committee has identified a number of weaknesses with risk measurement under the models-based approach under the 1996 market risk amendment. Specifically, the 10-day VaR calculation did not adequately capture credit risk or market liquidity risks; incentivised banks to take on tail risk; inadequately captured basis risk and proved procyclical due to its reliance on relatively recent historical data. In seeking to address these problems, the Committee proposed to: (i) strengthen requirements for defining the scope of portfolios that will be eligible for internal models treatment; and (ii) strengthen internal model standards to ensure that the output of such models reflects more fully the relevant trading book risks from a regulatory perspective.

To strengthen – and make more objective – the criteria for allowing banks to calculate capital requirements using internal models, the Committee has agreed to break the model approval process into smaller, more discrete steps, including at the trading desk level. The Committee has also agreed on a set of quantitative tools to measure the performance of models. First, a P&L attribution process that provides an assessment of how well a desk's risk management model captures risk factors that drive its P&L. Second, an enhanced daily backtesting framework for reconciling forecasted losses with actual losses. Where a trading desk fails these tests, the bank would be required to calculate capital requirements for that desk using the standardised approach. Finally, as mentioned above, the Committee will also pursue the introduction of a non-model-based tool for the risk assessment of desks.

To strengthen model standards, the Committee has agreed to limit diversification benefits, move to an ES metric and require calibration to periods of market stress that are particularly relevant to banks' own portfolios. In addition, it is introducing a more robust process for assessing whether individual risk factors can be deemed as "modellable" by a particular bank. This would be a systematic process for identifying, recording and calculating regulatory capital against risk factors deemed not to be amenable to market risk modelling, largely due to data quality issues.

The Committee has sought to incorporate the lessons learned from its recent investigations on the variability of market risk-weighted assets in the revised requirements. The proposals in this paper seek to provide additional specificity with respect to certain modelling choices identified by the hypothetical portfolio drivers as important drivers of variability across banks. For example, the Committee is specifying a methodology for choosing a stressed period; it is providing additional guidance on scaling short-horizon risk estimates to longer-horizon ones; and it is considering whether to constrain estimated correlation parameters in the IDR Charge. Annex 2 provides a detailed exposition of how the proposals in this paper reflect the lessons from the Committee's investigations on consistency of capital charges.

## Revised standardised approach

The revised standardised approach should achieve three objectives. First, it must provide a method for calculating capital requirements for banks with business models that do not require a more sophisticated measurement of market risk. Second, it should provide a credible fall-back in the event that a bank's

internal market risk model is deemed inadequate, including its potential use as a surcharge or floor to an internal models-based capital charge. Finally, the approach should facilitate transparent, consistent and comparable reporting of market risk across banks and jurisdictions. As discussed above, the Committee has agreed that the revised standardised approach will be the only method used to capture the risk of securitisations.

The first Consultative Paper consulted on a "partial risk factor" approach and a "fuller risk factor" approach as alternatives for use as the revised standardised approach. After further consideration, the Committee has decided to use the "partial risk factor" approach, recognising that it is more likely to deliver a standardised approach that can be applied by both small and large banks.

Specifically, under the revised standardised approach, instruments that exhibit similar risk characteristics are grouped into buckets and Committee-specified risk weights are applied to the aggregate market value for each bucket. Greater differentiation according to risk characteristics will result in broader risk capture relative to the current standardised approach. Risk weights have been calibrated based on observed market price fluctuations in periods of stress. Hedging and diversification benefits will be better captured through the incorporation of regulatory-determined correlation parameters. Correlations to be used in the aggregation formula have been calibrated based on a long time period – because stress period correlations will not always be prudent for certain portfolios. In order to capture the lack of stability in correlation parameters in some cases, two values have been specified for each pair of risk positions: a higher correlation to be used when the risk positions have the same sign (to capture diversification benefits) and a lower correlation to be used when their signs differ (to capture hedging benefits).

The Committee has sought to balance the different objectives for the revised standardised approach. The increase in risk sensitivity that is required in order for the standardised approach to function as a fall-back to internal models comes at a cost in terms of increased complexity. The Committee therefore encourages participation from a broad spectrum of banks in the QIS.

The Committee has discussed the appropriate treatment for generalised interest rate risk (GIRR), and in particular the question of whether to differentiate between exposures based on the volatility of domestic interest rates in different jurisdictions. Although the Committee believes some level of differentiation would increase risk sensitivity, it is also concerned about arbitrary classifications associated with a bucketing scheme. Therefore, the Committee is consulting on a single calibration for GIRR but is seeking feedback on alternatives to introduce additional risk sensitivity.

## Next steps

The Committee welcomes comments from the public on all aspects of this consultative document by 31 January 2014. All comments will be published on the Bank for International Settlements website unless a respondent specifically requests confidential treatment. In parallel, the Committee will initiate a thorough Quantitative Impact Study to assess the capital implications of these proposals.

Once the Committee has reviewed responses and results of the Quantitative Impact Study (QIS), it intends to publish the final revised Accord text within an appropriate timeframe. Ahead of this publication, implementation arrangements for the revised standards (including the timetable) will be discussed by the Basel Committee, taking into account the range of other reforms that have been, or are due to be, agreed by the Committee.

# Section 1: Overall revisions to the market risk framework

## 1.1 The trading book/banking book boundary

The Committee believes that the definition of the regulatory boundary has been a source of weakness in the current regime. A key determinant of the existing boundary has been banks' effectively self-determined intent to trade, an inherently subjective criterion that has proved difficult to police and insufficiently restrictive from a prudential perspective in some jurisdictions. Coupled with large differences in capital requirements against similar types of risk on either side of the boundary, the overall capital framework proved susceptible to arbitrage in the run-up to the crisis.

The regulatory boundary can be viewed as an operational construct used to allocate instruments/portfolios into the prudential capital regime that is best equipped to deliver an appropriate capital charge for that instrument/portfolio. Its definition is therefore crucial in guiding the design of other key elements of the trading book framework – including the approach to risk measurement.

In considering the relative merits of different options for defining the boundary, certain criteria were particularly relevant for the Committee:

- Objectivity in the definition of the boundary;
- Degree to which capital arbitrage opportunities can be mitigated;
- Extent to which the boundary can be made less permeable.
- Extent to which the definition of the boundary aligns with banks' risk management processes; and
- Ease of application.

In order to address concerns regarding the current boundary, the Committee put forward for consideration two alternative definitions for the boundary in the first Consultative Paper:

- A trading-evidence approach: Under this approach, the boundary would be defined not only by banks' intent, but also by evidence of their ability to trade and manage risks on a trading desk. Fundamental to this proposal is the view that a bank's intention to trade – backed up by evidence of this intent and a regulatory requirement to keep items in the regulatory trading book once they are placed there – is the relevant characteristic for determining capital requirements.
- A valuation-based approach: This proposal would move away from the concept of "trading intent" and construct a boundary that seeks to align the design and structure of regulatory capital requirements with the risks posed to a bank's regulatory capital resources. Fundamental to this proposal was a view that capital requirements for market risk should apply when changes in the fair value of financial instruments, whether recognised in earnings or flowing directly to equity, pose risks to the regulatory and accounting solvency of banks.

After further consideration of the above criteria and boundary definitions, the Committee has agreed to develop a revised boundary approach. Fundamental to this new approach is the view that relevant information (focused on how positions are risk-managed as trading positions) will indicate the instruments that should be designated as trading positions. This will be further strengthened by a regulatory requirement to keep items in the regulatory trading or banking book once initially designated, and by providing more tools to increase the supervisability of the boundary. This approach is more likely to be aligned with banks' own risk management practices, and is in line with the majority of comments received on the first consultation paper. The revised boundary approach better allows banks to assign both assets and liabilities managed as a portfolio into the same book. This is in response

to a key issue emerging from industry comments, as well as in discussions among supervisors, on the treatment of fair-valued instruments used to manage liquidity and interest rate risk (as part of banks' asset/liability management activities). Respondents in favour of the trading evidence-based boundary argued that these should not be in the regulatory trading book and that asymmetrically including only assets (but not liabilities) in the trading book could result in adverse consequences with respect to risk management activities.

To strengthen the definition and implementation of the boundary, the revised boundary approach introduces more objective rules for determining whether instruments should be assigned to either the trading book or the banking book. For example, any instrument leading to a net short risk position in an equity in the banking book must be assigned to the trading book.

It also introduces a non-exhaustive list of "general presumptions" – as to what should be in the trading book – that supplements these objective requirements. Generally, instruments presumed to be in the trading book are so designated because they are held with the intention of short-term resale; held with expectations of profiting from short-term price movements or arbitrage profits; and/or to hedge risks resulting from such instrument types. With respect to equity investments in a fund, the bank has effectively outsourced trading activity to another party, and this fund manager is presumed to be holding instruments with the above intentions in mind. If a bank deviates from any general presumption, it must have policies and procedures that specify such potential deviations, must document these deviations, and submit them for supervisory approval. In cases where approval is not given by the supervisor, the position must be switched to the trading book.

These objective requirements and presumptions should facilitate the development of a common understanding amongst supervisors on the types of instrument that would typically be included in the different books.

The revised boundary also includes new requirements for instruments assigned to the trading book. For example, all trading book instruments must be fair-valued daily and any valuation changes must be recognised in the bank's profit and loss account for accounting purposes. Banks must also document and disclose their policies for the assignment of instruments to the trading book or banking book and make available such documentation to supervisors. As an additional example, banks will be required to monitor and document turnover and "stale positions" across different trading desks.

The Committee, however, has not pursued specific quantitative thresholds for determining whether certain instruments would be allowed in the trading book. For example, the draft Accord text does not include a regulatory definition of "stale positions". This decision has been taken on the grounds that it is difficult to determine universal quantitative criteria, applicable across different instruments, portfolios, banks and jurisdictions. Given that, the Committee accepts that a certain degree of discretion should be left to banks and supervisors.

Outstanding concerns over the risk of regulatory arbitrage are addressed by two complementary measures. The first measure is to impose strict constraints on switching instruments between books. After initial designation of an instrument to either the trading or banking book, a bank may not re-designate the instrument to the other regulatory book, except in extraordinary circumstances. Bank-initiated decisions to switch instruments must be reported to the supervisor, receive approval, and be disclosed to the public. Where an instrument is switched to another book, the bank will not be allowed to benefit from a lower regulatory capital requirement from this switch. Supervisors are also explicitly given the authority to require a bank to re-designate a given instrument to either the trading or banking book.

The second measure to mitigate the risk of regulatory arbitrage is an effort to better align the trading book and banking book charges. With respect to securitisations, default and credit spread risk (including migration risk) will be captured in the trading book capital charges. The default risk component will be calibrated with reference to the capital charges in the banking book. A similar approach is also taken on default risk for non-securitisations. The alignment of the trading book and

banking book capital charges is also being considered within other Committee initiatives outside the fundamental review of the trading book. The most important example is the Committee's consideration of a Pillar 1 capital charge for interest rate risk and credit spread risk in the banking book. This should reduce opportunities to arbitrage the boundary by better capturing market risks in the banking book.

The inclusion of overt supervisory discretion to re-designate instruments should also help to reduce regulatory arbitrage. Table 1 summarises the main differences between the current definition of the boundary and the revised boundary.

Main differences between the current and proposed definition of the boundary Table 1

| *Intent-based boundary (current)* | *Revised boundary* |
|---|---|
| **Definition of trading book:** Dependent on bank's self-determined and largely undefined intent to hold for short term resale or to benefit from short-term price movements, or to lock in arbitrage profits. | **Definition of trading book:** A requirement that instruments must be included in trading book if more explicit criteria are met (eg instruments managed on a trading desk or net short risk positions in an equity must be in the trading book). |
| **Guidance on appropriate contents of the trading book:** Currently there is no description of instruments that should be held in the trading book. | **Guidance on appropriate contents of the trading book:** Boundary definition augmented with presumptive list of instruments presumed to be in the trading book:<br>• Accounting trading asset or liability;[4]<br>• Instruments resulting from market-making activities;<br>• Instruments resulting from underwriting activities;<br>• Any listed equity or equity investment in a fund;[5]<br>• Naked short positions, including all short positions in cash instruments; or<br>• Options. |
| **Guidance on instruments that do not meet the definition of the trading book**: Currently, there is almost no guidance on instruments that should be held in the banking book – only a footnote.[6] | **Guidance on instruments that do not meet the definition of the trading book:** Description of instruments that do not meet the definition of the trading book (and should therefore be assigned to the banking book), owing to significant constraints on the ability of banks to liquidate these instruments and value them reliably on a daily basis:<br>• Any unlisted equity;<br>• Instrument designated for securitisation warehousing;<br>• Real estate holdings;<br>• Equity investment in a fund (including a hedge fund) where the bank cannot look through the fund daily or where the bank cannot obtain daily real prices for its equity investment in the fund; or |

[4] Under IFRS and US GAAP, these instruments would be designated as "held for trading".

[5] Subject to certain conditions set out in paragraph 11 in the draft Accord text in Annex 1.

[6] Paragraph 14 of the Revisions of the Basel II market risk framework (February 2011) introduces a footnote: "*However, it is the Committee's view that, at the present time, open equity stakes in hedge funds, private equity investments, positions in a securitisation warehouse and real estate holdings do not meet the definition of the trading book, owing to significant constraints on the ability of banks to liquidate these positions and value them reliably on a daily basis."* The Committee retains this view for the revised boundary.

Main differences between the current and proposed definition of the boundary Table 1

| | |
|---|---|
| | • Derivative instrument with the previous instruments types as underlying assets. |
| **Boundary permeability:** Switching between trading and banking book is allowed, given a bank's self-determined change in bank intent for holding an instrument. | **Boundary permeability:** Strict limit on switching instruments after initial designation, allowable only in exceptional circumstances and subject to approval by the supervisor. To further reduce the potential for arbitrage, the Committee is clear that "market conditions" alone would not count as exceptional circumstances; a change in the management of the instruments is required. |
| **Capital arbitrage mitigation:** N/A | **Capital arbitrage mitigation:** If the capital charge on an instrument, or portfolio is reduced as a result of switching (in rare instances where this is allowed), the difference in charges (measured at the point of the switch) is imposed on the bank as a fixed, additional disclosed Pillar 1 capital charge.<br>This additional charge will be allowed to run off as the instruments mature/expire, in a manner agreed with the supervisor. |
| **Supervisor authority to re-designate:** N/A | **Supervisor authority to re-designate:** Supervisor may initiate change from trading book to banking book or vice versa if asset is deemed to be improperly designated. |
| **Valuation requirement:** Daily valuation at readily available closed out prices. | **Valuation requirement:** All instruments in trading book must be fair-valued daily through the P&L statement. |
| **Requirement for reports to supervisors to make the boundary easier to supervise:** N/A | **Requirement for reports to supervisors to make the boundary easier to supervise:** Banks must prepare, evaluate and have available specified reports used by banks in their boundary determination decision, including reports on inventory ageing, daily limits, intraday limits (banks with active intraday trading), market liquidity and any deviations from the presumption lists. |

## 1.2 Treatment of credit

A particular area of focus for the Committee has been the treatment of positions subject to credit risk in the trading book. Credit-related instruments were a key source of losses during the crisis and the regulatory treatment of these positions proved particularly flawed. Recognising the lessons from the crisis, the Committee has agreed, as a general principle, to bring trading book requirements closer to those of the banking book. Moreover, the Committee has agreed a differential approach to securitisation and non-securitisation exposures.

### (i) Non-securitisation credit exposures

The first consultative paper on the fundamental review sought comment on whether default and migration risks should be measured using an integrated market risk framework or whether the measurement of default and migration risks should be separated from that of market risk. Generally, the Committee agrees with the feedback received from commenters that it is difficult to incorporate the

measurement of default risk into a fully integrated market risk model. Consistent with this feedback, the Committee has decided that, under both the models-based and the standardised approach, the total capital charge for credit risk will have two separate components; an integrated credit spread risk capital charge, which will also cover migration risk, and an Incremental Default Risk (IDR) capital charge.[7]

The objective of the capital requirement for credit spread risk is to capture the risk of changes in the market value of credit instruments with respect to the volatility of credit spreads. The Committee agrees with comments received on the first consultative document that it is possible to appropriately incorporate migration risk into the measurement of market risk through the volatility of credit spreads. This is particularly true since the Committee is increasing the time horizon of the market risk measurement. Both the standardised and internal models-based capital charges are therefore designed to capture migration risk.

The objective of the capital requirement for default risk is to capture the incremental loss from defaults in excess of the mark-to-market (MtM) loss from changes in credit spreads and migration. The capital charge for MtM loss captures the risk of changes in credit spreads. It does not capture the risk of loss from jump to default.

Credit spreads capture the expected loss from default (ie PD multiplied by LGD) and are a measure of the mean of the distribution of default losses (see chart). A change in credit spreads represents a shift in the mean of the default distribution. Therefore, the risk of an MtM loss from changes in credit spreads is the risk that the mean of the default distribution changes. The ES measure of MtM risk is a capital charge for the volatility of the mean of the default distribution. This measure does not capture the risk of a jump to default (a jump in the mean of the default distribution to 100%). Thus, banks must hold an incremental amount of capital against default risk. The capital requirement for default risk is an IDR charge to capture the risk that the severity of defaults over the capital horizon will fall in the extreme tail of the default distribution. To avoid double counting, the capital charge for default risk should be quantified in terms of incremental default loss relative to mark-to-market losses already recognised in market values.

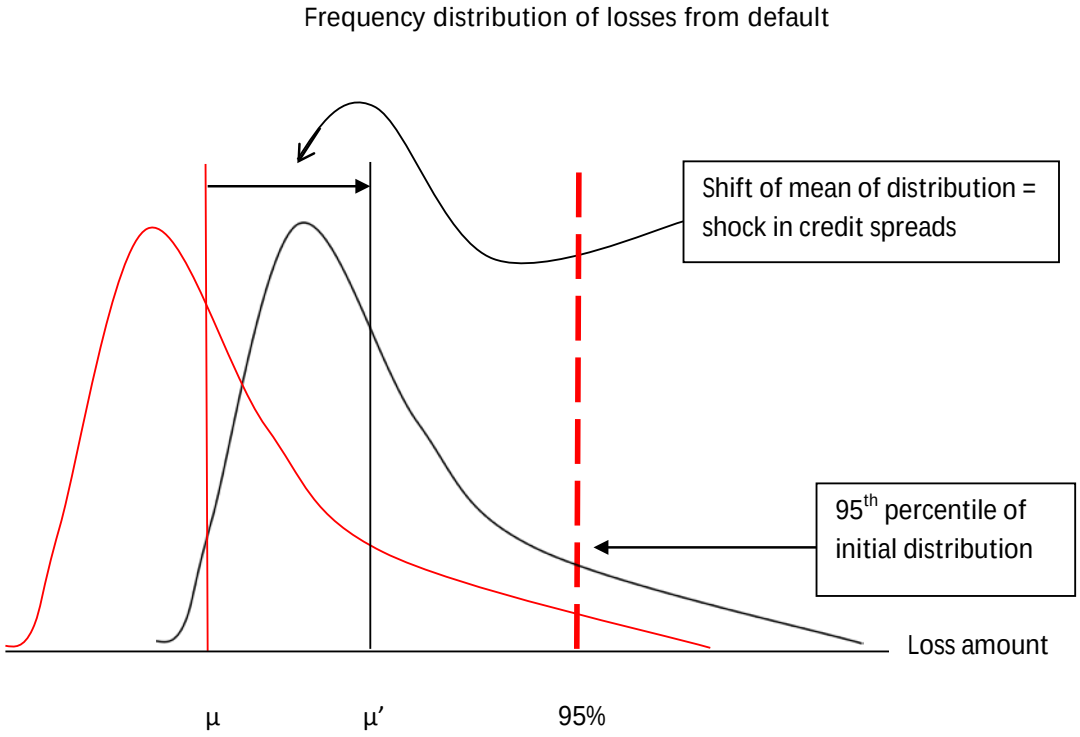
To maintain consistency with the banking book treatment, the Committee has decided to propose an incremental capital charge for default risk based on a VaR calculation using a one-year time horizon and calibrated to a 99.9th percentile confidence level (consistent with the holding period and confidence level in the banking book). This charge would apply to all instruments that are subject to issuer default risk (including equities).

One of the key observations from the Committee's review of the variability of market risk-weighted assets is that the more complex migration and default models were a relatively large source of variation.[8] The Committee has, therefore, decided to develop a more prescriptive IDR charge in the models-based framework. Banks using the internal model approach to calculate a default risk charge must use a two-factor default simulation model, which the Committee believes will reduce variation in market risk-weighted assets but be sufficiently risk sensitive as compared to multifactor models. Default correlations must be based on listed equity prices and must be estimated over a one-year time horizon (based on a period of stress) using a [250] day liquidity horizon.

[7] For the purposes of internal modelling, desks that have approval to model credit spread risk must also have approval to model the IDR charge.

[8] *Regulatory consistency assessment programme (RCAP) – Analysis of risk-weighted assets for market risk*, January 2013, www.bis.org/publ/bcbs240.htm.

Consistent with the current treatment,[9] the scope of credit risk charges under both standardised and models-based approaches include sovereign exposures. Sovereign risk will continue to be included in the scope of the IDR charge in the models-based framework, and general partial use of the standardised approach for sovereign bonds will not be granted. In the revised standardised approach, at national discretion, certain sovereign exposures will continue to be subject to a 0% risk weight; and a lower risk charge may still be applied to sovereign exposures denominated in the domestic currency and funded by a bank in the same currency.[10] Retaining these treatments, however, does not entail a view from the Committee that such exposures are free of default risk.




## (ii) Securitisation exposures

The Committee believes that there are significant risks in securitisation positions that are difficult to appropriately measure within an internal models-based framework without creating unacceptable levels of variation in capital across firms. The Committee has therefore decided to exclude securitisation positions from the internal models-based charges. Capital charges for all types of securitisation positions (including any positions previously classified as correlation trading positions) must be calculated according to the standardised charges. As with other instruments, the capital charge for credit risk in securitisations will comprise both a credit spread risk component and a default risk component.

[9] See Basel Committee on Banking Supervision, *Interpretive issues with respect to the market risk framework*, November 2011, www.bis.org/publ/bcbs208.htm.

[10] Basel Committee on Banking Supervision, *Basel II: International Convergence of Capital Measurement and Capital Standards – Comprehensive Version*, June 2006. Paragraph 711 states that when "government paper is denominated in the domestic currency and funded by the bank in the same currency, at national discretion a lower specific risk charge may be applied".

### (iii) Credit Valuation Adjustments

Basel III introduced a new set of capital charges to capture the risk of changes to credit valuation adjustments (CVA). Under these rules, banks must capitalise the impact of changes in their counterparties' credit spreads on the CVAs for all OTC derivatives, net of allowable hedges. This must be done using either the standardised or advanced CVA approaches.

The first consultative paper raised the question whether CVA risk should be captured in an integrated fashion with other forms of market risk within the market risk framework or continue to be calculated as a "standalone" capital charge. Further work is being undertaken to review the treatment of CVA. The Committee remains cautious of the degree to which CVA can be effectively captured in a single integrated modelling approach – recognising the potential complexity and model risk in such an integrated model and the likelihood that allowing full integration may lead to significant variation in results.

Basel III requires that "Banks with IMM approval for counterparty credit risk and approval to use the market risk internal models approach for the specific interest-rate risk of bonds must calculate [their CVA capital charge] by modelling the impact of changes in the counterparties' credit spreads on the CVAs of all OTC derivative counterparties, together with eligible CVA hedges according to new paragraphs 102 and 103, using the bank's VaR model for bonds."

Under the proposed framework, the CVA charge would continue to be calculated as a standalone capital charge using either the standardised or advanced approach. The advanced approach would be based upon the bank's ES model used to calculate the capital charge for bond credit spreads, net of any allowable counterparty credit hedges.

The Committee is not proposing any other revisions to the CVA capital charges at this time.

## 1.3 Factoring in market liquidity

The recent financial crisis was characterised by a sudden and severe impairment of liquidity across a range of asset markets. As a result, banks were often unable to promptly exit or hedge certain illiquid risk positions without materially affecting market prices. This violated a key assumption that was implicit in the 10-day VaR treatment of market risk. Moreover, large swings in liquidity premia, defined as the additional compensation required by investors to hold illiquid instruments, led to substantial mark-to-market losses on fair-valued instruments as liquidity conditions deteriorated. In responding to these lessons from the crisis, the Committee has confirmed its intention to incorporate the risk of market illiquidity in the revised trading book regime.

The Committee's main approach for factoring in market liquidity risk is through the incorporation of varying liquidity horizons in the market risk metric. In the first consultative paper, the Committee also raised the possibility of introducing capital add-ons for jumps in liquidity premia. Having further reflected on the latter proposal, the Committee has agreed to instead explore the possibility of introducing an additional, model-independent risk assessment tool for desks that would seek to identify desks that trade particularly illiquid complex products and set a higher bar for internal model permission in those cases. The remainder of this section sets out the Committee's proposal in more detail.

### (i) Introducing varying liquidity horizons in the market risk metric

As discussed above, the Committee has agreed that the main approach for incorporating market liquidity risk in the revised trading book regime will be through the introduction of varying liquidity horizons in the market risk metric. This seeks to account for the fact that firms might be unable to

promptly hedge or exit certain risk positions without materially affecting market prices. This is broadly in line with the direction taken under Basel 2.5, which introduced varying liquidity horizons as part of the Incremental Risk Charge (IRC) and the Comprehensive Risk Measure (CRM). But the Committee's new proposal is more comprehensive, seeking to account for the risk of illiquidity across the range of trading book risks.

The main elements of the Committee's agreed approach are set out below:

- *Definition of liquidity horizon*: The Committee has agreed to the definition of a liquidity horizon as being: "the time required to execute transactions that extinguish an exposure to a risk factor, without moving the price of the hedging instruments, in stressed market conditions". This definition implies that liquidity horizons will be assigned to risk factors, rather than to instruments. This is in recognition of the fact that some risk factors driving the valuation of a financial instrument might be easier to hedge than others in periods of financial market stress.
- *Liquidity horizon categories*: The Committee has agreed that risk factors will be assigned to five generic liquidity horizon categories, ranging from 10 days to one year. The shortest liquidity horizon (most liquid) is in line with the current 10-day VaR treatment in the trading book. The longest liquidity horizon (least liquid) matches the banking book horizon at one year. The Committee believes that such a framework will deliver a more graduated treatment of risks across the balance sheet. Among other benefits, this should also serve to reduce arbitrage opportunities between the banking and trading books.
- *Assessment of market liquidity*: The Committee has considered the costs and benefits of relying on firms' own assessment of market liquidity relative to incorporating a regulatory assessment of liquidity in the regime. In balancing the trade-off between simplicity, comparability and risk sensitivity, the Committee has agreed that liquidity horizons will be assigned by the Committee at the level of broad categories of risk factors. This is also in recognition of the fact that market liquidity is a systemic concept: while individual banks might judge that they can all promptly exit or hedge their risk exposures without affecting market prices, the market is likely to turn rapidly illiquid in times of banking system stress if the banking system as a whole holds similar exposures.
- *Liquidity horizons of broad risk factor categories*: In making this framework operational, the Committee has devised a regulatory grouping of risk factors into broad categories, each of which is associated with one of the five liquidity horizons. This is shown in Table 2. Risk factors are grouped into [24] separate categories. The Committee recognises that the definition of the buckets is relatively broad – which entails some risk sensitivity costs. But this is nonetheless an improvement to the current regime, which implicitly assumes all risk factors are equally liquid. As with current standards, supervisors will be able to require additional capital against exposures to particularly illiquid risk factors within a broad category, if this is deemed necessary under Pillar 2 (Supervisory Review Process) in the Basel capital framework. From an operational perspective, firms will be required to map their own risk factors to this regulatory grouping and assign the relevant liquidity horizon for the purposes of market risk modelling. For each of the five broad risk classes (interest rates; credit; foreign exchange; equities and commodities) an "other" sub-category is also included. This is meant to capture all risk factors that would not fall under any of the other buckets. The Committee recognises that this is likely to be a relatively heterogeneous category.
- *Incorporating varying liquidity horizons in ES*: A key operational consideration in the context of incorporating varying liquidity horizons in the regulatory market risk metric is how to apply risk factor shocks over longer and varying horizons. In the first consultative paper, the Committee identified three broad options for doing so. The first was to apply shocks directly at longer horizons. The second was to apply short-term shocks and scale the inputs of the market risk model to varying longer horizons. The third was to apply short-term shocks and scale the

output of the market risk model to a single longer horizon. The Committee has performed initial analysis to assess the capital implications of these different approaches. This analysis suggests that different modelling approaches might lead to materially different capital outcomes, potentially compromising the comparability of RWAs across banks. As a result, it has agreed that the baseline approach for the purposes of the QIS should be long horizon shocks. The Committee recognises that, for firms using historical simulation modelling techniques, non-overlapping returns would be impracticable in the case of risk factors with relatively long liquidity horizons. For example, a sample of 100 returns would require more than eight years of historical data if the liquidity horizon were set at one month. The Committee has agreed that overlapping returns could be used to tackle this issue.

- *Liquidation approach*: As set out in the first CP, the Committee has agreed that varying liquidity horizons be incorporated in the market risk metric under the assumption that banks are able to shed their risk at the end of the liquidity horizon. Accordingly, a liquidity horizon of three months would mean that the calculation of the regulatory capital charge would assume that the bank can hedge or exit its risk positions after three months and not require any rebalancing assumptions. This is a departure from the current requirements under the IRC, which require banks to calculate capital using a constant level of risk over a one-year capital horizon. This proposed "liquidation" approach recognises the dynamic nature of banks' trading portfolios but, at the same time, it also recognises that not all risks can be unwound over a short time period, which was a major flaw of the 1996 framework.
- *Relationship with prudent valuation requirements*: The Committee recognises that its decision to introduce varying liquidity horizons as part of the market risk metric interacts with the current draft of the prudent valuation requirements, which partly seek to capture the risk of market illiquidity. The Committee is making minor amendments to the prudent valuation requirements to clarify that banks are required to value their instruments consistently with the liquidity horizon assigned to the risk factors associated with those instruments. More broadly, the Committee has initiated an investigation around the consistency of valuation of similar fair-valued instruments across banks. Following the outcome of that investigation, it will consider whether more fundamental changes to the prudent valuation requirements are necessary.
- *Periodic update of liquidity horizons*: The Committee recognises that market liquidity is a dynamic concept. As such, it expects that it will periodically revisit its assignment of liquidity horizons to reflect changes in market structures.

Liquidity horizons of broad risk factor categories

Table 2

| Risk factor category | 10 days | 20 days | 60 days | 120 days | 250 days |
|---|---|---|---|---|---|
| Interest rate | | X | | | |
| Interest rate ATM volatility | | | X | | |
| Interest rate (other) | | | X | | |
| Credit spread – sovereign (IG) | | X | | | |
| Credit spread – sovereign (HY) | | | X | | |
| Credit spread – corporate (IG) | | | X | | |
| Credit spread – corporate (HY) | | | | X | |
| Credit spread – structured (cash and CDS) | | | | | X |
| Credit (other) | | | | | X |
| Equity price (large cap) | X | | | | |
| Equity price (small cap) | | X | | | |
| Equity price (large cap) ATM volatility | | X | | | |
| Equity price (small cap) ATM volatility | | | | X | |
| Equity (other) | | | | X | |
| FX rate | | X | | | |
| FX ATM volatility | | | X | | |
| FX (other) | | | X | | |
| Energy price | | X | | | |
| Precious metal price | | X | | | |
| Other commodities price | | | X | | |
| Energy price ATM volatility | | | X | | |
| Precious metal price ATM volatility | | | X | | |
| Other commodities price ATM volatility | | | | X | |
| Commodity (other) | | | | X | |

## (ii) A model-independent assessment tool for desks

In the first consultative paper, the Committee recognised that market illiquidity poses risks to banks' solvency, not only because banks might be unable to exit their risk positions over a short period of time, but also because of large swings in liquidity premia in times of stress. In some particularly egregious cases, historical price data used in the regulatory market risk metric might not sufficiently reflect this risk. This was the case, for example, with some structured credit products ahead of the crisis. These had been judged to be illiquid by both market participants and regulators, but the very limited price variation of these instruments prior to the crisis did not sufficiently reflect the risk posed to the solvency of banks from such market illiquidity. In recognition of this shortcoming, the Committee had considered requiring banks to hold additional capital for jumps in liquidity premia.

Having reflected on this proposal further, the Committee has agreed to explore the possibility of introducing an additional risk assessment tool for desks. This would seek to identify desks that trade particularly illiquid, complex products, setting the bar higher for allowing model permission for these desks. It would place greater emphasis on non-model-based measures of exposure, reflecting the Committee's broader concerns over excessive reliance on market risk models that rely on historical price fluctuations to determine capital requirements.

### (a) Outline of the approach

As the recent crisis demonstrated, reliance on historical price volatilities and correlations in the market risk metric may materially underestimate "true" risk in certain cases. Desks trading complex, illiquid products in large volumes might be particularly vulnerable to extreme movements in basis risks, liquidity and other risk premia. If historical price data used for the purposes of the market risk metric do not sufficiently reflect these risks, the build-up of exposures can pose material risks to the solvency of banks in times of stress.

In summary, the basic intent of the tool is to exclude the desk from internal models treatment – or keep a desk in the models but apply conservative capital add-ons – when at a desk level:

$$\frac{Capital_i}{Exposure\ Measure_{\ i}} < Threshold_i$$

Effectively, the tool seeks to identify situations in which the amount of capital required is too small relative to the overall size of the desk. The Committee intends to develop this tool with information received from the QIS. It will investigate different options for the three elements in the inequality: the numerator; the denominator and the actual threshold itself. These are discussed in more detail below.

### (b) Definitions of the measure

The numerator of this ratio (*Capital*) should be the desk-level Expected Shortfall (ES) plus the sum of capital requirements emerging from the stress scenario add-ons under the non-modellable risk factors framework. The ES calculated for the desk should factor in varying liquidity horizons in risk factors, but would be defined before any regulatory multipliers (eg those imposed as a result of poor backtesting performance).

The denominator of the ratio (*Exposure Measure*) is intended to be a non-model dependent measure of the size of the desk. If it became excessively reliant on models, this could compromise the overall intention of the exercise. The Committee will be exploring the exposure measure used for the purposes of the Basel III leverage ratio to maintain consistency with other elements of the regulatory capital framework.

The threshold is a regulatory-calibrated parameter that would trigger a desk "failing" the assessment tool. This would vary by the degree of illiquidity or complexity of a desk. This would add some risk sensitivity to the tool, such that desks trading complex, illiquid instruments would face a

higher bar before being allowed into internal models. The Committee will be exploring different observable indicators to measure complexity and liquidity, including – but not limited to – the liquidity horizon of the desk and the size of non-centrally cleared derivatives. Having collected these metrics, the Committee will explore options for defining and then calibrating the regulatory threshold.

## 1.4 Choice of market risk metric and calibration to stress conditions

The Committee has identified the choice and calibration of the regulatory risk metric and the market conditions to which it is calibrated as key policy decisions.

### (i) Moving to expected shortfall

As outlined in the first CP, the current framework's reliance on VaR as a quantitative risk metric raises a number of issues, most notably the inability of the measure to capture the "tail risk" of the loss distribution. The Committee has therefore decided to use an expected shortfall (ES) measure for the internal models-based approach and will determine the risk weights for the revised standardised approach using an ES methodology. ES accounts for the tail risk in a more comprehensive manner, considering both the size and likelihood of losses above a certain threshold.

Based on the more complete capture of tail risks using an ES model, the Committee believes that moving to a confidence level of 97.5% (relative to the 99th percentile confidence level for the current VaR measure) is appropriate. This confidence level will provide a broadly similar level of risk capture as the existing 99$^{th}$ percentile VaR threshold, while providing a number of benefits, including generally more stable model output and often less sensitivity to extreme outlier observations.

### (ii) Calibration to stressed conditions

A key weakness of the trading book regime in the pre-crisis period was its reliance on risk metrics that were calibrated to current market conditions. This resulted in undercapitalised trading book exposures going into the crisis and provided highly procyclical capital charges during the crisis. In response to this weakness, Basel 2.5 introduced an additional capital charge based on a "stressed VaR" calculation. This additional charge was intended to ensure that the resulting regulatory capital charge is sufficient not only under benign market conditions, but also during periods of significant financial stress. The Committee recognises, however, that basing regulatory capital on both current VaR and stressed VaR calculations may be unnecessarily duplicative. As a result, the proposed framework will simplify the capital framework by moving to a single ES calculation that is calibrated to a period of significant financial stress.

For the internal models approach, the calibration of an ES model to a period of stress entails practical difficulties. The process of identifying a stress period using the full set of current risk factors in the bank's ES model is practical only for relatively short windows of historical data. For the time being, the Committee is proposing that the observation horizon must go back at least to 2005. It is unlikely that all the risk factors used in the full ES model would be available over the entire observation period. As a result, identifying an appropriate period of financial stress (the historical period that would maximise the risk metric for a given portfolio) over an observation horizon of this length would require significant approximations. There is also a significant computational burden when searching for stress periods using the full set of risk factors.

To overcome these issues, the Committee is proposing the use of an "indirect" method of calculating the maximum stress over the observational period. In this method, banks specify a reduced set of risk factors that are relevant for their portfolios and for which there is a sufficiently long history of

observations that no approximations are required. While banks would have the freedom to specify the set of reduced factors that are most relevant for their particular portfolios, the identified set of risk factors must meet a range of criteria on data availability and quality. In addition, to ensure that the reduced set of risk factors is sufficiently complete to allow the accurate identification of stressed periods, these factors must explain at least [75%][11] of the variation of the full ES model.

The expected shortfall for the bank's portfolio using this reduced set of risk factors is then calibrated to the most severe 12-month period of stress available over the observation horizon. The stressed period is to be based on the bank's aggregated portfolio and not specific individual risk factors. That value is then scaled up by the ratio of the current expected shortfall using the full set of risk factors to the current expected shortfall measured using the reduced set of risk factors. The expected shortfall for risk capital purposes is therefore:

$$ES = ES_{R,S} \times \frac{ES_{F,C}}{ES_{R,C}}$$

Where the expected shortfall for capital purposes (ES) is equal to the expected shortfall based on a stressed observation period using a reduced set of risk factors ($ES_{R,S}$) multiplied by the ratio of the expected shortfall measure based on the current (most recent) 12-month observation period with a full set of risk factors ($ES_{F,C}$) and the expected shortfall measure based on the current period with a reduced set of risk factors ($ES_{R,C}$).

Risk weights used for the revised standardised approach will be similarly calibrated to a period of significant financial stress. Given the nature of the revised standardised approach, it is not possible to calibrate the risk weights for aggregated portfolios. Rather, the weights will be calibrated to significant periods of stress for each individual instrument group (or "bucket"). The risk weights for each bucket will be estimated based on the 97.5th percentile of the distribution of returns for the instrument bucket. The Committee will use the QIS to see whether this approach contributes towards a calibration difference between the revised standardised and internal models-based approaches.

## 1.5 Treatment of hedging and diversification

Calculating portfolio risk requires an estimate of correlations between different asset values. The current market risk framework allows banks to internally model correlations within different market risk measures (VaR, stressed VaR, IRC, CRM), and then requires the summation of these different measures. In contrast, under the capital framework for credit risk in the banking book, asset value correlations are regulatory-determined parameters, even for banks using internal models. Particularly in the context of trading portfolios, which typically include a range of long and short risk positions, the treatment of asset value correlations (and, implicitly, the capital treatment of hedging and diversification benefits) can have a material impact on capital outcomes.

The Committee recognises that trading book portfolios may significantly differ from those in the banking book, particularly as they typically contain significantly more short positions. While for the banking book, higher correlations are always more conservative, this is not the case in the trading book, where an overall capital charge is calculated for a mix of long and short positions. Here, depending on the portfolio composition, a higher correlation may imply a lower capital charge and, as a result, a less conservative treatment. This issue will be explicitly addressed through separate correlation parameters

[11] The specific percentage will be informed by the Quantitative Impact Study.

for long/long and long/short combinations in the revised standardised approach and by an indirect approach to partially restrict the diversification effect in the internal models approach.

Additionally, in some cases, the current framework has material differences between the treatment of imperfect hedges under the models-based and standardised approaches. The former places virtually no limits on the recognition of hedging within a particular risk measure as long as market-implied correlations are reflected in recent historical data (and provided backtesting exceptions have not exceeded thresholds). The latter, on the other hand, provides a highly restrictive recognition of hedging, effectively only providing a capital benefit for perfect, or near-perfect, hedges. This discrepancy contributes to the observed large differences in capital requirements between the two approaches.

The Committee's guiding principle is that the capital framework should only recognise hedges if they are likely to prove effective – and can be maintained – during periods of market stress. Different elements of the Committee's proposed reforms seek to ensure that both the revised models-based and standardised approaches take a more nuanced approach to the treatment of imperfect hedges going forward:

- The Committee has agreed that the capital framework for market risk should be calibrated to a period of stress (see Section 1.4). This should contribute to a more robust treatment of hedging strategies that might not prove effective in times of stress – at least to the extent that basis risk is reflected in market price data from previous stress periods.
- The model approval process will be broken into smaller, more discrete steps, and be applied at a more granular, trading desk level (see Section 2.1 and 2.2(i)). This should contribute to a more robust identification of risk factors affecting the valuation of a portfolio, reducing the possibility that market risk models fail to capture basis risk by either using proxies or mapping different instruments (eg bonds and CDS) to the same underlying risk factor.
- The Committee has decided to not incorporate rollover assumptions in market risk modelling to reflect the risk of hedge slippage in the context of maturity mismatches within hedging strategies (see Section 2.2(iv)). Instead it will require that internal models-based capital be calculated based on an "instantaneous shock" approach which will implicitly assume that positions remain constant throughout the relevant liquidity horizon. The Committee believes that such an approach will assist in reducing the variance in market risk-weighted assets.
- More broadly, the Committee has expressed concern that the current models-based approach may lead to significant over-estimation of overall portfolio diversification benefits across broad categories of exposures and consequent underestimation of the actual risk and required capital. Historically, estimated correlation parameters have been empirically shown to be extremely unstable, particularly during times of stress. Assumed diversification benefits can disappear, with hedges no longer functioning as intended. In this light, the Committee considered prescribing correlations between broad risk classes (interest rates, foreign exchange (FX), equity, credit, commodities) but has decided a simpler approach is to constrain diversification benefits through averaging the firm-wide ES charge with a simple sum of the partial ES charges for the primary risk factors.
- The Committee had decided to continue to not allow for diversification effects between market risks (including credit spread risk) and default risk. As such, banks must have a separate internal model for measuring the incremental default risk of credit (and equity) trading book positions. This measure will be added to other market risk charges.
- A key objective of the revisions to the standardised approach is to improve its risk sensitivity, in part by allowing for increased recognition of hedging (see Section 3).

A similar parameterisation is expected to be used under the revised models-based and standardised approaches. This should enhance the consistency of the overall revised framework and reduce the potential for the observed material divergences in capital outcomes between the two

approaches. Because the standardised approach parameterisation is explicitly prescribed whereas the revised internal models-based approach is indirectly prescribed, additional calibration will be made to ensure comparable outcomes.

## 1.6 Relationship between the standardised and internal model-based approaches

In the first consultative document, the Committee expressed its desire to strengthen the relationship between the revised models-based approach and revised standardised approach. In that document, the Committee proposed that all banks must regularly calculate the standardised charge for each trading desk as if it were a standalone regulatory portfolio. Among other benefits, this requirement would help ensure that the standardised approach provides a credible fallback to the models-based approach. The Committee is re-affirming its intention to require this.

In addition, the Committee now proposes that banks should publicly disclose these calculations in their regulatory reports. In other words, all banks – regardless of whether they are use models-based charges to determine their minimum capital requirements – would be required to disclose the minimum capital requirements calculated according to the standardised charges. Disclosure of the standardised capital requirement will create a public benchmark that would:

- Increase comparability across firms and jurisdictions;
- Provide insight on the capital outcomes of internal models relative to a consistent, and appropriately calibrated benchmark;
- Allow supervisors and market participants to monitor the relative calibration of standardised and modelled approaches over time;
- Provide macroprudential insight in a consistent format; and
- Ensure a directly available fallback to internal models if the models are deemed to be inadequate for determining regulatory capital.

The first consultative document also discussed whether to apply a standardised-based floor or surcharge to the models-based capital charges. Such an approach has a number of possible benefits:

- The Committee still believes that such a floor/surcharge could foster a level playing field by creating a common application of the new trading book regime across banks and jurisdictions.
- The results of the analysis of risk-weighted assets for market risk[12] showed that there are substantial differences in banks' calculations of risk-weighted assets in the current model-based measures of capital requirements. The Committee is particularly concerned about these significant variations in model-based capital charges. Although the Committee is proposing to restrict certain modelling choices based on these findings, the application of a floor/surcharge could further dampen this variation by reducing the scope for the most aggressive model assumptions.

[12] *Regulatory consistency assessment programme (RCAP) – Analysis of risk-weighted assets for market risk*, www.bis.org/publ/bcbs240.pdf. Note that the scope of the assessment was restricted to model-based measures, and standardised measures were not included as part of this analysis.

- In addition, the Committee believes that simplicity and comparability are important objectives. These objectives may be enhanced by the application of a floor/surcharge to model-based capital charges.
- As noted in the first consultative document, a floor/surcharge provides a safeguard against model risk or measurement error, helps identify models that undercapitalise risk, reduces downside variation in capital calculations, and provides assurance of a more level playing field across jurisdictions.

There are trade-offs, however, and the imposition of a standardised-based floor or surcharge to models-based capital charges raises several issues. In particular:

- A floor/surcharge may reduce risk sensitivity and distort incentives to improve modelling standards, especially for banks "caught" by the floor, although it could also be argued that a floor prevents a "rush to the bottom".
- Having a floor/surcharge based on the relative risk insensitivity of the standardised approach may result in an inappropriately diminished degree of hedge recognition for the models-based approach.
- It would create inconsistent interaction across the approaches.

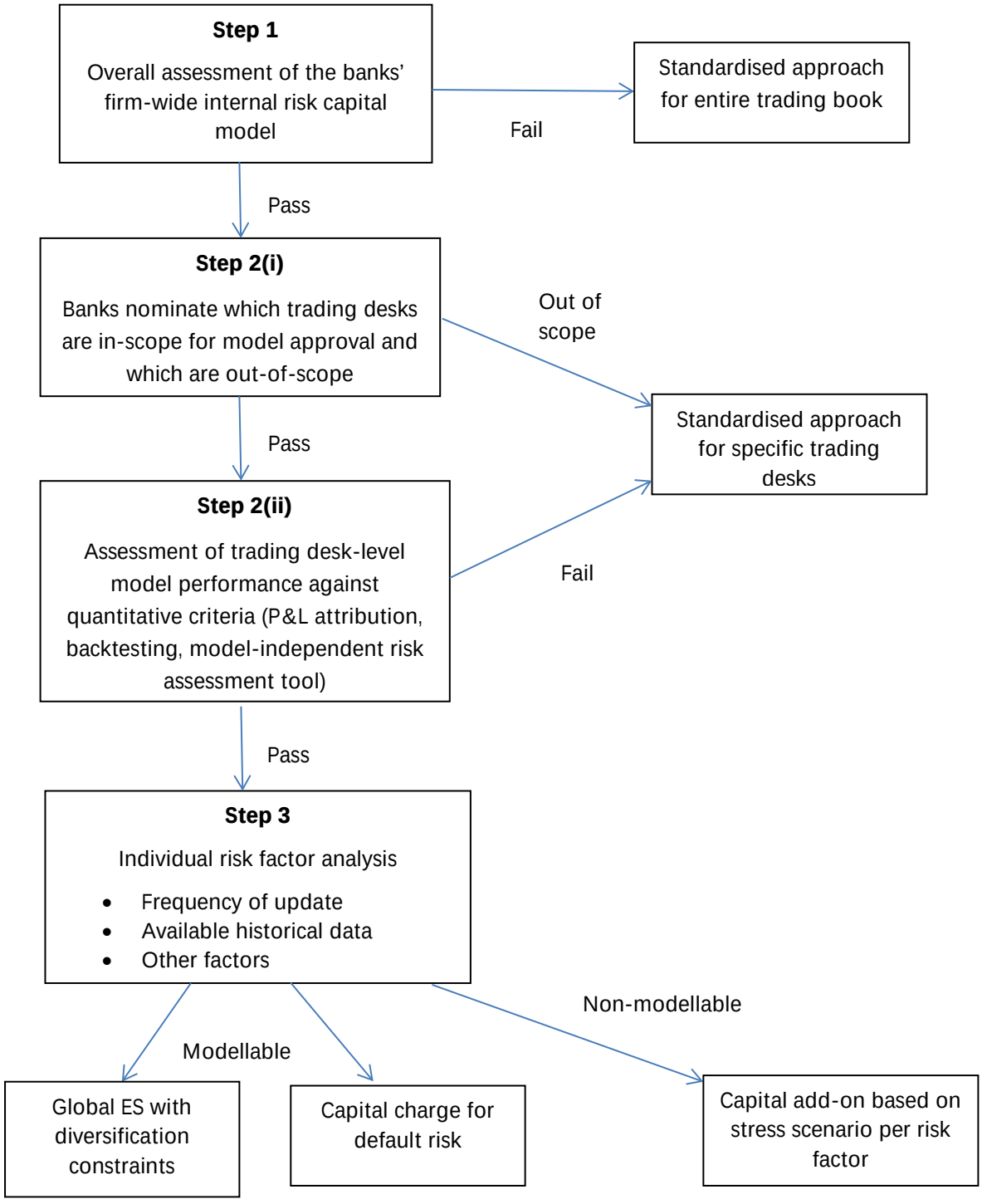
The Committee believes it is premature to make a final decision about a floor/surcharge at this stage. The upcoming QIS exercise will help assess the degree of risk-sensitivity of the revised standardised approach, the interaction between the revised standardised approach and the models-based approach across various types of desk, and the consistency of the model-based results. The Committee will consider all of these issues, in addition to the other issues already noted, before reaching a final judgement around whether to apply a standardised-based floor or surcharge to model-based capital charges.

# Section 2: Revised models-based approach

## 2.1 The overall approach to internal models-based measurement

The Committee's overarching objective for the design and calibration of the models-based approach is to estimate the amount of capital required to cover potential losses in a future period of stress from all sources of risk. The approach should be based on the full capture and symmetric treatment of all risk factors, regardless of the contractual form or instrument category in which they are embedded. The proposed approach presents an integrated framework that: (i) identifies and captures all material risk factors; and (ii) provides a common treatment of exposures to common risks. The framework recognises hedges for those risks, to the extent that such hedges are based on sound risk management principles and there is clear and convincing empirical evidence that such hedges are likely to remain effective in periods of stress. The framework provides a clear and effective process for determining both the scope of trading activities that are eligible for an internal models-based capital treatment and the determination of capital charges for these activities. The Committee's proposed process is outlined in Figure 1. The details of the specific steps are described in the following sections. The proposed Accord text is included in Annex 1.

Figure 1: Process for determining the eligibility of trading activities for the internal models-based approach



*Step 1* of the proposed process is the overall assessment of both the bank's organisational infrastructure (including the definition and structure of trading desks) and its firm-wide internal risk capital model. These evaluations would be based on both qualitative and quantitative factors (including backtesting). In the event that a bank fails this initial assessment, the entire trading book would be capitalised according to the revised standardised approach.

*Step 2* breaks the model approval process into smaller, more discrete, elements – the regulatory trading desks. At the first stage (Step 2(i)), banks have the option of nominating which specific trading desks will be in-scope for capitalisation under the internal models-based approach. The Committee has clear expectations that this choice should not be driven by the possibility of lower capital charges using the revised standardised approach. Those desks that are not nominated (out-of-scope desks) will be aggregated and capitalised on a portfolio basis according to the revised standardised approach. For those desks deemed to be in-scope, a desk-level model assessment is performed (step 2(ii)). Trading desks that do not satisfy the minimum assessment criteria must be included with the out-of-scope desks and capitalised using the revised standardised methodology. This desk-level approval process provides regulators with the ability to revoke models for specific trading activities without forcing the bank to apply the revised standardised approach to the entire trading book.

*Step 3* is a risk factor analysis. Following the identification of eligible trading desks, this step will determine which risk factors within the identified desks are eligible to be included in the bank's internal models for regulatory capital. A risk factor's eligibility for modelling is determined by evaluating the relative quality of the data based on factors such as availability of historical data and the frequency of observations. For those desks that are permitted to use the internal models approach, all risk factors that are deemed to be "modellable" are to be included in the bank's internal, firm-wide ES model. Each non-modellable risk factor is to be capitalised using a capital add-on based on a stress scenario. Banks must also have a separate default risk capital charge (detailed later in this section).

The *capital charge for eligible trading desks* would be the aggregated capital charge for modellable risk factors plus the sum of the individual capital requirements for non-modellable risk factors plus the IDR charge.

The *aggregate capital charge for market risk* under this process is equal to the capital charge for eligible trading desks plus the standardised capital charge for ineligible trading desks.

## 2.2 The identification of eligible trading desks

### (i) Definition of trading desks

The proposed process set out in Figure 1 starts with a trading book-wide assessment of quantitative and qualitative factors to determine the eligibility of a bank to use the internal models approach. This firm-wide assessment is then supplemented with a more granular assessment of model performance at the desk level.

A key component of this step is the identification and classification of bank's "trading desks". For the purposes of market risk capital calculations, a trading desk will be defined as a group of traders or trading accounts that implements a well defined business strategy operating within a clear risk management structure. The structure of trading desks will be defined by the individual bank, but will be subject to supervisory approval.

The key attributes of a trading desk are as follows:

- It is an unambiguously defined group of traders or trading accounts with a clear reporting line to senior management and a compensation policy linked to its pre-established objectives;

- It has a well defined business strategy, including an annual budget and regular management information reports;
- It has a clear and formal risk management structure, including trading limits and regular risk management reporting processes.

Any FX or commodity positions that are not held on a "trading desk" would be treated as if they were held in notional trading desks within the trading book. Banks would be required to internally construct an "actual" P&L for those instruments and the notional desks would be subject to the same tests of model accuracy that are applied to other desks.

The proposed framework would recognise hedges that are affected through internal trades between trading desks. There must be no distinction, however, between the prudential treatment (including market valuations) of these internal trades and external trades.

## (ii) Model approval process

Following the identification of the regulatory trading desks, the next step is to determine which desks are eligible to have their risk positions capitalised under the internal models approach. As an initial step, the bank may nominate which desks it wishes to have in-scope for model approval and which desks are out-of-scope. Desks that are declared to be out-of-scope at this stage will be amalgamated and capitalised, on a portfolio basis, using the revised standardised approach. Desks that opt out of the internal models approach at this stage must remain ineligible for model inclusion for a period of at least one year. The Committee has clear expectations that this choice should not be driven by the possibility of lower capital charges using on the revised standardised approach.

For those desks that the bank has deemed to be in-scope, model approval is required at the trading desk level. Approval is based on the following three criteria:

- P&L attribution;
- Backtesting;
- Model-independent assessment tool.

### (a) P&L attribution

For the P&L attribution tests, all of the instruments held within a particular trading desk would be identified and considered as a distinct portfolio. All of the risk factors for that portfolio that enter into the desk's risk management model would be used to calculate a "risk-theoretical" P&L. For these purposes, the desk's risk management model must include all the relevant risk factors that the bank models, including any risk factors which the bank includes in its internal firm-wide ES model. These may include any risk factors that the supervisor subsequently (in Step 3) deems unmodellable. This "risk-theoretical" P&L is defined as the daily P&L derived by running through the bank's internal pricing models the observed daily variations of the risk factors included in either: (i) the internal model capital charge calculation or (ii) in the stress scenarios used for non-modellable risks.[13] Observed movements in all risk factors contained in the firm's internal capital model on a given day should be used to calculate a risk-theoretical P&L for that day.

[13] The calculation should be based on the pricing models embedded in the firm's ES model and not the front office pricing system.

The risk-theoretical P&L would be compared to the actual daily desk-level P&L (excluding the impact of new transactions) to determine whether the risk factors included in the desk's risk management model capture the material drivers of the bank's actual P&L. A significant degree of association between the two P&L measures, observed over an appropriate period of time, would be required for the trading desk's positions to be deemed eligible for inclusion in the internal capital model. The Committee accepts that the theoretical P&L can vary from the actual daily P&L for a number of reasons.[14] However, the rationale for this assessment is that a desk's risk management model should provide a reasonably accurate assessment of the risks of a trading desk to be deemed eligible for the internal models-based approach.

The P&L attribution requirements would be based on two metrics:

- The mean of the difference between the theoretical and actual P&L (ie the "unexplained P&L") divided by the standard deviation of the actual P&L; and
- The variance of the unexplained P&L divided by the variance of the actual P&L.

Details regarding the proposed parameters for these tests are presented in the proposed Accord text (Annex 1).

### (b) Backtesting assessment

In addition to P&L attribution, the performance of a trading desk's risk management models will be evaluated though daily backtesting. Backtesting requirements would be based on comparing each desk's 1-day static value-at-risk measure at both the 97.5th percentile and the 99th percentile to actual P&L outcomes, using at least one year of current observations of the desk's one-day actual and theoretical P&L.[15] The backtesting assessment would be run at each trading desk as well as for the global (bank-wide) level. The proposed test parameters are outlined in the proposed Accord text (Annex 1).

### (c) Model-independent assessment tool

As mentioned in Section 1, the Committee will also be exploring the use of a model-independent risk assessment tool for desks. This reflects the Committee's broader concerns over excessive reliance on market risk models that rely entirely on historical price fluctuations to determine capital requirements.

Together, these three assessment tools would be used to determine which trading desks are eligible to have their risk positions capitalised under the internal models-based method. This would be a pass or fail regime. Any desk that fails any of the three tests moves immediately to the revised standardised approach. The designation of being ineligible for internal modelling is not, however, permanent, and a desk that has failed would be deemed eligible in the future once it meets all the assessment criteria.

## (iii) The identification of modellable risk factors

Following the identification of eligible trading desks, the next step is to determine which risk factors within the identified desks are eligible to be included in the bank's internal models for regulatory capital. For a risk factor to be classified as "modellable" there must be a sufficient set of representative

[14] These reasons could include the omission of certain risk factors from the model (either due to immateriality or modelling error) and the use of approximations or other shortcuts in the risk-theoretical P&L.

[15] Desks exposed to default risk will not be subject to an IDR backtesting requirement.

transactions in relevant products to allow for an appropriate historical data series for the factor. Sufficiency relies on the prices being both "real" and available at an acceptable frequency.

In this context, the Committee considers a price to be "real" if:

- It is a price at which the institution has transacted on an arms-length basis;
- It is a price for an actual transaction between two other (independent) third parties;
- The price is taken from a firm (transactable) quote.

To be considered modellable, a risk factor should have at least 24 observations per year, with a maximum period of one month between two consecutive transactions.

## (iv) Capitalisation of modellable risk factors at eligible desks

### (a) Expected Shortfall calculation and calibration

For those desks that are permitted to be on the internal models-based approach, all risk factors that are deemed to be "modellable" are to be included in the bank's internal, firm-wide, ES model. In calculating the expected shortfall, a 97.5th percentile, one-tailed confidence interval is to be used and the loss distribution must be based on an instantaneous shock equivalent to an *n*-day movement in the relevant risk factors, where *n* is based on the liquidity characteristics of the risk factor.

As described in Section 1.4, the ES calculation must be calibrated to a period of stress. This stressed calibration is to be based on an "indirect" approach that is based on a reduced set of risk factors. Banks are to specify a reduced set of risk factors that are relevant for their portfolio and for which there is a sufficiently long history of observations. The expected shortfall for the portfolio, using this set of risk factors and calibrated to the most severe 12-month period of stress available over the observation horizon, is calculated. That value is then scaled up by the ratio of the current expected shortfall using the full set of risk factors to the current expected shortfall using the reduced set of factors. Further details are provided in the proposed Accord text.

### (b) Aggregation of modellable risks

The Committee believes that the capital framework should only recognise hedging and diversification benefits to the extent that they will remain valid during periods of market stress. This issue is being addressed in two ways. First, calibrating the ES model to periods of stress should ensure that the correlation coefficients embedded in the bank's internal model are robust to periods of extreme market movements. Second, the Committee is proposing constraining the amount of diversification benefit across broad risk factors that may be recognised. This will be accomplished through averaging the firm-wide ES charge with a simple sum of the partial ES charges for the primary risk factors.

The first step of this approach is to calculate the firm-wide, unconstrained ES capital charge. For those desks that are permitted to be on the internal models approach, all risk factors deemed to be "modellable" are included in the bank's internal, firm-wide, expected shortfall model. The bank would then calculate its internally modelled capital charge at the bank-wide level (denoted as *IMCC(C)*) using this model, with no supervisory constraints on risk factor correlations.

The bank would also calculate a series of partial expected shortfall charges (ie all other risk factors should be held constant) for the range of broad regulatory risk factor classes (interest rate risk, equity risk, foreign exchange risk, commodity risk and credit risk). These partial expected shortfall values ($IMCC(C_i)$) would then be summed up to provide an aggregated risk-factor ES charge.

The aggregate capital charge for modellable risk factors (IMCC) is based on the weighted average of the constrained and unconstrained ES charges.

$$IMCC = \rho\big(IMCC(C)\big) + (1-\rho)\Big(\sum_{i=1}^{R} IMCC(C_i)\Big)$$

Where $IMCC(C) = ES_{R,S} \times \frac{ES_{F,C}}{ES_{R,C}}$ and $IMCC(C_i) = ES_{R,S,i} \times \frac{ES_{F,C,i}}{ES_{R,C,i}}$

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

ρ is the relative weight assigned to the firm's internal model. The value of ρ will be determined by the Committee and will be consistent across jurisdictions and institutions.

For regulatory capital purposes, the aggregated charge associated with approved desks ($C_A$) is equal to the maximum of the most recent observation and a weighted average of the previous [12] weeks scaled by a multiplier ($m_c$).

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

$SES$ is the aggregate regulatory capital measure for risk factors in model-eligible desks that are deemed unmodellable.

$m_c$ is a multiplier on the bank-wide regulatory capital measure, which reflects the backtesting of daily VaR at the 99th percentile based on current observations on the full set of risk factors ($VaR_{FC}$).

### (c) Incremental default risk charge

As detailed in Section 1, the Committee is proposing to treat default risk independently of other risk factors. Under this proposal banks must have a separate internal model to measure the default risk of trading book positions. The default risk must be measured weekly using a VaR measure with a one-year time horizon calibrated to a 99.9th percentile confidence level.

All trading book positions, with the exception of those subject to standardised charges or whose valuations depend solely on commodity prices or foreign exchange rates must be included in the default risk model. This means that sovereign exposures (including those denominated in the sovereign's domestic currency), equity positions, and defaulted debt positions must be included.

To capture the tail risks from defaults in portfolios with both long and short positions, a simulation model of portfolio defaults is required. The Committee considered a range of factors that would help ensure that the simulation model would provide a conservative and consistent internally modelled default risk charge.

*Increased guidance around correlation parameters:* To reduce variability in capital charges and achieve greater comparability of firms' default risk models, the Committee is providing increased guidance around the estimation of correlation parameters in the models. Specifically, correlation parameters must be estimated based on listed equity prices and use a one-year observation period based on a period of stress.

*Use of single-factor vs. multifactor models:* On one hand, several banks, often at supervisory direction, currently use multifactor models for their Incremental Risk Charge (IRC) because of the greater risk sensitivity. These models can easily be adapted for the revised approach to default risk. On the other hand, a single-factor approach may lead to more comparable capital outcomes across banks. Either single-factor or multifactor models could be more capital-conservative depending on the composition of a bank's exposures. As described above, the Committee is proposing the use of a two-factor simulation model. The Committee feels that this approach provides an appropriate balance between increased risk sensitivity (vis-a-vis a one-factor model), while still maintaining an acceptable degree of consistency and comparability (particularly given the constraints on estimating correlation parameters).

*Basis risk between long and short exposures must be modelled explicitly:* In a model of default risk, the extent of offsetting of risks among long and short exposures must be captured through the explicit modelling of defaults in long and short exposures in the model. Accordingly, the pre-netting of long and short positions across different obligors before input into the model would not be allowed.

*Default risk to target a 99.9th percentile calibration consistent with IRB:* The Committee proposes a 99.9th percentile severity for default risk capital, consistent with the treatment of default risk in the banking book. In the absence of a closed form solution, however, a 99.9th percentile expected shortfall (ES) might be too unstable. The Committee is, therefore, proposing the use of a VaR model for measuring default risk.

*Incremental default risk:* At the point of default, the loss from default is the loss in excess of the mark-to-market loss that has already been taken on the defaulting position (ie the loss is not relative to face value but is the incremental loss relative to the mark-downs already recorded in P&L.) In the internal models approach, the potential mark-to-market loss from shocks to credit spreads (including migration risk) will be captured by the ES models of price risks. To avoid double-counting of spread risk in the default models, the default models should be formulated as *incremental default risk* models, where the loss is incremental to the risk already captured in the ES price risk model. Likewise, in order to have permission to model the IDR charge a bank must have permission to model credit spread risk. At the desk level, in order to be approved to model credit risk, it must receive approval to model both credit spread risk and incremental default risk (Refer to paragraph 186 in Annex 1).

### (v) Capitalisation of non-modellable risk factors at eligible desks

Material risk factors that are deemed to be non-modellable would be capitalised individually using a stress scenario that is calibrated to be at least as conservative as the ES calibration used for the firm's internal model. For each non-modellable risk factor, the liquidity horizon of the stress scenario should be at least equal to the largest time interval between two consecutive price observations over the prior year. The individual capital charges for each non-modellable risk factor would then be summed to give a total capital charge for non-modelled risks (denoted as $SES$ in Annex 1).

### (vi) Aggregate capital charge

The total aggregated capital charge for market risk under the internal models-based approach would be equal to the capital requirements for eligible trading desks (which includes charges for both modellable risk factors through ES and non-modellable risk factors through stress scenarios) plus the IDR charge plus the standardised capital charge for ineligible trading desks.

# Section 3: Revised standardised approach

## 3.1 Objectives and rationale for a revised standardised approach

In the first consultative paper, the Committee identified a number of important shortcomings with the current standardised approach. These included a lack of risk sensitivity, limited recognition of hedging and diversification benefits, and an inability to sufficiently capture risks associated with more complex instruments.

There are three main objectives for the revised standardised approach. First, the approach must provide a method for calculating capital requirements for banks with business models that do not require sophisticated measurement of market risk. Second, it should provide a credible fall-back in the event that a bank's internal model is deemed inadequate, including to potentially be used as a surcharge or floor to an internal models based charge. Finally, the approach should facilitate consistent and comparable reporting of market risk across banks and jurisdictions. Given that the Committee has agreed that no modelling of securitisations will be permitted, the revised standardised approach will have to capture the pertinent risks from securitisations.

With these objectives in mind, the following principles for the design of the revised standardised approach were adopted:

1. Simplicity, transparency and consistency
2. Improved risk sensitivity
3. Credible calibration
4. Limited model reliance
5. A credible fall back to internal models

There are some inherent contradictions between some of these objectives, and as such the design of the revised standardised approach will involve inevitable trade-offs.

In the first consultative paper the Committee proposed a "partial risk factor" approach as a revised standardised approach. A "fuller risk factor" approach with increased risk sensitivity, but more complexity and greater use of pricing models was presented as an alternative.

Under the partial risk factor approach, instruments with similar risk characteristics would be grouped in buckets and regulatory prescribed risk weights would be applied to their notional positions or market value. Greater recognition of hedging and diversification benefits within asset classes would be allowed through the use of an aggregation formula using regulatory prescribed correlation parameters. Instruments subject to cross-cutting risk factors such as general interest rate and foreign exchange risk would be assigned to additional cross-cutting risk buckets in order to capture these risks in a risk-sensitive way.

Under the fuller risk factor approach, instruments would be mapped to a set of regulatory prescribed risk factors to which shocks would be applied to calculate a capital charge for the individual risk factors. The bank would use its own pricing model to determine the size of its risk positions with respect to each risk factor, and hedging would be recognised for systematic risk factors at the risk factor level. The risk positions would be input into a regulatory aggregation algorithm to determine a capital charge.

Responses to the first consultative paper showed that the fuller risk factor approach was the preferred option of some banks with more sophisticated methods for measuring market risk. An argument was presented by these banks that the greater risk sensitivity and use of pricing models would help to ensure that the revised standardised approach is a credible fallback to their internal models. However, many banks were concerned that the fuller risk factor approach was too complex for a

standardised approach and could not be calculated by all banks. After careful consideration, the Committee decided to proceed by developing the partial risk factor approach.

## 3.2 General features of the revised standardised approach

This section describes the general features of the revised standardised approach, which is the starting point for the detailed approaches that have been designed for each asset class.

Under this approach, the first step is to decompose instruments into "notional positions". The proposed Accord text sets out principles that should be followed by banks, as well as detailed decompositions of commonly traded instruments. Notional positions will then be allocated to risk buckets. It is expected that a bank should be able to decompose all instruments for the purposes of the standardised approach. However, if this is not possible, then supervisors will have discretion to impose a prudent percentage of either the market value or the notional of the position.

A set of risk buckets has been defined for each asset class. These risk buckets, which have been designed based on a combination of statistical analysis and expert judgement, group positions with similar risk characteristics together. Notional positions are assigned to risk buckets according to certain categorical variables, such as industry sector or credit quality. These buckets have been defined following a statistical procedure combined with a judgemental overlay. The maximum number of buckets in an asset class is 12. The Committee considers that this balances the objective of increased risk sensitivity against the added complexity that an even more granular set of buckets would generate.

If a notional position cannot be allocated to any of the risk buckets in an asset class (for example, because data on categorical variables is not available), it will be allocated to a "residual" bucket that has the same risk weight parameter as the most prudent bucket for that asset class. Hedging and diversification benefits between the residual bucket and other buckets in the asset class will not be recognised, resulting in a conservative treatment.

A single risk weight will apply to all notional positions assigned to a risk bucket. In addition, at least two regulatory-specified correlation parameters will be defined for each bucket. One correlation parameter will be used where positions have the same sign, to recognise diversification, and the other correlation parameter will be used where the positions have different signs, to recognise hedging. The correlation parameter for positions with the same sign will be higher than that where positions have different signs. This approach prudently captures the risk to perceived hedging and diversification benefits that arises due to the unstable and time-varying nature of correlation parameters, particularly in times of stress.

The standardised risk measure for each bucket will be calculated using the bucket aggregation formula:

$$K_b = \sqrt{\sum_i RW_i^2 MV_i^2 + \sum_i \sum_{j \neq i} \rho_{ij} RW_i MV_i RW_j MV_j}$$

where the summations are over all notional positions $i$ allocated to bucket $b$, the $MV_i$ is the market value (or mark to model) of each notional position $i$, $RW_i$ is the risk weight applied to notional positions in the bucket, and $\rho_{ij}$ is the correlation between two notional positions $i$ and $j$ in the bucket

The right-hand term within the square root of the aggregation formula captures hedging where the signs of two positions differ and diversification where the signs of two positions are the same. Diversification is recognised to a much greater extent in the revised standardised approach relative to the current approach, which represents a convergence with the internal models approach.

In the case of general interest rate risk and credit spread risk, the cash flow vertex method will be used as a starting point. Under this approach, an instrument will be decomposed into its constituent cash flows. These will be discounted, following a procedure set out in the Accord text, and then assigned, on a proportional basis, to nearby maturity points (referred to as vertices). There will be 10 vertices in total, a level of granularity which balances risk sensitivity against the objective of simplicity. These vertices correspond to the tenors 0.25yr, 0.5yr, 1yr, 2yr, 3yr, 5yr, 10yr, 15yr, 20yr, and 30yr. Long and short cash flows at each vertex will be allowed to offset, subject to a disallowance factor to mitigate the inaccuracy that arises from allocating cash flows with different maturities to the same vertex.

The bucket aggregation formula for the standardised risk measure will then be applied for each currency separately:

$$K_b = \sqrt{\sum_i RW_i^2 MV_i^2 + \sum_i \sum_{j \neq i} \rho_{ij} RW_i MV_i RW_j MV_j}$$

Where the summations are over all vertices $i$ in each currency $b$, the $MV_i$ is the net discounted cash flow at each vertex $i$, $RW_i$ is the risk weight applied to each vertex, $\rho_{ij}$ is the correlation between two vertices $i$ and $j$

The aggregation formula captures hedging between vertices in the same currency where the signs of the net positions at two vertices differ, and diversification where the signs are the same. No hedging between different currencies (yield curves) will be recognised in the formula.

Having determined the risk measure $K_b$ for each bucket or currency, offsetting and diversification will then be recognised across different buckets to compute the standardised capital requirement for asset class *a*, using the cross-bucket aggregation formula:

$$capital_a = \sqrt{\sum_b K_b^2 + \sum_b \sum_{b \neq c} \gamma_{bc} S_b S_c} + K_{residual}$$

Where $S_b = \sum_b RW_b MV_b$, a risk-weighted sum of market values for instruments that fall into bucket $b$, and $\gamma_{bc}$ is a regulatory-specified correlation between buckets $b$ and $c$. $K_{residual}$ is the capital requirement that arises due to the residual bucket for positions that cannot be allocated to any other bucket.

The approach for non-linear products such as options will be to allocate a "delta-equivalent" position in the underlying, including for the purposes of offsetting, hedging and diversification. The delta-equivalent position is equal to the delta of the product multiplied by the notional of the product.

In addition, the non-delta risks of non-linear products will be captured through a delta-stripped scenario matrix approach, based on the current Basel intermediate approach for options. The magnitude of the volatility shifts upwards and downwards will depend on the direction in which the underlying is shifted, to reduce scenario inconsistency.

The trading book standardised capital requirement will equal the sum of standardised requirements across asset classes. No diversification or offsetting between different asset classes will be recognised. An alternative could be to specify correlation parameters between different asset classes (with the possible exception of default risk) and apply another aggregation formula. The Committee will consider the implications of not allowing diversification across asset classes through the QIS, and determine the right way forward.

The Committee acknowledges that in the revised standardised approach, the full market value of an instrument may be placed into several different risk buckets (each of which is calibrated to a stress event holding other risk factors constant), and the capital requirements then added together. This could potentially result in a capital charge for a position that exceeds its market value. This is particularly the case for debt products that are placed into both the general interest rate risk and credit spread risk (CSR)

frameworks, as well as default risk. Several solutions were considered to this issue, but these had potentially serious unintended consequences. Therefore, the Committee has decided to proceed with the approach and consider the implications through the QIS.

As a point of clarification, the use of the term "risk weight" in the revised standardised approach for the trading book has a different connotation to the use of the same term in the banking book. In the banking book, banks calculate capital requirements by multiplying risk weights by minimum capital ratios. A 100% risk weight implies an 8% capital requirement (in addition to buffers).

In the revised standardised approach for trading book, risk weights are more analogous to a gross *standalone* capital requirement for a particular asset (ie a 50% gross risk weight represents a 50% gross standalone capital requirement.) However, given that the revised standardised approach allows for increased recognition of hedging and diversification, the *net* capital requirement for a particular asset will almost certainly be different to the gross risk weights for that asset. For example, a trading book asset may have a 50% risk weight but, when diversified and hedged, the net capital requirement may only be 10%.

## 3.3 Calibration of the revised standardised approach

This section gives details of the procedures that were used to define and calibrate risk buckets, as well as the parameters required under the revised standardised approach. Going forward, the Committee will review its validation of this calibration on an annual basis and make necessary adjustments in the case of material changes. Every five years, the Committee intends to undertake a more comprehensive review of its calibration. Minor departures from the general calibration methodology were made for individual asset classes where this was required, due to data availability or to capture the risk of the particular asset.

The underlying principle for bucketing was to group instruments deemed to be sufficiently homogenous from a risk perspective. The number of risk buckets per asset class reflects the Committee's goal of balancing simplicity and risk sensitivity. In some cases, refinements were made by pre-bucketing based on an initial statistical analysis of the data and expert judgement. This was necessary to ensure a simple bucketing structure with sufficient granularity for all positions.

The statistical procedure used to define the buckets in almost all cases was a regression tree analysis using expected shortfall at 97.5%, based on one year of stressed data, as the dependent variable. To capture the impact of liquidity horizons, the calibration was carried out using overlapping liquidity horizons using the same liquidity horizons as specified for internal models in Table 2 in Section 1.

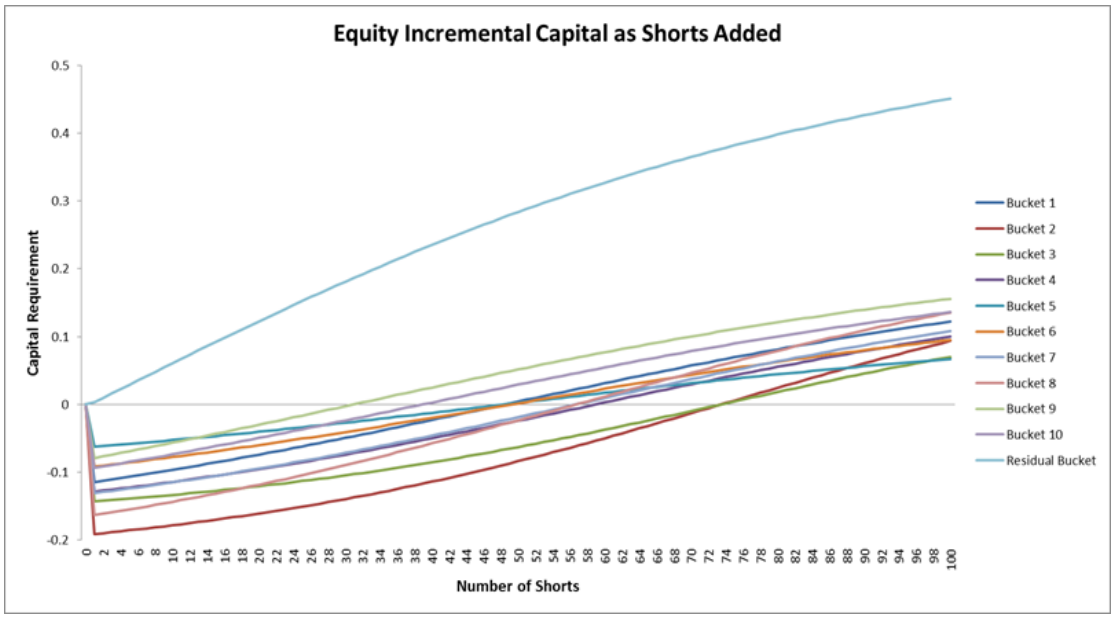
The length of the time series used to find the stress period was as long as possible, conditional on accurate and consistent data being available. Different categorical variables were considered, and those which were most relevant selected. In most instances, the stress periods were found by calculating an expected shortfall for all available periods to find the maximum expected shortfall.

Once a bucketing structure had been developed, risk weights and correlations were calculated for each bucket. The calibration of these buckets was done as far as possible in a way that would ensure convergence with the internal models approach, although in the internal model approach it is unlikely that all asset classes will undergo a period of maximum stress at the same time. The risk weight for each bucket was the average of the 97.5% stress expected shortfalls of the positions allocated to each bucket.

Correlations between positions were calculated using long histories of data. Within each bucket, the 25th and 75th percentiles of the correlations were found. These were used for the lower and upper correlations (to be used when two positions have different signs, or the same signs, respectively). The median correlation was used for aggregation across buckets, because only one correlation was required.

Because the correlation of positions with different signs is lower than the correlation for positions with the same sign within a bucket, there will come a point where the incremental impact of adding a hedge will be to increase the capital charge for the bucket.

An illustration of this is provided in the chart below. The chart uses the calibration for the equity asset class and shows the incremental impact on capital of adding between 0 and 100 shorts to a portfolio of 100 longs (all positions are assumed to have a market value of 1). For example, in the case of 50 along the x-axis, the portfolio consists of 100 long positions and 50 short positions. When the y-axis value is negative, the incremental impact of adding the hedge is to reduce capital requirements, but where it is positive the incremental impact is to increase capital requirements.




The Committee is aware that the behaviour of the capital requirements illustrated in the chart could result in a disincentive to hedging in some cases, and might result in lower capital for directional positions relative to positions hedged on a macro basis. The Committee is also aware that the low correlations resulting from bucketing using ES as the dependent variable[16] mean that significant diversification benefit is given, but little hedging is recognised. This could result in under-capitalisation of a directional portfolio during a stress period where correlations can increase significantly. The implications of these points will be considered by the Committee during the QIS, and solutions such as a more granular correlation structure within buckets might be explored.

## 3.4 Proposed treatments by asset class

Due to the particular characteristics of each asset class and the different risks that need to be captured, the general features of the revised standardised approach and calibration has had to be adapted to each individual asset class. This section describes the proposed treatment for each asset class in detail.

[16] This approach ensures that the level of risk within a bucket is sufficiently homogenous to justify using a single risk weight for all positions within the bucket, but does not ensure that correlations within the bucket are high

## (i) General interest rate risk

The basis for capitalising general interest rate risk is the cash flow vertex method described above. Under this method, instruments must be decomposed into their constituent cash flows, which are then discounted before being assigned to nearby vertices on a proportional basis. For example, the value of a cash flow with a maturity of 1.2 years would be assigned 80% to the 1 year vertex and 20% to the 2 year vertex. Cash flows in the same currency assigned to the same vertex will be allowed to offset, subject to a disallowance factor to capture the inaccuracy arising from cash flows with different tenors being assigned to the same vertex.

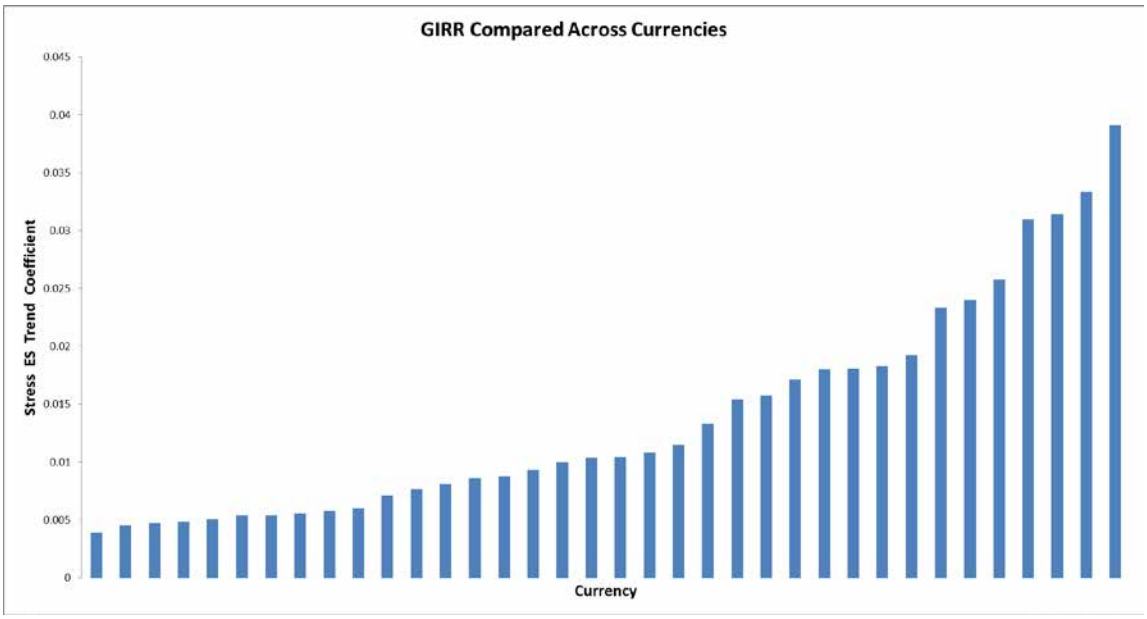
The Committee has set out regulatory prescribed risk weights for each vertex, which should be applied to the net cash flow at each vertex. Risk weights were calculated for each vertex using an expected shortfall based on returns to the discount factor arising due to historical variation in interest rates at each vertex. These risk weights capture the risk arising from variation in the present values of future cash flows due to variation in interest rates.

Cash flows will be assigned to vertices separately for each currency. Offsetting between cash flows at the same vertex will not be permitted for cash flows in different currencies. Regulatory prescribed correlation parameters between each pair of vertices will be used to recognise hedging and diversification between cash flows at different vertices.

Diversification between different currencies will be recognised by using an aggregation formula with a correlation parameter set to 0.5. The Committee found that correlations between different currencies were not sufficiently stable to justify a granular treatment of correlations across different currencies. This is particularly the case because relative movements in different yield curves will not necessarily be parallel (since slope and curvature can also change), and therefore a position at the short end of one curve cannot be relied on to hedge a position at the long end of another curve. Following the QIS the Committee will review whether a more granular treatment is required.

In this framework, only fixed payments are subject to capital charges; floating payments are implicitly assumed not to have general interest rate risk. However, floating payments do generally carry this risk. The Committee seeks feedback on the materiality of this issue and will consider possible extensions to the GIRR framework to address it.

The Committee analysed the volatility of interest rates in different jurisdictions using a stressed expected shortfall measure. The chart below presents the results of this analysis, with one bar for each anonymous currency. A 97.5% stress ES on the returns to the discount factor was calculated at each vertex for each currency, before a linear trend was fitted to aid comparison of risk across currencies. The values on the y-axis are line coefficients, with a higher value indicating greater interest rate risk.




Overall, the Committee proposes a single risk weight for general interest rate risk, regardless of currency. Feedback is invited on whether this provides sufficiently granular risk sensitivity. It would be possible to introduce risk sensitivity into the GIRR framework by dividing jurisdictions into categories capturing low, medium and high volatility of domestic interest rates. An alternative approach would be for the Committee to specify quantitative thresholds for stressed ES, to allow classification of exposures into the buckets by supervisors or banks. This would avoid the need to maintain a specific list of currencies associated with each bucket.

### (ii) Foreign exchange risk

The Committee has adopted an approach that is more risk sensitive than the current standardised approach for market risk, but does not depend on the reporting currency of the bank.

Under the simplified method for FX risk, there are three term buckets, corresponding to the terms “less than one year”, “one to three years” and “over three years”. The cash flows are similarly discounted following methodology procedure set out in the Accord text. They are then fully attributed to the nearest corresponding term bucket (no proportional basis).

Within these buckets long and short positions are allowed to offset each other fully, without the application of a disallowance factor. A correlation parameter is then applied when aggregating net positions in the three term buckets to arrive at a net position in each currency.

Net exposures in all currencies will then be aggregated, allowing for some diversification for positions with the same sign and offsetting for positions with different signs. The correlation parameters used to achieve this will be the same regardless of currency pair. This will result in an aggregate exposure to foreign exchange risk, which will be multiplied by 15% to determine the capital charge.[17]

[17] The treatment of pegged or linked currencies will be subject to further review by the Committee.

### (iii) Equity risk

The treatment of equity risk follows the general features of the revised standardised approach closely. After decomposing instruments into notional positions, long and short positions in the same equity name can be offset. No disallowance factor will be applied due to the high liquidity of the equity market. The net position in each equity name will then be assigned to the relevant bucket based on their observable characteristics. Buckets are defined using the dimensions; market capitalisation of equity name, industrial sector, and whether the equity is located in a developed or emerging market.

The same risk weight will be applied to all positions within the same bucket. Two correlation parameters have been specified per bucket; one to be used where the signs of two positions within the bucket are the same, and one to be used where they differ. A further two correlation parameters have been specified between each pair of buckets. The bucket and cross-bucket aggregation formulas will be applied, as described in the general approach, to capture hedging and diversification.

In a change to the current framework, the capital requirements for equities will in some cases be lower than for debt instruments. In addition to debt instruments generally having higher liquidity horizons than for equities, one reason for this is due to possible double-counting of GIRR and CSR. Although the risk weights for debt instruments are much higher than for equities at long tenors, this is appropriate given that the duration of a zero coupon bond is a linear function of time, and may not translate into higher capital requirements because the cash flows that the risk weights are applied to will be discounted more at longer tenors. The Committee will consider the implications of potentially higher capital requirements for debt instruments, relative to equities, through the QIS.

### (iv) Commodity risk

The treatment of commodity risk follows the general approach, but with a richer correlation structure to capture differences between commodities of the same broad type (for example, the difference between WTI and Brent in the case of crude oil). Offsetting will only be allowed between long and short positions in identical instruments, because buckets are defined according to commodity type. All positions in a particular commodity type (for example, crude oil) will be assigned to the same bucket.

The same risk weight will apply to all positions within the same bucket. Different correlation parameters are specified according to whether a pair of positions are delivered to the same or a different location, whether they are of the same grade, the difference between their maturities, and whether their signs are the same or different. These correlations are used in the bucket aggregation formula. A further two correlation parameters are specified between each pair of buckets, for use in the cross-bucket formula.

Gold will be included in the commodity risk framework within the precious metals commodity risk bucket, which is a change relative to the current approach where it is included in the FX framework. This reflects the high volatility of gold recently and its correlation with other precious metals.

Unusual underlyings, such as temperature in the case of weather derivatives, or mortality in the case of mortality bonds, will be assigned to an “other” bucket in the commodities asset class.

### (v) Credit spread risk (non-securitisations)

The CSR framework captures the risk that arises due to changes in the present value of cash flows due to changes in credit spread. There are some differences with the general cash flow vertex approach described above, because a bucketing structure is used to capture differences in spread risk based on characteristics of the underlying name.

As required under the cash flow vertex method, instruments will be decomposed into their constituent cash flows, which will then be discounted. The discounted cash flows will be assigned to buckets based on the credit quality and sector of the underlying name. Different risk weights will be applied to cash flows depending on whether the maturity of the cash flow is less than five years, from five to 10 years, from 10 to 20 years, or more than 20 years.

The bucket aggregation formula will be applied using regulatory prescribed correlation parameters that depend on whether two cash flows within a bucket have the same underlying name, the size of their maturity difference, and whether they have the same or different signs. This will capture hedging and diversification between cash flows assigned to the same bucket. The cross-bucket aggregation formula will be applied using correlations specified between buckets.

### (vi) Credit spread risk (securitisations)

All securitisation positions will receive a standardised capital charge for the credit spread risk component in addition to the default risk component and GIRR component. The framework will recognise hedging and diversification across different tranches and between tranches and their non-securitised hedges, such as index and single name positions, referencing the same underlying entities. Hedging and diversification benefit will be recognised through the bucket aggregation formula. However, hedging and diversification will not be recognised across positions in different securitisation types, such as asset-backed securities (ABS) and mortgage-backed securities (MBS). Hedging and diversification will not be recognised for positions other than corporate positions in different regions ("Europe", "Asia" and "North America"). Hedging and diversification will not be recognised for positions with differing credit quality (HY vs. IG).

Risk weights will be applied to the present value of cash flows, and reflect the credit quality, residual maturity, and attachment and detachment points of the tranches. Non-securitisation credit hedges of securitisation positions are included in the framework by assuming their attachment point to be 0% and their detachment point to be 100%.

The Committee is aware that the capital impact of this revised treatment on more "exotic" securitisation instruments could potentially be very large. As such, a re-calibration of this asset class, or more detailed treatment for some specific instruments, may be warranted in the future. The Committee thus intends to collect sufficient data in the QIS to inform its assessment of the impact and to carry out any subsequent re-calibration.

Securitisations have particular features and their cashflows can vary in ways which merit specific treatment. Despite the unique features of securitisations, the risk weights and correlations for the credit spread risk in securitisations (including risk weights derived from the formula in Annex 1, paragraph 117) reflect preliminary analysis of data sets that followed the approach used in other asset classes. These should therefore be considered illustrative, although they will be used as a starting point for the QIS analysis. Further analysis and augmentation of these data sets could result in findings which suggest that changes to the securitisation approach may be warranted. Further work is envisioned in this area. In particular, through the QIS the Committee will look at the size of the ratings-based charges and how to define maturity.

The final risk weights and correlations for both credit spread risk and credit default risk in securitisations will be determined in conjunction. This is to ensure a credible calibration of the overall capital charges for securitisations in the trading book. The Committee is also conscious of not creating material arbitrage incentives resulting from differences in capital requirements for securitisations in the trading book and banking book. As with all areas in the consultative paper, the Committee welcomes comments in this area.

### (vii) Credit default risk (non-securitisations)

Due to the nature of default risk, the approach differs somewhat from the general features of the revised standardised approach. The framework for default risk requires that positions are first allocated to default risk categories. The different categories are corporates, sovereigns, local governments/municipalities, and securitisations. Exposures in different countries to sovereigns or local governments/municipalities must be assigned to separate risk categories. Long and short exposures in the same obligor may offset, although the LGD assumed for equities and debt securities will differ and thereby limit the degree of offsetting recognised between them. No hedging or diversification is recognised across different categories. Therefore, the total capital charge for default risk will be calculated as a simple sum of the risk category level capital charges.

Exposures are risk-weighted according to credit quality. Then, the risk-weighted long positions and risk-weighted short positions are added separately. A discounting term that is a function of the ratio of long to gross positions will be applied to the risk-weighted short positions. This discounting term helps to capture tail risks by ensuring that not all short positions are recognised as offsetting long positions.

The overall capital charge for each default risk category is then simply calculated as the sum of the risk-weighted long positions less the discounted risk-weighted short positions.

### (viii) Credit default risk (securitisations)

The approach for credit default risk (securitisations) is comparable to that for credit default risk (non-securitisations), but with a more conservative treatment of offsetting and hedging across different obligors. The risk weights will be scaled down by 12.5 times relative to those produced in the proposed corresponding treatment for default risk for securitisations in the banking book, to promote consistency across the trading and banking books. The publication of these risk weights is forthcoming, and is not available at this stage.

No offsetting will be allowed across securitisations of different asset pools, even if the tranche is the same, although for corporate index tranches different series of the same index can be offset. No offsetting will be allowed across tranches of the same asset pool. Offsetting is, however, allowed across different maturities of the same tranche of the same asset pool or index, subject to some additional provisions.

Hedging across different obligors will not be recognised across regions, but will be recognised within regions. Regions will be defined along the lines of “Europe”, “Asia”, or “North America”. For example, hedging will not be allowed between securitisations in Canada and the UK, but will be recognised between securitisations in the US and Canada, or the UK and Germany. No hedging will be recognised across different reference asset classes (for example, between ABS and RMBS). Hedging will be recognised across regions for corporate securitised exposures only. Limited hedging across tranches will be recognised, but not between senior, mezzanine and junior tranches, except where there is a high degree of overlap between the underlying names. In the case of a high degree of overlap the tranche may also offset outright credit exposures in the underlying names.

### (ix) Options non-delta risk

In order to capture the risk of options, the Committee is consulting on a “scenario matrix approach”, similar to the intermediate approach in the current Accord text.

Under the scenario matrix approach, the delta-equivalent position in an option underlying will first be allocated to the appropriate risk bucket and treated like any other position in the underlying. The delta-equivalent position is equal to the delta of the product multiplied by the notional of the product.

To capture the non-delta risk of options, a separate scenario matrix will be required for the portfolio of options on each underlying. The worst loss scenario for the portfolio on each underlying given various combinations of shifts up and down in the price (or rate) of the underlying and the volatility of the underlying must be identified. Relative to the current intermediate approach,[18] the number of shifts upwards and downwards that must be calculated has been reduced to simplify the matrices.

The implied volatility of options on a given underlying with different contractual parameters (such as strike, maturity, and whether the option is a put or a call) can move differently. In order to capture this basis risk, additional volatility parameters have been specified (for options with differing characteristics) depending on the sign of vega. This will entail some additional complexity but will introduce recognition of basis risk and therefore enhance risk sensitivity.

However, for some portfolios this approach does not fully reflect the tendency for implied volatilities to rise and fall together. This is a problem, for example, where gains due to changes in the implied volatility of options on one underlying are offset by the losses due to changes in implied volatility on options on another similar underlying. In this case the two options are likely to hedge each other, but the approach aggregates the charges on both.

In another contrast to the current intermediate approach, the magnitude of the volatility shifts upwards and downwards will depend on the direction in which the underlying is shifted. This will help to reduce the scenario inconsistency that could otherwise occur. For example, it is unlikely that a sharp fall in equities prices will occur together with a decrease in volatility. Therefore, conditional on the underlying equity falling, a tail event for an increase in volatility will involve a shift of greater magnitude compared to a tail event for a decrease in volatility.

Once the worst case losses for the portfolios of options on each underlying have been calculated, these need to be aggregated. In the current intermediate approach they are simply added together. However, the Committee recognises that the scenario matrix approach does not recognise hedging of non-delta risk between options on similar underlyings. This can result in scenario-inconsistent (implausible) outcomes. The rules text therefore includes an aggregation formula with a set of correlation parameters designed to increase the diversification benefit between portfolios of options where their respective worst losses are more scenario-inconsistent, and reduce this benefit where it is scenario-consistent.

However, this approach only indirectly deals with the scenario inconsistency that can arise due to not recognising hedging of non-delta risk between options on similar underlyings. An alternative "extended aggregation approach" is also under consideration by the Committee. This approach seeks to explicitly recognise hedging between portfolios of options on different underlyings and is discussed in detail in Box 1. The Committee seeks feedback on both approaches.

[18] See Basel Committee on Banking Supervision, *Basel II: International Convergence of Capital Measurement and Capital Standards - Comprehensive Version*, June 2006. Paragraph 718 (lxiii) – (lxvii).

## Box 1: The Extended Aggregation Approach

As an alternative to the scenario matrix approach, the Committee has considered a separate "extended aggregation approach". This approach introduces correlation parameters that allow hedging to be recognised between vega risk positions across different underlyings, and between the vega risk positions and the risk positions for the underlying.

The CP provides rules text for the scenario approach only; the extended aggregation approach is discussed below.

### *Capital charge*

Under the "extended aggregation approach", the capital charge $K_b$ for bucket b is determined as:

$$K_b = \sqrt{\sum_i ES_i^2 + \sum_i \sum_{j \neq i} \rho_{ij}\ ES_i\ ES_j + \sum_i ES_{curvature,i}^{\ 2}} \qquad (1)$$

where $ES_i$ is the expected shortfall contribution from the bank's linear risks with respect to risk factor i. For instruments that are linear in a risk factor and for the delta-equivalent of an option this expected shortfall is determined as $ES_i = RW_i \cdot MV_i$. This means that the extended aggregation approach differs from the scenario matrix approach only with respect to the capitalisation of non-delta option risks. Otherwise both approaches are identical.

For any underlying of an option, there is also a risk weight for implied volatility. Identical options, ie options that differ only with respect to counterparty and sign are allowed to fully offset. For non-identical options on the same underlying basis risk is reflected by aggregating the risks from long and short vega risk positions as follows:

- Vegas of the same sign are added up.
- For vegas of different sign a correlation $\rho_i$ applies. $\rho_i$ is initially calibrated at 0.9.

The expected shortfall contribution for vega risk with respect to implied volatility $\sigma_i$ is:

$$ES_i = sign_i\ RW_i\ \sigma_i \sqrt{\left(\sum_k vega_{ki}^{+}\right)^2 + 2\rho_i \left(\sum_k vega_{ki}^{+}\right)\left(\sum_k vega_{ki}^{-}\right) + \left(\sum_k vega_{ki}^{-}\right)^2} \qquad (2)$$

where $RW_i$ is the relative change of the implied volatility $\sigma_i$ for a given underlying, $vega_{ki}^{+}$ is the vega of an option k on the underlying when vega is positive and $vega_{ki}^{-}$ is the vega of an option k on the underlying when vega is negative. The sign $sign_i$ of the expected shortfall is positive, if the net vega is positive or zero (ie $\sum_k vega_{ki}^{+} + \sum_k vega_{ki}^{-} \geq 0$). $ES_i$ can be interpreted as an expected shortfall for vega risk for an underlying that takes the sign of the net open vega risk position and is adjusted for basis risk between options of this underlying.

This approach, like the scenario matrix approach, recognises hedge slippage risk between options of the same underlying. In contrast to the scenario matrix approach the expected shortfall for vega risk is included in the general aggregation approach of the standardised approach in exactly the same way as the expected shortfalls $ES_i = RW_i \cdot MV_i$ for the delta-equivalents of options and linear instruments.

$ES_{curvature,i}$ is the maximum scenario loss from the net change in value of the options on underlying i given the shifts $-RW_i \cdot MV_i$ or $+RW_i \cdot MV_i$, with the effect of delta removed. As basis risk is already addressed in the context of vega risk the scenario losses are simply added up across all options, separately for each of the two scenarios. The $ES_{curvature,i}$ are aggregated across underlyings with an implicit assumption of a zero correlation. This reflects a view that gamma risk is relevant mostly for large shocks to the underlying, and that such large shocks may be roughly idiosyncratic even when changes to the underlyings are correlated.

Curvature for implied volatility is not considered because vega tends to change fairly little with implied volatility.

The capital charges are aggregated across bucket to the capital charge per risk class as generally proposed for the standardised approach.

$$K_a = \sqrt{\sum_{b=1}^{B} K_b^2 + \sum_{b=1}^{B} \sum_{b \neq c} \gamma_{bc} \, S_b \, S_c} + K_{residual}$$

where $K_{residual}$ is the capital charge for the residual bucket, $\gamma_{bc}$ the correlation parameter between buckets b and c and $S_b = \sum_{i \in b} ES_i$ the sum of all signed expected shortfalls in the buckets, ie of the expected shortfalls for vega risks and the linear and delta risks. $ES_{curvature,i}$ is not included in the aggregation.

*Calibration*

The extended aggregation approach requires the calibration of:

- a risk weight for the implied volatility of each underlying;
- the correlations between the implied volatilities for different underlyings of a bucket; and
- the correlations between the implied volatilities and the underlyings of a bucket.

The general principles for the calibration of the standardised approach will apply.

# Section 4: Disclosure requirements

Trading Book disclosures have historically been relatively limited compared to banking book disclosures. The RCAP analysis of Risk-Weighted Assets for Market Risk[19] shed new light on the effectiveness of market risk disclosures.

The analysis suggested that disclosures could be improved by including more granular information regarding the components of market risk-weighted assets (mRWAs), the VaR and other market risk models used for regulatory capital purposes. When performing the cross-jurisdictional comparison of mRWAs, the Committee found in general that disclosures could: (i) be clearer on the drivers of market risk; (ii) be outlined more consistently across jurisdictions; (iii) be provided on a more timely and consistent basis; and (iv) provide more relevant information to their users that is based on information presented to management, risk committees and boards of directors for decision-making purposes. In this regard, the Committee sought to consider the following measures for improving the quality, content and consistency of disclosures related to mRWAs:

1. Common standards for the frequency of reporting – less than half of the banks in the sample reported information on a quarterly basis;
2. Common standards for explanations of the drivers of the change in mRWAs from period to period;
3. A more granular and consistent segmentation of the components of mRWAs to facilitate a deeper recognition of a bank's market risks;
4. Disclosure of key modelling choices, particularly those highlighted by the hypothetical test portfolio exercise as driving the greatest variation in the results of models; and
5. Disclosure of key differences in models used for internal risk management and those used for regulatory capital calculations. It was found that banks seldom directly report the 10-day 99% VaR used in regulatory capital calculations.

Another potential area for future policy work concerned harmonisation and/or consistency of the content and accessibility of supervisory and regulatory reports across jurisdictions.

In the light of these considerations, this Consultative Paper contains more granular market risk disclosures. These requirements would include disclosures related to the boundary, as noted in the first consultative paper, which suggested a set of "disclosure requirements regarding the composition of the trading book". In addition, banks would be required to disclose their desk structures, as this is a key element of the revised framework that may impact capital calculations. To facilitate comparability, the key components of the proposed framework – including standardised charges, internal model-based calculations, and components of the liquidity requirements – would be disclosed at the desk level and in aggregate, as applicable.

[19] See Basel Committee on Banking Supervision, *Regulatory consistency assessment programme (RCAP) – Analysis of risk-weighted assets for market risk*, January 2013 (revised February 2013), www.bis.org/publ/bcbs240.pdf.

# Section 5: Impact assessment

Based on the various objectives of the trading book review, this Consultative Paper is proposing fundamental changes to the methods for measuring market risk; the relationship between the revised standardised and internal models approaches; and a clearer, more objective definition of the boundary between the trading book and banking book to reduce the potential for arbitrage.

Proposals were thoroughly discussed during the development phase, with different alternatives considered and compared to one another. An important aim in the trading book review was to strike a balance between simplicity, comparability, and risk sensitivity. Several test calculations were performed to ensure that a sensible balance between these objectives could be achieved. For these calculations, certain assumptions with regard to portfolio composition and market data were necessary.

The Committee believes that the supervisory assumptions underlining the calibration of the new framework need to be supplemented with analysis of the impact of new market risk capital requirements on actual bank portfolios. A comprehensive quantitative impact study (QIS) for the trading book review will thus be performed. It is intended that this QIS will be incorporated in the biannual Basel III monitoring exercise. Banks will be asked to provide quantitative bank data and RWA calculations in spreadsheets to estimate the quantitative impact of the new rules. This will be possibly supplemented by additional qualitative questions that are relevant for providing the Committee with a broader picture and an accurate interpretation of the quantitative results.

As mentioned in Section 1, the Committee is aiming to reduce arbitrage between the banking book and trading book. As such, an important basis of assessment in the QIS will be comparing the impact from the proposed market risk charges with that of relevant banking book charges, in order to inform the Committee's investigations into arbitrage possibilities.

The results of the RCAP analysis of mRWAs, conducted through test portfolio exercises, were an important basis for the development of the proposed revisions to the market risk framework. Test portfolio exercises may also serve to provide useful, timely and complementary information for the purposes of a "standard" QIS. Banks will therefore be requested to undertake a hypothetical test portfolio exercise based on the proposed trading book capital requirements, using certain supervisory-defined scenarios. This test portfolio exercise will only ask for banks' estimates using the calculation methods introduced in this consultative paper, and will not request the calculation of RWA figures under current approaches. Policy changes arising from the trading book review will affect a larger universe of banks compared to those introduced under the "Basel 2.5" revisions to the market risk framework. The Committee thus encourages active participation in the QIS, not just from systemically important banks with large trading books, but also from small and mid-sized banks.

As with all QIS' conducted by the Committee, data collected from banks during this exercise will be treated as strictly confidential and will not be attributed to individual firms.

# Annex 1

## Revised market risk framework

This Annex sets out revised standards for market risk, based on the policy proposals introduced in this Consultative Paper. The text herein is intended to replace the existing Basel II market risk framework, including amendments made after the June 2006 publication of *Basel II: International Convergence of Capital Measurement and Capital Standards - Comprehensive Version*.

With reference to the current Basel II market risk framework, limited changes have been made in the following sub-sections:

- "Treatment of counterparty credit risk in the trading book"
- "The capital requirement"
- "Adjustment to the current valuation of less liquid positions for regulatory capital purposes"

No changes are proposed on the Supervisory Review Process (ie "The Second Pillar") for Market Risk.

To provide a complete picture of the revised market risk framework, these subsections are still reproduced below together with the updated Accord text.

# Minimum capital requirements for market risk

## A. The definition of the trading book and risk measurement framework

### 1. Definition of the trading book

1. A trading book consists of all instruments that meet the specifications below ("covered instruments").

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

3. Banks may only include an instrument or commodity when there is no legal impediment against selling or fully hedging it.

4. Any instrument a bank holds for one or more of the following purposes must be designated as a covered instrument:

(a) holds with the intention of short-term resale;

(b) holds with the expectation of profiting from actual or expected short-term price movements;

(c) holds with the intention of locking in arbitrage profits; or

(d) holds for the purpose of hedging risks resulting from instruments meeting criteria a, b, or c, above.

5. Any instrument which is not held for any of the purposes listed in paragraph 4 at inception must be assigned to the banking book.

6. There is a strict limit on banks moving instruments between the trading book and the banking book at the choice of the bank after initial designation (see paragraphs 25–28).

7. The supervisor may require the bank to designate an instrument to the banking book if the supervisor is of the view that a bank has not provided enough evidence to support the assignment of an instrument to the trading book, or if the supervisor believes such instruments would customarily belong in the banking book.

8. The supervisor may require the bank to designate an instrument to the trading book if the supervisor is of the view that a bank has not provided enough evidence to support the assignment of an instrument to the banking book, or if the supervisor believes such instruments would customarily belong in the trading book.

9. Any instrument which is managed on a trading desk as defined by the criteria set out in paragraphs 21 to 23, is seen as being held for at least one of the purposes listed in paragraph 4 and therefore must be included in the trading book.

10. Any instrument which would lead to a net short risk position in an equity in the banking book is seen as being held for at least one of the purposes listed in paragraph 4 and therefore it must be included in the trading book.

11. The general presumption is that any:

(a) instrument held as an accounting trading asset or liability, (so it would be fair-valued daily through the profit and loss (P&L) account[20];

(b) instrument resulting from market-making activities;

(c) instrument resulting from underwriting activities;

(d) equity investment in a fund (excluding paragraph 13(d));

(e) listed equity;[21]

(f) naked short position, including any short position in cash instruments; or

(g) option.

is being held for at least one of the purposes listed in paragraph 4 and therefore is a covered instrument.

12. As it is possible there will be jurisdictional variance in terms of what should be presumed to be in included in the trading or banking book, each supervisor could provide specific guidance on this subject. Banks will be expected to assign instruments to the appropriate boundary designation based on this guidance. If a bank believes that they have to deviate from the presumption list for a certain instrument, the bank must submit a request to its supervisor and receive explicit approval. In cases where this approval is not given by the supervisor, the instrument must be switched to the trading book.

13. The Committee is of the view that any

(a) unlisted equity;

(b) instrument designated for securitisation warehousing;

(c) real estate holding;

(d) equity investment in a fund (including a hedge fund) where the bank cannot look through the fund daily or where the bank cannot obtain daily real prices for its equity investment in the fund; or

(e) derivative instrument with the above instrument types as underlying assets

does not meet the definition of the trading book, owing to significant constraints on the ability of banks to liquidate these positions and value them reliably on a daily basis and should therefore be assigned to the banking book.

14. Banks must fair-value daily any covered instrument and recognise any valuation change in the profit and loss (P&L) account.

15. Banks must have clearly defined policies, procedures and documented practices for determining which instruments to include in, and to exclude from, the trading book for purposes of calculating their regulatory capital, ensuring compliance with the criteria set forth in this section and taking into account the bank's risk management capabilities and practices.

[20] Under IFRS and US GAAP, these instruments would be designated as "held for trading".

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

16. Banks' internal control functions must conduct ongoing evaluation of instruments both in and out of the trading book, to assess whether the bank's instruments are being properly initially designated as trading or non-trading instruments in the context of the bank's trading activities. Compliance with the policies and procedures must be fully documented and subject to periodic (at least yearly) internal audit, and available for supervisory review.

17. The treatment of internal transfers with the purpose of transferring risk, and their treatment under market risk capital requirements, is discussed in paragraphs 38 to 39.

## 2. Risk management policies for covered positions

18. Covered instruments must be subject to clearly defined policies and procedures, approved by senior management, that are aimed at ensuring active risk management. The application of the policies and procedures must be thoroughly documented. These policies and procedures should, at a minimum, address the subjects listed below:

(a) The activities the bank considers to be trading or hedging of covered instruments and therefore constitutes elements of the trading book for regulatory capital purposes;

(b) Trading strategies (including expected holding horizon and possible reactions if this limit is breached) for every covered instrument or portfolio;

(c) Standards regarding the extent to which a bank's portfolio of covered instruments must be marked-to-market daily by reference to an active, liquid two-way market;

(d) For covered instruments that are marked-to-model, the standards for:

  (i) Identifying the material risks of the covered instruments;

  (ii) Hedging the material risks of the covered instruments and the extent to which hedging instruments would have an active, liquid two-way market; and

  (iii) Reliably deriving estimates for the key assumptions and parameters used in the model.

(e) The extent to which the bank is required to generate valuations for the covered instruments that can be validated externally in a consistent manner;

(f) The extent to which instruments may have operational requirements that could impede the bank's ability to effect an immediate liquidation of the covered position;

(g) The processes constituting active management of covered instruments, which must include:

  (i) The setting of limits and ongoing monitoring for appropriateness;

  (ii) The requirement that each trading desk compile a trading strategy and the process for monitoring covered instruments against the bank's trading strategy, including that:

    o for any given trading desk, bank senior management assumes the responsibility that a given covered instrument or portfolio is managed with trading intent and in accordance with the trading strategy document.

    o the monitoring process includes evaluation of turnover and "stale positions" in order to determine compliance with specified holding periods.

  (iii) The degree of autonomy a trader has to enter into or manage covered instruments within agreed limits and according to the agreed strategy;

  (iv) The process for reporting to senior management as an integral part of the institution's risk management process; and

(v) The active monitoring of instruments and risk positions with reference to market information sources, including:

- Assessment of market liquidity and the ability to hedge instruments, risk positions or the portfolio risk profile;
- Analysis of changes in the market values of instruments and sensitivities due to changes in market risk factors; and
- Evaluation of the quality and availability of market inputs with respect to the valuation process, the level of market turnover, and the relative size of instruments traded in the market.

19. In addition to policies and procedures, the bank must prepare, evaluate, and have available for supervisors the following for all trading desks:

(a) Inventory ageing 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.

20. With regard to instruments which are generally presumed to be included in the trading book (see paragraph 11), the following requirements apply:

(a) Banks need to have policies and procedures that specify potential deviations from the general presumptions. These must be regularly updated and satisfy the supervisor.

(b) Any actual deviation from the general presumptions must be in line with the bank's policies and procedures.

(c) Banks need to document any actual deviations from the general presumptions in detail, in a timely manner, and report the nature and extent of these deviations to their supervisor.

## 3. Definition of the trading desk

21. A key component of calculating market risk capital charges is the identification and classification of a bank's "trading desks". 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.

22. Trading desks are defined by the bank, but subject to the regulatory approval of the supervisor for capital purposes. Within this supervisory-approved desk structure, banks may further define operational sub-desks without the need for supervisory approval. These sub-desks would be for internal operational purposes only and would not be used in the market risk capital framework.

23. The key attributes of trading desks 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. Each individual trader or trading account must be assigned to only one trading desk.

(b) The desk must have a clear reporting line to senior management and must have a clear and formal compensation policy linked to its pre-established objectives.

(c) 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).

(d) A trading desk must have a clear risk management structure. This must include clearly defined trading limits based on the business strategy of the desk. The desk must also produce, at least weekly, appropriate risk management reports. This would include, at a minimum, profit and loss reports and internal and regulatory risk measurement reports.

(e) Internal hedges between trading desks are recognised under the market risk capital rules. There must be no distinction between the prudential treatment of internal trades (ie trades entered between defined trading desks) and external trades.

(f) Further detail around the definition of a trading desk for regulatory capital purposes is provided in Appendix A.

24. Any FX or commodity positions held in the banking book will be included in the market risk capital charges. For regulatory capital calculation purposes, these positions will be treated as if they were held in notional trading desks within the trading book.

## 4. Restrictions on moving instruments between the regulatory books

25. There is a strict limit on the ability of banks to move instruments between the trading book and the banking book at their own choice after initial designation. In practice, switching should be rare and is allowed only in extraordinary circumstances. Possible examples could be a major publicly announced event, such as a bank restructuring that results in permanent closure of trading desks or a change in accounting standards that allow an item to be fair-valued through the P&L. In this regard switching always requires termination of the business activity applicable to the instrument or portfolio. Market events, changes in the liquidity of a financial instrument or a change of trading intent alone are not valid reasons for re-designating an instrument to a different book. When switching positions, banks must ensure that the conditions of paragraph 4 and 5 are met and must provide respective supporting documentation to their supervisor.

26. Switching instruments for regulatory arbitrage is strictly prohibited, and capital benefit as a result of switching will not be allowed. This means that the bank must determine its total capital charge (across banking book and trading book) before and immediately after the switch. If this capital charge is reduced as a result of this switch, the difference as measured at the time of the switch is 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 supervisor. To maintain operational simplicity, it is not envisaged that this additional charge would be recalculated on an ongoing basis although the positions would continue to be subject to the ongoing capital requirements of the book into which they have been switched.

27. Any re-designation between books must be approved by senior management, thoroughly documented, determined by internal review to be in compliance with the bank's policies, approved by the supervisor, and publicly disclosed. Any such re-designation is irrevocable.

28. A bank must adopt relevant policies, which must be updated at least yearly. Updates should be based on an analysis of all extraordinary events identified during the previous year. Updated policies with changes highlighted must be sent to the appropriate supervisor. Policies must include the following:

(a) The above transfer restriction requirements, especially that transfers may only be allowed in extraordinary circumstances, and a description of the circumstances or criteria where such a transfer may be considered.

(b) The process for obtaining senior management and supervisory approval of such a transfer.

(c) How a bank identifies an extraordinary event.

(d) A requirement that transfers into or out of the trading book be publicly disclosed at the earliest reporting date.

## 5. Scope of application and method and methods of measuring market risk

29. Market risk is defined as the risk of losses arising from movements in market prices. The risks subject the market risk measurement framework are:

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

30. The market risk capital charges apply to all covered instruments and to foreign exchange and commodities risk positions in the banking book.

31. In measuring their market risks, a choice between two broad methodologies (described in [paragraphs 709 to 718(Lxix) and 718(Lxx) to 718(xcix), respectively][22] will be permitted, subject to the approval of the national authorities. One alternative will be to measure the risks in a standardised manner, using the measurement frameworks described in [paragraphs 709 to 718(Lxix)][23] below.

32. All transactions, including forward sales and purchases, shall be included in the calculation of capital requirements as from the date on which they were entered into. Although regular reporting will in principle take place only at intervals (in most countries quarterly), banks are expected to manage the market risk in their trading book in such a way that the capital requirements are being met on a continuous basis, including at the close of each business day. Supervisory authorities have at their disposal a number of effective measures to ensure that banks do not "window-dress" by showing significantly lower market risk positions on reporting dates. Banks will also be expected to maintain strict risk management systems to ensure that intraday exposures are not excessive. If a bank fails to meet the capital requirements at any time, the national authority shall ensure that the bank takes immediate measures to rectify the situation.

33. A matched currency risk position will protect a bank against loss from movements in exchange rates, but will not necessarily protect its capital adequacy ratio. 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. By running a short risk position in the domestic currency the bank can protect its capital adequacy ratio, although the risk position would lead to a loss if the domestic currency were to appreciate. Supervisory authorities are free to allow banks to protect their capital adequacy ratio in this way. Thus, any risk positions which a bank has deliberately taken in order to hedge partially or totally against the adverse effect of the exchange rate on its capital ratio may be excluded from the calculation of net open currency risk positions, subject to each of the following conditions being met:

- Such risk positions need to be of a "structural", ie of a non-dealing, nature (the precise definition to be set by national authorities according to national accounting standards and practices);
- The national authority needs to be satisfied that the "structural" risk position excluded does no more than protect the bank's capital adequacy ratio;

[22] References to paragraphs in the existing Basel II Framework will be updated once the revised market risk framework is finalised by the Basel Committee.

[23] References to paragraphs in the existing Basel II Framework will be updated once the revised market risk framework is finalised by the Basel Committee.

- Any exclusion of the risk position needs to be applied consistently, with the treatment of the hedge remaining the same for the life of the assets or other items.

34. Risk positions in the bank's own eligible regulatory capital instruments are deducted from capital. Risk positions in other banks', securities firms', and other financial entities' eligible regulatory capital instruments, as well as intangible assets, will receive the same treatment as that set down by the national supervisor for such assets held in the banking book, which in many cases is deduction from capital. Where a bank demonstrates that it is an active market-maker then a national supervisor 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 financial institutions' eligible regulatory capital instruments. Risk positions for capital instruments which are deducted or risk-weighted at 1250% are not allowed to be included in the market risk framework.

35. Term trading-related repo-style transactions that a bank accounts for in its banking book may be included in the bank's trading book for regulatory capital purposes so long as all such repo-style transactions are included. For this purpose, trading-related repo-style transactions are defined as only those that meet the requirements of as mentioned in paragraphs 4 and 5, and both legs are in the form of either cash or securities which are eligible for inclusion in the trading book. Regardless of where they are booked, all repo-style transactions are subject to a banking book counterparty credit risk charge.

36. In the same way as for credit risk and operational risk, the capital requirements for market risk are to apply on a worldwide consolidated basis. Yet, for market risk national authorities may permit banking and financial entities in a group which is running a global consolidated book and whose capital is being assessed on a global basis to include just the net of short and long risk positions no matter where they are booked.[24] National authorities may grant this treatment only when the revised standardised approach permits a full offset of the risk position, ie risk positions of opposite sign do not attract a capital charge. Nonetheless, there will be circumstances in which supervisory authorities demand that the individual risk positions be taken into the measurement system without any offsetting or netting against risk positions in the remainder of the group. This may be needed, for example, where there are obstacles to the quick repatriation of profits from a foreign subsidiary or where there are legal and procedural difficulties in carrying out the timely management of risks on a consolidated basis. Moreover, all national authorities will retain the right to 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. Supervisory authorities will be especially vigilant in ensuring that banks do not conceal risk positions on reporting dates in such a way as to escape measurement.

37. For the time being, the Committee does not believe that it is necessary to allow any de minimis exemptions from the capital requirements for market risk, except for those for foreign exchange risk set out in [paragraph 718(xLii)][25] below, because this Framework applies only to internationally active banks, and then essentially on a consolidated basis; all of these banks are likely to be involved in trading to some extent.

[24] 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.

[25] References to paragraphs in the existing Basel II Framework will be updated once the revised market risk framework is finalised by the Basel Committee.

## 6. Treatment of hedges[26]

38. When a bank hedges a banking book credit risk exposure using a credit derivative booked in its trading book (ie using an internal hedge), the banking book exposure is not deemed to be hedged for capital purposes unless the bank purchases from an eligible third-party protection provider a credit derivative meeting the requirements of [paragraph 191] vis-à-vis the banking book exposure. Where such third-party protection is purchased and is recognised as a hedge of a banking book exposure for regulatory capital purposes, neither the internal nor external credit derivative hedge would be included in the trading book for regulatory capital purposes.

39. Eligible hedges that are included in the CVA capital charge must be removed from the bank's market risk capital charge calculation.

## 7. Treatment of counterparty credit risk in the trading book[27]

40. Banks will be required to calculate the counterparty credit risk charge for OTC derivatives, repo-style and other transactions booked in the trading book, separate from the capital charge for general market risk. The risk weights to be used in this calculation must be consistent with those used for calculating the capital requirements in the banking book. Thus, banks using the standardised approach for credit risk in the banking book will use the standardised approach risk weights in the trading book and banks using the IRB approach in the banking book will use the IRB risk weights in the trading book in a manner consistent with the IRB roll out situation in the banking book as described in [paragraphs 256 to 262]. For counterparties included in portfolios where the IRB approach is being used the IRB risk weights will have to be applied.

41. In the trading book, for repo-style transactions, all instruments, which are included in the trading book, may be used as eligible collateral. Those instruments which fall outside the banking book definition of eligible collateral shall be subject to a haircut at the level applicable to non-main index equities listed on recognised exchanges (as noted in [paragraph 151]). However, where banks are using the own estimates approach to haircutting they may also apply it in the trading book in accordance with [paragraphs 154 and 155]. Consequently, for instruments that count as eligible collateral in the trading book, but not in the banking book, the haircuts must be calculated for each individual security. Where banks are using a Value at Risk (VaR) approach to measuring exposure for repo-style transactions, they also may apply this approach in the trading book in accordance with [paragraphs 178 to 181 (i) and Annex 4].

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

43. The calculation of the counterparty charge for repo-style transactions will be conducted using the rules in [paragraphs 147 to 181 (i) and Annex 4] spelt out for such transactions booked in the banking book. The firm-size adjustment for SMEs as set out in [paragraph 273] shall also be applicable in the trading book.

[26] References to paragraphs in the existing Basel II Framework contained in this section will be updated once the revised market risk framework is finalised by the Basel Committee.

[27] References to paragraphs in the existing Basel II Framework contained in this section will be updated once the revised market risk framework is finalised by the Basel Committee.

### 8. Transitional arrangements

44. [To be determined.]

## B. The capital requirement

### 1. Definition of capital[28]

45. The definition of capital to be used for market risk purposes is set out in paragraphs [49(xiii) and 49(xiv) of this Framework].

46. In calculating eligible capital, it will be necessary first to calculate the bank's minimum capital requirement for credit and operational risks, and only afterwards its market risk requirement, to establish how much Tier 1 and Tier 2 capital is available to support market risk. Eligible capital will be the sum of the whole of the bank's Tier 1 capital, plus all of its Tier 2 capital under the limits imposed in [paragraph 49(iii)] of this Framework.]

## C. Market Risk – The Standardised Approach

### 1. General provisions

47. The standardised approach must be calculated by all banks and reported to supervisors at least monthly. In addition all banks must calculate, and have the ability to produce to their supervisors, the standard rules calculations on demand.

48. If no explicit approach is set out for a particular instrument, a bank should apply the rules and principles in this section by analogy, and should do so in a way that results in a prudent capitalisation of risk.

### 2. Derivation of notional positions

49. The standardised approach requires that instruments held by banks are first decomposed into "notional positions". This is necessary to capitalise often complex financial instruments in a relatively simple standardised approach. In most cases the notional positions are equal to either the market value, "notional value", or the discounted cash flows of the instrument. The notional value of an instrument is equal to the number of units underlying the instrument, multiplied by the current market value of each unit of the underlying.

50. This section sets out principles for decomposing instruments by type, followed by a detailed decomposition of common instruments. Where a detailed decomposition of an instrument is not provided, the principles should be applied, in a prudent and consistent manner. If a bank is unable to decompose a position they should consult with their supervisors, who will require a prudent percentage of the notional or market value. For positions denominated in a different currency than the domestic

[28] References to paragraphs in the existing Basel II Framework contained in this section will be updated once the revised market risk framework is finalised by the Basel Committee.

one, the conversion to the domestic currency should be done at the spot rate prior to any cross-currency aggregation.

### (a) Principles for decomposing different types of instrument

*Bonds*

51. A bond should be decomposed into the following notional positions:

- A notional position equal to the market value of the bond, which should be placed into the default risk framework.
- A series of cash flows, which should be assigned to the relevant bucket in the credit spread framework.
- A series of fixed cash flows, which should be assigned to the relevant vertices in the general interest rate risk framework.
- For fixed rate bonds, a series of cash flows, which should be assigned to the relevant bucket in the FX risk framework.

*Floating rate instruments*

52. Only the fixed payments of a floating rate instrument should be captured through the general interest rate framework. Floating rate cash flows should be placed into the appropriate bucket of the credit spread framework, framework and into the appropriate term bucket of the FX risk framework. The market value of the floating rate instrument should be placed into the default risk framework.

*Equities*

53. An equity should be decomposed into the following notional positions:

- A notional position equal to the market value or notional value of the equity instrument, which should be placed into the equity risk framework.
- A notional position equal to the market value or notional value of the equity instrument, which should be placed into the default risk framework.

*Commodities*

54. A commodity instrument gives rise to a notional position equal to the market value or notional value of the commodity instrument, which should be placed into the commodity risk framework.

*Foreign exchange*

55. A foreign currency exposure gives rise to a notional position equal to the market value or notional value of the position denominated in the foreign currency, to be placed into the FX risk framework.

*Futures/forwards*

56. A forward or a future should be decomposed into the following notional positions:

- A long cash flow equal to the forward price of the underlying in the case of a sold forward and a short cash flow equal to the forward price of the underlying in the case of a bought forward, which should be assigned to the appropriate vertex in the general interest rate framework.
- A notional position in the underlying of the future/forward equal to the notional value of the future or forward, which should be placed into the appropriate risk bucket(s) for the underlying.

*Options*

57. An option should be decomposed into the following notional positions:

- A delta-equivalent position in the underlying, equal to delta multiplied by the notional value of the option, which should be further decomposed as necessary and allocated to the appropriate risk bucket like any other position in the underlying.
- The non-delta risks of the option should be captured through the scenario matrix approach.

*Indices and baskets*

58. Indices and baskets should be decomposed into either of the following notional positions:

- A separate notional position for each of the constituents, equal to the market value of the index multiplied by the proportion of the index that the constituent represents; or
- A single notional position in the index, which should be placed into the relevant bucket if all parts of the index meet the criteria to go into a single bucket. If this is not the case, the index should be placed into the conservative residual bucket for the relevant asset class.

*Swaps*

59. Swaps should be decomposed into the following notional positions:

- A long leg, which should be placed into the appropriate standardised risk framework, with a value equal to the notional value or the decomposed cash flows of the leg.
- A short leg, which should be placed into the appropriate standardised risk framework, with a value equal to the notional value or the decomposed cash flows of the leg.

*Inflation products*

60. Inflation products should generally be treated in the same way as interest rate products.

*Derivatives where the underlying is not a traded instrument*

61. In some cases the underlying of a derivative will not be a traded instrument (such as temperature in the case of a weather derivative). In these cases, the approach taken by banks should be to attempt to infer a prudent notional value from the characteristics of the derivative contract. The notional position should then be entered into the "other" bucket of the commodity asset class. If no prudent notional position can be determined, a bank should consult with their supervisors, who will specify a prudent charge to be held against the position.

*Multi-asset derivatives*

62. Where a derivative has more than one underlying, a notional position in each of the underlyings should be allocated separately to the appropriate underlying risk buckets. In the case of an option, the delta-equivalent position in each underlying should be assigned to the appropriate bucket.

*Securitisations*

63. A securitisation should be decomposed into three notional positions:

- A series of cash flows, which should be assigned to the relevant bucket in the credit spread (securitisations) framework.
- A position equal to the market value of the instrument to go into the default risk (securitisations) framework.

- A series of fixed cash flows, which should be assigned to the relevant vertices in the GIRR framework.

*Deferred start instruments*

64. In the case of deferred start products, a notional position with a maturity equal to the start date of the instrument should be assigned to the appropriate risk bucket if the deferred start generates a risk that remains until the start date of the instrument.

*Foreign exchange swaps*

65. The separate legs of foreign exchange swaps should be included in the relevant foreign exchange risk term buckets.

*Futures/forwards on a basket/index*

66. Futures or forwards on a basket or index should be decomposed into either of the following:

- A series of futures/forwards for each of the constituents, equal to the market value of the index multiplied by the proportion of the index that the constituent represents, which should be further decomposed as necessary; or
- A position in a notional forward/future, which should be further decomposed as necessary, and resulting notional positions placed into the relevant buckets if all parts of the index meet the criteria to go into a single bucket. If this is not the case, the position should be placed into the conservative residual bucket for the relevant asset class.

*Contracts for difference*

67. A contract for difference should generally be treated as a future/forward.

*Repurchase agreements*

68. The forward cash leg of a repurchase agreement should be treated as a short cash flow that should be placed into the cash flow vertex method with a maturity equal to that of the repurchase agreement, and a long position in the asset sold under the repurchase agreement which should be placed into the appropriate risk bucket.

*Reverse repurchase agreements*

69. The forward cash leg of a reverse repurchase agreement should be treated as a long cash flow that should be placed into the cash flow vertex method with a maturity equal to that of the repurchase agreement, and a short position in the asset sold under the repurchase agreement which should be placed into the appropriate risk bucket.

*Convertible bonds*

70. A convertible bond should be treated as position in the equity into which it converts, with an adjustment to the equity risk capital requirement equal to either of the following values:

- An addition equal to the current value of any loss that would arise if the convertible bond did convert to equity; or
- A deduction equal to the current value of any profit which the firm would make if it did convert to equity.

*Deposits*

71. A deposit with a fixed rate should be treated as a long cash flow that should be placed into the cash flow vertex method, with a maturity equal to that of the deposit.

*Cash borrowings*

72. A cash borrowing with a fixed rate should be treated as a short cash flow that should be placed into the cash flow vertex method, with a maturity equal to that of the cash borrowing.

### (b) Detailed decomposition of common instruments

73. This section applies the principles set out above to those instruments that the Committee considers are most commonly traded by banks. These detailed decompositions should be considered by analogy when applying the principles to other instruments.

*Interest rate forwards/futures/FRAs*

74. An interest rate forward/future/FRA should be decomposed into the following notional positions:

- Any fixed rate cash flows should be assigned to the vertices in the general interest rate framework.
- Any floating rate cash flows do not generate a notional position. in the general interest rate framework.
- Fixed rate positions should be decomposed into the corresponding cash flows for FX risk. Any other position generates a notional in the FX risk framework.

*Interest rate options*

75. For an interest rate option, any delta equivalent fixed cash flows should be placed into the general interest rate framework. In addition, the non-delta risks of the option should be captured through the scenario matrix approach.

*Interest rate swaps*

76. An interest rate swap should be decomposed into the following notional positions:

- A series of long cash flows arising due to the receiving leg of the swap, to be placed into the cash flow vertex method. If this leg has a floating rate, then only the fixed cash flows should be placed into the cash flow vertex method.
- A series of short cash flows arising due to the paying leg of the swap, to be placed into the cash flow vertex method. If this leg has a floating rate, then only the fixed cash flow should be placed into the cash flow vertex method.
- All fixed cash flows, (including payment of notional) should be placed in the appropriate FX risk term bucket.

*Inflation options*

77. An inflation option should be treated in the same way as an interest rate option.

*Inflation swaps*

78. An inflation swap should be treated in the same way as an interest rate swap.

*Bond forwards/futures*

79. A bond forward/future should be decomposed into the following notional positions:

- A notional position equal to the notional value in the underlying bond, which should be further decomposed into cash flows that are entered into the cash flow vertex framework for general interest rate risk and the appropriate bucket for credit spread risk, as well as a notional position equal to the notional value to go into the default risk framework.
- A fixed cash flow equal to the forward price which should be placed into the cash flow vertex method, with a maturity equal to that of the forward/future.

*Credit default swaps*

80. A credit default swap (CDS) should be decomposed into the following notional positions:

- The notional value in the underlying of the CDS should be capitalised under the default risk framework.
- A series of fixed cash flows, which should be assigned to the appropriate vertices in the general interest rate risk framework.
- A series of cash flows, which should be assigned to the appropriate bucket in the credit spread risk framework.

*Credit default swap indices*

81. A credit default swap index should be decomposed as follows:

- For default risk:
    - Either: A series of separate positions in notional credit default swap should be placed in the default risk framework, equal to the market value of the index multiplied by the proportion of the index that each of the underlying credit default swaps represents.
    - Or: A single notional position, which should be placed into the default framework if all CDS in the index meet the criteria to go into that bucket.
- For credit spread risk:
    - Either: A series of fixed cash flows (including payment of notional, if applicable) on of the index multiplied by the proportion of the index that each of the underlying credit default swaps represents. Each of these should then be placed into the appropriate credit spread risk bucket, based on characteristics of the name.
    - Or: all fixed cash flows on the position, which should be placed into the appropriate credit spread risk bucket if all CDS in the index meet the criteria to go into that bucket. If this is not the case, the index should be placed into the residual credit spread risk bucket**.**
- For interest rate risk: All fixed cash flows on the position should be placed into the general interest rate framework.

*Equity forwards/futures*

82. An equity forward/future should be decomposed into the following notional positions:

- A notional position equal to the notional value of the forward or future, which should be placed into the appropriate equity risk bucket.
- A notional position equal to the notional value of the forward or future, which should be placed into the default risk framework.

- A fixed cash flow which should be placed into the cash flow vertex method for GIRR, with a value equal to the forward price and a maturity equal to that of the forward or future.

*Equity swaps*

83. An equity swap should be decomposed into the following notional positions:

- A series of long cash flows arising due to the receiving leg of the swap, to be placed into the cash flow vertex method. If this leg has a floating rate, then only the fixed payments should be placed into the GIRR framework.
- A series of short cash flows arising due to the paying leg of the swap, to be placed into the cash flow vertex method. If this leg has a floating rate, then only the fixed payments should be placed into the GIRR framework.
- A notional position equal to the notional value of the equity leg of the swap to be placed into the appropriate equity risk bucket.
- A notional position equal to the notional value of the equity leg of the swap to be placed into the default risk framework.

*Equity Option*

84. For an equity option, the delta equivalent position (delta multiplied by the notional value) in the underlying equity should be placed in the appropriate equity risk bucket. This amount should also be placed separately into the default risk framework. In addition, the non-delta risks of the option should be captured through the scenario matrix approach.

*Foreign exchange forwards/futures*

85. A foreign exchange forward/future should be decomposed into the following notional positions:

- A notional position equal to the notional value of the forward/future, with a maturity equal to the maturity of the forward/future, which should be placed into the appropriate foreign exchange risk term bucket.
- A cash flow which should be placed into the cash flow vertex method for general interest rate risk, with a value equal to the forward price and a maturity equal to that of the forward/future.

*Cross-currency swaps*

86. A cross-currency swap should be decomposed into the following notional positions:

- A series of long cash flows arising due to the receiving leg of the swap, to be placed into the cash flow vertex method. If this leg has a floating rate, then only the fixed cash flows should be placed into the cash flow vertex method.
- A series of short cash flows arising due to the paying leg of the swap, to be placed into the cash flow vertex method. If this leg has a floating rate, then only the fixed cash flows should be placed into the cash flow vertex method.
- All fixed cash flows, (including payment of notional) should be placed in the appropriate FX risk term bucket.

*Foreign exchange options*

87. For a foreign exchange option, the delta equivalent position (delta multiplied by the notional value) in the foreign currency should be placed in the appropriate foreign exchange "term bucket",

based on the maturity of the option. In addition, the non-delta risks of the option should be captured through the scenario matrix approach.

*Commodity forwards/futures*

88. A commodity forward/future should be decomposed into the following notional positions:

- A notional position equal to the notional value of the forward or future, and with a maturity equal to that of the forward/future, which should be placed into the appropriate commodity risk bucket.
- A fixed cash flow which should be placed into the cash flow vertex method, with a value equal to the forward price and a maturity equal to that of the forward/future.

*Commodity swaps*

89. A commodity swap should be decomposed into the following notional positions:

- A series of long cash flows arising due to the receiving leg of the swap, to be placed into the cash flow vertex method. If this leg has a floating rate, then only the fixed cash flows should be placed into the cash flow vertex method.
- A series of short cash flows arising due to the paying leg of the swap, to be placed into the cash flow vertex method. If this leg has a floating rate, then only the fixed cash flows should be placed into the cash flow vertex method.
- A position equal to the notional value of the commodity leg of the swap to be placed into the appropriate commodity risk bucket.

*Commodity options*

90. For a commodity option, the delta equivalent position (delta multiplied by the notional value) in the underlying commodity should be placed in the appropriate commodity risk bucket. In addition, the non-delta risks of the option should be captured through the scenario matrix approach.

## 3. Capitalisation of market risk by asset class

This section sets out in detail how capital requirements should be calculated for each asset class. Positions should be converted at the spot rate into the domestic currency of the bank.

### (a) General Interest Rate Risk (GIRR)

91. The following steps should be followed by a bank calculating a capital charge for GIRR.

#### (1) Discount cash flows using the appropriate yield curve

92. Cash flows must be discounted to their present values, using the following methodology:

(i) A risk-free yield curve for the currency in which cash flows are denominated should be constructed.

(a) A risk-free curve for each currency should be based on money market instruments that have the lowest credit risk.[29] If data on these is not available the most appropriate of the sovereign curve for the currency and the bank's own funding costs should be used.

(b) If available, the risk-free curve should be based on the curve that the firm uses internally to mark positions to market.

(c) An adjustment should be made to the risk-free curve to remove the impact of any credit spread risk from the instruments used in its construction

(ii) For each instrument, an implied credit spread should be found by calculating the option-adjusted spread assuming a parallel shift.

(iii) The curve used to discount cash flows should be the risk-free curve plus a constant add-on equal to the implied credit spread.

93. If it is not possible (for example, due to lack of data) to construct a discount curve using the methodology in paragraph 92, supervisors may allow the yield to maturity of the instrument to be used to discount at all tenors. For those instruments (such as swaps) that do not have a meaningful price, supervisors may specify an alternative methodology.

### (2) Assign discounted cash flows to vertex points on a proportional basis

94. The present values of the cash flows must then be assigned to vertex points (0.25yr, 0.5yr, 1yr, 2yr, 3yr, 5yr, 10yr, 15yr, 20yr, and 30yr), separately for each currency. Where a cash flow falls between two vertices it should be assigned on a proportional basis[30]. For example, if it has a tenor of 2.25yr, 75% of its value is assigned to the 2yr vertex and 25% of its value is assigned to the 3yr vertex.

95. Only fixed cash flows should be assigned to the GIRR framework. For a floating rate instrument, only the fixed cash flows should be assigned to a vertex. For example, for a floating rate bond the next payment date and the principal might be the only cash flows which are fixed. In this case, only these cash flows would be entered into the cash flow vertex method.

96. The risk weights in the following table are assigned to each vertex:

| **Vertex Risk Weights** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **0.25yr** | **0.5yr** | **1yr** | **2yr** | **3yr** | **5yr** | **10yr** | **15yr** | **20yr** | **30yr** |
| 0.4% | 0.8% | 1.5% | 2.5% | 3.5% | 5% | 10% | 15% | 20% | 30% |

### (3) Offset long and short discounted cash flows at each vertex

97. Long and short discounted cash flows at each vertex should be offset, in order to determine a net cash flow at each vertex. In order to account for basis risk, the position that is smaller in magnitude (ie ignoring sign) at each vertex should be multiplied by 0.9 prior to offsetting.

[29] For example, a money market curve based on OIS for shorter maturities (up to two years) and swaps for longer maturities.

[30] For a cash flow with a maturity of t which falls between two vertices with maturities $T_1$ and $T_2$ the proportion of the cash flow that should be assigned to the vertex with maturity $T_1$ is equal to $\left(\frac{T_2 - t}{T_2 - T_1}\right)$ and the proportion of the cash flow that should be assigned to the vertex with maturity $T_2$ is equal to $\left(1 - \left(\frac{T_2 - t}{T_2 - T_1}\right)\right)$. A cash flow with a maturity < 0.25 years (> 30 years) should be assigned 100% to the 0.25 year vertex (30 year vertex).

(4) Apply the formula that recognises hedging and diversification within each currency

98. The discounted net cash flows at each vertex are then put into the following formula, which recognises offsetting between cash flows at different vertices in the same currency:

$$K_b = \sqrt{\sum_i RW_i^2 MV_i^2 + \sum_i \sum_{j \neq i} \rho_{ij} RW_i MV_i RW_j MV_j}$$

Where $MV_i$ is the present value of the net cash flow at vertex $i$, $RW_i$ is the risk weight assigned to vertex $i$, and $\rho_{ij}$ is the correlation parameter between vertices $i$ and $j$,

99. The first correlation matrix below should be used for $\rho_{ij}$ if the net cash flows at vertices $i$ and $j$ have the same sign (long/long or short/short). The second correlation matrix below should be used if the net cash flows at vertices $i$ and $j$ have different signs (long/short).

**Correlations for Positions with the Same Sign**

| | 0.25yr | 0.5yr | 1yr | 2yr | 3yr | 5yr | 10yr | 15yr | 20yr | 30yr |
|---|---|---|---|---|---|---|---|---|---|---|
| **0.25yr** | | | | | | | | | | |
| **0.5yr** | 95% | | | | | | | | | |
| **1yr** | 85% | 90% | | | | | | | | |
| **2yr** | 75% | 75% | 90% | | | | | | | |
| **3yr** | 65% | 70% | 85% | 95% | | | | | | |
| **5yr** | 55% | 65% | 75% | 90% | 95% | | | | | |
| **10yr** | 45% | 50% | 60% | 75% | 80% | 90% | | | | |
| **15yr** | 40% | 45% | 50% | 65% | 75% | 85% | 95% | | | |
| **20yr** | 40% | 45% | 50% | 60% | 70% | 75% | 90% | 100% | | |
| **30yr** | 35% | 40% | 50% | 60% | 65% | 70% | 85% | 100% | 100% | |

**Correlations for Positions with Different Signs**

| | 0.25yr | 0.5yr | 1yr | 2yr | 3yr | 5yr | 10yr | 15yr | 20yr | 30yr |
|---|---|---|---|---|---|---|---|---|---|---|
| **0.25yr** | | | | | | | | | | |
| **0.5yr** | 90% | | | | | | | | | |
| **1yr** | 70% | 85% | | | | | | | | |
| **2yr** | 55% | 70% | 80% | | | | | | | |
| **3yr** | 50% | 60% | 75% | 90% | | | | | | |
| **5yr** | 40% | 45% | 60% | 75% | 85% | | | | | |
| **10yr** | 25% | 35% | 45% | 55% | 60% | 75% | | | | |
| **15yr** | 20% | 25% | 35% | 40% | 50% | 60% | 85% | | | |
| **20yr** | 15% | 20% | 30% | 40% | 50% | 60% | 75% | 85% | | |
| **30yr** | 15% | 15% | 20% | 40% | 45% | 50% | 65% | 70% | 70% | |

(5) Apply the formula that recognises hedging and diversification across currencies

100. The capital requirements for each of the individual currencies are then aggregated to obtain the overall capital requirement for GIRR. The following formula should be used to aggregate the individual currency capital requirements, recognising diversification across currencies:

$$GIRR\ Capital = \sqrt{\sum_{b=1}^{B} K_b^2 + \sum_{b=1}^{B} \sum_{c \neq b} \gamma_{bc} K_b K_c}$$

Where $K_b^2$ is the capital requirement arising from currency b and $\gamma_{bc}$ is equal to 0.5.

## (b) Credit Spread Risk (CSR): non-securitisations

101. The following steps should be followed by a bank calculating a capital charge for credit spread risk (non-securitisations).

### (1) Offset positions in identical instruments

102. Long and short positions in identical instruments are allowed to fully offset. Identical instruments should have the same underlying name, maturity, issue and coupon.

### (2) Discount cash flows using the appropriate yield curve

103. Cash flows must be discounted to their present values, using the following methodology:

(i) A risk-free curve for the currency in which cash flows are denominated should be constructed.

(a) A risk-free curve for each currency should be based on money market instruments that have the lowest credit risk.[31] If data on these are not available, the most appropriate of the sovereign curve for the currency and the bank's own funding costs should be used.

(b) If available, the risk-free curve should be based on the curve that the firm uses internally to mark positions to market.

(c) An adjustment should be made to the risk-free curve to remove the impact of any credit spread risk from the instruments used in its construction

(ii) For each instrument, an implied credit spread should be found by calculating the option-adjusted spread assuming a parallel shift.

(iii) The curve used to discount cash flows should be the risk-free curve calculated under steps (a) to (c) above, plus a constant add-on equal to the implied credit spread.

104. If it is not possible (for example, due to lack of data) to construct a discount curve using the methodology in paragraph 103, supervisors may allow the yield to maturity of the instrument to be used to discount at all tenors. For those instruments (such as swaps) that do not have a meaningful price, supervisors may specify an alternative methodology.

### (3) Assign discounted cash flows to risk buckets

105. Discounted cash flows should be assigned to the appropriate risk bucket based on the credit quality and sector of the underlying instrument. These buckets are defined as follows:

| Bucket Number | Credit Quality | Sector |
|---|---|---|
| **1** | Investment Grade (IG) | Sovereigns |
| **2** | | Financial (includes national banks) |
| **3** | | Basic Materials, Energy, Industrials |
| **4** | | Consumer |
| **5** | | Technology, Telecommunications |
| **6** | | Health care, Utilities, Local government, Government- |

[31] For example, a money market curve based on OIS for shorter maturities (up to two years) and swaps for longer maturities.

| | | |
|---|---|---|
| | | backed corporates (non-financial) |
| **7** | High Yield (HY) & Non-rated (NR) | Sovereigns |
| **8** | | Financial (includes national banks) |
| **9** | | Basic Materials, Energy, Industrials |
| **10** | | Consumer |
| **11** | | Technology, Telecommunications |
| **12** | | Health care, Utilities, Local government, Government-backed corporates (non-financial) |

106. Risk weights should be allocated to each cash flow according to the bucket that the cash flow is assigned to, and the maturity of the cash flow, as set out in the following table:

| Bucket Number | Maturity of less than five years | Maturity from five to less than 10 years | Maturity from 10 to less than 20 years | Maturity of 20 years or more |
|---|---|---|---|---|
| **1** | 5% | 5% | 10% | 20% |
| **2** | 10% | 20% | 35% | 55% |
| **3** | 5% | 15% | 25% | 45% |
| **4** | 5% | 10% | 20% | 45% |
| **5** | 5% | 10% | 20% | 40% |
| **6** | 5% | 10% | 20% | 40% |
| **7** | 5% | 10% | 20% | 35% |
| **8** | 20% | 40% | 55% | 80% |
| **9** | 15% | 30% | 50% | 75% |
| **10** | 15% | 35% | 50% | 70% |
| **11** | 15% | 35% | 45% | 65% |
| **12** | 10% | 25% | 40% | 65% |

107. If it is not possible to allocate a position to one of these buckets (for example, because data on categorical variables is not available) then the position must be allocated to a "residual bucket". The risk weights for the residual bucket are:

| | Maturity of less than five years | Maturity from five to less than 10 years | Maturity from 10 to less than 20 years | Maturity of 20 years or more |
|---|---|---|---|---|
| **Residual bucket** | 20% | 40% | 55% | 80% |

### (4) Apply the formula that recognises hedging and diversification within each bucket

108. The risk exposure for each bucket with discounted cash flows $i = 1, 2, \ldots, I$ will be calculated using the following formula, which recognises hedging and diversification within the bucket:

$$K_b = \sqrt{\sum_i RW_i^2 MV_i^2 + \sum_i \sum_{j \neq i} \rho_{ij} RW_i MV_i RW_j MV_j}$$

Where $MV_i$ is the discounted cash flow at vertex $i$, $RW_i$ is the risk weight assigned to the cash flow $i$, and $\rho_{ij}$ is the correlation parameter between cash flows $i$ and $j$.

109. The value of $\rho_{ij}$ for a pair of cash flows $i$ and $j$ will depend on the characteristics of the instruments that generate the cash flows. The correlations that should be used are set out in the following table:

| | **Same name and maturity difference less than or equal to 5 years** | **Same name, and maturity difference over 5 years** | **Different name** |
|---|---|---|---|
| **Cash flows have the same sign** | 95% | 90% | 40% |
| **Cash flows have different signs** | 75% | 60% | 10% |
| **Residual bucket – Cash flows have the same sign** | 100% | | |
| **Residual bucket – Cash flows have different signs** | 0% | | |

### (5) Apply the formula that recognises hedging and diversification across buckets

110. The risk exposures for each of the individual risk buckets must be aggregated to obtain the capital requirement for CSR. The following formula is used to aggregate the individual bucket risk exposures, recognising hedging and diversification across buckets:

$$CSR\ Capital\ = \sqrt{\sum_{b=1}^{B} K_b^2 + \sum_{b=1}^{B}\sum_{c\neq b} \gamma_{bc} S_b S_c} + K_{residual}$$

Where $K_{residual}$ is the capital requirement that arises due to the residual bucket, the parameter $S_b = \sum_{i\in b} RW_i MV_i$ and $\gamma_{bc}$ is the correlation parameter between buckets b and c, which are set out in the following correlation matrix:

| **Bucket** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | | | | | | | | | | | | |
| **2** | 10% | | | | | | | | | | | |
| **3** | 20% | 5% | | | | | | | | | | |
| **4** | 25% | 15% | 20% | | | | | | | | | |
| **5** | 20% | 20% | 25% | 25% | | | | | | | | |
| **6** | 15% | 5% | 5% | 5% | 5% | | | | | | | |
| **7** | 20% | 10% | 10% | 10% | 15% | 10% | | | | | | |
| **8** | 15% | 15% | 15% | 15% | 20% | 15% | 25% | | | | | |
| **9** | 20% | 5% | 0% | 0% | 10% | 5% | 15% | 20% | | | | |
| **10** | 20% | 15% | 25% | 25% | 20% | 20% | 20% | 20% | 25% | | | |
| **11** | 20% | 0% | 0% | 5% | 20% | 10% | 15% | 20% | 15% | 15% | | |
| **12** | 15% | 30% | 40% | 40% | 15% | 30% | 20% | 15% | 15% | 20% | 15% | |

## (C) Credit Spread Risk (CSR): securitisations

111. The following steps should be followed by a bank calculating a capital charge for credit spread risk (securitisations).

### (1) Offset positions in identical instruments

112. Long and short positions in identical instruments are allowed to fully offset. Identical instruments should have the same underlying name, seniority, maturity, issue and coupon.

### (2) Discount cash flows using the appropriate yield curve

113. Cash flows must be discounted to their present values, using the following methodology:

(i) A risk-free curve for the currency in which cash flows are denominated should be constructed.

(a) A risk-free curve for each currency should be based on money market instruments that have the lowest credit risk.[32] If data on these are not available, the most appropriate of the sovereign curve for the currency and the bank's own funding costs should be used.

(b) If available, the risk-free curve should be based on the curve that the firm uses internally to mark positions to market.

(c) An adjustment should be made to the risk-free curve to remove the impact of any credit spread risk from the instruments used in its construction

(ii) For each instrument, an implied credit spread should be found by calculating the option-adjusted spread assuming a parallel shift.

(iii) The curve used to discount cash flows should be the risk-free curve calculated under steps (a) to (c) above, plus a constant add-on equal to the implied credit spread.

114. If it is not possible (for example, due to lack of data) to construct a discount curve using the methodology in paragraph 113, supervisors may allow the yield to maturity of the instrument to be used to discount at all tenors. For those instruments (such as swaps) that do not have a meaningful price, supervisors may specify an alternative methodology.

### (3) Assign discounted cash flows to risk buckets[33]

115. Discounted cash flows should be assigned to the appropriate risk bucket based on the credit quality and type the underlying instrument. For corporate CDOs and their hedges there are two buckets: investment grade and high-yield/non-rated.

[32] For example, a money market curve based on OIS for shorter maturities (up to two years) and swaps for longer maturities.

[33] Securitisations have particular features and their cashflows can vary in ways which merit specific treatment. Despite the unique features of securitisations, the risk weights and correlations for the credit spread risk in securitisations (including risk weights derived from the formula in paragraph 117) reflect preliminary analysis of data sets that followed the approach used in other asset classes. These should therefore be considered illustrative, although they will be used as a starting point for the QIS analysis. Further analysis and augmentation of these data sets could result in findings which suggest that changes to the securitisation approach may be warranted. Further work is envisioned in this area. In particular, through the QIS the Committee will look at the size of the ratings-based charges and how to define maturity.

The final risk weights and correlations for both credit spread risk and credit default risk in securitisations will be determined in conjunction. This is to ensure a credible calibration of the overall capital charges for securitisations in the trading book. The Committee is also conscious of not creating material arbitrage incentives resulting from differences in capital requirements for securitisations in the trading book and banking book. As with all areas in the consultative paper, the Committee welcomes comments in this area.

| Bucket Number | Credit Quality | Sector |
|---|---|---|
| **1** | Investment grade (IG) | Corporate CDOs |
| **2** | High-yield (HY) & Non-rated (NR) | Corporate CDOs |
| **3** | Quality by tranche seniority | MBS |
| **4** | Quality by tranche seniority | Credit Card ABS |
| **5** | Quality by tranche seniority | Residual |

116. For corporate CDOs the index risk weights should be allocated to each cash flow according to the vertex that the cash flow is assigned to, and the maturity of the cash flow, as set out in the following table:

| Bucket Number | Product | Grade | Maturity 1 year | Maturity T years |
|---|---|---|---|---|
| **1** | Corporate CDOs | Investment grade (IG) | 1.8% | min( T*1.8% ,100% ) |
| **2** | Corporate CDOs | High-yield (HY)/Non-rated (NR) | 7.0% | min( T*7.0% , 100% ) |

117. The risk weight for a corporate CDO tranche with attachment A and detachment D is calculated according to the formula:

$$RW_{A,D,b} = f(A,D)RW_{index,b}$$

Where $RW_{index,b}$ is defined in paragraph 116 and the function f is defined as:

$$f(A,D) = \frac{1+\alpha}{(1+\alpha A)(1+\alpha D)}$$

with $\alpha = 14$.

118. An exposure to a credit index or other portfolio of credit exposures (eg single-name hedges) which hedges or is hedged by credit corporate CDO tranches may be considered a 0–100% tranche. When credit exposures are used in this way, they must be removed from the model-based approach or non-securitisation standardised approach as applicable.

119. For corporate MBS and credit card ABS the risk weights should be allocated to each cash flow according to the vertex that the cash flow is assigned to, and the maturity of the cash flow, as set out in the following table. Positions rated below [BB] will have a 100% risk weight:

| Bucket Number | Product | Tranche Grade | Maturity one year | Maturity T years |
|---|---|---|---|---|
| **3** | MBS | AAA | 0.9% | min( T*0.9% , 100% ) |
| | | AA | 2.6% | min( T*2.6% , 100% ) |
| | | BBB | 5.3% | min( T*5.3% , 100% ) |
| | | BB | 25% | min( T*25% , 100% ) |

| | | | | |
|---|---|---|---|---|
| **4** | Credit cards ABS | AAA | 1.1% | min( T*1.1% , 100% ) |
| | | A | 2.5% | min( T*2.5% , 100% ) |
| | | BBB | 3.7% | min( T*3.7% , 100% ) |
| | | BB | 18% | min( T*18% , 100% ) |

120. If it is not possible to allocate a position to one of these buckets (for example, because data on categorical variables is not available) then the position must be allocated to a "residual bucket". The risk weights for the residual buckets are listed in the following table. Positions rated below [BB] will have a 100% risk-weight:

| Bucket Number | Product | Tranche Grade | Maturity 1 year | Maturity T years |
|---|---|---|---|---|
| **5** | Residual | AAA | 1.5% | min( T*1.5% , 100% ) |
| | | A/AA | 4.5% | min( T*4.5% , 100% ) |
| | | BBB | 8% | min( T*8% , 100% ) |
| | | BB | 40% | min( T*40% , 100% ) |

(4) Apply the formula that recognises hedging and diversification within each bucket

121. The risk exposure for each bucket with discounted cash flows $i = 1, 2, \ldots, I$ will be calculated using the following formula, which recognises hedging and diversification within the bucket:

$$K_b = \sqrt{\sum_{i=1}^{I} RW_i^2 MV_i^2 + \sum_{i=1}^{I} \sum_{j \neq i} \rho_{ij} \, RW_i MV_i RW_j MV_j}$$

Where $MV_i$ is the discounted cash flow at vertex $i$, $RW_i$ is the risk weight assigned to the cash flow $i$, and $\rho_{ij}$ is the correlation parameter between cash flows $i$ and $j$.

122. The value of $\rho_{ij}$ for a pair of cash flows $i$ and $j$ will depend on the characteristics of the instruments that generate the cash flows. The correlations that should be used are set out in the following table:

| | Same underlying names (more than 80% overlap in notional terms) | Different underlying names (less than 80% overlap in notional terms) |
|---|---|---|
| **Cash flows have the same sign** | 80% | 100% |
| **Cash flows have different signs** | 40% | 0% |
| **Residual bucket – Cash flows have the same sign** | 100% | |
| **Residual bucket – Cash flows have different signs** | 0% | |

### (5) Apply the formula that recognises hedging and diversification across buckets

123. The risk exposures for each of the individual risk buckets must be aggregated to obtain the capital requirement for CSR. The following formula is used to aggregate the individual bucket risk exposures, recognising hedging and diversification across buckets:

$$CSR\ Capital\ =\ \sqrt{\sum_{b=1}^{B} K_b^2 + \sum_{b=1}^{B}\sum_{c\neq b} \gamma_{bc} S_b S_c}\ +\ K_{residual}$$

Where $K_{residual}$ is the capital requirement that arises due to the residual bucket, the parameter $S_b = \sum_{i\in b} RW_i MV_i$ and $\gamma_{bc}$ is the correlation parameter between buckets b and c, which is set to zero.

## (D) Equity Risk

124. The following steps should be followed by a bank calculating a capital charge for equity risk.

### (1) Offset equities in the same equity name

125. Long and short notional positions in the same equity name are allowed offset each other.

### (2) Place the net position in each equity name into the relevant bucket

126. Net notional positions in each equity name are then assigned to the appropriate equity bucket based on their observable characteristics, according to the following table:

| Bucket Number | Size | Region | Sector |
|---|---|---|---|
| **1** | Large | Emerging markets | Consumer, Utilities |
| **2** | | | Telecommunications, Industrials |
| **3** | | | Basic materials, Energy |
| **4** | | | Financial, Technology |
| **5** | | Developed markets | Consumer, Utilities |
| **6** | | | Telecommunications, Industrials |
| **7** | | | Basic materials, Energy |
| **8** | | | Financial, Technology |
| **9** | Small | Emerging markets | All sectors |
| **10** | | Developed markets | All sectors |

Where “large” is defined as a market capitalisation equal to or greater than $2 billion and “small” is defined as a market capitalisation of less than $2 billion.

Where the developed markets are defined as: North America, the euro area, the non-euro area western European countries (the United Kingdom, Norway, Sweden, Denmark, and Switzerland), Japan, and Oceania (Australia and New Zealand).

The sectors definition is the one generally used in the market. When allocating an equity position to a particular bucket, the bank must prove that the equity issuer’s most material activity indeed corresponds to the bucket’s definition. Acceptable proofs might be external providers’ information, or internal analysis.

For those multinational multi-sector equity issuers, the allocation to a particular bucket must be done according to the most material region and sector the issuer operates in.

127. If it is not possible to allocate a position to one of these buckets (for example, because data on categorical variables is not available) then the position must be allocated to a "residual bucket". Risk weights should be assigned to each notional position as in the following table:

| Bucket number | Risk weight |
|---|---|
| **1** | 55% |
| **2** | 60% |
| **3** | 45% |
| **4** | 55% |
| **5** | 30% |
| **6** | 35% |
| **7** | 40% |
| **8** | 50% |
| **9** | 70% |
| **10** | 50% |
| **Residual bucket** | 70% |

(3) Apply the formula that recognises hedging and diversification within each bucket

128. The risk exposure for each bucket with notional positions $i = 1, 2, \ldots, I$ will be calculated using the following formula, which recognises offsetting and diversification within the bucket:

$$K_b = \sqrt{\sum_i RW_i^2 MV_i^2 + \sum_i \sum_{j \neq i} \rho_{ij} RW_i MV_i RW_j MV_j}$$

Where $MV_i$ is the value of the notional position in equity $i$, $RW_i$ is the risk weight assigned to equity $i$, and $\rho_{ij}$ is the correlation parameter between equities $i$ and $j$.

129. The value of $\rho_{ij}$ for a pair of equities $i$ and $j$ will depend on whether the two positions have the same sign (long/long or short/short) or different signs (long/short), according to the table:

| Bucket number | Same sign | Different sign |
|---|---|---|
| **1** | 20% | 10% |
| **2** | 20% | 15% |
| **3** | 25% | 15% |
| **4** | 30% | 20% |
| **5** | 20% | 10% |
| **6** | 30% | 15% |
| **7** | 35% | 20% |
| **8** | 35% | 20% |
| **9** | 15% | 5% |
| **10** | 25% | 10% |
| **Residual bucket** | 100% | 0% |

Where "large" is defined as a market capitalisation equal to or greater than $2 billion and "small" is defined as a market capitalisation of less than $2 billion.

### (4) Apply the formula that recognises hedging and diversification across buckets

130. The risk exposures for each of the individual risk buckets must be aggregated to obtain the capital requirement for equity risk. The following formula is used to aggregate the individual bucket risk exposures, recognising hedging and diversification across buckets:

$$Equity\ Risk\ Capital\ = \sqrt{\sum_{b=1}^{B} K_b^2 + \sum_{b=1}^{B}\sum_{c\neq b} \gamma_{bc} S_b S_c} + K_{residual}$$

Where $K_{residual}$ is the capital requirement that arises due to the residual bucket, the parameter $S_b = \sum_{i\in b} RW_i MV_i$ and $\gamma_{bc}$ is the correlation parameter between buckets b and c, which are set out in the following correlation matrix:

| Buckets | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | | | | | | | | | | |
| **2** | 15% | | | | | | | | | |
| **3** | 15% | 15% | | | | | | | | |
| **4** | 15% | 15% | 15% | | | | | | | |
| **5** | 10% | 10% | 10% | 10% | | | | | | |
| **6** | 10% | 10% | 10% | 10% | 20% | | | | | |
| **7** | 10% | 10% | 10% | 10% | 20% | 20% | | | | |
| **8** | 10% | 10% | 10% | 10% | 20% | 20% | 20% | | | |
| **9** | 10% | 10% | 10% | 10% | 10% | 10% | 10% | 10% | | |
| **10** | 10% | 10% | 10% | 10% | 15% | 15% | 15% | 15% | 10% | |

## (E) Commodity Risk

131. The following steps should be followed by a bank calculating a charge for commodity risk.

### (1) Offset positions in identical instruments

132. Long and short positions in identical instruments only are allowed to fully offset. Offsetting is not permitted between different instruments relating to the same commodity.

### (2) Place notional positions into the relevant bucket

133. Notional positions in each commodity must be assigned to the appropriate bucket. The buckets and risk weights assigned to positions in each bucket are as follows:

| Bucket | Commodity | Risk Weight |
|---|---|---|
| **1** | Coal | 30% |
| **2** | Crude oil | 35% |
| **3** | Electricity | 60% |
| **4** | Freight | 80% |
| **5** | Metals | 40% |
| **6** | Natural gas | 45% |
| **7** | Precious metals (inc. gold) | 20% |
| **8** | Other | 50% |
| **9** | Grains & oilseed | 35% |
| **10** | Livestock & dairy | 25% |
| **11** | Softs and other agriculturals | 35% |

(3) Apply the formula that recognises hedging and diversification within each bucket

134. The risk exposure for each bucket with notional positions $i = 1, 2, \ldots, I$ must be calculated using the following formula, which recognises offsetting and diversification within the bucket:

$$K_b = \sqrt{\sum_i RW_i^2 MV_i^2 + \sum_i \sum_{j \neq i} \rho_{ij} RW_i MV_i RW_j MV_j}$$

Where $MV_i$ is the value of the notional position in commodity$i$, $RW_i$ is the risk weight assigned to commodity $i$, and $\rho_{ij}$ is the correlation parameter between commodities $i$ and $j$.

135. The value of $\rho_{ij}$ for a pair of commodity positions $i$ and $j$ will depend on the characteristics of the instrument and underlying commodity, as set out in the following tables. The correlation parameters within the "other" bucket should be set to one for positions with the same sign and zero for positions with different signs.

**Maturity difference less than six months**

| | **Same location, Same grade,** | **Same location, Different grade** | **Different location, Same grade** | **Different location, Different grade** |
|---|---|---|---|---|
| **Same sign** | 90% | 70% | 70% | 50% |
| **Different sign** | 80% | 60% | 60% | 40% |

**Maturity difference from six months to one year**

| | **Same location, Same grade,** | **Same location, Different grade** | **Different location, Same grade** | **Different location, Different grade** |
|---|---|---|---|---|
| **Same sign** | 80% | 60% | 60% | 40% |
| **Different sign** | 70% | 50% | 50% | 30% |

**Maturity difference more than one year**

| | **Same location, Same grade,** | **Same location, Different grade** | **Different location, Same grade** | **Different location, Different grade** |
|---|---|---|---|---|
| **Same sign** | 70% | 50% | 50% | 30% |
| **Different sign** | 60% | 40% | 40% | 20% |

### (4) Apply the formula that recognises hedging and diversification across buckets

136. The risk exposures for each of the individual risk buckets must be aggregated to obtain the capital requirement for commodity risk. The following formula is used to aggregate the individual bucket risk exposures, recognising hedging and diversification across buckets:

$$Commodity\ Risk\ Capital = \sqrt{\sum_{b=1}^{B} K_b^2 + \sum_{b=1}^{B} \sum_{c \neq b} \gamma_{bc} S_b S_c} + K_{residual}$$

Where $K_{residual}$ is the capital requirement that arises due to the "Other" bucket, the parameter $S_b = \sum_{i \in b} RW_i MV_i$ and $\gamma_{bc}$ is the correlation parameter between buckets b and c, which are set out in the following correlation matrix:

| Buckets | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | | | | | | | | | | | |
| **2** | 35% | | | | | | | | | | |
| **3** | 5% | 5% | | | | | | | | | |
| **4** | 20% | 45% | 0% | | | | | | | | |
| **5** | 20% | 45% | 5% | 25% | | | | | | | |
| **6** | 25% | 15% | 0% | 0% | 5% | | | | | | |
| **7** | 15% | 30% | 15% | 10% | 25% | 5% | | | | | |
| **8** | 0% | 0% | 0% | 0% | 0% | 0% | 0% | | | | |
| **9** | 25% | 35% | 0% | 15% | 25% | 15% | 15% | 0% | | | |
| **10** | 10% | 5% | 5% | 0% | 10% | 0% | 0% | 0% | 5% | | |
| **11** | 20% | 35% | 5% | 15% | 35% | 10% | 20% | 0% | 30% | 10% | |

## (F) Foreign Exchange Risk

137. The following steps should be followed by a bank calculating a capital charge for FX risk.

### (1) Discount cash flows using the appropriate yield curve

138. Cash flows must be discounted to their present values, using the following methodology:

(i) A risk-free yield curve for the currency in which cash flows are denominated should be constructed.

(a) A risk-free curve for each currency should be based on money market instruments that have the lowest credit risk.[34] If data on these are not available the most appropriate of the sovereign curve for the currency and the banks' own funding costs should be used.

(b) If available, the risk-free curve should be based on the curve that the firm uses internally to mark positions to market.

(c) An adjustment should be made to the risk-free curve to remove the impact of any credit spread risk from the instruments used in its construction

(ii) For each instrument, an implied credit spread should be found by calculating the option-adjusted spread assuming a parallel shift.

[34] For example, a money market curve based on OIS for shorter maturities (up to two years) and swaps for longer maturities.

(iii) The curve used to discount cash flows should be the risk-free curve plus a constant add-on equal to the implied credit spread.

139. If it is not possible (for example, due to lack of data) to construct a discount curve using the methodology in paragraph 138, supervisors may allow the yield to maturity of the instrument to be used to discount at all tenors. For those instruments (such as swaps) that do not have a meaningful price, supervisors may specify an alternative methodology.

### (2) Allocate currencies to term buckets

140. The present values of the cash flows are, in each currency, separately allocated to one of the following term buckets:

| Term Bucket | Maturity |
|---|---|
| **1** | Less than 1 year |
| **2** | 1 year to 3 years |
| **3** | More than 3 years |

141. The above cash flow decomposition does not apply to floating rate instruments or instruments where the cash flows are unknown. For floating rate instruments, the entire market value of the instrument should be assigned to the corresponding term bucket. For instance, for a floating rate bond, the next payment date and the principal might be the only cash flows, which are fixed. In this case, the market value of the bond will be assigned to the bucket corresponding to the bond's maturity. For swaps, the notional of each leg is assigned to the corresponding term bucket.

### (3) Offset long and short positions within term buckets

142. Within each term bucket long and short positions may offset each other.

### (4) Aggregate term buckets to arrive at a net exposure in each currency

143. For each currency, a net exposure to the currency is calculated by applying an aggregation formula that reflects limited offsetting between exposures in different term buckets.

$$\sqrt{\sum_{i=1}^{I} MV_i^2 + \sum_{i=1}^{I} \sum_{j \neq i} \rho_{ij}\, MV_i MV_j}$$

Where $MV_i$ is the value of the net exposure in term bucket $i$, and $\rho_{ij}$ is the correlation parameter between term buckets $i$ and $j$ as given in the following table:

| Net exposures with the same sign | | | |
|---|---|---|---|
| **Term Bucket** | **1** | **2** | **3** |
| **1** | | | |
| **2** | 95% | | |
| **3** | 70% | 85% | |

| Net exposures with different signs | | | |
|---|---|---|---|
| **Term Bucket** | **1** | **2** | **3** |
| **1** | | | |
| **2** | 90% | | |
| **3** | 65% | 80% | |

### (5) Aggregate exposures across all currencies

144. The net exposures towards each currency must then be aggregated to obtain an overall exposure to all currencies. The following formula should be used in order to recognise hedging and diversification between net exposures in different currencies.

$$\sqrt{\sum_{i=1}^{I} MV_i^2 + \sum_{i=1}^{I}\sum_{j\neq i} \rho\, MV_i MV_j}$$

Where $MV_i$ is the net exposure in currency $i$, and the correlation parameter $\rho$ is equal to 60%.

### (6) Calculate the capital charge for FX risk

145. The overall exposure to all currencies is multiplied by 15% to obtain the capital charge for FX risk.

## (G) Default risk (non-securitisations)

146. The following steps should be followed by a bank calculating a capital charge for default risk (non-securitisations).

### (1) Risk weight exposures based on LGD of asset class

147. Loss risk weights (LGD) are assigned to positions to determine the jump-to-default (JTD) loss amount. The jump-to-default (JTD) amount is determined by the notional amount and market value.

$$JTD = LGD \times Notional - MtM\ Loss$$

Where *MtM Loss* is the mark-to-market loss already taken on the exposure, and *Notional* is the bond equivalent notional of the position.

Equity instruments and non-senior debt instruments are assigned a LGD of 100%. Senior debt instruments are assigned a LGD of 75%.

### (2) Offset exposures to the same obligor

148. LGD-weighted long positions and LGD-weighted short positions to the same obligor may be offset, where the short position has the same or lower seniority relative to the long (for example, a short position in an equity may offset a long position in a bond, but a short position in a bond cannot offset a long position in the equity).

### (3) Sum the loss risk-weighted positions for long positions

149. A simple sum of the loss risk-weighted long positions must be calculated, where the summation is across the credit quality categories.

### (4) Sum the loss risk-weighted positions for short positions

150. A simple sum of the loss risk-weighted short positions must be calculated, where the summation is across the credit quality categories. Short positions with a maturity less than the capital horizon should be weighted by the ratio of their maturity relative to the capital horizon. For example, if the capital horizon is one year, a three-month short position would be weighted so that its benefit against long positions would be reduced to one quarter of the position size.

(5) Discount the loss risk-weighted short positions by the ratio of gross long to short positions

151. The sum of the risk-weighted short positions must be multiplied by the weighting term WtS

$$WtS = \frac{\sum JTD_{long}}{\sum JTD_{long} + \sum |JTD_{short}|}$$

Where the summation is across the credit quality categories, and the jump-to-default (JTD) amount is as specified above.

(6) Assign default risk weights according to credit quality of underlying name

152. Default risk weights are assigned to credit quality categories, as in the following table:

| Credit Quality Category | Default Risk Weight |
|---|---|
| **AAA** | 0.5% |
| **AA** | 2% |
| **A** | 3% |
| **BBB** | 6% |
| **BB** | 15% |
| **B** | 30% |
| **CCC** | 50% |
| **Unrated** | 15% |

153. For government paper[35] that is denominated in a domestic currency and funded by the bank in the same currency, at national discretion a lower default risk weight may be applied.

(7) Calculate the capital requirement for each credit quality category

154. The overall capital charge for each category should then be calculated as the sum of the risk-weighted long positions less the discounted risk-weighted short positions, which recognises hedging:

$$\text{Capital Charge for each credit quality category} = \sum RW\ long - WtS \times \sum RW\ short$$

Where *RW long* are the risk-weighted long positions, *RW short* are the risk-weighted short positions, and the summation is across the credit quality subcategories.

(8) Calculate the overall capital requirement for default risk

155. No hedging is recognised across different asset class categories. Therefore, the total capital charge for default risk must be calculated as a simple sum of the asset class category level capital charges. For example, no hedging or diversification is recognised across corporate and sovereign debt, and the total capital charge is the sum of the corporate capital charge and the sovereign capital charge.

[35] Government paper includes sovereign bonds as well as Treasury bills and other short-term instruments. It also includes, at national discretion, local and regional governments subject to a 0% credit risk weight in the banking book, under the Basel II Capital Accord.

## (H) Default risk (securitisations)

156. For default risk (securitisations), the same approach should be followed as for default risk (non-securitisations). However, the default risk weights will differ by tranche (instead of by credit quality category), and additional constraints will apply to the recognition of offsetting and hedging.

### Constraints on offsetting for securitisations (step 3 of the default risk framework)

157. For default risk (securitisations) the definition of the same "obligor" for the purposes of offsetting is limited to a specific tranche and underlying asset pool. This means that:

- No offsetting is permitted across securitisations of different asset pools, even if the tranche is the same. However, for corporate index tranches different series of the same name may offset.
- No offsetting is permitted across tranches of the same asset pool.

158. Offsetting will be allowed across different maturities of the same asset pool or index.

### Default risk weights for securitisations (step 7 of the default risk framework)

159. [*The risk weights will be based on the proposed risk weights in the corresponding treatment for the Banking Book, which will be released in a separate Basel Committee publication. Adjustments will be made to avoid double counting due to the maturity adjustment since migration risk will be captured in the credit spread charge.*]

160. For the purposes of calculating JTD in step 6 above the LGDs for securitisation tranches will be 100% for equity [and mezzanine] tranches and [75%] for senior tranches.

161. The tranches in the table of default risk weights above correspond to:

- Equity: any tranche with detachment point less than or equal to 10%.
- Mezzanine: any tranche with detachment point >10% and attachment point < 30%.
- Senior: any tranche with attachment point equal to or greater than 30%.

### Constraints on hedging for securitisations (step 8 of the default risk framework)

162. For default risk (securitisations) the extent that hedging benefit will be recognised under step 6 of the default risk framework will be recognised is constrained:

- No hedging between long and short exposures across regions is allowed, except for corporates. Offsetting is allowed within regions. For example, no hedging of North America vs Europe, or Europe vs Asia.
- No hedging is permitted across asset classes (such as ABS vs RMBS).
- Hedging is allowed among corporate securitised exposures, within tranche groups across regions, for example across CDX and iTraxx index tranche exposures.
- Hedging is allowed within tranche groups: equity, mezzanine and senior - as defined in the table of default risk weights for securitisations above.
- No hedging is allowed across tranches, except as described in the following. Hedging is allowed across tranche groups, for tranches of the same credit index (whether or not of the same series). Hedging is also allowed for tranches where the overlap between the underlying names is 80% or greater in notional terms. For the purposes of this article, credit exposures to underlying names may be considered 0–100% tranches, so a 30–100% tranche in an index may be hedged by a short position in the index. The risk-weight for the 0–100% tranche will be the risk-weight of the underlying assets according to the default risk (non-securitisations) asset class treatment. When

underlying names are used in this way, they must be removed from the model based approach or non-securitisation standardised approach as applicable.

## (l) Options non-delta risk

163. The following steps should be followed by a bank calculating a capital charge for options:

### (1) Assign the delta equivalent position in the underlying to the appropriate risk bucket

164. The delta-equivalent position in the underlying of the option should be placed into the appropriate risk bucket and treated like any other position in the underlying. The delta-equivalent position is equal to delta multiplied by the notional of the option.

### (2) Revalue the option portfolio following simultaneous shifts in the underlying and volatility

165. All options on a particular underlying should be placed into a single scenario matrix. These options must be fully revalued using the pricing models of the firm, given seven scenarios:

- Underlying price or rate up / underlying volatility up
- Underlying price or rate up / underlying volatility down
- Underlying price or rate down / underlying volatility up
- Underlying price or rate down / underlying volatility down
- No change in either underlying price/rate or volatility
- Underlying price or rate unchanged / underlying volatility up
- Underlying price or rate unchanged / underlying volatility down

166. Positions in identical option contracts with the same underlying should be revalued as single positions. Positions in option contracts that are not identical should be revalued separately. Option contracts should be regarded identical if they have equal contractual parameters. The contractual parameters that should be regarded are maturity, strike, type of option (ie call or put), barrier and all other parameters that may be specific to an option contract.

167. The magnitude of the assumed shift in the underlying price or rate is given by the risk weight of the underlying. For interest rates, the risk weight should be divided by the tenor of the vertex in years (ie 3 months = 0.25 years) to determine an absolute shift in rates. For example, the one-year vertex has a risk weight of 1.5% and so a 1.5% absolute shift in rates should be used, whereas the 30-year vertex has a 30% risk weight and so a 1% absolute shift in rates should be used.

168. The shifts upwards and downwards to the volatility of the underlying will depend on the direction the underlying is shifted and the sign of the vega of each option position, as set out in the following tables:

| **Equity options** | | | | |
|---|---|---|---|---|
| | **Volatility up** | | **Volatility down** | |
| | **Vega > 0** | **Vega ≤ 0** | **Vega > 0** | **Vega ≤ 0** |
| **Underlying up** | +20% | +25% | -25% | -20% |
| **Underlying unchanged** | +20% | +25% | -25% | -20% |
| **Underlying down** | +30% | +40% | -10% | -5% |

| **Interest rate options** |
|---|

| | Volatility up | | Volatility down | |
|---|---|---|---|---|
| | **Vega > 0** | **Vega ≤ 0** | **Vega > 0** | **Vega ≤ 0** |
| **Underlying up** | +20% | +30% | -20% | -15% |
| **Underlying unchanged** | +20% | +25% | -25% | -20% |
| **Underlying down** | +20% | +25% | -25% | -20% |

| **Commodity options** | | | | |
|---|---|---|---|---|
| | **Volatility up** | | **Volatility down** | |
| | **Vega > 0** | **Vega ≤ 0** | **Vega > 0** | **Vega ≤ 0** |
| **Underlying up** | +30% | +40% | -10% | -5% |
| **Underlying unchanged** | +20% | +25% | -25% | -20% |
| **Underlying down** | +20% | +25% | -25% | -20% |

| **All other options** | | | | |
|---|---|---|---|---|
| | **Volatility up** | | **Volatility down** | |
| | **Vega > 0** | **Vega ≤ 0** | **Vega > 0** | **Vega ≤ 0** |
| **Underlying up** | +30% | +40% | -25% | -20% |
| **Underlying unchanged** | +20% | +25% | -25% | -20% |
| **Underlying down** | +30% | +40% | -25% | -20% |

### (3) Strip out the effect of delta from the scenario matrix

169. After revaluing each set of identical option contracts given an assumed shift in the underlying and an assumed shift in the volatility of the underlying, the effect of delta should be stripped out. The result should be that only the changes in the value of each option that arise due to non-delta impacts will be captured in the scenario matrix.

170. To strip out the effect of delta for each individual option for each scenario, the value of delta before any shifts are assumed should be multiplied by all of the following:

- The number of underlying the option contract specifies.
- The price of each underlying before any shift is assumed.
- The relative percentage shift in the underlying specified for that scenario.

171. This amount is equivalent to the current value of delta multiplied by:

- The number of underlying the option contract specifies.
- The absolute shift in the underlying specified for the scenario.

### (4) Calculate the capital charge for non-delta risk for each underlying

172. After delta-stripping, the scenario matrix each cell will constitute net profits or losses across options on a particular underlying due to the non-delta impacts of that particular scenario. Each scenario will contain one cell with a net profit or loss for the positive vega positions and one cell with a net profit or loss for the negative vega positions.

173. For each scenario, the net profits or losses in the positive and negative vega cells should be netted. The netting of the positive and negative vega position profits and losses will result in a net profit or loss for each scenario for each underlying.

174. The risk exposure for non-delta risk for an underlying will then be calculated as the largest net loss contained in the scenario matrix for that underlying. In some cases all scenarios will result in a gain

(for example, where a bank is long gamma). In these cases, the central scenario (of no change) should be used; resulting in a risk exposure of zero.

### (5) Calculate an overall capital charge for non-delta risk

175. The overall capital charge for non-delta risk for each risk class will be calculated by placing the capital charges arising due to individual scenario matrices for that risk class into the aggregation formula:

$$Options\ Non\ Delta\ Risk\ Capital = \sqrt{\sum_{b=1}^{B} K_b^2 + \sum_{b=1}^{B}\sum_{c\neq b} \gamma_{bc} K_b K_c}$$

Where $K_b$ is the risk exposure arising from the scenario matrix from underlying b, $K_c$ is the risk exposure arising from the scenario matrix for underlying c and $\gamma_{bc}$ is the correlation between the two underlyings. The correlation $\gamma_{bc}$ will depend on combination of scenarios that generated the largest losses for the two underlyings. The correlation will be determined according to the following table:

| | **Same direction move in underlying / Same direction move in volatility** | **Same direction move in underlying / Different direction move in volatility** | **Different direction move in underlying / Same direction move in volatility** | **Different direction move in underlying / Different direction move in volatility** |
|---|---|---|---|---|
| **Underlyings in same buckets** | 0.9 | 0.5 | 0.5 | 0.1 |
| **Underlyings in different buckets** | 0.6 | 0.5 | 0.5 | 0.4 |

# D. Market risk – The Internal Models Approach

## 1. General criteria

176. The use of an internal model for the purposes of regulatory capital determination will be conditional upon the explicit approval of the bank's supervisory authority. Home and host country supervisory authorities of banks that carry out material trading activities in multiple jurisdictions intend to work cooperatively to ensure an efficient approval process.

177. The supervisory authority will only give its approval if at a minimum:

- It is satisfied that the bank's risk management system is conceptually sound and is implemented with integrity;
- The bank has, in the supervisory authority's view, sufficient numbers of staff skilled in the use of sophisticated models not only in the trading area but also in the risk control, audit and, if necessary, back office areas;
- The bank's models have, in the supervisory authority's judgement, a proven track record of reasonable accuracy in measuring risk;
- The bank regularly conducts stress tests along the lines discussed in paragraphs 195 to 202 below; and

- The positions included in the internal model for regulatory capital determination are held in approved trading desks that have passed the required tests described in paragraph 182 below.

178. Supervisory authorities will be able to insist on a period of initial monitoring and live testing of a bank's internal model before it is used for supervisory capital purposes.

179. In addition to these general criteria, banks using internal models for capital purposes will be subject to the additional requirements detailed below.

## 2. Qualitative standards

180. Supervisory authorities must be able to assure themselves that banks using internal models have market risk management systems that are conceptually sound and implemented with integrity. Accordingly, the bank must meet the following *qualitative criteria* on an ongoing basis. Supervisors must assess that banks have met the criteria before they are permitted to use a models-based approach. These qualitative criteria include:

(a) The bank must have an independent risk control unit that is responsible for the design and implementation of the bank's risk management system. The unit should produce and analyse daily reports on the output of the bank's risk measurement model, including an evaluation of the relationship between measures of risk exposure and trading limits. This unit must be independent from business trading units and should report directly to senior management of the bank.

(b) The unit must conduct regular backtesting and profit and loss (P&L) attribution programmes, ie an ex-post comparison of the risk measure and P&L values generated by the model against actual daily changes in portfolio values over longer periods of time, as well as hypothetical changes based on static positions. Both of these exercises should be conducted at a trading desk level, while regular backtesting should also be conducted on the firm-wide internal model for regulatory capital determination level.

(c) A distinct unit must conduct the initial and ongoing validation of all internal models.

(d) Board of directors and senior management must be actively involved in the risk control process and need to regard risk control as an essential aspect of the business to which significant resources are devoted. In this regard, the daily reports prepared by the independent risk control unit must be reviewed by a level of management with sufficient seniority and authority to enforce both reductions of positions taken by individual traders and reductions in the bank's overall risk exposure.

(e) Internal models used to calculate market risk capital charges are likely to differ from those used by banks in their day-to-day internal management functions. Nevertheless, the starting point for the design of both the regulatory and the internal risk models should be the same. In particular, the valuation models that are embedded in both should be similar. These valuation models should be an integral part of the internal identification, measurement, management and internal reporting of price risks within the firm. As well, internal risk models should, at a minimum, cover the positions covered by the regulatory models, although they may cover more. In the construction of their regulatory capital models, banks should start from the methodologies used in their internal models with regard to risk factor identification, parameter estimation and proxy concept and deviate only if this is appropriate due to regulatory constraints. It is expected that the same risk factors are covered in the regulatory models as in the internal models.

(f) A routine and rigorous programme of stress testing is required as a supplement to the risk analysis based on the output of the bank's risk measurement model. The results of stress testing must be reviewed at least monthly by senior management, used in the internal

assessment of capital adequacy, and reflected in the policies and limits set by management and the board of directors. Where stress tests reveal particular vulnerability to a given set of circumstances, prompt steps must be taken to mitigate those risks appropriately (eg by hedging against that outcome or reducing the size of the bank's exposures, or increasing capital).

(g) Banks need to have a routine in place for ensuring compliance with a documented set of internal policies, controls and procedures concerning the operation of the risk measurement system. The bank's risk measurement system must be well documented, for example, through a comprehensive risk management manual that describes the basic principles of the risk management system and that provides a detailed explanation of the empirical techniques used to measure market risk.

(h) Any significant changes to an approved model must be approved by the supervisor prior to being implemented.

(i) Risk measures must be calculated on the full set of positions which are in the scope of application of the model. The risk measures must be based on a sound theoretical basis, calculated correctly, and reported accurately.

(j) An independent review of the risk measurement system should be carried out regularly by either the bank's own internal auditing process or an external auditor. This review should include both the activities of the business trading units and of the independent risk control unit. The review must be sufficiently detailed to determine for any failings which desks are impacted. A review of the overall risk management process should take place at regular intervals (not less than once a year) and should specifically address, at a minimum:

- The organisation of the risk control unit;
- The adequacy of the documentation of the risk management system and process;
- The accuracy and appropriateness of the risk measurement system (including any significant changes);
- The verification of the consistency, timeliness and reliability of data sources used to run internal models, including the independence of such data sources;
- The approval process for risk pricing models and valuation systems used by front and back-office personnel;
- The scope of market risks captured by the risk measurement model;
- The integrity of the management information system;
- The accuracy and completeness of position data;
- The accuracy and appropriateness of volatility and correlation assumptions;
- The accuracy of valuation and risk transformation calculations; and
- The verification of the model's accuracy through frequent backtesting and P&L attribution as described in Appendix B: *Supervisory framework for the use of backtesting in conjunction with the internal models approach to market risk capital requirements*.

## 3. Quantitative standards

181. Banks will have flexibility in devising the precise nature of their models, but the following minimum standards will apply for the purpose of calculating their capital charge. Individual banks or their supervisory authorities will have discretion to apply stricter standards.

(a) "*Expected shortfall*" must be computed on a daily basis for the bank-wide internal model for regulatory capital purposes. Expected shortfall must also be computed on a daily basis for each trading desk that a bank wishes to include within the scope for the internal model for regulatory capital purposes.

(b) In calculating the expected shortfall, a 97.5th percentile, one-tailed confidence interval is to be used.

(c) In calculating the expected shortfall, instantaneous shocks equivalent to an *n*-business day movement in risk factors are to be used. *n* is defined based on the liquidity characteristics of the risk factor being modelled, as described in point (k) below. These shocks must be calculated based on a sample of *n*-business day horizon overlapping observations over the relevant sample period (see point (d)).[36]

(d) The expected shortfall measure must be calibrated to a period of stress. Specifically, the measure should replicate an expected shortfall charge that would be generated on the bank's current portfolio if the relevant risk factors were experiencing a period of stress. This is a joint assessment across all relevant risk factors, which will capture stressed correlation measures. This calibration is to be based on an "indirect" approach using a reduced set of risk factors. Banks are to specify a reduced set of risk factors that are relevant for their portfolio and for which there is a sufficiently long history of observations. This reduced set of risk factors is subject to supervisory approval and must meet the data quality requirements for a modellable risk factor as outlined in paragraph 183(c) and have a minimum observation history of [10] years. The identified reduced set of risk factors must be able to explain a minimum of [75%] of the variation in of the full ES model.

The expected shortfall for the portfolio using this set of risk factors, calibrated to the most severe 12-month period of stress available over the observation horizon, is calculated. That value is then scaled up by the ratio of the current expected shortfall using the full set of risk factors to the current expected shortfall measure using the reduced set of factors. The expected shortfall for risk capital purposes is therefore:

$$ES = ES_{R,S} \times \frac{ES_{F,C}}{ES_{R,C}}$$

where the expected shortfall for capital purposes (ES) is equal to the expected shortfall based on a stressed observation period using a reduced set of risk factors ($ES_{R,S}$) multiplied by the ratio of the expected shortfall measure based on the current (most recent) 12-month observation period with a full set of risk factors ($ES_{F,C}$) and the expected shortfall measure based on the current period with a reduced set of risk factors ($ES_{R,C}$).

(e) For measures based on current observations ($ES_{F,C}$), banks must update their *data sets* no less frequently than once every month and should also reassess them whenever market prices are subject to material changes. This updating process must be flexible enough to allow for more frequent updates. The supervisory authority may also require a bank to calculate its Expected Shortfall using a shorter observation period if, in the supervisor's judgement; this is justified by

[36] For historical simulation this implies that two years of historical data are needed, because of a 12-month observation period and liquidity horizons up to one year. To calculate the different overlapping periods a common starting point (t-x) must be defined. Starting from this data point the P&L changes have to be estimated using the different liquidity horizons. Assume one instrument with a 10-day liquidity horizon and one with a 250-day liquidity horizon. Within the historical simulation $P\&L_{t-x;\ t-x+10}$ is added to $P\&L_{t-x;\ t-x+250}$; $P\&L_{t-x+1;\ t-x+11}$ is added to $P\&L_{t-x+2;\ t-x+252;}$ and so on. Finally the ES is estimated based on these aggregated scenarios. This implies that for the 10-day liquidity horizon the most recent data point used is 240 days before the data point used for the 250-day liquidity horizon.

a significant upsurge in price volatility. In this case, however, the period should be no shorter than [6] months.

(f) For measures based on stressed observations ($ES_{R,S}$), banks must identify the 12-month period of stress over the observation horizon in which the portfolio experiences the largest loss. The observation horizon for determining the most stressful 12 months must, at a minimum, span back to 2005. Observations within this period must be equally weighted. Banks must update their 12-month stressed periods no less than monthly, or whenever there are material changes in the risk factors in the portfolio.

(g) No particular type of expected shortfall model is prescribed. So long as each model used captures all the material risks run by the bank, as confirmed through P&L attribution and backtesting, and conforms to each of the requirements set out above and below, supervisors may permit banks to use models based on either historical or Monte Carlo simulations.

(h) Banks will have discretion to recognise empirical *correlations* within broad regulatory risk factor classes (interest rate risk, equity risk, foreign exchange risk, commodity risk and credit risk, including related options volatilities in each risk factor category). Empirical correlations across broad risk factor categories will be constrained by the supervisory aggregation scheme (see paragraph 189), and must be calculated and used in a manner consistent with the applicable liquidity horizons, clearly documented and able to be explained to supervisors on request.

(i) Banks' models must accurately capture the unique risks associated with *options* within each of the broad risk categories. The following criteria apply to the measurement of options risk:

- Banks' models must capture the *non-linear price characteristics* of options positions;
- Each bank's risk measurement system 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. This means that banks should model the volatility surface across both strike price and tenor.

(j) Each bank must meet, on a daily basis, a *capital requirement* expressed as the sum of the higher of (1) its previous day's aggregate capital charge for market risk according to the parameters specified in this section ($ACC_{t-1}$); and (2) an average of the daily capital measures in the preceding 60 business days ($ACC_{avg}$).

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

$$\text{(a)} \quad c = \max\{ACC_{t-1}; ACC_{avg}\}$$

(k) As set out in point (c), an instantaneous shock equivalent to an *n*-business day movement in risk factors is to be used. *n* is calculated using the following conditions.

- Banks must map each risk factor on to one of the risk factor categories shown in (c) below using consistent and clearly documented procedures;
- The mapping must be (i) set out in writing; (ii) validated by the Bank's risk management; (iii) made available to supervisors; and (iv) subject to internal audit; and
- *n* is determined for each broad category of risk factor as set out in the following table:

| Risk factor category | *n* |
|---|---|
| Interest rate | 20 |
| Interest rate ATM volatility | 60 |
| Interest rate (other) | 60 |
| Credit spread – sovereign (IG) | 20 |
| Credit spread – sovereign (HY) | 60 |
| Credit spread – corporate (IG) | 60 |

| Risk factor category | *n* |
|---|---|
| Equity price (small cap) volatility | 120 |
| Equity (other) | 120 |
| FX rate | 20 |
| FX volatility | 60 |
| FX (other) | 60 |
| Energy price | 20 |

| | | | |
|---|---|---|---|
| Credit spread – corporate (HY) | 120 | Precious metal price | 20 |
| Credit spread – structured (cash and CDS) | 250 | Other commodities price | 60 |
| Credit (other) | 250 | Energy price volatility | 60 |
| Equity price (large cap) | 10 | Precious metal price volatility | 60 |
| Equity price (small cap) | 20 | Other commodities price volatility | 120 |
| Equity price (large cap) volatility | 20 | Commodity (other) | 120 |

## 4. Model validation standards

182. Banks must have processes in place to ensure that their internal models have been adequately validated by suitably qualified parties independent of the development process to ensure that they are conceptually sound and adequately capture all material risks. This validation must be conducted when the model is initially developed and when any significant changes are made to the model. Models must be periodically revalidated, particularly when there have been significant structural changes in the market or changes to the composition of the portfolio which might lead to the model no longer being adequate. Model validation should not be limited to P&L attribution and backtesting, but should, at a minimum, also include the following:

(a) Tests to demonstrate that any assumptions made within the internal model are appropriate and do not underestimate risk. This may include the assumption of the normal distribution and any pricing models.

(b) Further to the regulatory backtesting programmes, testing for model validation must use hypothetical changes in portfolio value that would occur were end-of-day positions to remain unchanged. It therefore excludes fees, commissions, bid-ask spreads, net interest income and intraday trading. Moreover, additional tests are required which may include, for instance:

- Testing carried out for longer periods than required for the regular backtesting programme (eg three years);
- Testing carried out using confidence intervals other than the 97.5% and 99% interval required under the quantitative standards;
- Testing carried out using liquidity horizons other than those applicable to the risk factors or not using overlapping periods;
- Testing of portfolios should be done at both the trading desk and bank-wide level; and
- Testing of the necessary inputs for an IDR VaR measure at the 99.9% interval.

(c) The use of hypothetical portfolios to ensure that the model is able to account for particular structural features that may arise, for example:

Where data histories for a particular instrument do not meet the quantitative standards in paragraph 181 and where the bank has to map these positions to proxies, then the bank must ensure that the proxies produce conservative results under relevant market scenarios;

- Ensuring that material basis risks are adequately captured. This may include mismatches between long and short positions by maturity or by issuer;
- Ensuring that the model captures concentration risk that may arise in an undiversified portfolio.

## 5. Determining the eligibility of trading activities

183. The process for determining the eligibility of trading activities for the internal models-based approach is based on a four-stage approach.

(a) The first step is the overall assessment of both the bank's organisational infrastructure (including the definition and structure of trading desks) and its firm-wide internal risk capital model. These evaluations are based on both qualitative and quantitative factors. The quantitative factors are based on backtesting and are detailed further in the *Supervisory framework for the use of backtesting and profit and loss attribution in conjunction with the internal models approach to market risk capital measurement*.

(b) The second step breaks the model approval process into smaller, more discrete, elements – the regulatory trading desks (as defined in paragraphs 21 to 23). At this stage, banks must nominate which trading desks are in-scope for model approval and which trading desks are out-of-scope. Banks must specify in writing the basis for the nomination. Banks must not nominate desks to be out-of-scope due to standardised approach capital charges being less than the modelled requirements. Desks that are out-of-scope will be capitalised according to the standardised approach on a portfolio basis. Desks that opt out of the internal models approach at this stage must remain ineligible for model inclusion for a period of at least one year.

For those desks that the bank has deemed to be in-scope for the internal models approach, model approval is required at the trading desk level. Each trading desk must satisfy P&L attribution, backtesting requirements and a model-independent risk assessment tool on an ongoing basis.

Backtesting requirements are based on comparing each desk's 1-day static value-at-risk measure 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. If any given desk experiences either more than [12] exceptions at the 99th percentile or [30] exceptions at the 97.5th percentile in the most recent 12-month period, all of its positions must be capitalised using the standardised approach.[37] Positions must continue to be capitalised using the standardised method until the desk no longer exceeds the above thresholds over the prior 12 months.

P&L attribution requirements are based on two metrics: mean unexplained daily P&L (ie theoretical P&L minus actual P&L) over the standard deviation of actual daily P&L (excluding the impact of new transactions) and the ratio of variances of unexplained daily P&L and actual daily P&L (excluding the impact of new transactions). These ratios are calculated monthly and reported prior to [the end of the following month]. If the first ratio is outside of the range of [-10% to +10%] or if the second ratio were in excess of [20%] then the desk experiences a breach. If the desk experiences four or more breaches within the prior 12 months then it must be capitalised under the standardised approach. The desk must remain on the standardised approach until it can pass the monthly P&L attribution requirement and provided it has satisfied its backtesting exceptions requirements. Trading desks that do not satisfy the minimum backtesting, P&L attribution and model-independent risk assessment tool requirements are ineligible for capitalisation using the internal models approach. Risk exposures

[37] Desks with credit risk exposure must pass a two-stage approval process. First, the market risk model must pass backtesting and P&L attribution. Conditional on approval of the market risk model, the desk than may apply for approval to model incremental default risk (paragraph 186). Desks that fail either test must be capitalised under the standardised approach.

within these ineligible desks must be included with the out-of-scope desks and capitalised according to the standardised methodology on a portfolio basis.

For an institution to remain eligible for capitalisation under the internal models approach, a minimum of [10%] of the bank's aggregated market risk capital charges must be based on positions held in desks that qualify for inclusion in the bank's internal model for regulatory capital.

(c) Step three is a risk factor analysis. Following the identification of eligible trading desks, this step will determine which risk factors within the identified desks are eligible to be included in the bank's internal models for regulatory capital. For a risk factor to be classified as modellable by a bank, there must be continuously available "real" prices for a sufficient set of representative transactions. A price will be considered "real" if:

- It is a price at which the institutions has conducted a transaction;
- It is a verifiable price for an actual transaction between other arms-length parties; or
- The price is obtained from a committed quote.

To be considered modellable, a risk factor should have at least 24 observations per year with a maximum period of one month between two consecutive observations.

Some risk factors that would be considered modellable under the above criteria may be temporarily excluded from a bank's firm-wide regulatory capital model. In these circumstances, the bank will be given [12 months] to include the relevant risk factors in the regulatory capital model.

(d) Step four is a model-independent risk assessment tool for desks. Each desk must calculate these three items:

(i) *Capital*: the desk-level Expected Shortfall (ES) plus the sum of capital requirements emerging from the stress scenario add-ons under the non-modellable risk factors framework. The ES calculated for the desk should factor in varying liquidity horizons in risk factors, but be defined before any regulatory multipliers (eg those imposed as a result of poor backtesting performance).

(ii) *Exposure measure*: The exposure measure for the desk calculated as set out in the consultative paper "Revised Basel III leverage ratio framework and disclosure requirements" published by the Committee in June 2013.[38]

(iii) *Threshold*: as set out in the following table:

| **Desk description** | **Threshold (%)** |
|---|---|
| *[to be determined following the QIS]* | *[to be determined following the QIS]* |

The bank must test each desk against the threshold as follows. If the following inequality is breached then the model-based method may not be used and the desk must use the standardised approach.

[38] www.bis.org/publ/bcbs251.pdf

$$\frac{Capital}{Exposure\ Measure} < Threshold$$

## 6. Interaction with the standardised approach methodology

184. Banks must calculate the standardised capital charge for each trading desk as if it were a standalone regulatory portfolio. This calculation must be performed at least monthly and will:

(a) Serve as an indication of the fallback capital charge for those desks that fail the eligibility criteria for inclusion in the bank's internal model (as outlined in paragraphs 180 and 181).

(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.

(d) Provide macroprudential insight in an ex ante consistent format.

## 7. Specification of market risk factors

185. An important part of a bank's internal market risk measurement system is the specification of an appropriate set of market risk factors, ie the market rates and prices that affect the value of the bank's trading positions. The risk factors contained in a market risk measurement system should be sufficient to capture the risks inherent in the bank's portfolio of on- and off-balance sheet trading positions. Although banks will have some discretion in specifying the risk factors for their internal models, the following requirements should be fulfilled.

(a) Factors that are deemed relevant for pricing should be included as risk factors in the bank's internal models. Where a risk factor is incorporated in a pricing model but not in the risk capital model, the bank must justify this omission to the satisfaction of its supervisor. In addition, the ES model and any stress scenarios calculated for non-modellable risk factors must capture non-linearities for options and other relevant products (eg mortgage-backed securities), as well as correlation risk and relevant basis risks (eg between credit default swaps and bonds). Moreover, the supervisor has to be satisfied that proxies are used which show a good track record for the actual position held (ie an equity index for a position in an individual stock).

(b) For *interest rates*, there must be a set of risk factors corresponding to interest rates in each currency in which the bank has interest rate-sensitive on- or off-balance sheet positions. The risk measurement system should model the yield curve using one of a number of generally accepted approaches, for example, by estimating forward rates of zero coupon yields. The yield curve should be divided into various maturity segments in order to capture variation in the volatility of rates along the yield curve; there will typically be one risk factor corresponding to each maturity segment. For material exposures to interest rate movements in the major currencies and markets, banks must model the yield curve using a minimum of [six] risk factors. However, the number of risk factors used should ultimately be driven by the nature of the bank's trading strategies. For instance, a bank with a portfolio of various types of securities across many points of the yield curve and that engages in complex arbitrage strategies would require a greater number of risk factors to capture interest rate risk accurately. For *credit* the risk measurement system must incorporate separate risk factors to capture spread risk (eg between bonds and swaps). A variety of approaches may be used to capture the spread risk arising from less than perfectly correlated movements between government and other fixed-income interest rates, such as specifying a completely separate yield curve for non-government

fixed-income instruments (for instance, swaps or municipal securities) or estimating the spread over government rates at various points along the yield curve.

(c) For *exchange rates* (which may include gold), the risk measurement system should incorporate risk factors corresponding to the individual foreign currencies in which the bank's positions are denominated. Since the expected shortfall figure calculated by the risk measurement system will be expressed in the bank's domestic currency, any net position denominated in a foreign currency will introduce a foreign exchange risk. Thus, there must be risk factors corresponding to the exchange rate between the domestic currency and each foreign currency in which the bank has a significant exposure.

(d) For *equity prices*, there should be risk factors corresponding to each of the equity markets in which the bank holds significant positions:

- At a minimum, there should be a risk factor that is designed to capture market-wide movements in equity prices (eg a market index). Positions in individual securities or in sector indices could be expressed in "beta-equivalents" relative to this market-wide index;
- A somewhat more detailed approach would be to have risk factors corresponding to various sectors of the overall equity market (for instance, industry sectors or cyclical and non-cyclical sectors). As above, positions in individual stocks within each sector could be expressed in beta-equivalents relative to the sector index;
- The most extensive approach would be to have risk factors corresponding to the volatility of individual equity issues.
- The sophistication and nature of the modelling technique for a given market should correspond to the bank's exposure to the overall market as well as its concentration in individual equity issues in that market.

(e) For *commodity prices*, there should be risk factors corresponding to each of the commodity markets in which the bank holds significant positions.

- For banks with relatively limited positions in commodity-based instruments, a straightforward specification of risk factors would be acceptable. Such a specification would likely entail one risk factor for each commodity price to which the bank is exposed (including different risk factors for different geographies where relevant). In cases where the aggregate positions are quite small, it might be acceptable to use a single risk factor for a relatively broad sub-category of commodities (for instance, a single risk factor for all types of oil);
- For more active trading, the model must also take account of variation in the "convenience yield"[39] between derivatives positions such as forwards and swaps and cash positions in the commodity.

(f) All securitised products are ineligible for inclusion in the models-based capital charge and must be capitalised using the standardised approach.

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

## 8. Default risk

186. Banks must have a separate internal model to measure the default risk of trading book positions. The general criteria in paragraphs 176 to 178 and the qualitative standards in paragraph 180 also apply to the default risk model.

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

(b) Default risk must be measured using a VaR model. Banks must use a two-factor default simulation model with default correlations based on listed equity prices. Correlations must be based on a period of stress (as defined in paragraph 181(d)), estimated over a 10-year time horizon and be based on a [one]-year liquidity horizon. The VaR calculation must be done weekly and be based on a one-year time horizon at a one-tail, 99.9th percentile confidence level.

(c) All positions subject to the market risk framework, with the exception of those positions subject to standardised charges or whose valuations depend solely on commodity prices or foreign exchange rates are subject to the default risk model. Therefore, sovereign exposures (including those denominated in the sovereign's domestic currency), equity positions and defaulted debt positions must be included in the model.

(d) The default risk model capital requirement is the greater of: (1) the average of the default risk model measures over the previous 12 weeks; or (2) the most recent default risk model measure.

(e) A bank must assume constant positions over the one-year horizon.

(f) Default risk must be measured for each obligor.

- PDs implied from market prices are not acceptable unless they are corrected to obtain an objective probability of default.[40]
- PDs are subject to a floor of 0.03%.

(g) The model may reflect netting of long and short exposures to the same obligor, and 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 (eg differences in seniority).

(h) 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 (g) is not allowed.

(i) The default risk model must recognise the impact of correlations between defaults among obligors, including the effect on correlations of periods of stress as described in (b).

- These correlations should 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.
- 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

[40] In other words, market implied PDs are not acceptable.

must document its modelling approach and the period of time used to calibrate the model.

- These correlations must be measured over a liquidity horizon of one year.
- These correlations should be calibrated over a period of at least 10 years.
- Firms need to reflect all significant basis risks in recognising these correlations, including, for example, maturity mismatches, internal or external ratings, vintage etc.

(j) The model must capture any material mismatch between a position and its hedge.

(k) The model must reflect the effect of issuer and market concentrations, as well as concentrations that can arise within and across product classes during stressed conditions.

(l) As part of this default risk model, the bank must calculate, for each and every position subjected to the model, an incremental loss amount that the bank would incur in the event that the obligor of the position defaults.

(m) These loss estimates must reflect the economic cycle; for example, the model must incorporate the dependence of the recovery on the systemic risk factors.

(n) The model must reflect the non-linear impact of options and other positions with material non-linear behaviour with respect to default.

(o) To avoid double counting of the risk from mark-to-market loss and the risk of loss from default, the model may assess default risk from the perspective of the incremental loss from default in excess of the mark-to-market losses already taken at the time of default.

(p) Owing to the high confidence standard and long capital horizon of the IDR, robust direct validation of the IDR model through standard backtesting methods at the 99.9%/one-year soundness standard will not be possible. Accordingly, validation of an IRC model necessarily must rely more heavily on indirect methods including but not limited to stress tests, sensitivity analyses and scenario analyses, to assess its qualitative and quantitative reasonableness, particularly with regard to the model's treatment of concentrations. Given the nature of the IDR soundness standard such tests must not be limited to the range of events experienced historically. The validation of an IDR model represents an ongoing process in which supervisors and firms jointly determine the exact set of validation procedures to be employed.

(q) Firms should strive to develop relevant internal modelling benchmarks to assess the overall accuracy of their IDR models.

(r) Due to the unique relationship between credit spread and default risk, banks must seek approval for each desk with exposure to these risks, both for credit spread risk and default risk. Desks which do not receive approval will be deemed ineligible for internal modelling standards and be subject to the standardised capital framework.

## 9. Capitalisation of risk factors

187. For those desks that are permitted to be on the internal models approach, all risk factors that are deemed to be "modellable" must be included in the bank's internal, firm-wide, expected shortfall model. The bank must calculate its internally modelled capital charge at the bank-wide level using this model, with no supervisory constraints on cross risk factor correlations (*IMCC(C)*).

188. The bank must calculate a series of partial expected shortfall charges (ie all other risk factors should be held constant) for the range of broad regulatory risk factor classes (interest rate risk, equity risk, foreign exchange risk, commodity risk and credit risk). These partial expected shortfall values ($IMCC(C_i)$) will then be summed to provide an aggregated risk-factor expected shortfall charge.

189. The aggregate capital charge for modellable risk factors (*IMCC*) is based on the weighted average of the constrained and unconstrained expected shortfall charges.

$$IMCC = \rho\big(IMCC(C)\big) + (1-\rho)\Big(\sum_{i=1}^{R} IMCC(C_i)\Big)$$

where $IMCC(C) = ES_{R,S} \times \frac{ES_{F,C}}{ES_{R,C}}$ and $IMCC(C_i) = ES_{R,S,i} \times \frac{ES_{F,C,i}}{ES_{R,C,i}}$

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

ρ is the relative weight assigned to the firm's internal model. The value of ρ is [X] [*to be determined by the Committee following the QIS. [X] will be consistent across jurisdictions and institutions.*]

For regulatory capital purposes, the aggregated charge associated with approved desks ($C_A$) is equal the maximum of the most recent observation and a weighted average of the previous [12] weeks scaled by a multiplier ($m_c$).

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

where $SES$ is the aggregate regulatory capital measure for *K* risk factors in model-eligible desks that are deemed unmodellable.

The multiplication factor $m_c$ will be [3] or set by individual supervisory authorities on the basis of their assessment of the quality of the bank's risk management system, subject to an absolute minimum of [3]. Banks must add to this factor a "plus" directly related to the ex-post performance of the model, thereby introducing a built-in positive incentive to maintain the predictive quality of the model. The plus will range from 0 to 1 based on the outcome of the backtesting of the bank's *daily VaR at the 99th percentile* based on current observations on the full set of risk factors ($VaR_{FC}$). If the backtesting results are satisfactory and the bank meets all of the qualitative standards set out in paragraph 180, the plus factor could be zero. Appendix B presents in detail the approach to be applied for backtesting and the plus factor. Banks must develop the capability to perform backtests using both hypothetical (ie using changes in portfolio value that would occur were end-of-day positions to remain unchanged) and actual trading (ie excluding fees, commissions, and net interest income) outcomes. The multiplication factor will, however, be based upon [hypothetical] backtesting results.

190. Each non-modellable risk factor is to be capitalised using a stress scenario that is calibrated to be at least as prudent as the expected shortfall calibration used for modelled risks (ie a loss calibrated to a 97.5% confidence threshold over a period of extreme stress for the given risk factor). For each non-modellable risk factor, the liquidity horizon of the stress scenario should be the greater of the largest time interval between two consecutive price observations over the prior year and the liquidity horizon assigned to the risk factor in paragraph 181. No correlation or diversification effect between non-modellable risk factors should be assumed. In the event that a bank cannot provide a stress scenario which is acceptable for the supervisor, the bank will have to use the maximum possible loss as the stress scenario.

The aggregate regulatory capital measure for *K* risk factors in model-eligible desks that are deemed unmodellable ($SES$) is:

$$SES = \sum_{j=1}^{K} SES_{NM,j}$$

Where $SES_{NM,j}$ is the stress scenario capital charge for non-modellable risk *j*.

191. The additional regulatory capital charge for modellable risk positions subject to default risk is *IDR* (as described in paragraph 186 above).

192. The aggregate capital charge for those desks eligible for the internal models approach is equal to the aggregate capital charge for modellable risk factors ($C_{A,M}$) plus the sum of the individual capital requirements for non-modellable risk factors ($C_{A,U}$) plus the charge for incremental default risk (*IDR*).

193. The regulatory capital charge associated with risks from unapproved desks (Cu) is

$$C_U = \sum_{l=1}^{N'} SM_l$$

where $SM_l$ is the standardised charge for desk *l* of *N'* unapproved desks.

194. The aggregate capital charge for market risk (*ACC*) under the internal models approach is equal to the aggregate capital requirement for eligible trading desks plus the standardised capital charge for ineligible trading desks.

$$ACC = C_A + IDR + C_U$$

## 10. Stress testing

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

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

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

198. Banks should combine the use of supervisory stress scenarios with stress tests developed by banks themselves to reflect their specific risk characteristics. Specifically, supervisory authorities may ask banks to provide information on stress testing in three broad areas, which are discussed in turn below.

### Supervisory scenarios requiring no simulations by the bank

199. Banks should have information on the largest losses experienced during the reporting period and should make this available for supervisory review. This loss information could be compared to the level of capital that results from a bank's internal measurement system. For example, it could provide supervisory authorities with a picture of how many days of peak day losses would have been covered by a given expected shortfall estimate.

### Scenarios requiring a simulation by the bank

200. Banks should subject their portfolios to a series of simulated stress scenarios and provide supervisory authorities with the results. These scenarios could include testing the current portfolio against past periods of significant disturbance, for example, the 1987 equity crash, the Exchange Rate Mechanism crises of 1992 and 1993, the increase in interest rates in the first quarter of 1994, the 1998

Russian financial crisis, the 2000 bursting of the technology stock bubble, the 2007–08 sub-prime crisis, or the 2011–12 euro zone crisis, incorporating both the large price movements and the sharp reduction in liquidity associated with these events. A second type of scenario would evaluate the sensitivity of the bank's market risk exposure to changes in the assumptions about volatilities and correlations. Applying this test would require an evaluation of the historical range of variation for volatilities and correlations and evaluation of the bank's current positions against the extreme values of the historical range. Due consideration should be given to the sharp variation that at times has occurred in a matter of days in periods of significant market disturbance. For example, the above-mentioned situations involved correlations within risk factors approaching the extreme values of 1 or –1 for several days at the height of the disturbance.

### Scenarios developed by the bank itself to capture the specific characteristics of its portfolio.

201. In addition to the scenarios prescribed by supervisory authorities under paragraphs 199 and 200, a bank should also develop its own stress tests which it identifies as most adverse based on the characteristics of its portfolio (eg problems in a key region of the world combined with a sharp move in oil prices). Banks should provide supervisory authorities 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.

202. The results should be reviewed periodically by senior management and should be reflected in the policies and limits set by management and the board of directors. Moreover, if the testing reveals particular vulnerability to a given set of circumstances, the national authorities would expect the bank to take prompt steps to manage those risks appropriately (eg by hedging against that outcome or reducing the size of its exposures).

## 11. External validation

203. The validation of models' accuracy by external auditors and/or supervisory authorities should at a minimum include the following steps:

(a) Verifying that the *internal validation processes* described in paragraph 182 and 183 are operating in a satisfactory manner;

(a) Ensuring that the *formulae* used in the calculation process as well as for the pricing of options and other complex instruments are validated by a qualified unit, which in all cases should be independent from the trading area;

(b) Checking that the *structure* of internal models is adequate with respect to the bank's activities and geographical coverage;

(c) Checking the results of both the banks' *backtesting* of its internal measurement system (ie comparing expected shortfall estimates with actual profits and losses) and its *P&L attribution* process to ensure that the models provide a reliable measure of potential losses over time. This means that banks should make the results as well as the underlying inputs to their expected shortfall calculations and details of the P&L attribution exercise available to their supervisory authorities and/or external auditors on request; and

(d) Making sure that data flows and processes associated with the risk measurement system are *transparent and accessible*. In particular, it is necessary that auditors and supervisory authorities are in a position to have easy access, whenever they judge it necessary and under appropriate procedures, to the models' specifications and parameters.

# Appendix A

## Trading desk definitions

For the purpose of regulatory capital calculations, a "trading desk" is defined as a group of traders or trading accounts (key element #1 below) that implements a well defined business strategy (key element #2 below), operating within a clear risk management structure (key element #3 below), defined by the bank but with the definition approved by supervisors for capital purposes (key element #4 below).

Key element #1: a "trading desk" for the purposes of the regulatory capital framework is an unambiguously defined **group of traders or trading accounts**.

- An individual trader or trading account is an **indisputable and unambiguous unit of observation** in accounting for trading activity.
- The desk must have a **Head Trader**.
    - The head trader must have direct oversight of the group of traders or trading accounts.
    - Each trader or each trading account in the desk must have a clearly defined specialty(ies).
- **Each trader or each trading account must be assigned to only one trading desk.** For the Head Trader, his role may cut across several businesses. Nonetheless, a given trader can only be the Head Trader at one desk and not multiple desks.
- The desk must have a clear reporting line to bank senior management, and should have a clear and formal compensation policy clearly linked to the pre-established objectives of the desk.

Key element #2: a "trading desk" must have a **well defined business strategy.**

- There must be a clear description of the **economics** of the business strategy for the desk, its **primary activities** and **trading/hedging strategies**:
    - Economics: what is the economics behind the strategy (eg trading on 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?
    - Primary activities: what is the list of **permissible instruments** and, out of this list, which are the instruments most frequently traded?
    - Trading/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?
- The management team at the desk (starting from the Head Trader) must have a clear annual plan for the budgeting and staffing of the desk.
- Regular Management Information reports, covering revenue, costs and risk-weighted assets for the desk.

Key element #3: a "trading desk" must have **a clear risk management structure**.

- Risk management responsibilities: the bank must identify key groups and personnel responsible for overseeing the risk-taking activities at the desk.
- Limits setting: the desk must have

- Well defined trading limits or directional exposures at the desk level that are based on the appropriate market risk metric (eg CS01 and/or JTD for a credit desk), or just overall notional limit.
- Well defined trader mandates.
- These limits must be reviewed at least annually by senior management at the firm.

- Risk reporting: the desk must produce, at least once a week
  - **P&L reports**, which would be periodically reviewed, validated and modified (if necessary) by Product Control.
  - I**nternal and regulatory risk measure reports**, including desk VaR/ES, desk VaR/ES sensitivities to risk factors, backtesting and p-value.

Key element #4: a "trading desk" must be **proposed by the bank** but **approved by supervisors**.

- The bank should be allowed to propose the trading desk structure per their organisational structure, consistent with the requirements in key elements #1 to #3 above.
- The bank must prepare a policy document for each desk it defines, documenting how the desk satisfies key elements #1 to #3 above.
- Supervisors will treat the definition of the trading desk as part of the initial model approval for the desk, as well as ongoing approval:
  - Supervisors may determine, based on the size of the bank's overall trading operations, whether the proposed desk definitions are sufficiently granular.
  - Supervisors should check that the bank's proposed definition of trading desk meets the criteria listed in Key elements #1, #2 and #3.

# Appendix B

## Supervisory framework for the use of backtesting and profit and loss attribution in conjunction with the internal models approach to market risk capital requirements

## I. Introduction

This document presents the framework developed by the Basel Committee on Banking Supervision ("the Committee") for incorporating backtesting and profit and loss (P&L) attribution into the internal models approach to market risk capital requirements. It represents an elaboration of paragraph 183 of the internal models rules text.

P&L attribution and backtesting are critical components of the revised internal models approach for capitalising trading activities. In order for a bank to obtain approval to use internal models to capitalise its trading exposures, it must meet several qualitative and quantitative criteria (outlined in paragraphs 180 and 181). A key component of these requirements is that the bank demonstrates that its internal models, both at the firm-wide level and for individual trading desks, can model P&L behaviour with an appropriate degree of accuracy.

The essence of both P&L attribution and backtesting efforts is the comparison of actual trading results with model-generated risk measures. If this comparison is close enough, the tests raise no issues regarding the quality of the risk measurement models. In some cases, however, the comparison uncovers sufficient differences that problems almost certainly must exist, either with the model or with the assumptions of the backtest. In between these two cases is a grey area where the test results are, on their own, inconclusive.

The Committee believes that the framework outlined in this document strikes an appropriate balance between recognition of the potential limitations of P&L attribution and backtesting and the need to put in place appropriate constraints on the use of internal models (as well as incentives for model improvement).

The remainder of this document describes the P&L attribution/backtesting framework that accompanies the internal models capital requirement. The next section deals with the nature of the tests themselves, while the section that follows concerns the supervisory interpretation of the results and sets out the agreed standards of the Committee in this regard.

## II. Description of the P&L attribution and backtesting frameworks at the trading desk level

The P&L attribution and backtesting frameworks developed by the Committee consist of a periodic comparison of the bank's daily risk measures (expected shortfall or value at risk) with the subsequent daily profit or loss ("trading outcome"). The risk measures are intended to be larger than all but a certain fraction of the trading outcomes, where that fraction is determined by the confidence level of the risk measure. Comparing the risk measures with the trading outcomes simply means that the bank counts the number of times that the risk measures were larger than the trading outcome. The fraction actually

covered can then be compared with the intended level of coverage to gauge the performance of the bank's risk model.

## P&L attribution

For the P&L attribution assessment, all of the instruments held within a particular trading desk would be identified and considered as a distinct portfolio. All of the risk factors for that portfolio that enter into the desk's risk management model and that contribute to the regulatory capital calculation would be used to calculate a "risk-theoretical" P&L. This "risk-theoretical" P&L is defined as the daily P&L explained by the observed daily variations of the risk factors included in the internal model capital charge computation or in the stress scenarios used to define the aggregate capital charge for market risk, and by the pricing functions (or approximations) used to determine these quantities. Observed movements in all risk factors contained in the firm's internal capital model on a given day should be used to calculate a risk-theoretical P&L for that day. The calculation of the risk-theoretical P&L should be based on the pricing models embedded in the firm's ES model and not front office pricing systems.

This risk-theoretical P&L would be compared to the actual daily desk-level P&L (excluding the impact of new trades), based on the mark-to-market value of the trading desk's instruments used for the books and records of the bank. The P&L attribution should not take into account any risk factors that the bank does not include in its desk's risk management model.

The desk's risk management model, for the above purpose, includes all risk factors which the bank includes in its internal ES model. These may include any risk factors that the supervisor subsequently deems to be unmodellable and for which capital requirements are calculated based on individual stress scenarios.

This comparison between the theoretical and actual P&L is performed to determine whether the risk factors included in the desk's risk management model capture the material drivers of the bank's actual P&L. A significant degree of association between the two P&L measures, observed over a suitable time period, would be required for the trading desk to be deemed eligible for internal modelling. The Committee accepts that the theoretical P&L can vary from the actual daily P&L for a number of reasons. However, the rationale for this assessment is that a desk's risk management model should provide a reasonably accurate assessment of the risks of a trading desk to be deemed eligible for the internal models-based approach.

The P&L attribution requirements are based on two metrics:

- The mean of the difference between the theoretical and actual P&L (unexplained P&L) divided by the standard deviation of the actual P&L; and
- The variance of the unexplained P&L divided by the variance of the actual P&L.

Banks are required to estimate and report these ratios for each trading desk on a monthly basis. The decision to include or exclude a specific desk in the perimeter of the internal model would be taken if the averages of the proposed measures are inside supervisory-specified thresholds (as defined in paragraph 183]) over a given period.

## Backtesting assessment

In addition to P&L attribution, the performance of a trading desk's risk management models will be tested through daily backtesting. The backtesting assessment is considered to be complementary to the P&L attribution assessment when determining the eligibility of a trading desk for the internal models-based approach. The backtests to be applied compare whether the observed percentage of outcomes covered by the risk measure is consistent with both a *97.5% and 99% level of confidence*. The number of permitted exceptions is detailed in paragraph 183.

Together, P&L attribution and backtesting thresholds would be used to determine which trading desks are eligible for internal model treatment for regulatory capital purposes. The designation of being ineligible for internal modelling is not, however, envisaged as being permanent. If P&L attribution and backtesting performance sufficiently improved for a sufficient period of time, the designation for the relevant internal models-based approach could be changed from ineligible to eligible.

An additional consideration in specifying the appropriate risk measures and trading outcomes for P&L attribution and backtesting arises because the internally modelled risk measurement is generally based on the sensitivity of a static portfolio to instantaneous price shocks. That is, end-of-day trading positions are input into the risk measurement model, which assesses the possible change in the value of this static portfolio due to price and rate movements over the assumed holding period.

While this is straightforward in theory, in practice it complicates the issue of backtesting. For instance, it is often argued that neither expected shortfall nor value-at-risk measures can be compared against actual trading outcomes, since the actual outcomes will reflect changes in portfolio composition during the holding period. According to this view, the inclusion of fee income together with trading gains and losses resulting from changes in the composition of the portfolio should not be included in the definition of the trading outcome because they do not relate to the risk inherent in the static portfolio that was assumed in constructing the value-at-risk measure.

This argument is persuasive with regard to the use of risk measures based on price shocks calibrated to longer holding periods. That is, comparing the liquidity-adjusted time horizon 99th percentile risk measures from the internal models capital requirement with actual liquidity-adjusted time horizon trading outcomes would probably not be a meaningful exercise. In particular, in any given multi-day period, significant changes in portfolio composition relative to the initial positions are common at major trading institutions. For this reason, *the backtesting framework described here involves the use of risk measures calibrated to a one-day holding period*. Other than the restrictions mentioned in this paper, the test would be based on how banks model risk internally.

Given the use of one-day risk measures, it is appropriate to employ one-day trading outcomes as the benchmark to use in the backtesting program. The same concerns about "contamination" of the trading outcomes discussed above continue to be relevant, however, even for one-day trading outcomes. That is, there is a concern that the overall one-day trading outcome is not a suitable point of comparison, because it reflects the effects of intraday trading, possibly including fee income that is booked in connection with the sale of new products.

On the one hand, intraday trading will tend to increase the volatility of trading outcomes, and may result in cases where the overall trading outcome exceeds the risk measure. This event clearly does not imply a problem with the methods used to calculate the risk measure; rather, it is simply outside the scope of what the measure is intended to capture. On the other hand, including fee income may similarly distort the backtest, but in the other direction, since fee income often has annuity-like characteristics. Since this fee income is not typically included in the calculation of the risk measure, problems with the risk measurement model could be masked by including fee income in the definition of the trading outcome used for backtesting purposes.

To the extent that the P&L attribution and backtesting programs are viewed purely as a statistical test of the integrity of the calculation of the risk measures, it is appropriate to employ a definition of daily trading outcome that allows for an "uncontaminated" test. To meet this standard, banks must have the capability to perform the tests based on the hypothetical changes in portfolio value that would occur were end-of-day positions to remain unchanged.

Backtesting and P&L attribution using actual daily profits and losses are also useful exercises since they can uncover cases where the risk measures are not accurately capturing trading volatility in spite of being calculated with integrity.

For these reasons, *the Committee requires banks to develop the capability to perform these tests using both hypothetical and actual trading outcomes*. In combination, the two approaches are likely to provide a strong understanding of the relation between calculated risk measures and trading outcomes.

The implementation of the P&L attribution and backtesting program should formally begin on the date that the internal models capital requirement becomes effective. However, the model should be under observation until a one-year backtesting report can confirm the quality of the model submitted for approval. During this period, a multiplier of [X] should be applied in the calculation of capital requirements for that specific trading desk. *This does not preclude national supervisors from requesting backtesting results prior to that date, and in particular does not preclude their usage, at national discretion, as part of the internal model approval process. Using the most recent 12 months of data yields approximately 250 daily observations for the purposes of backtesting. The national supervisor will use the number of exceptions (out of 250) generated by the bank's model as the basis for a supervisory response.* In many cases, there will be no response. In other cases, the supervisor may initiate a dialogue with the bank to determine if there is a problem with a bank's model. In the most serious cases, the supervisor may impose an increase in a bank's capital requirement or disallow use of the model.

# III. Supervisory framework for the interpretation of backtesting results for the firm-wide risk model

## (a) Definition of a backtesting exception / outlier

Backtesting the firm-wide risk model will be based on a VaR measure calibrated at a 99$^{th}$ percentile confidence level. An exception or an outlier occurs when either the actual or theoretical loss of a trading desk registered in a day of the backtesting period is higher than the corresponding daily risk measure given by the model. In the case when either the P&L or the risk measure is not available or impossible to compute, it will count as an outlier.

## (b) Description of three-zone approach

The framework for the supervisory interpretation of backtesting results for the firm-wide capital model encompasses a range of possible responses, depending on the strength of the signal generated from the backtest. These responses are classified into three zones, distinguished by colours into a hierarchy of responses. The green zone corresponds to backtesting results that do not themselves suggest a problem with the quality or accuracy of a bank's model. The yellow zone encompasses results that do raise questions in this regard, but where such a conclusion is not definitive. The red zone indicates a backtesting result that almost certainly indicates a problem with a bank's risk model.

The Committee has agreed to standards regarding the definitions of these zones in respect of the number of exceptions generated in the backtesting program, and these are set forth below. To place these definitions in proper perspective, however, it is useful to examine the probabilities of obtaining various numbers of exceptions under different assumptions about the accuracy of a bank's risk measurement model.

## (c) Statistical considerations in defining the zones

Three zones have been delineated and their boundaries chosen in order to balance two types of statistical error: (1) the possibility that an accurate risk model would be classified as inaccurate on the basis of its backtesting result, and (2) the possibility that an inaccurate model would not be classified that way based on its backtesting result.

Table 1 below reports the probabilities of obtaining a particular number of exceptions from a sample of 250 independent observations under several assumptions about the actual percentage of outcomes that the model captures (that is, these are binomial probabilities). For example, the left-hand portion of the Table 1 reports probabilities associated with an accurate model (that is, a true coverage level of 99%). Under these assumptions, the column labelled “exact” reports that exactly five exceptions can be expected in 6.7% of the samples.

Table 1

| Model is accurate | | | Model is inaccurate: Possible alternative levels of coverage | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Exceptions (out of 250) | Coverage = 99% | | Coverage = 98% | | Coverage = 97% | | Coverage = 96% | | Coverage = 95% | |
| | exact | type 1 | exact | type 2 | exact | type 2 | exact | type 2 | exact | type 2 |
| 0 | 8.1 % | 100.0 % | 0.6 % | 0.0 % | 0.0 % | 0.0 % | 0.0 % | 0.0 % | 0.0 % | 0.0 % |
| 1 | 20.5 % | 91.9 % | 3.3 % | 0.6 % | 0.4 % | 0.0 % | 0.0 % | 0.0 % | 0.0 % | 0.0 % |
| 2 | 25.7 % | 71.4 % | 8.3 % | 3.9 % | 1.5 % | 0.4 % | 0.2 % | 0.0 % | 0.0 % | 0.0 % |
| 3 | 21.5 % | 45.7 % | 14.0 % | 12.2 % | 3.8 % | 1.9 % | 0.7 % | 0.2 % | 0.1 % | 0.0 % |
| 4 | 13.4 % | 24.2 % | 17.7 % | 26.2 % | 7.2 % | 5.7 % | 1.8 % | 0.9 % | 0.3 % | 0.1 % |
| 5 | 6.7 % | 10.8 % | 17.7 % | 43.9 % | 10.9 % | 12.8 % | 3.6 % | 2.7 % | 0.9 % | 0.5 % |
| 6 | 2.7 % | 4.1 % | 14.8 % | 61.6 % | 13.8 % | 23.7 % | 6.2 % | 6.3 % | 1.8 % | 1.3 % |
| 7 | 1.0 % | 1.4 % | 10.5 % | 76.4 % | 14.9 % | 37.5 % | 9.0 % | 12.5 % | 3.4 % | 3.1 % |
| 8 | 0.3 % | 0.4 % | 6.5 % | 86.9 % | 14.0 % | 52.4 % | 11.3 % | 21.5 % | 5.4 % | 6.5 % |
| 9 | 0.1 % | 0.1 % | 3.6 % | 93.4 % | 11.6 % | 66.3 % | 12.7 % | 32.8 % | 7.6 % | 11.9 % |
| 10 | 0.0 % | 0.0 % | 1.8 % | 97.0 % | 8.6 % | 77.9 % | 12.8 % | 45.5 % | 9.6 % | 19.5 % |
| 11 | 0.0 % | 0.0 % | 0.8 % | 98.7 % | 5.8 % | 86.6 % | 11.6 % | 58.3 % | 11.1 % | 29.1 % |
| 12 | 0.0 % | 0.0 % | 0.3 % | 99.5 % | 3.6 % | 92.4 % | 9.6 % | 69.9 % | 11.6 % | 40.2 % |
| 13 | 0.0 % | 0.0 % | 0.1 % | 99.8 % | 2.0 % | 96.0 % | 7.3 % | 79.5 % | 11.2 % | 51.8 % |
| 14 | 0.0 % | 0.0 % | 0.0 % | 99.9 % | 1.1 % | 98.0 % | 5.2 % | 86.9 % | 10.0 % | 62.9 % |
| 15 | 0.0 % | 0.0 % | 0.0 % | 100.0 % | 0.5 % | 99.1 % | 3.4 % | 92.1 % | 8.2 % | 72.9 % |

**Notes to Table 1:** The table reports both exact probabilities of obtaining a certain number of exceptions from a sample of 250 independent observations under several assumptions about the true level of coverage, as well as type 1 or type 2 error probabilities derived from these exact probabilities.

The left-hand portion of the table pertains to the case where the model is accurate and its true level of coverage is 99%. Thus, the probability of any given observation being an exception is 1% (100% — 99% = 1%). The column labelled "exact" reports the probability of obtaining exactly the number of exceptions shown under this assumption in a sample of 250 independent observations. The column labelled "type 1" reports the probability that using a given number of exceptions as the cut-off for rejecting a model will imply erroneous rejection of an accurate model using a sample of 250 independent observations. For example, if the cut-off level is set at five or more exceptions, the type 1 column reports the probability of falsely rejecting an accurate model with 250 independent observations is 10.8%.

The right-hand portion of the table pertains to models that are inaccurate. In particular, the table concentrates of four specific inaccurate models, namely models whose true levels of coverage are 98%, 97%, 96% and 95% respectively. For each inaccurate model, the "exact" column reports the probability of obtaining exactly the number of exceptions shown under this assumption in a sample of 250 independent observations. The columns labelled "type 2" report the probability that using a given number of exceptions as the cut-off for rejecting a model will imply erroneous acceptance of an inaccurate model with the assumed level of coverage using a sample of 250 independent observations. For example, if the cut-off level is set at five or more exceptions, the type 2 column for an assumed coverage level of 97% reports the probability of falsely accepting a model with only 97% coverage with 250 independent observations is 12.8%.

The right-hand portion of the table reports probabilities associated with several possible inaccurate models, namely models whose true levels of coverage are 98%, 97%, 96%, and 95%, respectively. Thus, the column labelled “exact” under an assumed coverage level of 97% shows that five exceptions would then be expected in 10.9% of the samples.

Table 1 also reports several important error probabilities. For the assumption that the model covers 99% of outcomes (the desired level of coverage), the table reports the probability that selecting a given number of exceptions as a threshold for rejecting the accuracy of the model will result in an erroneous rejection of an accurate model (“type 1” error). For example, if the threshold is set as low as one exception, then accurate models will be rejected fully 91.9% of the time, because they will escape rejection only in the 8.1% of cases where they generate zero exceptions. As the threshold number of exceptions is increased, the probability of making this type of error declines.

Under the assumptions that the model’s true level of coverage is not 99%, the table reports the probability that selecting a given number of exceptions as a threshold for rejecting the accuracy of the

model will result in an erroneous acceptance of a model with the assumed (inaccurate) level of coverage ("type 2" error). For example, if the model's actual level of coverage is 97%, and the threshold for rejection is set at seven or more exceptions, the table indicates that this model would be erroneously accepted 37.5% of the time.

## (d) Definition of the green, yellow, and red zones

The results in the table in (c) also demonstrate some of the statistical limitations of backtesting. In particular, there is no threshold number of exceptions that yields both a low probability of erroneously rejecting an accurate model and a low probability of erroneously accepting all of the relevant inaccurate models. It is for this reason that the Committee has rejected an approach that contains only a single threshold.

Given these limitations, the Committee has classified outcomes for the backtesting of the firm-wide model into three categories. In the first category, the test results are consistent with an accurate model, and the possibility of erroneously accepting an inaccurate model is low (green zone). At the other extreme, the test results are extremely unlikely to have resulted from an accurate model, and the probability of erroneously rejecting an accurate model on this basis is remote (red zone). In between these two cases, however, is a zone where the backtesting results could be consistent with either accurate or inaccurate models, and the supervisor should encourage a bank to present additional information about its model before taking action (yellow zone).

Table 2 sets out the Committee's agreed boundaries for these zones and the presumptive supervisory response for each backtesting outcome, based on a sample of 250 observations. For other sample sizes, the boundaries should be deduced by calculating the binomial probabilities associated with true coverage of 99%, as in Table 1. The yellow zone begins at the point such that the probability of obtaining that number or fewer exceptions equals or exceeds 95%. Table 2 reports these cumulative probabilities for each number of exceptions. For 250 observations, it can be seen that five or fewer exceptions will be obtained 95.88% of the time when the true level of coverage is 99%. Thus, the yellow zone begins at five exceptions.

Similarly, the beginning of the red zone is defined as the point such that the probability of obtaining that number or fewer exceptions equals or exceeds 99.99%. Table 2 shows that for a sample of 250 observations and a true coverage level of 99%, this occurs with 10 exceptions.

Table 2

| Zone | Number of exceptions | Increase in scaling factor | Cumulative probability |
|---|---|---|---|
| Green zone | 0 | 0.00 | 8.11% |
| | 1 | 0.00 | 28.58% |
| | 2 | 0.00 | 54.32% |
| | 3 | 0.00 | 75.81% |
| | 4 | 0.00 | 89.22% |
| Yellow zone | 5 | 0.40 | 95.88% |
| | 6 | 0.50 | 98.63% |
| | 7 | 0.65 | 99.60% |
| | 8 | 0.75 | 99.89% |
| | 9 | 0.85 | 99.97% |
| Red zone | 10 or more | 1.00 | 99.99% |

**Notes to Table 2:** The table defines the green, yellow and red zones that supervisors will use to assess backtesting results in conjunction with the internal models approach to market risk capital requirements. The boundaries shown in the table are based on a sample of 250 observations. For other sample sizes, the yellow zone begins at the point where the cumulative probability equals or exceeds 95%, and the red zone begins at the point where the cumulative probability equals or exceeds 99.99%.

The cumulative probability is simply the probability of obtaining a given number or fewer exceptions in a sample of 250 observations when the true coverage level is 99%. For example, the cumulative probability shown for four exceptions is the probability of obtaining between zero and four exceptions.

Note that these cumulative probabilities and the type 1 error probabilities reported in Table 1 do not sum to one because the cumulative probability for a given number of exceptions includes the possibility of obtaining exactly that number of exceptions, as does the type 1 error probability. Thus, the sum of these two probabilities exceeds one by the amount of the probability of obtaining exactly that number of exceptions.

## (e) The green zone

The green zone needs little explanation. Since a model that truly provides 99% coverage would be quite likely to produce as many as four exceptions in a sample of 250 outcomes, there is little reason for concern raised by backtesting results that fall in this range. This is reinforced by the results in Table 1, which indicate that accepting outcomes in this range leads to only a small chance of erroneously accepting an inaccurate model.

## (f) The yellow zone

The range from five to nine exceptions constitutes the yellow zone. Outcomes in this range are plausible for both accurate and inaccurate models, although Table 1 suggests that they are generally more likely for inaccurate models than for accurate models. Moreover, the results in Table 1 indicate that the presumption that the model is inaccurate should grow as the number of exceptions increases in the range from five to nine.

The Committee has agreed that, within the yellow zone, the number of exceptions should generally guide the size of potential supervisory increases in a firm's capital requirement. Table 2 sets out the Committee's agreed guidelines for increases in the multiplication factor applicable to the internal models capital requirement, resulting from backtesting results in the yellow zone.

These particular values reflect the general idea that the increase in the multiplication factor should be sufficient to return the model to a 99th percentile standard. For example, five exceptions in a sample of 250 imply only 98% coverage. Thus, the increase in the multiplication factor should be sufficient to transform a model with 98% coverage into one with 99% coverage. Needless to say, precise calculations of this sort require additional statistical assumptions that are not likely to hold in all cases. For example, if the distribution of trading outcomes is assumed to be normal, then the ratio of the 99th percentile to the 98th percentile is approximately 1.14, and the increase needed in the multiplication factor is therefore approximately 0.40 for a scaling factor of 3. If the actual distribution is not normal, but instead has "fat tails", then larger increases may be required to reach the 99th percentile standard. The concern about fat tails was also an important factor in the choice of the specific increments set out in Table 2.

Banks should also document all of the exceptions generated from their ongoing backtesting program, including an explanation for the exception. Banks may also implement backtesting for confidence intervals other than the 99th percentile, or may perform other statistical tests not considered here. Naturally, this information could also prove very helpful in assessing their model.

In practice, there are several possible explanations for a backtesting exception, some of which go to the basic integrity of the model, some of which suggest an under-specified or low-quality model,

and some of which suggest either bad luck or poor intraday trading results. Classifying the exceptions generated by a bank's model into these categories can be a very useful exercise.

Basic integrity of the model

(1) The bank's systems simply are not capturing the risk of the positions themselves (eg the positions of an overseas office are being reported incorrectly).

(2) Model volatilities and/or correlations were calculated incorrectly.

Model's accuracy could be improved

(3) The risk measurement model is not assessing the risk of some instruments with sufficient precision (eg too few maturity buckets or an omitted spread).

"Bad luck" or markets moved in fashion unanticipated by the model

(4) Random chance (a very low probability event).

(5) Markets moved by more than the model predicted was likely (ie volatility was significantly higher than expected).

(6) Markets did not move together as expected (ie correlations were significantly different than what was assumed by the model).

Intraday trading

(7) There was a large (and money-losing) change in the bank's positions or some other income event between the end of the first day (when the risk estimate was calculated) and the end of the second day (when trading results were tabulated).

The supervisor will impose a higher capital requirement for any outcomes that place the bank in the yellow zone. In the case of severe problems with the basic integrity of the model, however, the supervisor should consider whether to disallow the use of the model for capital purposes altogether.

### (g) The red zone

Finally, outcomes in the red zone (10 or more exceptions) should generally lead to an automatic presumption that a problem exists with a bank's model. This is because it is extremely unlikely that an accurate model would independently generate 10 or more exceptions from a sample of 250 trading outcomes.

In general, therefore, if a bank's model falls into the red zone, the supervisor should automatically increase the multiplication factor applicable to a firm's model by one (from three to four). Needless to say, the supervisor should also begin investigating the reasons why the bank's model produced such a large number of misses, and should require the bank to begin work on improving its model immediately.

## IV. Conclusion

The above framework is intended to set out a consistent approach for incorporating P&L attribution and backtesting into the internal models approach to market risk capital requirements. The goals of this effort have been to build appropriate and necessary incentives into a framework that relies heavily on the efforts of banks themselves to calculate the risks they face, to do so in a way that respects the

inherent limitations of the available tools, and to keep the burdens and costs of the imposed procedures to a minimum.

The Basel Committee believes that the framework described above strikes the right balance in this regard. Perhaps more importantly, however, the Committee believes that this approach represents the first, and therefore critical, step toward a tighter integration of supervisory guidelines with verifiable measures of bank performance.

# E. Treatment for illiquid positions[41]

## 1. Prudent valuation guidance

718(c). This section provides banks with guidance on prudent valuation for positions that are accounted for at fair value, whether they are in the trading book or in the banking book. This guidance is especially important for positions without actual market prices or observable inputs to valuation, as well as less liquid positions which raise supervisory concerns about prudent valuation. The valuation guidance set forth below is not intended to require banks to change valuation procedures for financial reporting purposes. Supervisors should assess a bank's valuation procedures for consistency with this guidance. One factor in a supervisor's assessment of whether a bank must take a valuation adjustment for regulatory purposes under [paragraphs 718(cx) to 718(cxii)] should be the degree of consistency between the bank's valuation procedures and these guidelines.

718(ci). A framework for prudent valuation practices should at a minimum include the following:

### [1.] Systems and controls

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

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

### [2.] Valuation methodologies

*Marking to market*

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

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

[41] This section retains the paragraph numbering and references used in the existing Basel II Framework. These will be updated once the revised market risk framework is finalised by the Basel Committee.

may not be observable, such as when markets are inactive. In such cases, the observable data should be considered, but may not be determinative.

### *Marking to model*

[695.] Only where marking to market is not possible should banks mark to model, but this must be demonstrated to be prudent. Marking to model is defined as any valuation which has to be benchmarked, extrapolated or otherwise calculated from a market input. When marking to model, an extra degree of conservatism is appropriate. Supervisory authorities will consider the following in assessing whether a mark-to-model valuation is prudent:

- Senior management should be aware of the elements of the trading book or of other fair-valued positions which are subject to mark to model and should understand the materiality of the uncertainty this creates in the reporting of the risk/performance of the business.
- Market inputs should be sourced, to the extent possible, in line with market prices (as discussed above). The appropriateness of the market inputs for the particular position being valued should be reviewed regularly.
- Where available, generally accepted valuation methodologies for particular products should be used as far as possible.
- Where the model is developed by the institution itself, it should be based on appropriate assumptions, which have been assessed and challenged by suitably qualified parties independent of the development process. The model should be developed or approved independently of the front office. It should be independently tested. This includes validating the mathematics, the assumptions and the software implementation.
- There should be formal change control procedures in place and a secure copy of the model should be held and periodically used to check valuations.
- Risk management should be aware of the weaknesses of the models used and how best to reflect those in the valuation output.
- The model should be subject to periodic review to determine the accuracy of its performance (eg assessing continued appropriateness of the assumptions, analysis of P&L versus risk factors, comparison of actual close out values to model outputs).
- Valuation adjustments should be made as appropriate, for example, to cover the uncertainty of the model valuation (see also valuation adjustments in paragraphs 718(cviii) to 718(cxii)).

### *Independent price verification*

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

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

### [3.] Valuation adjustments

718(cviii). As part of their procedures for marking to market, banks must establish and maintain procedures for considering valuation adjustments. Supervisory authorities expect banks using third-party valuations to consider whether valuation adjustments are necessary. Such considerations are also necessary when marking to model.

718(cix). Supervisory authorities expect the following valuation adjustments to be formally considered at a minimum: unearned credit spreads, close-out costs, operational risks, early termination, investing and funding costs, and future administrative costs and, where appropriate, model risk.

## 2. Adjustment to the current valuation of less liquid positions for regulatory capital purposes

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

718(cxi). Bearing in mind that the assumptions made about liquidity in the market risk capital charge may not be consistent with the bank's ability to sell or hedge out less liquid positions, where appropriate, banks must take an adjustment to the current valuation of these positions, and review their continued appropriateness on an ongoing basis. Reduced liquidity may have arisen from market events. Additionally, close-out prices for concentrated positions and/or stale positions should be considered in establishing the adjustment. Banks must consider all relevant factors when determining the appropriateness of the adjustment for less liquid positions. These factors may include, but are not limited to, the amount of time it would take to hedge out the position/risks within the position, the average volatility of bid/offer spreads, the availability of independent market quotes (number and identity of market-makers), the average and volatility of trading volumes (including trading volumes during periods of market stress), market concentrations, the ageing of positions, the extent to which valuation relies on marking to model, and the impact of other model risks not included in paragraph 718(cx).

718(cxi-1-) For complex products including, but not limited to, securitisation exposures and n-th-to-default credit derivatives, banks must explicitly assess the need for valuation adjustments to reflect two forms of model risk: the model risk associated with using a possibly incorrect valuation methodology; and the risk associated with using unobservable (and possibly incorrect) calibration parameters in the valuation model.

718(cxii). The adjustment to the current valuation of less liquid positions made under paragraph 718(cxi) must impact Tier 1 regulatory capital and may exceed those valuation adjustments made under financial reporting standards and paragraphs 718(cviii) and 718(cix).

# F. Supervisory Review Process – The Second Pillar[42]

## Market risk

### 1. Policies and procedures for trading book eligibility

778(i). Clear policies and procedures used to determine the exposures that may be included in, and those that should be excluded from, the trading book for purposes of calculating regulatory capital are critical to ensure the consistency and integrity of a firm's trading book. Such policies must conform to paragraph 687(i) of this Framework. Supervisors should be satisfied that the policies and procedures clearly delineate the boundaries of the firm's trading book, in compliance with the general principles set forth in paragraphs 684 to 689(iii) of this Framework, and consistent with the bank's risk management capabilities and practices. Supervisors should also be satisfied that transfers of positions between banking and trading books can only occur in a very limited set of circumstances. A supervisor will require a firm to modify its policies and procedures when they prove insufficient for preventing the booking in the trading book of positions that are not compliant with the general principles set forth in paragraphs 684 to 689(iii) of this Framework, or not consistent with the bank's risk management capabilities and practices.

### 2. Valuation

778(ii). Prudent valuation policies and procedures form the foundation on which any robust assessment of market risk capital adequacy should be built. For a well diversified portfolio consisting of highly liquid cash instruments, and without market concentration, the valuation of the portfolio, combined with the minimum quantitative standards set out in paragraph 718(Lxxvi), as revised in this section, may deliver sufficient capital to enable a bank, in adverse market conditions, to close out or hedge its positions within 10 days in an orderly fashion. However, for less well diversified portfolios, for portfolios containing less liquid instruments, for portfolios with concentrations in relation to market turnover, and/or for portfolios which contain large numbers of positions that are marked to model this is less likely to be the case. In such circumstances, supervisors will consider whether a bank has sufficient capital. To the extent there is a shortfall the supervisor will react appropriately. This will usually require the bank to reduce its risks and/or hold an additional amount of capital.

### 3. Stress testing under the internal models approach

778(iii). A bank must ensure that it has sufficient capital to meet the minimum capital requirements set out in paragraphs 718(Lxx) to 718(xciv) and to cover the results of its stress testing required by paragraph 718(Lxxiv) (g), taking into account the principles set forth in paragraphs 738(ii) and 738(iv). Supervisors will consider whether a bank has sufficient capital for these purposes, taking into account the nature and scale of the bank's trading activities and any other relevant factors such as valuation adjustments made by the bank. To the extent that there is a shortfall, or if supervisors are not satisfied with the premise upon which the bank's assessment of internal market risk capital adequacy is based, supervisors will take the appropriate measures. This will usually involve requiring the bank to reduce its risk exposures and/or to hold an additional amount of capital, so that its overall capital resources at least cover the Pillar 1 requirements plus the result of a stress test acceptable to the supervisor.

[42] This section retains the paragraph numbering and references used in the existing Basel II Framework. These will be updated once the revised market risk framework is finalised by the Basel Committee.

## 4. Specific risk modelling under the internal models approach

778(iv). For banks wishing to model the specific risk arising from their trading activities, additional criteria have been set out, including conservatively assessing the risk arising from less liquid positions and/or positions with limited price transparency under realistic market scenarios. Where supervisors consider that limited liquidity or price transparency undermine the effectiveness of a bank's model to capture the specific risk, they will take appropriate measures, including requiring the exclusion of positions from the bank's specific risk model. Supervisors should review the adequacy of the bank's measure of the incremental risk capital charge; where the bank's approach is inadequate, the use of the standardised specific risk charges will be required.

# G. Market Discipline – The Third Pillar[43]

## Market risk[44]

[Table 10]

Market risk: disclosures for all banks

| | | |
|---|---|---|
| **Qualitative disclosures** | (a) | The general qualitative disclosure requirement [paragraph 824] for market risk including:<br>• the desk structure of the firm;<br>• types instruments included in each desk;<br>• policies for determining whether a position is designated as trading, including the definition of stale positions, the market value of stale positions, and the nominal value of stale positions;<br>• any positions assigned to the trading or banking book in contradiction of the general presumptions of their instrument category, and the market and nominal values of such positions;<br>• differences in risk management practices and policies for any portfolios of covered positions that are split between the banking book and the trading book;<br>• any positions that have been moved from one book to the other since the last reporting period, including the market and nominal values of such positions and the reason for the move; and<br>• the desks for which capital requirements are calculated using the standardised approach. |
| **Quantitative disclosures** | (b) | At the desk-level:<br>• the total standardised capital charge for the desk;<br>• the total standardised default risk charge for the desk;<br>• the credit spread risk and incremental default risk (IDR) capital charge for securitisation positions on the desk; and<br>• the numerator and denominator of the model-independent risk assessment tool<br>At the top-level:<br>• the total standardised capital charge for all positions, and including a breakdown by primary asset class (ie interest rates, FX, commodities, credit spread and equity);<br>• the total standardised default risk charge; and<br>• the credit spread risk and IDR capital charge for securitisation positions; |

[43] The paragraph and table numbering in this section are based on the existing Basel II Framework. These will be updated once the revised market risk framework is finalised by the Basel Committee.

[44] The proposed revisions to [Table 10] and [Table 11] will also be a component of a wider review by the Committee of Pillar 3 disclosure requirements.

[Table 11]

Market risk: disclosures for banks using the internal models-based approach (IMA) for trading portfolios

| | | |
|---|---|---|
| **Qualitative disclosures** | (a) | The general qualitative disclosure requirement [paragraph 824] for market risk including the portfolios covered by the IMA. In addition, a discussion of the extent of and methodologies for compliance with the "Prudent valuation guidance" for positions held in the trading book [paragraphs 690 to 701]. |
| | (b) | The discussion should include an articulation of the soundness standards on which the bank's internal capital adequacy assessment is based. It should also include a description of the methodologies used to achieve a capital adequacy assessment that is consistent with the soundness standards. |
| | (c) | For each portfolio covered by the IMA:<br>• the characteristics of the models used;<br>• a description of stress testing applied to the portfolio; and<br>• a description of the approach used for backtesting and P&L attribution, as well as any other means of validating the accuracy and consistency of the internal models and modelling processes. |
| | (d) | The scope of acceptance by the supervisor. |
| | (e) | For the incremental default risk (IDR) capital charge the methodologies used and the risks measured through the use of internal models, including details of the estimation of the parameters for the default model. It should also include the approaches used in the validation of the models. |
| | (f) | For each desk, the stress period used and a description of the process used to determine the stress period. |
| **Quantitative disclosures** | (g) | At each desk under the IMA:<br>• The high, mean and low ES values over the reporting period and period-end;<br>• The high, mean and low IDR capital charges over the reporting period and period-end;<br>• The number of backtesting exceptions during the period, and the resulting multiplier;<br>• The number of P&L attribution exceptions during the period;<br>• The desk-level ES calculation, including a breakdown by individual risk factor; and<br>• The capital charges for any risks not amenable to modelling.<br>At the top-level:<br>• The total expected shortfall calculation;<br>• The difference between the bank-wide expected shortfall calculation and the simple sum of risk factor expected shortfall;<br>• The total modelled IDR charge; and<br>• The total capital charge. |

# Annex 2

## Actions to reduce variation in risk-weighted assets for market risk

In January 2013, the Basel Committee concluded detailed analysis on the regulatory consistency of risk-weighted assets for market risk.[45] As part of this exercise, the Committee conducted detailed analysis of variation in RWA for market risk ("mRWAs") based on available public information as disclosed by banks. Results of a hypothetical test portfolio exercise, conducted with 15 internationally active banks from nine jurisdictions, were analysed. The results from this exercise provided a clear picture of significant variation in mRWAs across banks. The analysis showed considerable variation in average published mRWAs for trading assets and provides some indication that differences in the composition and size of trading positions are correlated with banks' average mRWAs. However the quality of disclosures was insufficient to provide clear evidence of how much of the variation is a true reflection of differing levels of actual risk.

The Committee has identified the most important modelling choices that drive variation in outcomes:

- For VaR and sVaR models:
  1. Length of data period for calibrating and the weighting scheme applied;
  2. Aggregation approach across asset classes and across specific and general risk;
  3. The choice of whether to scale a one-day risk estimate to a 10-day measure or estimate risk over 10 days directly; and
  4. Approach to choosing stress period (for sVaR) and the resulting stress period calibration.
- For IRC models:
  1. The overall modelling approach (the use of spread-based models or transition matrix-based models);
  2. Calibration of the transition matrix and the initial credit rating assigned to positions; and
  3. Correlation assumptions across obligors.

## Proposed policy responses

The analysis pointed to considerable variation in average mRWAs for trading assets and that only a part of the differences could be explained by variation in actual risk-taking or business models. While some amount of variation in mRWAs may be expected and views may differ as to what is an acceptable

[45] See Basel Committee on Banking Supervision, *Regulatory consistency assessment programme (RCAP) – Analysis of risk-weighted assets for market risk*, January 2013 (revised February 2013), www.bis.org/publ/bcbs240.pdf.

amount of variation, the findings suggested a direction for future policy work that could narrow down the potential variation in outcomes.

The analysis highlights three potential types of policy option that could be considered in the future: (i) improvement of public disclosure and regulatory data collection (to aid the understanding of mRWAs); (ii) narrowing down the modelling choices for banks; and (iii) a further harmonisation of supervisory practices with regard to model approvals (to reduce the level of variation in mRWAs). The revised models-based approach outlined in this consultative paper incorporates a number of recommendations that will help address the variance in risk-weighted assets for market risk (mRWA).

## Improving disclosure

The proposed internal models-based approach (IMA) includes the mandatory calculation of the capital charge under the standardised approach (SA) for each trading desk. Banks must then regularly disclose the following:

- The internal-models based charge for each approved trading desk;
- The standardised charge for each trading desk;
- The standardised add-on (for non-modellable risk factors) where appropriate;
- The firm-wide ES calculation;
- The individual risk factor ES calculations;
- The internal consolidated diversification benefit (the difference between the bank-wide ES calculation and the simple sum of risk factor ES);
- The regulatory capital charge, separately for both internal models and the standardised approach; and
- The regulatory capital diversification benefit (the difference between the regulatory capital charge and the simple sum of risk factor ES).

Table 1 provides an example of the type of disclosure envisaged. This proposal will also be a component of a wider review of Pillar 3 disclosure requirements by the Committee.

## Trading desk risk disclosure report (1)

Table 1

| | | | | | | | | | | Risk Type | | Model-Independent Assessment | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Desk** | **ES (2)** | **NMR (3)** | **IDR (4)** | **Total IMA** | **SA w/o DR charge** | **SA DR charge(5)** | **Total SA** | **IMA/SA** | **Risk Factor** | **ES** | **Exposure** | **Ratio** |
| FX | Spot FX | 10 | 0 | 0 | 10 | 15 | 0 | 15 | 67% | FX | 28 | 300 | 3.3% |
| | FX derivatives | 15 | 0 | 0 | 15 | 20 | 0 | 20 | 75% | | | 485 | 3.1% |
| Equity | Domestic cash equity | 13 | 0 | 2 | 15 | 20 | 3 | 23 | 65% | Equity | 83 | 278 | 5.4% |
| | Domestic equity derivatives | 18 | 0 | 3 | 21 | 22 | 4 | 26 | 81% | | | 500 | 4.2% |
| | Foreign equities | 25 | 0 | 4 | 29 | 30 | 6 | 36 | 81% | | | 325 | 8.9% |
| | Emerging market equities | 28 | 3 | 8 | 39 | 35 | 9 | 44 | 89% | | | 423 | 9.2% |
| Interest rates | Domestic interest rates and derivatives | 19 | 0 | 3 | 22 | 30 | 5 | 35 | 73% | Interest rates | 45 | 1250 | 1.8% |
| | International interest rates and derivatives | 19 | 0 | 5 | 24 | 32 | 2 | 34 | 75% | | | 984 | 2.4% |
| | **Dom structured products** | | | | **NA** | **40** | **3** | 43 | **NA** | | | **NA** | |
| | **Global structured products** | | | | **NA** | **38** | **5** | 43 | **NA** | | | **NA** | |
| Credit | High-grade credit | 19 | 0 | 1 | 20 | 24 | 2 | 26 | 77% | Credit | 48 | 698 | 2.9% |
| | High-yield credit | 13 | 2 | 4 | 19 | 25 | 6 | 31 | 61% | | | 502 | 3.8% |
| | Distressed debt | 16 | 5 | 8 | 29 | 25 | 12 | 37 | 78% | | | **298** | 9.7% |
| | **Syndicated loans** | | | | **NA** | **30** | **8** | 38 | **NA** | | | | |
| Commodities | Agricultural commodities | 17 | 2 | 0 | 19 | 21 | 0 | 21 | 90% | Commodities | 34 | 198 | 10% |
| | Energy | 17 | 2 | 0 | 19 | 19 | 0 | 19 | 100% | | | 126 | 15% |
| Other | Macro hedge portfolio | 36 | 4 | 7 | 47 | 59 | 9 | 68 | 80% | | | 1845 | 3% |
| **Total** | | **265** | **18** | **45** | **328** | **485** | **50** | **535** | **55%** | | **238** | | |

| | | | |
|---|---|---|---|
| **Internal bank-wide consolidated ES** | **200** | **Internal consolidated diversification benefit (6)** | **-38** | **-16%** |
| **Sum of risk factor ES** | **238** | **Rho** | | **0.75** |
| **Rho * internal bank-wide ES** | **150** | **Regulatory ES-based capital charge (7)** | | **210** |
| **(1-Rho) * sum of risk factor ES** | **60** | **Regulatory capital diversification benefit (8)** | **-28** | **-11%** |
| **Total regulatory capital charge (9)** | **397** | | | |

**Desks highlighted in yellow have securitisation exposures and are required to be capitalised using the standardised approach.**

**Desks highlighted in green have failed backtesting and/or P&L attribution and are capitalised under the standardised approach.**

Notes to Table 1:

(1) Report to be completed monthly by all institutions.

(2) ES refers to the stressed ES charge calculated for the specific trading desk (as described in paragraph 181)

(3) NMR refers to the total stress scenario capital charges for non-modellable risks for the specific trading desk (paragraph 185).

(4) IDR refers to the incremental default risk capital charge under the IMA (paragraph 186).

(5) DR charge refers to the default risk capital charge for non-securitisations under the SA (paragraphs 146 – 155).

(6) The internal consolidated diversification benefit is equal to the difference between the unrestricted internal consolidated charge and the sum of risk factor charges.

(7) The regulatory ES-based capital charge is the weighted average of the internal bank-wide ES charge and the sum of risk factors ES charge (*IMCC* in paragraph 188).

(8) The regulatory capital diversification benefit is equal to the difference between the regulatory ES-based capital charge and the sum of risk factor ES.

(9) The total regulatory capital charge is equal to the regulatory ES-based capital charge plus the total stress scenario capital charges for non-modellable risks plus the incremental default charge plus the standardised charges for non-approved desks (*ACC* in paragraph 194).

## Narrowing modelling choices

The RCAP analysis of risk-weighted assets for market risk provided clear evidence that differences in modelling choices are important drivers of the amount of variation in mRWA across banks. To address this, the proposed internal models-based approach constrains the set of possible modelling choices available to institutions in a number of ways. Table 1 highlights the key areas.

Constraints on modelling choices

Table 2

| | Modelling choice | Proposed treatment under IMM |
|---|---|---|
| **VaR/sVaR vs ES models** | Length of data period for calibrating model and weighting scheme applied | The ES model will be calibrated to a 12-month period. The observation horizon must be a minimum of 10 years. Observations within this period must be equally weighted (Annex 1, paragraph 181(f)) |
| | Diversification recognition in aggregation approach across asset classes and across specific and general risk | The proposal includes a constraint on diversification benefits realised across broad risk factors. The aggregate capital charge for modellable risk factors is based on the weighted average of the constrained and unconstrained ES charge (paragraphs 188 to 190) |
| | The choice of whether to scale a one-day risk estimate to a longer term or estimate risk over the longer term directly | ES will use an instantaneous shock equivalent to an n-day movement in risk factors. This shock will be calculated directly, based on a sample of n-day horizon overlapping observations. |
| | Approach to choosing stress period and the resulting stress calibration | ES will be calibrated to a stress period. This period will be determined using the "indirect method", whereby the bank uses a reduced set of risk factors to identify the most severe 12-month period of stress available for the portfolio over the observation horizon. |
| **IRC vs IDR models** | Overall modelling approach | Model will be default risk only (ie no credit spread-based models). |

| | | |
|---|---|---|
| | | Banks will also no longer have the choice of using either a single-factor or multifactor default risk model. The market risk rules will require the use of a two-factor model. |
| | Calibration of transition matrix and initial credit rating | Market-implied PDs are not acceptable. PDs are subject to a floor of 0.03%. |
| | Correlation assumptions across obligors | Default correlations must be measured over a horizon of one year and be calibrated to a period of at least 10 years. As well, there are constraints as to which instruments can be used to measure correlations. |

## Harmonising supervisory practices

The revised internal models approach will also seek to harmonise supervisory practices. This will include:

- Consistent P&L attribution and backtesting thresholds and requirements for trading desk model approval;
- Requiring consistency (where appropriate) across supervisory-specified parameters. For example, the weighting parameter in the capital aggregation formula (the relative weighting assigned to the internal ES vis-à-vis the simple sum of risk factor ES) will be consistent across institutions and jurisdictions.
- Consistent application of supervisory multipliers.

# Glossary

**Actual daily desk-level P&L:** The daily desk-level economic P&L based on the marking to market of the books and records of the bank.

**Backtesting:** The process of comparing daily profits and losses with model-generated risk measures to gauge the quality and accuracy of risk measurement systems.

**Basis risk:** The risk that prices of financial instruments in a hedging strategy will move in a way that reduces the effectiveness of the hedging strategy.

**Benchmark (in the context of the SMM/internal models-based approach relationship):**

The use of SMM capital charges as a consistent metric of comparison of capital charges calculated using internal models-based approaches both across banks and through time.

**Component risk factor:** An instrument is decomposed into individual component risk factors that are then mapped to a risk factor class

**"Cross-cutting" risk factor:** A risk factor that affects the valuation of a large number of instruments across the trading book. Examples include exchange rates and interest rates from money market or swap curves.

**Credit Valuation Adjustment (CVA):** An adjustment to the valuation of a derivative transaction to account for the credit risk of contracting parties.

**Current expected shortfall:** ES based on current data history of the risk factors (in contrast to the stressed data history).

**CVA risk**: The risk of changes to CVA arising from changes in credit spreads of the contracting parties, perhaps compounded by changes to the value of the underlying of the derivative transaction.

**Desk's risk management model:** The desk's risk management model includes all risk factors that are included in the bank's internal ES with supervisory parameters. Risk factors deemed not modellable by the supervisor in Step 3, and which are therefore not included in the ES for calculating the respective regulatory capital charge, might be still included in the bank's internal ES.

**Diversification:** The process of constructing a portfolio of long or short positions in different instruments that are relatively uncorrelated with one another, in order to minimise exposure to individual risks, such as issuers or risk classes.

**Expected holding period:** The time period banks expect to hold risk positions as part of their documented trading strategies.

**Endogenous liquidity:** The relative effect on the sale price from the act of liquidating exposures or portfolios within a certain amount of time.

**Fallback (in the context of the SMM /internal models-based approach relationship):**

The process of requiring banks to switch to the SMM when internal models are not performing to adequate standards.

**Financial instrument:** Any contract that gives rise to both a financial asset of one entity and a financial liability or equity instrument of another entity. Financial instruments include both primary financial instruments (or cash instruments) and derivative financial instruments.

**Floor (in the context of the SMM /internal models-based approach relationship):** A level of capital charges (calculated as a percentage of the SMM capital charges) acting as a minimum to the Pillar 1 internal models-based capital charges.

**Hedge:** The process of counterbalancing risks from exposure to long and short positions in correlated instruments.

**Instrument**: The term used to describe financial instruments and commodities (including electric power).

**Liquidity horizon:** The time required to exit or hedge a risk position without materially affecting market prices in stressed market conditions.

**Liquidity premium:** The additional premium demanded by investors to hold financial instruments that cannot be readily liquidated in the market.

**Market risk:** The risk of losses in on- and off-balance sheet risk positions arising from movements in market prices.

**Notional position:** The result of decomposing real-world financial instruments into simpler positions that can be capitalised under the standardised approach. In most cases notional positions will be equal to either the market value, "notional value", or the discounted cash flows of the instrument.

**Notional value:** The notional value of a derivative instrument is equal to the number of units underlying the instrument, multiplied by the current market value of each unit of the underlying.

**Offset:** The process of counterbalancing risks from exposure to long and short positions in the same instrument.

**Pricing model**: 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. The latter kind of pricing model may be simpler than the former. A pricing model may be the combination of several calculations; for example a first valuation technique to compute a price, followed by valuation adjustments for risks that are not incorporated in the first step.

**Primary risk class:** A set of trading desks that are exposed to largely similar primary risk factors.

**Primary risk factor:** The risk factor which is most important for a specific instrument.

**Profit and loss (P&L) attribution:** A backtesting method for assessing the robustness of banks' risk management models by comparing the hypothetical P&L predicted by risk management models with the actual P&L.

**"Real" prices:** A criterion for assessing whether risk factors will be amendable to modelling. A price will be considered "real" if: it is a price from an actual transaction conducted by the bank; it is a price from an actual transaction between other parties (eg at an exchange); or it is a price taken from a firm quote (ie a price at which the bank could transact).

**Risk class:** Either a primary risk class or a risk factor class depending on the method used to aggregate risk positions in the internal models-based approach. Across risk classes supervisory determined/restricted correlations have to be used to determine regulatory capital.

**Risk factor:** A principal determinant of the change in value of a transaction that is used for the quantification of risk. Risk positions are modelled by risk factors.

**Risk factor class:** (Component) Risk factors are mapped to the risk factor classes equity, credit, interest rate, commodities and FX.

**Risk position**: A risk position is a conceptual construct that represents a particular aspect of risk associated with a transaction within a market risk model or a standardised approach for market risk. Example: A bond denominated in a currency different to a bank's reporting currency may be mapped to a risk position for FX risk, a number of risk positions for interest rate risk (in the foreign currency) and one or more risk positions for credit risk.

**“Risk-theoretical” P&L:** The daily desk-level (hypothetical) P&L that is predicted by the risk management model conditional on a realisation of all relevant risk factors that enter the model.

**Trading desk:** A separately managed business line within a bank that follows defined trading strategies with certain instruments, with the goal of generating revenues or maintaining market presence while from assuming and managing risk.

**Surcharge (in the context of the SMM/internal models-based approach relationship):** A

Pillar 1 capital charge (calculated as a percentage of the SMM capital charges) required in addition to the capital charge under the internal models-based approach.

**Interest rate risk in the banking book:** The exposure of a bank’s financial condition to adverse movements in interest rates stemming from banking book assets and liabilities.