Guideline

Subject: Capital Adequacy Requirements (CAR)

Chapter 4 - Settlement and Counterparty Risk

Effective Date: November 2018 / January 2019[1]

The Capital Adequacy Requirements (CAR) for banks (including federal credit unions), bank holding companies, federally regulated trust companies, federally regulated loan companies and cooperative retail associations, collectively referred to as 'institutions', are set out in nine chapters, each of which has been issued as a separate document. This document, Chapter 4 – Settlement and Counterparty Risk, should be read in conjunction with the other CAR chapters which include:

Chapter 1	Overview
Chapter 2	Definition of Capital
Chapter 3	Credit Risk – Standardized Approach
Chapter 4	Settlement and Counterparty Risk
Chapter 5	Credit Risk Mitigation
Chapter 6	Credit Risk – Internal Ratings Based Approach
Chapter 7	Securitization
Chapter 8	Operational Risk
Chapter 9	Market Risk

Please refer to OSFI's *Corporate Governance Guideline* for OSFI's expectations of institution Boards of Directors in regards to the management of capital and liquidity.

[1] For institutions with a fiscal year ending October 31 or December 31, respectively.

Chapter 4 - Settlement and Counterparty Risk

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Chapter 4 – Settlement and Counterparty Risk

[previously Annex 4]

1. This chapter is drawn from the Basel Committee on Banking Supervision (BCBS) Basel II and Basel III frameworks, entitled: "International Convergence of Capital Measurement and Capital Standards – June 2006", "Basel III: A global regulatory framework for more resilient banks and banking systems – December 2010 (rev June 2011)", "The standardised approach for measuring counterparty credit risk exposures – April 2014", "Capital requirements for bank exposures to central counterparties – April 2014", "Basel III: The standardised approach for measuring counterparty credit risk exposures: Frequently asked questions – August 2015" and "Frequently asked questions on the Basel III standardised approach for measuring counterparty credit risk exposures – March 2018". For reference, the Basel II, Basel III, Standardised approach for measuring counterparty credit risk exposures, Capital requirements for bank exposures to CCPs and FAQ text paragraph numbers that are associated with the text appearing in this chapter are indicated in square brackets at the end of each paragraph[2].

4.1. Treatment of counterparty credit risk and cross-product netting

2. This rule identifies permissible methods for estimating the Exposure at Default (EAD) or the exposure amount for instruments with counterparty credit risk under this guideline.[3] Institutions may seek OSFI approval to make use of an Internal Modelling Method (IMM) meeting the requirements and specifications identified herein. As an alternative institutions may also use the Standardized Approach for Counterparty Credit Risk (SA-CCR). [BCBS April 2014 (SA-CCR), Annex 4 par 1]

4.1.1. Definitions and general terminology

3. This section defines terms that will be used throughout this chapter.

4.1.1.1. General terms

- **Counterparty Credit Risk (CCR)** is the risk that the counterparty to a transaction could default before the final settlement of the transaction's cash flows. An economic loss would occur if the transactions or portfolio of transactions with the counterparty has a positive economic value at the time of default. Unlike an institution's exposure to credit risk through a loan, where the exposure to credit risk is unilateral and only the lending institution faces the risk of loss, CCR creates a bilateral risk of loss: the market value of the transaction can be positive or negative to either counterparty to the transaction. The

[2] Following the format: [BCBS June 2006 par x], [BCBS June 2011 par x], [BCBS April 2014 (SA-CCR), par x], [BCBS April 2014 (CCP), par x], [BCBS August 2015, question x] and [BCBS March 2018, question x].

[3] In this document, the terms "exposure at default" and "exposure amount" are used together in order to identify measures of exposure under both an internal ratings-based (IRB) and a standardised approach for credit risk.

market value is uncertain and can vary over time with the movement of underlying market factors.

- A **central counterparty** (CCP) is a clearing house that interposes itself between counterparties to contracts traded in one or more financial markets, becoming the buyer to every seller and the seller to every buyer and thereby ensuring the future performance of open contracts. A CCP becomes a counterparty to trades with market participants through novation, an open offer system, or another legally binding arrangement. For the purposes of the capital framework, a CCP is a financial institution.

- A **qualifying central counterparty** (QCCP) is an entity that is licensed to operate as a CCP (including a license granted by way of confirming an exemption), and is permitted by the appropriate regulator/overseer to operate as such with respect to the products offered. This is subject to the provision that the CCP is based and prudentially supervised in a jurisdiction where the relevant regulator/overseer has established, and publicly indicated that it applies to the CCP on an on-going basis, domestic rules and regulations that are consistent with the CPSS-IOSCO Principles for Financial Market Infrastructures.

  As is the case more generally, OSFI still reserves the right to require institutions to hold additional capital against their exposures to such CCPs via Pillar 2. This might be appropriate where, for example, an external assessment such as an Financial Sector Assessment Program (FSAP) has found material shortcomings in the CCP or the regulation of CCPs, and the CCP and/or the CCP regulator have not since publicly addressed the issues identified.

  Where the CCP is in a jurisdiction that does not have a CCP regulator applying the Principles to the CCP, then OSFI may make the determination of whether the CCP meets this definition.

  In addition, for a CCP to be considered as a QCCP, the terms defined in paragraph 181 for the purposes of calculating the capital requirements for default fund exposures must be made available or calculated in accordance with paragraph 185.

- A **clearing member** is a member of, or a direct participant in, a CCP that is entitled to enter into a transaction with the CCP, regardless of whether it enters into trades with a CCP for its own hedging, investment or speculative purposes or whether it also enters into trades as a financial intermediary between the CCP and other market participants[4].

- A **client** is a party to a transaction with a CCP through either a clearing member acting as a financial intermediary, or a clearing member guaranteeing the performance of the client to the CCP.

- **Initial margin** means a clearing member's or client's collateral posted to the CCP to mitigate the potential future credit exposure of the CCP to the clearing member arising from the possible future change in the value of their transactions. For the purposes of this chapter, initial margin does not include contributions to a CCP for mutualised loss sharing

[4] For the purposes of this chapter, where a CCP has a link to a second CCP, that second CCP is to be treated as a clearing member of the first CCP. Whether the second CCP's collateral contribution to the first CCP is treated as initial margin or a default fund contribution will depend upon the legal arrangement between the CCPs. OSFI should be consulted to determine the treatment of this initial margin and default fund contributions.

arrangements (i.e., in case a CCP uses initial margin to mutualise losses among the clearing members, it will be treated as a default fund exposure). Initial margin may include excess collateral, in cases where the CCP may prevent the clearing member and the clearing member may prevent the client from withdrawing the excess.

- **Variation margin** means a clearing member's or client's funded collateral posted on a daily or intraday basis to a CCP based upon price movements of their transactions.
- **Trade exposures** (in section 4.1.9) include the current[5] and potential future credit exposure of a clearing member or a client to a CCP arising from OTC derivatives, exchange traded derivatives transactions or securities financing transactions (SFTs), as well as initial margin.
- **Default funds**, also known as clearing deposits or guaranty fund contributions (or any other names), are clearing members' funded or unfunded contributions towards, or underwriting of, a CCP's mutualised loss sharing arrangements. The description given by a CCP to its mutualised loss sharing arrangements is not determinative of its status as a default fund; rather, the substance of such arrangements will govern its status.
- **Offsetting transaction** means the transaction leg between the clearing member and the CCP when the clearing member acts on behalf of a client (e.g. when a clearing member clears or novates a client's trade).
- A **multi-level client structure** is one in which institutions can centrally clear as indirect clients; that is, when clearing services are provided to the institution by an institution which is not a direct clearing member, but is itself a client of a clearing member or another clearing client. For exposures between clients and clients of clients, we use the term "**higher level client**" for the institution providing clearing services; and the term "**lower level client**" for the institution clearing through that client.

[BCBS June 2006 Annex 4 par 2A] , [BCBS April 2014 (CCPs), Annex 4, Section I, A. General Terms]

4.1.1.2. Transaction types

- **Long Settlement Transactions** are transactions where a counterparty undertakes to deliver a security, a commodity, or a foreign exchange amount against cash, other financial instruments, or commodities, or vice versa, at a settlement or delivery date that is contractually specified as more than the lower of the market standard for this particular instrument and five business days after the date on which the institution enters into the transaction.
- **Securities Financing Transactions (SFTs)** are transactions such as repurchase agreements, reverse repurchase agreements, security lending and borrowing, and margin lending transactions, where the value of the transactions depends on market valuations and the transactions are often subject to margin agreements.

[5] For the purposes of this definition, the current exposure of a clearing member includes the variation margin due to the clearing member but not yet received.

- **Margin Lending Transactions** are transactions in which an institution extends credit in connection with the purchase, sale, carrying or trading of securities. Margin lending transactions do not include other loans that happen to be secured by securities collateral. Generally, in margin lending transactions, the loan amount is collateralised by securities whose value is greater than the amount of the loan.

[BCBS June 2006 Annex 4 par 2B]

4.1.1.3. Netting sets, hedging sets, and related terms

- **Netting Set** is a group of transactions with a single counterparty that are subject to a legally enforceable bilateral netting arrangement and for which netting is recognised for regulatory capital purposes under chapters 3 and 5 or the Cross-Product Netting Rules set forth in this chapter. Each transaction that is not subject to a legally enforceable bilateral netting arrangement that is recognised for regulatory capital purposes should be interpreted as its own netting set for the purpose of these rules.
- **Hedging Set** is a set of transactions within a single netting set within which full or partial offsetting is recognized for purposes of calculating the potential future exposure (PFE) add-on of the SA-CCR. .
- **Margin Agreement** is a contractual agreement or provisions to an agreement under which one counterparty must supply collateral to a second counterparty when an exposure of that second counterparty to the first counterparty exceeds a specified level.
- **Margin Threshold** is the largest amount of an exposure that remains outstanding until one party has the right to call for collateral.
- **Margin Period of Risk** is the time period from the last exchange of collateral covering a netting set of transactions with a defaulting counterpart until that counterpart is closed out and the resulting market risk is re-hedged.
- **Effective Maturity under the Internal Model Method** for a netting set with maturity greater than one year is the ratio of the sum of expected exposure over the life of the transactions in a netting set discounted at the risk-free rate of return divided by the sum of expected exposure over one year in a netting set discounted at the risk-free rate. This effective maturity may be adjusted to reflect rollover risk by replacing expected exposure with effective expected exposure for forecasting horizons under one year. The formula is given in paragraph 43.
- **Cross-Product Netting** refers to the inclusion of transactions of different product categories within the same netting set pursuant to the Cross-Product Netting Rules set out in this chapter.
- **Current Market Value (CMV)** refers to the net market value of the portfolio of transactions within the netting set with the counterparty. Both positive and negative market values are used in computing CMV.

[BCBS June 2006 Annex 4 par 2C], [BCBS April 2014 (SA-CCR), Annex 4, Section I, A. General Terms]

4.1.1.4. Distributions

- **Distribution of Market Values** is the forecast of the probability distribution of net market values of transactions within a netting set for some future date (the forecasting horizon) given the realised market value of those transactions up to the present time.
- **Distribution of Exposures** is the forecast of the probability distribution of market values that is generated by setting forecast instances of negative net market values equal to zero (this takes account of the fact that, when the institution owes the counterparty money, the institution does not have an exposure to the counterparty).
- **Risk-Neutral Distribution** is a distribution of market values or exposures at a future time period where the distribution is calculated using market implied values such as implied volatilities.
- **Actual Distribution** is a distribution of market values or exposures at a future time period where the distribution is calculated using historic or realised values such as volatilities calculated using past price or rate changes.

[BCBS June 2006 Annex 4 par 2D]

4.1.1.5. Exposure measures and adjustments

- **Current Exposure** is the larger of zero, or the market value of a transaction or portfolio of transactions within a netting set with a counterparty that would be lost upon the default of the counterparty, assuming no recovery on the value of those transactions in bankruptcy. Current exposure is often also called Replacement Cost.
- **Peak Exposure** is a high percentile (typically 95% or 99%) of the distribution of exposures at any particular future date before the maturity date of the longest transaction in the netting set. A peak exposure value is typically generated for many future dates up until the longest maturity date of transactions in the netting set.
- **Expected Exposure** is the mean (average) of the distribution of exposures at any particular future date before the longest-maturity transaction in the netting set matures. An expected exposure value is typically generated for many future dates up until the longest maturity date of transactions in the netting set.
- **Effective Expected Exposure** at a specific date is the maximum expected exposure that occurs at that date or any prior date. Alternatively, it may be defined for a specific date as the greater of the expected exposure at that date, or the effective exposure at the previous date. In effect, the Effective Expected Exposure is the Expected Exposure that is constrained to be non-decreasing over time.
- **Expected Positive Exposure (EPE)** is the weighted average over time of expected exposures where the weights are the proportion that an individual expected exposure represents of the entire time interval. When calculating the minimum capital requirement, the average is taken over the first year or, if all the contracts in the netting set mature before one year, over the time period of the longest-maturity contract in the netting set.

- **Effective Expected Positive Exposure (Effective EPE)** is the weighted average over time of effective expected exposure over the first year, or, if all the contracts in the netting set mature before one year, over the time period of the longest-maturity contract in the netting set where the weights are the proportion that an individual expected exposure represents of the entire time interval.
- **Credit Valuation Adjustment** is an adjustment to the mid-market valuation of the portfolio of trades with a counterparty. This adjustment reflects the market value of the credit risk due to any failure to perform on contractual agreements with a counterparty. This adjustment may reflect the market value of the credit risk of the counterparty or the market value of the credit risk of both the institution and the counterparty.
- **One-Sided Credit Valuation Adjustment** is a credit valuation adjustment that reflects the market value of the credit risk of the counterparty to the firm, but does not reflect the market value of the credit risk of the institution to the counterparty.
- **Debit Valuation Adjustment** is a valuation adjustment that reflects the market value of the credit risk of the institution to the counterparty (i.e., changes in the reporting institution's own credit risk), but does not reflect the market value of the credit risk of the counterparty to the institution. [Added by OSFI]

[BCBS June 2006 Annex 4 par 2E unless otherwise noted]

4.1.1.6. CCR-related risks

- **Rollover Risk** is the amount by which expected positive exposure is understated when future transactions with a counterpart are expected to be conducted on an ongoing basis, but the additional exposure generated by those future transactions is not included in calculation of expected positive exposure.
- **General Wrong-Way Risk** arises when the probability of default of counterparties is positively correlated with general market risk factors.
- **Specific Wrong-Way Risk** arises when the exposure to a particular counterpart is positively correlated with the probability of default of the counterparty due to the nature of the transactions with the counterparty.

[BCBS June 2006 Annex 4 par 2F]

4.1.2. Scope of application

4. The methods for computing the exposure amount under the standardised approach for credit risk or EAD under the internal ratings-based (IRB) approach to credit risk described in this chapter are applicable to SFTs and derivatives. [BCBS June 2006 Annex 4 par 3]

5. Such instruments generally exhibit the following abstract characteristics:

- the transactions generate a current exposure or market value;
- the transactions have an associated random future market value based on market variables;

- the transactions generate an exchange of future payments or an exchange of a financial instrument (including commodities) against payment;
- the transactions are undertaken with an identified counterparty against which a unique probability of default can be determined.[6]

[BCBS June 2006 Annex 4 par 4]

6. Other common characteristics of the transactions to be covered may include the following:

- collateral may be used to mitigate risk exposure and is inherent in the nature of some transactions;
- short-term financing may be a primary objective in that the transactions mostly consist of an exchange of one asset for another (cash or securities) for a relatively short period of time, usually for the business purpose of financing. The two sides of the transactions are not the result of separate decisions but form an indivisible whole to accomplish a defined objective;
- netting may be used to mitigate the risk;
- positions are frequently valued (most commonly on a daily basis), according to market variables.
- remargining may be employed.

[BCBS June 2006 Annex 4 par 5]

7. Exposures to central counterparties arising from OTC derivatives, exchange traded derivatives transactions, SFTs and long settlement transactions will be subject to the counterparty credit risk treatment laid out in section 4.1.9. Exposures arising from settlement of cash transactions (equities, fixed income, spot FX and spot commodities) are not subject to this treatment[7]. The settlement of cash transactions remains subject to the treatment described in section 4.2. [BCBS July 2012, Annex 4, section II par 6(i)], [BCBS April 2014 (CCPs), Annex 4, par 6(i)]

8. When the clearing member-to-client leg of an exchange traded derivative transaction is conducted under a bilateral agreement, both the client and the clearing member are to capitalize that transaction as an OTC derivative[8]. This treatment also applies to transactions between lower level clients and higher level clients in a multi-level client structure. [BCBS April 2014 (CCPs), Annex 4, par 6(ii)]

9. Under the two methods identified in this chapter, when an institution purchases credit derivative protection against a banking book exposure, or against a counterparty credit risk exposure, it will determine its capital requirement for the hedged exposure subject to the criteria

[6] Transactions for which the probability of default is defined on a pooled basis are not included in this treatment of CCR.

[7] For contributions to prepaid default funds covering settlement-risk-only products, the applicable risk weight is 0%.

[8] For this purpose, the treatment in paragraph 169 would also apply.

and general rules for the recognition of credit derivatives, i.e. substitution or double default rules as appropriate. Where these rules apply, the exposure amount or EAD for counterparty credit risk from such instruments is zero. [BCBS June 2006 Annex 4 par 7]

10. The exposure amount or EAD for counterparty credit risk is zero for sold credit default swaps in the banking book where they are treated in the framework as a guarantee provided by the institution and subject to a credit risk charge for the full notional amount. [BCBS June 2006 Annex 4 par 8]

11. Under the internal model method and SA-CCR , the exposure amount or EAD for a given counterparty is equal to the sum of the exposure amounts or EADs calculated for each netting set with that counterparty[9]. [BCBS June 2006 Annex 4 par 9]

12. Outstanding EAD for a given OTC derivative counterparty is defined as the greater of zero and the difference between the sum of EADs across all netting sets with the counterparty and the credit valuation adjustment (CVA) for that counterparty which has already been recognised by the institution as an incurred write-down (i.e. a CVA loss). This CVA loss is calculated without taking into account any offsetting debit valuation adjustments which have been deducted from capital under Chapter 2 – Definition of Capital, Section 2.3.1 Regulatory Adjustment to Common Equity Tier 1 Capital, Cumulative gains and losses due to changes in own credit risk on fair valued financial liabilities[10]. RWAs for a given OTC derivative counterparty may be calculated as the applicable risk weight under the Standardised or IRB approach multiplied by the outstanding EAD of the counterparty. This reduction of EAD by incurred CVA losses does not apply to the determination of the CVA risk capital charge. [BCBS June 2011 addition to Annex 4 par 9]

4.1.3. Cross-product netting rules[11]

13. Institutions that receive approval to estimate their exposures to CCR using the internal model method may include within a netting set SFTs, or both SFTs and OTC derivatives subject to a legally valid form of bilateral netting that satisfies the following legal and operational criteria for a Cross-Product Netting Arrangement (as defined below). The institution must also have satisfied any prior approval or other procedural requirements that OSFI determines to implement for purposes of recognising a Cross-Product Netting Arrangement. [BCBS June 2006 Annex 4 par 10]

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[9] Where a single margin agreement applies to multiple netting sets and the SA-CCR is used, refer to paragraphs 147-148.

[10] The incurred CVA loss deduced from exposures to determine outstanding EAD is the CVA loss gross of all debit value adjustments (DVA) which have been separately deducted from capital. To the extent DVA has not been separately deducted from a bank's capital, the incurred CVA loss used to determine outstanding EAD will be net of such DVA.

[11] These Cross-Product Netting Rules apply specifically to netting across SFTs, or to netting across both SFTs and OTC derivatives, for purposes of regulatory capital computation under IMM. They do not revise or replace the rules that apply to recognition of netting within the OTC derivatives, repo-style transaction, and margin lending transaction product categories under this guideline. The rules in this guideline continue to apply for purposes of regulatory capital recognition of netting within product categories under IMM or other relevant methodology.

4.1.3.1. Legal Criteria

14. The institution has executed a written, bilateral netting agreement with the counterparty that creates a single legal obligation, covering all included bilateral master agreements and transactions ("Cross-Product Netting Arrangement"), such that the institution would have either a claim to receive or obligation to pay only the net sum of the positive and negative (i) close-out values of any included individual master agreements and (ii) mark-to-market values of any included individual transactions (the "Cross-Product Net Amount"), in the event a counterparty fails to perform due to any of the following: default, bankruptcy, liquidation or similar circumstances. [BCBS June 2006 Annex 4 par 11]

15. The institution has written and reasoned legal opinions that conclude with a high degree of certainty that, in the event of a legal challenge, relevant courts or administrative authorities would find the firm's exposure under the Cross-Product Netting Arrangement to be the Cross-Product Net Amount under the laws of all relevant jurisdictions. In reaching this conclusion, legal opinions must address the validity and enforceability of the entire Cross-Product Netting Arrangement under its terms and the impact of the Cross-Product Netting Arrangement on the material provisions of any included bilateral master agreement.

- The laws of "all relevant jurisdictions" are: (i) the law of the jurisdiction in which the counterparty is chartered and, if the foreign branch of a counterparty is involved, then also under the law of the jurisdiction in which the branch is located, (ii) the law that governs the individual transactions, and (iii) the law that governs any contract or agreement necessary to effect the netting.
- A legal opinion must be generally recognised as such by the legal community in the firm's home country or a memorandum of law that addresses all relevant issues in a reasoned manner.

[BCBS June 2006 Annex 4 par 12]

16. The institution has internal procedures to verify that, prior to including a transaction in a netting set, the transaction is covered by legal opinions that meet the above criteria. [BCBS June 2006 Annex 4 par 13]

17. The institution undertakes to update legal opinions as necessary to ensure continuing enforceability of the Cross-Product Netting Arrangement in light of possible changes in relevant law. [BCBS June 2006 Annex 4 par 14]

18. The Cross-Product Netting Arrangement does not include a walkaway clause. A walkaway clause is a provision which permits a non-defaulting counterparty to make only limited payments, or no payment at all, to the estate of the defaulter, even if the defaulter is a net creditor. [BCBS June 2006 Annex 4 par 15]

19. Each included bilateral master agreement and transaction included in the Cross-Product Netting Arrangement satisfies applicable legal requirements for recognition of (i) bilateral netting of derivatives contracts in paragraph 94 , or (ii) credit risk mitigation techniques in chapter 5. [BCBS June 2006 Annex 4 par 16]

20. The institution maintains all required documentation in its files. [BCBS June 2006 Annex 4 par 17]

4.1.3.2. Operational Criteria

21. OSFI is satisfied that the effects of a Cross-Product Netting Arrangement are factored into the firm's measurement of a counterparty's aggregate credit risk exposure and that the institution manages its counterparty credit risk on such basis. [BCBS June 2006, Annex 4 par 18]

22. Credit risk to each counterparty is aggregated to arrive at a single legal exposure across products covered by the Cross-Product Netting Arrangement. This aggregation must be factored into credit limit and economic capital processes. [BCBS June 2006 Annex 4 par 19]

4.1.4. Approval to adopt an internal modelling method to estimate EAD

23. An institution (meaning the individual legal entity or a group) that wishes to adopt an internal modelling method to measure exposure or EAD for regulatory capital purposes must seek OSFI approval. IMM is available both for institutions that adopt the internal ratings-based approach to credit risk and for institutions for which the standardised approach to credit risk applies to all of their credit risk exposures. The institution must meet all of the requirements given in Section 4.1.5 and must apply the method to all of its exposures that are subject to counterparty credit risk, except for long settlement transactions. [BCBS June 2006 Annex 4 par 20]

24. An institution may also choose to adopt an internal modelling method to measure CCR for regulatory capital purposes for its exposures or EAD to only OTC derivatives, to only SFTs, or to both, subject to the appropriate recognition of netting specified above. The institution must apply the method to all relevant exposures within that category, except for those that are immaterial in size and risk. During the initial implementation of the internal models method, an institution may use the SA-CCR for a portion of its business. The institution must submit a plan to OSFI to bring all material exposures for that category of transactions under the IMM. [(BCBS June 2006 Annex 4 par 21]

25. For all OTC derivative transactions and for all long settlement transactions for which an institution has not received OSFI approval to use the internal models method, the institution must use the SA-CCR. [BCBS June 2006 Annex 4 par 22]

26. Exposures or EAD arising from long settlement transactions can be determined using the SA-CCR regardless of the methods chosen for treating OTC derivatives and SFTs. In computing capital requirements for long settlement transactions, institutions that hold permission to use the internal ratings-based approach may opt to apply the risk weights under the standardised approach for credit risk on a permanent basis and irrespective to the materiality of such positions. [BCBS June 2006 Annex 4 par 23]

27. After adoption of the internal model method, the institution must comply with the above requirements on a permanent basis. Only under exceptional circumstances or for immaterial

exposures can an institution revert to the SA-CCR for all or part of its exposure. The institution must demonstrate that reversion to a less sophisticated method does not lead to an arbitrage of the regulatory capital rules. [BCBS June 2006 Annex 4 par 24]

4.1.5. Internal Model Method: measuring exposure and minimum requirements

4.1.5.1. Exposure amount or EAD under the internal model method

28. CCR exposure or EAD is measured at the level of the netting set as defined in Sections 4.1.1 and 4.1.3. A qualifying internal model for measuring counterparty credit exposure must specify the forecasting distribution for changes in the market value of the netting set attributable to changes in market variables, such as interest rates, foreign exchange rates, etc. The model then computes the firm's CCR exposure for the netting set at each future date given the changes in the market variables. For margined counterparties, the model may also capture future collateral movements. Institutions may include eligible financial collateral as defined in paragraph 45 of section 5.1.3 and chapter 9 in their forecasting distributions for changes in the market value of the netting set, if the quantitative, qualitative and data requirements for internal model method are met for the collateral. [BCBS June 2006 Annex 4 par 25]

29. To determine the default risk capital charge for counterparty credit risk as defined in paragraph 158, institutions must use the greater of the portfolio-level capital charge (not including the CVA charge in paragraphs 149 to 157) based on Effective EPE using current market data and the portfolio-level capital charge based on Effective EPE using a stress calibration. The stress calibration should be a single consistent stress calibration for the whole portfolio of counterparties. The greater of Effective EPE using current market data and the stress calibration should be applied on a total portfolio level and not on a counterparty by counterparty basis. [BCBS June 2011 Annex 4 par 25(i)]

30. OSFI expects institutions to have in place a policy for verifying the adequacy of, and updating, their choice of stress period. This policy would have to be approved in advance by OSFI as part of the IMM model approval process. Changes to this policy would constitute a major modification of the IMM model

31. To the extent that an institution recognises collateral in exposure amount or EAD via current exposure, an institution would not be permitted to recognise the benefits in its estimates of LGD. As a result, the institution would be required to use an LGD of an otherwise similar uncollateralised facility. In other words, it would be required to use an LGD that does not include collateral that is already included in EAD. [BCBS June 2006 Annex 4 par 26]

32. Under the IMM, the institution need not employ a single model. Although the following text describes an internal model as a simulation model, no particular form of model is required. Analytical models are acceptable so long as they are subject to supervisory review, meet all of the requirements set forth in this section and are applied to all material exposures subject to a CCR-related capital charge as noted above, with the exception of long settlement transactions, which are treated separately, and with the exception of those exposures that are immaterial in size and risk. [BCBS June 2006 Annex 4 par 27]

33. Expected exposure or peak exposure measures should be calculated based on a distribution of exposures that accounts for the possible non-normality of the distribution of exposures, including the existence of leptokurtosis ("fat tails"), where appropriate. [BCBS June 2006 Annex 4 par 28]

34. When using an internal model, exposure amount or EAD is calculated as the product of alpha times Effective EPE, as specified below (except for counterparties that have been identified as having explicit specific wrong way risk – see paragraph 73):

$$\text{EAD} = \alpha \times \text{Effective EPE} \qquad (1)$$

[BCBS June 2006 and June 2011 Annex 4 par 29]

35. Effective EPE ("Expected Positive Exposure") is computed by estimating expected exposure (EE_t) as the average exposure at future date t, where the average is taken across possible future values of relevant market risk factors, such as interest rates, foreign exchange rates, etc. The internal model estimates EE at a series of future dates $t_1, t_2, t_3 \ldots$[12] Specifically, "Effective EE" is computed recursively as

$$\text{Effective } EE_{tk} = \max(\text{Effective } EE_{tk-1}, EE_{tk}) \qquad (2)$$

where the current date is denoted as t_0 and Effective EE_{t0} equals current exposure.
[BCBS June 2006 Annex 4 par 30]

36. In this regard, "Effective EPE" is the average Effective EE during the first year of future exposure. If all contracts in the netting set mature before one year, EPE is the average of expected exposure until all contracts in the netting set mature. Effective EPE is computed as a weighted average of Effective EE:

$$\textit{Effective EPE} = \sum_{k=1}^{\min(1year, maturity)} \textit{Effective}\, EE_{t_k} \times \Delta t_k \qquad (3)$$

where the weights $\Delta t_k = t_k - t_{k-1}$ allows for the case when future exposure is calculated at dates that are not equally spaced over time.

[BCBS June 2006 Annex 4 par 31]

37. Alpha (α) is set equal to 1.4. [BCBS June 2006 Annex 4 par 32]

38. OSFI retains discretion to require a higher alpha based on a firm's CCR exposures. Factors that may require a higher alpha include the low granularity of counterparties; particularly high exposures to general wrong-way risk; particularly high correlation of market values across

[12] In theory, the expectations should be taken with respect to the actual probability distribution of future exposure and not the risk-neutral one. Supervisors recognise that practical considerations may make it more feasible to use the risk-neutral one. As a result, supervisors will not mandate which kind of forecasting distribution to employ.

counterparties; and other institution-specific characteristics of CCR exposures. [BCBS June 2006 Annex 4 par 33]

4.1.5.2. Own estimates for alpha

39. Institutions may seek OSFI approval to compute internal estimates of alpha subject to a floor of 1.2, where alpha equals the ratio of economic capital from a full simulation of counterparty exposure across counterparties (numerator) and economic capital based on EPE (denominator), assuming they meet certain operating requirements. Eligible institutions must meet all the operating requirements for internal estimates of EPE and must demonstrate that their internal estimates of alpha capture in the numerator the material sources of stochastic dependency of distributions of market values of transactions or of portfolios of transactions across counterparties (e.g. the correlation of defaults across counterparties and between market risk and default). [BCBS June 2006 Annex 4 par 34]

40. In the denominator, EPE must be used as if it were a fixed outstanding loan amount. [BCBS June 2006 Annex 4 par 35]

41. To this end, institutions must ensure that the numerator and denominator of alpha are computed in a consistent fashion with respect to the modelling methodology, parameter specifications and portfolio composition. The approach used must be based on the firm's internal economic capital approach, be well-documented and be subject to independent validation. In addition, institutions must review their estimates on at least a quarterly basis, and more frequently when the composition of the portfolio varies over time. Institutions must assess the model risk given the significant variation in estimates of alpha can arise from the possibility for mis-specification in the models used for the numerator, especially where convexity is present. The assessment of model risk must be part of the independent model validation and approval process and model performance monitoring. [BCBS June 2006 and June 2011 Annex 4 par 36]

42. Where appropriate, volatilities and correlations of market risk factors used in the joint simulation of market and credit risk should be conditioned on the credit risk factor to reflect potential increases in volatility or correlation in an economic downturn. Internal estimates of alpha should take account of the granularity of exposures. [BCBS June 2006 Annex 4 par 37]

4.1.5.3. Maturity

43. If the original maturity of the longest-dated contract contained in the set is greater than one year, the formula for effective maturity (M) in Chapter 6 - Internal Ratings Based Approach paragraph 121 of chapter 6 is replaced with the following:

$$M = \frac{\sum_{k=1}^{t_k \le 1year} Effective\,EE_k \times \Delta t_k \times df_k + \sum_{t_k > 1year}^{maturity} EE_k \times \Delta t_k \times df_k}{\sum_{k=1}^{t_k \le 1year} Effective\,EE_k \times \Delta t_k \times df_k}$$

where df_k is the risk-free discount factor for future time period t_k and the remaining symbols are defined above. Similar to the treatment under corporate exposures, M has a cap of five years[13].
[BCBS June 2006 Annex 4 par 38]

44. For netting sets in which all contracts have an original maturity of less than one year, the formula for effective maturity (M) in Chapter 6 - Internal Ratings Based Approach paragraph 121 is unchanged and a floor of one year applies, with the exception of short-term exposures as described in Chapter 6 - Internal Ratings Based Approach, paragraphs 122 to 124. [BCBS June 2006 Annex 4 par 39]

4.1.5.4. Margin agreements

45. If the netting set is subject to a margin agreement and the internal model captures the effects of margining when estimating EE, the model's EE measure may be used directly in equation (2). Such models are noticeably more complicated than models of EPE for unmargined counterparties. As such, they are subject to a higher degree of supervisory scrutiny before they are approved, as discussed below. [BCBS June 2006 Annex 4 par 40]

46. An EPE model must also include transaction-specific information in order to capture the effects of margining. It must take into account both the current amount of margin and margin that would be passed between counterparties in the future. Such a model must account for the nature of margin agreements (unilateral or bilateral), the frequency of margin calls, the margin period of risk, the thresholds of unmargined exposure the institution is willing to accept, and the minimum transfer amount. Such a model must either model the mark-to-market change in the value of collateral posted or apply this Framework's rules for collateral. [BCBS June 2011 Annex 4 after par 40]

47. For transactions subject to daily re-margining and mark-to-market valuation, a supervisory floor of five business days for netting sets consisting only of repo-style transactions, and 10 business days for all other netting sets is imposed on the margin period of risk used for the purpose of modelling EAD with margin agreements. In the following cases a higher supervisory floor is imposed:

- for all netting sets where the number of trades exceeds 5,000 at any point during a quarter, a supervisory floor of 20 business days is imposed for the margin period of risk for the following quarter;
- for netting sets containing one or more trades involving either illiquid collateral, or an OTC derivative that cannot be easily replaced, a supervisory floor of 20 business days is imposed for the margin period of risk. For these purposes, "Illiquid collateral" and "OTC derivatives that cannot be easily replaced" must be determined in the context of stressed market conditions and will be characterised by the absence of continuously active markets where a counterparty would, within two or fewer days, obtain multiple price

[13] Conceptually, M equals the effective credit duration of the counterparty exposure. A bank that uses an internal model to calculate a one-sided credit valuation adjustment (CVA) can use the effective credit duration estimated by such a model in place of the above formula with prior approval of its supervisor.

quotations that would not move the market or represent a price reflecting a market discount (in the case of collateral) or premium (in the case of an OTC derivative). Examples of situations where trades are deemed illiquid for this purpose include, but are not limited to, trades that are not marked daily and trades that are subject to specific accounting treatment for valuation purposes (e.g. OTC derivatives or repo-style transactions referencing securities whose fair value is determined by models with inputs that are not observed in the market).

- in addition, an institution must consider whether trades or securities it holds as collateral are concentrated in a particular counterparty and if that counterparty exited the market precipitously whether the institution would be able to replace its trades.

[BCBS June 2011 Annex 4 par 41(i))

48. If an institution has experienced more than two margin call disputes on a particular netting set over the previous two quarters that have lasted longer than the applicable margin period of risk (before consideration of this provision), then the institution must reflect this history appropriately by using a margin period of risk that is at least double the supervisory floor for that netting set for the subsequent two quarters. [BCBS June 2011 Annex 4 par 41(ii)]

49. For re-margining with a periodicity of N-days, the margin period of risk should be at least equal to the supervisory floor, F, plus the N days minus one day. That is,

$$\text{Margin Period of Risk} = F + N - 1.$$

[BCBS June 2011 Annex 4 par 41(iii)], [BCBS April 2014 (SA-CCR), Annex 4 par 41 (iii)]

50. Institutions using the IMM must not capture the effect of a reduction of EAD due to any clause in a collateral agreement that requires receipt of collateral when counterparty credit quality deteriorates. [BCBS June 2011 Annex 4 par 41(iv)]

4.1.5.5. Model validation

51. In order to assure itself that institutions using models have counterparty credit risk management systems that are conceptually sound and implemented with integrity, OSFI will specify a number of qualitative criteria that institutions would have to meet before they are permitted to use a models-based approach. The extent to which institutions meet the qualitative criteria may influence the level at which OSFI will set the multiplication factor referred to in paragraph 37 (Alpha). Only those institutions in full compliance with the qualitative criteria will be eligible for application of the minimum multiplication factor. The qualitative criteria include:

- the institution must conduct a regular programme of backtesting, ie an ex-post comparison of the risk measures[14] generated by the model against realised risk measures,

[14] "Risk measures" refers not only to Effective EPE, the risk measure used to derive regulatory capital, but also to the other risk measures used in the calculation of Effective EPE such as the exposure distribution at a series of future dates, the positive exposure distribution at a series of future dates, the market risk factors used to derive those exposures and the values of the constituent trades of a portfolio.

as well as comparing hypothetical changes based on static positions with realised measures;

- the institution must carry out an initial validation and an on-going periodic review of its IMM model and the risk measures generated by it. The validation and review must be independent of the model developers;
- senior management should be actively involved in the risk control process and must regard credit and counterparty credit risk control as an essential aspect of the business to which significant resources need to be devoted. In this regard, the daily reports prepared by the independent risk 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 institution's overall risk exposure;
- the institution's internal risk measurement exposure model must be closely integrated into the day-to-day risk management process of the institution. Its output should accordingly be an integral part of the process of planning, monitoring and controlling it's counterparty credit risk profile;
- the risk measurement system should be used in conjunction with internal trading and exposure limits. In this regard, exposure limits should be related to the institution's risk measurement model in a manner that is consistent over time and that is well understood by traders, the credit function and senior management;
- institutions should have a routine in place for ensuring compliance with a documented set of internal policies, controls and procedures concerning the operation of the risk measurement system. The institution's risk measurement system must be well documented, for example, through a risk management manual that describes the basic principles of the risk management system and that provides an explanation of the empirical techniques used to measure counterparty credit risk;
- an independent review of the risk measurement system should be carried out regularly in the institution's own internal auditing process. This review should include both the activities of the business trading units and of the independent risk control unit. A review of the overall risk management process should take place at regular intervals (ideally no less than once a year) and should specifically address, at a minimum:
    - the adequacy of the documentation of the risk management system and process;
    - the organisation of the risk control unit;
    - the integration of counterparty credit risk measures into daily risk management;
    - the approval process for counterparty credit risk models used in the calculation of counterparty credit risk used by front office and back office personnel;
    - the validation of any significant change in the risk measurement process;
    - the scope of counterparty credit risks captured by the risk measurement model;
    - the integrity of the management information system;
    - the accuracy and completeness of position data;

- the verification of the consistency, timeliness and reliability of data sources used to run internal models, including the independence of such data sources;
- the accuracy and appropriateness of volatility and correlation assumptions;
- the accuracy of valuation and risk transformation calculations; and
- the verification of the model's accuracy as described in paragraphs 52 to 55.

- the on-going validation of counterparty credit risk models, including backtesting, must be reviewed periodically by a level of management with sufficient authority to decide the course of action that will be taken to address weaknesses in the models.

[BCBS June 2011 Annex 4 par 42]

52. Institutions must document the process for initial and on-going validation of their IMM model to a level of detail that would enable a third party to recreate the analysis. Institutions must also document the calculation of the risk measures generated by the models to a level of detail that would allow a third party to re-create the risk measures. This documentation must set out the frequency with which backtesting analysis and any other on-going validation will be conducted, how the validation is conducted with respect to data flows and portfolios and the analyses that are used. [BCBS June 2011 Annex 4 par 43]

53. Institutions must define criteria with which to assess their EPE models and the models that input into the calculation of EPE and have a written policy in place that describes the process by which unacceptable performance will be determined and remedied. [BCBS June 2011 Annex 4 par 44]

54. Institutions must define how representative counterparty portfolios are constructed for the purposes of validating an EPE model and its risk measures. [BCBS June 2011 Annex 4 par 45]

55. When validating EPE models and its risk measures that produce forecast distributions, validation must assess more than a single statistic of the model distribution. [BCBS June 2011 Annex 4 par 46]

56. As part of the initial and on-going validation of an IMM model and its risk measures, the following requirements must be met:

- a institution must carry out backtesting using historical data on movements in market risk factors prior to OSFI approval. Backtesting must consider a number of distinct prediction time horizons out to at least one year, over a range of various start (initialisation) dates and covering a wide range of market conditions;
- institutions must backtest the performance of their EPE model and the model's relevant risk measures as well as the market risk factor predictions that support EPE. For collateralised trades, the prediction time horizons considered must include those reflecting typical margin periods of risk applied in collateralised/margined trading, and must include long time horizons of at least 1 year;
- the pricing models used to calculate counterparty credit risk exposure for a given scenario of future shocks to market risk factors must be tested as part of the initial and on-going

model validation process. These pricing models may be different from those used to calculate Market Risk over a short horizon. Pricing models for options must account for the non-linearity of option value with respect to market risk factors;

- an EPE model must capture transaction specific information in order to aggregate exposures at the level of the netting set. Institutions must verify that transactions are assigned to the appropriate netting set within the model;
- static, historical backtesting on representative counterparty portfolios must be a part of the validation process. At regular intervals, a institution must conduct such backtesting on a number of representative counterparty portfolios. The representative portfolios must be chosen based on their sensitivity to the material risk factors and correlations to which the institution is exposed. In addition, IMM institutions need to conduct backtesting that is designed to test the key assumptions of the EPE model and the relevant risk measures, e.g. the modelled relationship between tenors of the same risk factor, and the modelled relationships between risk factors;
- significant differences between realised exposures and the forecast distribution could indicate a problem with the model or the underlying data that the supervisor would require the institution to correct. Under such circumstances, supervisors may require additional capital to be held while the problem is being solved;
- the performance of EPE models and its risk measures must be subject to good backtesting practice. The backtesting programme must be capable of identifying poor performance in an EPE model's risk measures;
- institutions must validate their EPE models and all relevant risk measures out to time horizons commensurate with the maturity of trades for which exposure is calculated using an internal modelling method;
- the pricing models used to calculate counterparty exposure must be regularly tested against appropriate independent benchmarks as part of the on-going model validation process;
- the on-going validation of a institution's EPE model and the relevant risk measures include an assessment of recent performance;
- the frequency with which the parameters of an EPE model are updated needs to be assessed as part of the validation process;
- under the IMM, a measure that is more conservative than the metric used to calculate regulatory EAD for every counterparty, may be used in place of alpha times Effective EPE with the prior OSFI approval. The degree of relative conservatism will be assessed upon initial OSFI approval and at the regular supervisory reviews of the EPE models. The institution must validate the conservatism regularly;
- the on-going assessment of model performance needs to cover all counterparties for which the models are used;
- the validation of IMM models must assess whether or not the institution level and netting set exposure calculations of EPE are appropriate.

[BCBS June 2011 Annex 4 par 46(i)]

57. In the case where the pricing model used to calculate counterparty credit risk exposure is different than the pricing model used to calculate Market Risk over a short horizon, OSFI expects institutions to provide documented justification for the use of two different pricing models, including an assessment of the resulting model risk

4.1.5.6. Operational requirements for EPE models

58. In order to be eligible to adopt an internal model for estimating EPE arising from CCR for regulatory capital purposes, an institution must meet the following operational requirements. These include meeting the requirements related to the qualifying standards on CCR Management, a use test, stress testing, identification of wrong-way risk, and internal controls. [BCBS June 2006 Annex 4 par 47]

Qualifying standards on CCR Management

59. The institution must satisfy its supervisor that, in addition to meeting the operational requirements identified in paragraphs 60 to 86 below, it adheres to sound practices for CCR management. [BCBS June 2006 Annex 4 par 48]

Use test

60. The distribution of exposures generated by the internal model used to calculate effective EPE must be closely integrated into the day-to-day CCR management process of the institution. For example, the institution could use the peak exposure from the distributions for counterparty credit limits or expected positive exposure for its internal allocation of capital. The internal model's output must accordingly play an essential role in the credit approval, counterparty credit risk management, internal capital allocations, and corporate governance of institutions that seek approval to apply such models for capital adequacy purposes. Models and estimates designed and implemented exclusively to qualify for the internal models method are not acceptable. [BCBS June 2006 Annex 4 par 49]

61. The institution must have an independent risk control unit that is responsible for the design and implementation of the institution's counterparty credit risk management system. The unit should produce and analyse daily reports on the output of the institution's risk measurement model, including an evaluation of the relationship between measures of counterparty credit exposure and trading limits. The unit must be independent from the business trading units and should report directly to senior management of the institution. [BCBS June 2011 Annex 4 par 49(i)]

62. An institution must have a credible track record in the use of internal models that generate a distribution of exposures to CCR. Thus, the institution must demonstrate that it has been using an internal model to calculate the distributions of exposures upon which the EPE calculation is based that meets broadly the minimum requirements for at least one year prior to supervisory approval. [BCBS June 2006 Annex 4 par 50]

63. Institutions employing the internal model method must have an independent control unit that is responsible for the design and implementation of the firm's CCR management system, including the initial and on-going validation of the internal model. This unit must control input data integrity and produce and analyse reports on the output of the firm's risk measurement model, including an evaluation of the relationship between measures of risk exposure and credit and trading limits. This unit must be independent from business credit and trading units; it must be adequately staffed; it must report directly to senior management of the firm. The work of this unit should be closely integrated into the day-to-day credit risk management process of the firm. Its output should accordingly be an integral part of the process of planning, monitoring and controlling the firm's credit and overall risk profile. [BCBS June 2006 Annex 4 par 51]

64. Institutions applying the IMM must have a collateral management unit that is responsible for calculating and making margin calls, managing margin call disputes and reporting levels of independent amounts, initial margins and variation margins accurately on a daily basis. This unit must control the integrity of the data used to make margin calls, and ensure that it is consistent and reconciled regularly with all relevant sources of data within the institution. This unit must also track the extent of reuse of collateral (both cash and non-cash) and the rights that the institution gives away to its respective counterparties for the collateral that it posts. These internal reports must indicate the categories of collateral assets that are reused, and the terms of such reuse including instrument, credit quality and maturity. The unit must also track concentration to individual collateral asset classes accepted by the institutions. Senior management must allocate sufficient resources to this unit for its systems to have an appropriate level of operational performance, as measured by the timeliness and accuracy of outgoing calls and response time to incoming calls. Senior management must ensure that this unit is adequately staffed to process calls and disputes in a timely manner even under severe market crisis, and to enable the institution to limit its number of large disputes caused by trade volumes. [BCBS June 2011 Annex 4 par 51(i)]

65. The institution's collateral management unit must produce and maintain appropriate collateral management information that is reported on a regular basis to senior management. Such internal reporting should include information on the type of collateral (both cash and non-cash) received and posted, as well as the size, aging and cause for margin call disputes. This internal reporting should also reflect trends in these figures. [BCBS June 2011 Annex 4 par 51(ii)]

66. A institution employing the IMM must ensure that its cash management policies account simultaneously for the liquidity risks of potential incoming margin calls in the context of exchanges of variation margin or other margin types, such as initial or independent margin, under adverse market shocks, potential incoming calls for the return of excess collateral posted by counterparties, and calls resulting from a potential downgrade of its own public rating. The institution must ensure that the nature and horizon of collateral reuse is consistent with its liquidity needs and does not jeopardise its ability to post or return collateral in a timely manner.
[BCBS June 2011 Annex 4 par 51(iii)]

67. The internal model used to generate the distribution of exposures must be part of a counterparty risk management framework that includes the identification, measurement,

management, approval and internal reporting of counterparty risk.[15] This framework must include the measurement of usage of credit lines (aggregating counterparty exposures with other credit exposures) and economic capital allocation. In addition to EPE (a measure of future exposure), an institution must measure and manage current exposures. Where appropriate, the institution must measure current exposure gross and net of collateral held. The use test is satisfied if an institution uses other counterparty risk measures, such as peak exposure or potential future exposure (PFE), based on the distribution of exposures generated by the same model to compute EPE. [BCBS June 2006 Annex 4 par 52]

68. An institution is not required to estimate or report EE daily, but to meet the use test it must have the systems capability to estimate EE daily, if necessary, unless it demonstrates to its supervisor that its exposures to CCR warrant some less frequent calculation. It must choose a time profile of forecasting horizons that adequately reflects the time structure of future cash flows and maturity of the contracts. For example, an institution may compute EE on a daily basis for the first ten days, once a week out to one month, once a month out to eighteen months, once a quarter out to five years and beyond five years in a manner that is consistent with the materiality and composition of the exposure. [BCBS June 2006 Annex 4 par 53]

69. Exposure must be measured out to the life of all contracts in the netting set (not just to the one year horizon), monitored and controlled. The institution must have procedures in place to identify and control the risks for counterparties where exposure rises beyond the one-year horizon. Moreover, the forecasted increase in exposure must be an input into the firm's internal economic capital model. [BCBS June 2006 Annex 4 par 54]

Stress testing

70. An institution must have in place sound stress testing processes for use in the assessment of capital adequacy. These stress measures must be compared against the measure of EPE and considered by the institution as part of its internal capital adequacy assessment process. Stress testing must also involve identifying possible events or future changes in economic conditions that could have unfavourable effects on a firm's credit exposures and assessment of the firm's ability to withstand such changes. Examples of scenarios that could be used are; (i) economic or industry downturns, (ii) market-place events, or (iii) decreased liquidity conditions. [BCBS June 2006 Annex 4 par 55]

71. Institutions must have a comprehensive stress testing program for counterparty credit risk. The stress testing program must include the following elements:

- institutions must ensure complete trade capture and exposure aggregation across all forms of counterparty credit risk (not just OTC derivatives) at the counterparty-specific level in a sufficient time frame to conduct regular stress testing;
- for all counterparties, institutions should produce, at least monthly, exposure stress testing of principal market risk factors (eg interest rates, FX, equities, credit spreads, and

[15] This section draws heavily on the Counterparty Risk Management Policy Group's paper, *Improving Counterparty Risk Management Practices* (June 1999); a copy can be found online at http://archives-financialservices.house.gov/banking/62499crm.pdf

commodity prices) in order to proactively identify, and when necessary, reduce outsized concentrations to specific directional sensitivities;

- institutions should apply multi-factor stress testing scenarios and assess material non-directional risks (i.e. yield curve exposure, basis risks, etc.) at least quarterly. Multiple-factor stress tests should, at a minimum, aim to address scenarios in which a) severe economic or market events have occurred; b) broad market liquidity has decreased significantly; and c) the market impact of liquidating positions of a large financial intermediary. These stress tests may be part of institution-wide stress testing;
- stressed market movements have an impact not only on counterparty exposures, but also on the credit quality of counterparties. At least quarterly, institutions should conduct stress testing applying stressed conditions to the joint movement of exposures and counterparty creditworthiness;
- exposure stress testing (including single factor, multifactor and material non-directional risks) and joint stressing of exposure and creditworthiness should be performed at the counterparty-specific, counterparty group (e.g. industry and region), and aggregate institution-wide CCR levels;
- stress tests results should be integrated into regular reporting to senior management. The analysis should capture the largest counterparty-level impacts across the portfolio, material concentrations within segments of the portfolio (within the same industry or region), and relevant portfolio and counterparty specific trends;
- the severity of factor shocks should be consistent with the purpose of the stress test. When evaluating solvency under stress, factor shocks should be severe enough to capture historical extreme market environments and/or extreme but plausible stressed market conditions. The impact of such shocks on capital resources should be evaluated, as well as the impact on capital requirements and earnings. For the purpose of day-to-day portfolio monitoring, hedging, and management of concentrations, institutions should also consider scenarios of lesser severity and higher probability;
- institutions should consider reverse stress tests to identify extreme, but plausible, scenarios that could result in significant adverse outcomes;
- senior management must take a lead role in the integration of stress testing into the risk management framework and risk culture of the institution and ensure that the results are meaningful and proactively used to manage counterparty credit risk. At a minimum, the results of stress testing for significant exposures should be compared to guidelines that express the institution's risk appetite and elevated for discussion and action when excessive or concentrated risks are present.

[BCBS June 2011 Annex 4 par 56]

Wrong-way risk

72. Institutions must identify exposures that give rise to a greater degree of general wrong-way risk. Stress testing and scenario analyses must be designed to identify risk factors that are positively correlated with counterparty credit worthiness. Such testing needs to address the possibility of severe shocks occurring when relationships between risk factors have changed.

Institutions should monitor general wrong way risk by product, by region, by industry, or by other categories that are germane to the business. Reports should be provided to senior management on a regular basis that communicate wrong way risks and the steps that are being taken to manage that risk. [BCBS June 2011 Annex 4 par 57]

73. An institution is exposed to "specific wrong-way risk" (SWWR) if future exposure to a specific counterparty is highly correlated with the counterparty's probability of default. For example, a company writing put options on its own stock creates wrong-way exposures for the buyer that is specific to the counterparty. An institution must have procedures in place to identify, monitor and control cases of SWWR, beginning at the inception of a trade and continuing through the life of the trade. To calculate the CCR capital charge, the instruments for which there exists a legal connection between the counterparty and the underlying issuer, and for which specific wrong way risk has been identified, are not considered to be in the same netting set as other transactions with the counterparty. Furthermore, for single-name credit default swaps where there exists a legal connection between the counterparty and the underlying issuer, and where SWWR has been identified, EAD in respect of such swap counterparty exposure equals the full expected loss in the remaining fair value of the underlying instruments assuming the underlying issuer is in liquidation. The use of the full expected loss in remaining fair value of the underlying instrument allows the institution to recognise, in respect of such swap, the market value that has been lost already and any expected recoveries. Accordingly LGD for Advanced or Foundation IRB institutions must be set to 100% for such swap transactions[16]. For institutions using the Standardised Approach for credit risk, the risk weight to use is that of an unsecured transaction. For equity derivatives, bond options, securities financing transactions etc. referencing a single company where there exists a legal connection between the counterparty and the underlying company, and where SWWR has been identified, EAD equals the value of the transaction under the assumption of a jump-to-default of the underlying security. Inasmuch this makes re-use of possibly existing (market risk) calculations (for IRC) that already contain an LGD assumption, the LGD must be set to 100%. LGD for Advanced and Foundation IRB banks will be that of an unsecured exposure. For institutions using the Standardized Approach for credit risk, the risk weight of an unsecured transaction should be used.

The counterparty credit risk arising from trades where SWWR has been identified can be mitigated through either prepayment or the collection of independent collateral amounts. If a counterparty prepays the notional amount of the exposure for a trade where SWWR has been identified, or a portion of it, then the EAD for that trade may be reduced by the amount of the prepayment.

In situations where independent collateral amounts have been collected, the EAD for those trades may be reduced by the independent collateral amount (after any applicable haircuts) provided one of the following situations applies:

[16] Note that the recoveries may also be possible on the underlying instrument beneath such swap. The capital requirements for such underlying exposure are to be calculated under the Accord without reduction for the swap which introduces wrong way risk. Generally this means that such underlying exposure will receive the risk weight and capital treatment associated with an unsecured transaction (i.e. assuming such underlying exposure is an unsecured credit exposure).

- The independent collateral amount is legally pledged to cover risk solely on the trade for which SWWR has been identified; or
- Both counterparties to the trade where SWWR has been identified agree that the independent collateral amount is posted to account for the SWWR trade and this independent amount is managed internally as such.

[BCBS June 2011 Annex 4 par 58]

Integrity of Modelling Process

74. Other operational requirements focus on the internal controls needed to ensure the integrity of model inputs; specifically, the requirements address the transaction data, historical market data, frequency of calculation, and valuation models used in measuring EPE. [BCBS June 2006 Annex 4 par 59]

75. The internal model must reflect transaction terms and specifications in a timely, complete, and conservative fashion. Such terms include, but are not limited to, contract notional amounts, maturity, reference assets, collateral thresholds, margining arrangements, netting arrangements, etc. The terms and specifications must reside in a secure database that is subject to formal and periodic audit. The process for recognising netting arrangements must require signoff by legal staff to verify the legal enforceability of netting and be input into the database by an independent unit. The transmission of transaction terms and specifications data to the internal model must also be subject to internal audit and formal reconciliation processes must be in place between the internal model and source data systems to verify on an ongoing basis that transaction terms and specifications are being reflected in EPE correctly or at least conservatively. [BCBS June 2006 Annex 4 par 60]

76. When the Effective EPE model is calibrated using historic market data, the institution must employ current market data to compute current exposures and at least three years of historical data must be used to estimate parameters of the model. Alternatively, market implied data may be used to estimate parameters of the model. In all cases, the data must be updated quarterly or more frequently if market conditions warrant. To calculate the Effective EPE using a stress calibration, the institution must also calibrate Effective EPE using three years of data that include a period of stress to the credit default spreads of an institution's counterparties or calibrate Effective EPE using market implied data from a suitable period of stress. The following process will be used to assess the adequacy of the stress calibration:

- the institution must demonstrate, at least quarterly, that the stress period coincides with a period of increased CDS or other credit spreads – such as loan or corporate bond spreads – for a representative selection of the institution's counterparties with traded credit spreads. In situations where the institution does not have adequate credit spread data for a counterparty, the institution should map each counterparty to specific credit spread data based on region, internal rating and business types;
- the exposure model for all counterparties must use data, either historic or implied, that includes the data from the stressed credit period, and must use such data in a manner consistent with the method used for the calibration of the Effective EPE model to current data;

- to evaluate the effectiveness of its stress calibration for Effective EPE, the institution must create several benchmark portfolios that are vulnerable to the same main risk factors to which it is exposed. The exposure to these benchmark portfolios shall be calculated using (a) current
- positions at current market prices, stressed volatilities, stressed correlations and other relevant stressed exposure model inputs from the 3-year stress period and (b) current positions at end of stress period market prices, stressed volatilities, stressed correlations and other relevant stressed exposure model inputs from the 3-year stress period. Supervisors may adjust the stress calibration if the exposures of these benchmark portfolios deviate substantially.

[BCBS June 2011 Annex 4 par 61]

77. When two different calibration methods are used for different parameters within the Effective EPE model, OSFI expects institutions' model development and validation groups to provide documented justification for the choice of calibration methods that includes an assessment of the resulting model risk.

78. If an institution wished to recognise in its EAD calculations for OTC derivatives the effect of collateral other than cash of the same currency as the exposure itself, then it must model collateral jointly with the exposure., If the institution is not able to model collateral jointly with the exposure then it must use either haircuts that meet the standards of the financial collateral comprehensive method with own haircut estimates or the standard supervisory haircuts. [BCBS June 2011 Annex 4 par 61(i)]

79. If the internal model includes the effect of collateral on changes in the market value of the netting set, the institution must model collateral other than cash of the same currency as the exposure itself jointly with the exposure in its EAD calculations for securities-financing transactions. [BCBS June 2011 Annex 4 par 61(ii)]

80. The EPE model (and modifications made to it) must be subject to an internal model validation process. The process must be clearly articulated in firms' policies and procedures. The validation process must specify the kind of testing needed to ensure model integrity and identify conditions under which assumptions are violated and may result in an understatement of EPE. The validation process must include a review of the comprehensiveness of the EPE model, for example such as whether the EPE model covers all products that have a material contribution to counterparty risk exposures. [BCBS June 2006 Annex 4 par 62]

81. The use of an internal model to estimate EPE, and hence the exposure amount or EAD, of positions subject to a CCR capital charge will be conditional upon the explicit OSFI approval.
[BCBS June 2006 Annex 4 par 63]

82. The BCBS has issued guidance regarding the use of internal models to estimate certain parameters of risk and determine minimum capital charges against those risks. OSFI requires that institutions seeking to make use of internal models to estimate EPE meet similar requirements regarding, for example, the integrity of the risk management system, the skills of staff that will rely on such measures in operational areas and in control functions, the accuracy of models, and

the rigour of internal controls over relevant internal processes. As an example, institutions seeking to make use of an internal model to estimate EPE must demonstrate that they meet the Committee's general criteria for institutions seeking to make use of internal models to assess market risk exposures, but in the context of assessing counterparty credit risk.[17] [BCBS June 2006 Annex 4 par 64]

83. The Internal Capital Adequacy Assessment Program provides general background and specific guidance to cover counterparty credit risks that may not be fully covered by the Pillar 1 process. [BCBS June 2006 Annex 4 par 65]

84. No particular form of model is required to qualify to make use of an internal model. Although this text describes an internal model as a simulation model, other forms of models, including analytic models, are acceptable subject to OSFI approval and review. Institutions that seek recognition for the use of an internal model that is not based on simulations must demonstrate to OSFI that the model meets all operational requirements. [BCBS June 2006 Annex 4 par 66]

85. For an institution that qualifies to net transactions, the institution must have internal procedures to verify that, prior to including a transaction in a netting set, the transaction is covered by a legally enforceable netting contract that meets the applicable requirements of section 4.1.6.3 and chapter 5, or the Cross-Product Netting Rules set forth in this chapter. [BCBS June 2006 Annex 4 par 67]

86. For an institution that makes use of collateral to mitigate its CCR, the institution must have internal procedures to verify that, prior to recognising the effect of collateral in its calculations, the collateral meets the appropriate legal certainty standards as set out in chapter 5. [BCBS June 2006 Annex 4 par 68]

4.1.6. Standardized Approach for Counterparty Credit Risk

87. Institutions that do not have approval to apply the internal models method must use the SA-CCR method. SA-CCR can be used for OTC derivatives, exchange-traded derivatives and long settlement transactions; SFTs are subject to the treatments set out under the Internal Model Method of this chapter or in Chapter 5 of the CAR Guideline. EAD is to be calculated separately for each netting set. It is determined as follows:

$$EAD = alpha * (RC + PFE)$$ [18]

where:

alpha = 1.4,

RC = the replacement cost calculated according to paragraphs 89-105, and

PFE = the amount for potential future exposure calculated according to paragraphs 146-187

[17] *Amendment to the Capital Accord to Incorporate Market Risk*, Basel Committee on banking Supervision (1996), Part B.1., "General Criteria,".

[18] EAD can be set to zero for sold options that are outside of netting and margin agreements. Options sold *outside* of a margin agreement but *inside* a netting agreement do not qualify for EAD to be set at zero.

[BCBS, April 2014 (SA-CCR), par 128] and [BCBS, August 2015, question #9]

88. The replacement cost (*RC*) and the *PFE* components are calculated differently for margined and unmargined netting sets. The *EAD* for a margined netting set is capped at the *EAD* of the same netting set calculated on an unmargined basis. [BCBS, April 2014 (SA-CCR), par 129]

4.1.6.1. RC and NICA

89. For unmargined transactions, the *RC* intends to capture the loss that would occur if a counterparty were to default and were closed out of its transactions immediately. The *PFE* add-on represents a potential conservative increase in exposure over a one-year time horizon from the present date (i.e. the calculation date). [BCBS, April 2014 (SA-CCR), par 130]

90. For margined trades, the *RC* intends to capture the loss that would occur if a counterparty were to default at the present or at a future time, assuming that the closeout and replacement of transactions occur instantaneously. However, there may be a period (the margin period of risk) between the last exchange of collateral before default and replacement of the trades in the market. The *PFE* add-on represents the potential change in value of the trades during this time period. [BCBS, April 2014 (SA-CCR), par 131]

91. In both cases, the haircut applicable to noncash collateral in the replacement cost formulation represents the potential change in value of the collateral during the appropriate time period (one year for unmargined trades and the margin period of risk for margined trades (inclusive of those under one-way margining agreements)). [BCBS, April 2014 (SA-CCR), par 132]

92. Cash variation margin (VM) is not subject to any additional haircut provided the variation margin is posted in a currency that is agreed to and listed in the applicable contract[19]. Cash initial margin (IM) that is exchanged in a currency other than the termination currency (that is, the currency in which the institution will submit its claim upon a counterparty default) is subject to the additional haircut for foreign currency risk.

93. Replacement cost is calculated at the netting set level, whereas *PFE* add-ons are calculated for each asset class within a given netting set and then aggregated (see paragraphs 110-147). [BCBS, April 2014 (SA-CCR), par 133]

94. For capital adequacy purposes, institutions may net transactions (eg when determining the RC component of a netting set) subject to novation under which any obligation between an institution and its counterparty to deliver a given currency on a given value date is automatically amalgamated with all other obligations for the same currency and value date, legally substituting one single amount for the previous gross obligations. Institutions may also net transactions subject to any legally valid form of bilateral netting not covered in the preceding sentence, including other

[19] Currencies listed in the CSA are not subject to additional haircuts.

forms of novation[20]. In every such case where netting is applied, an institution must satisfy its OSFI that it has:

(i) A netting contract with the counterparty or other agreement which creates a single legal obligation, covering all included transactions, such that the institution would have either a claim to receive or obligation to pay only the net sum of the positive and negative mark-to-market values of included individual transactions in the event a counterparty fails to perform due to any of the following: default, bankruptcy, liquidation or similar circumstances[21];

(ii) Written and reasoned legal reviews that, in the event of a legal challenge, the relevant courts and administrative authorities would find the institution's exposure to be such a net amount under:

- The law of the jurisdiction in which the counterparty is chartered and, if the foreign branch of a counterparty is involved, then also under the law of the jurisdiction in which the branch is located;
- The law that governs the individual transactions; and
- The law that governs any contract or agreement necessary to affect the netting.

OSFI, after consultation when necessary with other relevant supervisors, must be satisfied that the netting is enforceable under the laws of each of the relevant jurisdictions[22].

(iii) Procedures in place to ensure that the legal characteristics of netting arrangements are kept under review in light of the possible changes in relevant law.

[BCBS, April 2014 (SA-CCR), par 134]

95. There are two formulations of replacement cost depending on whether the trades with a counterparty are subject to a margin agreement. Where a margin agreement exists, the formulation could apply both to bilateral transactions and central clearing relationships. The formulation also addresses the various arrangements that an institution may have to post and/or receive collateral that may be referred to as initial margin. [BCBS, April 2014 (SA-CCR), par 135]

A. Formulation for unmargined transactions

96. For unmargined transactions (that is, where VM is not exchanged, but collateral other than VM may be present), *RC* is defined as the greater of: (i) the current market value of the derivative contracts less net haircut collateral held by the institution (if any), and (ii) zero. This is consistent with the use of replacement cost as the measure of current exposure, meaning that when

[20] In instances where trades are removed from the netting set in which they naturally belong and are moved to a separate netting set solely for the purposes of calculating EAD, it is permissible to allocate collateral to these transactions. An example of such an instance would be Specific Wrong Way Risk (WWR) transactions which are required to each be moved to their own standalone netting set.

[21] The netting contract must not contain any clause which, in the event of default of a counterparty, permits a non-defaulting counterparty to make limited payments only, or no payments at all, to the estate of the defaulting party, even if the defaulting party is a net creditor.

[22] Thus, if any of these supervisors is dissatisfied about enforceability under its laws, the netting contract or agreement will not meet this condition and neither counterparty could obtain supervisory benefit.

the institution owes the counterparty money it has no exposure to the counterparty if it can instantly replace its trades and sell collateral at current market prices. Mathematically:

$$RC = \max\{V\text{-}C,0\}$$

where V is the value of the derivative transactions in the netting set and C is the haircut value of net collateral held, which is calculated in accordance with the *NICA* methodology defined in paragraph 103. For this purpose, the value of non-cash collateral posted by the institution to its counterparty is increased and the value of the non-cash collateral received by the institution from its counterparty is decreased using haircuts (which are the same as those that apply to repo-style transactions) for the time periods described in paragraph 91.
[BCBS, April 2014 (SA-CCR), par 136]

97. In the above formulation, it is assumed that the replacement cost representing today's exposure to the counterparty cannot go less than zero. However, institutions sometimes hold excess collateral (even in the absence of a margin agreement) or have out-of-the-money trades which can further protect the institution from the increase of the exposure. As discussed in paragraphs 107 to 109, the SA-CCR would allow such over-collateralisation and negative mark-to market value to reduce *PFE*, but would not affect replacement cost. [BCBS, April 2014 (SA-CCR), par 137]

98. Bilateral transactions with a one-way margining agreement in favour of the institution's counterparty (that is, where an institution posts, but does not collect, collateral) must be treated as unmargined transactions. [BCBS, April 2014 (SA-CCR), par 138]

B. Formulation for margined transactions

99. The RC formula for margined transactions builds on the RC formula for unmargined transactions. It also employs concepts used in standard margining agreements, as discussed more fully below. [BCBS, April 2014 (SA-CCR), par 139]

100. The RC for margined transactions in the SA-CCR is defined as the greatest exposure that would not trigger a call for VM, taking into account the mechanics of collateral exchanges in margining agreements. Such mechanics include, for example, "Threshold", "Minimum Transfer Amount" and "Independent Amount" in the standard industry documentation[23], which are factored into a call for VM[24]. [BCBS, April 2014 (SA-CCR), par 140]

[23] For example, the 1992 (Multicurrency-Cross Border) Master Agreement and the 2002 Master Agreement published by the International Swaps & Derivatives Association, Inc. (ISDA Master Agreement). The ISDA Master Agreement includes the ISDA CSA: the 1994 Credit Support Annex (Security Interest – New York Law), or, as applicable, the 1995 Credit Support Annex (Transfer – English Law) and the 1995 Credit Support Deed (Security Interest – English Law).

[24] For example, in the ISDA Master Agreement, the term "Credit Support Amount", or the overall amount of collateral that must be delivered between the parties, is defined as the greater of the Secured Party's Exposure plus the aggregate of all Independent Amounts applicable to the Pledgor minus all Independent Amounts applicable to the Secured Party, minus the Pledgor's Threshold and zero.

C. Incorporating NICA into replacement cost

101. One objective of the SA-CCR is to more fully reflect the effect of margining agreements and the associated exchange of collateral in the calculation of CCR exposures. The following paragraphs address how the exchange of collateral is incorporated into the SA-CCR. [BCBS, April 2014 (SA-CCR), par 141]

102. To avoid confusion surrounding the use of terms initial margin and independent amount which are used in various contexts and sometimes interchangeably, the term *independent collateral amount* (ICA) is introduced. ICA represents (i) collateral (other than VM) posted by the counterparty that the institution may seize upon default of the counterparty, the amount of which does not change in response to the value of the transactions it secures and/or (ii) the *Independent Amount* (IA) parameter as defined in standard industry documentation. ICA can change in response to factors such as the value of the collateral or a change in the number of transactions in the netting set. [BCBS, April 2014 (SA-CCR), par 142]

103. Because both an institution and its counterparty may be required to post ICA, it is necessary to introduce a companion term, *net independent collateral amount* (*NICA*), to describe the amount of collateral that an institution may use to offset its exposure on the default of the counterparty. *NICA* does not include collateral that an institution has posted to a segregated, bankruptcy remote account, which presumably would be returned upon the bankruptcy of the counterparty. That is, *NICA* represents any collateral (segregated or unsegregated) posted by the counterparty less the unsegregated collateral posted by the institution. With respect to IA, *NICA* takes into account the differential of IA required for the institution minus IA required for the counterparty. [BCBS, April 2014 (SA-CCR), par 143]

104. For margined trades, the replacement cost is:

$$\mathrm{RC} = \max\{V - C;\ TH + MTA - NICA; 0\}$$

Where: V and C are defined as in the unmargined formulation, TH is the positive threshold before the counterparty must send the institution collateral, and MTA is the minimum transfer amount applicable to the counterparty. [BCBS, April 2014 (SA-CCR), par 144]

105. $TH + MTA - NICA$ represents the largest exposure that would not trigger a VM call and it contains levels of collateral that need always to be maintained. For example, without initial margin or IA, the greatest exposure that would not trigger a variation margin call is the threshold plus any minimum transfer amount. In the adapted formulation, *NICA* is subtracted from $TH + MTA$. This makes the calculation more accurate by fully reflecting both the actual level of exposure that would not trigger a margin call and the effect of collateral held and/or posted by an institution. The calculation is floored at zero, recognising that the institution may hold *NICA* in excess of $TH + MTA$, which could otherwise result in a negative replacement cost. [BCBS, April 2014 (SA-CCR), par 145]

4.1.6.2. PFE Add-ons

106. The *PFE* add-on consists of (i) an aggregate add-on component, which consists of add-ons calculated for each asset class and (ii) a multiplier that allows for the recognition of excess collateral or negative mark-to-market value for the transactions. Mathematically:

$$PFE = multiplier * AddOn^{aggregate}$$

Where $AddOn^{aggregate}$ is the aggregate add-on component and multiplier is defined as a function of three inputs: *V*, *C* and $AddOn^{aggregate}$.

The paragraphs below describe the inputs that enter into the calculation of the add-on formulas in more detail, and set out the formula for each asset class.
[BCBS, April 2014 (SA-CCR), par 146]

4.1.6.3. Recognition of excess collateral and negative mark-to-market

107. As a general principle, over-collateralisation should reduce capital requirements for counterparty credit risk. In fact, many institutions hold excess collateral (i.e. collateral greater than the net market value of the derivatives contracts) precisely to offset potential increases in exposure represented by the add-on. As discussed in paragraphs 96 and 104, collateral may reduce the replacement cost component of the exposure under the SA-CCR. The *PFE* component also reflects the risk-reducing property of excess collateral. [BCBS, April 2014 (SA-CCR), par 147]

108. For prudential reasons and in line with Basel Committee direction, OSFI applied a multiplier to the *PFE* component that decreases as excess collateral increases, without reaching zero (the multiplier is floored at 5% of the *PFE* add-on). When the collateral held is less than the net market value of the derivative contracts ("under-collateralisation"), the current replacement cost is positive and the multiplier is equal to one (ie the PFE component is equal to the full value of the aggregate add-on). Where the collateral held is greater than the net market value of the derivative contracts ("over-collateralisation"), the current replacement cost is zero and the multiplier is less than one (ie the PFE component is less than the full value of the aggregate add-on). [BCBS, April 2014 (SA-CCR), par 148]

109. This multiplier will also be activated when the current value of the derivative transactions is negative. This is because out-of-the-money transactions do not currently represent an exposure and have less chance to go in-the-money. Mathematically:

$$multiplier = min\left\{1; Floor + (1 - Floor) * \ exp^{\left(\frac{V-C}{2*(1-Floor)*AddOn^{aggregate}}\right)}\right\}$$

where exp(…) equals to the exponential function, *Floor* is 5%, *V* is the value of the derivative transactions in the netting set, and *C* is the haircut value of net collateral held.
[BCBS, April 2014 (SA-CCR), par 149]

4.1.6.4. Aggregation across asset classes

110. Diversification benefits across asset classes are not recognised. Instead, the respective add-ons for each asset class are simply aggregated. Mathematically:

$$AddOn^{aggregate} = \sum_{a} AddOn^{a}$$

where the sum of each asset class add-on is taken.

[BCBS, April 2014 (SA-CCR), par 150]

4.1.6.5. Allocation of derivative transactions to one or more asset classes

111. The designation of a derivative transaction to an asset class is be made on the basis of its primary risk driver. Most derivative transactions have one primary risk driver, defined by its reference underlying instrument (eg an interest rate curve for an interest rate swap, a reference entity for a credit default swap, a foreign exchange rate for a FX call option, etc). When this primary risk driver is clearly identifiable, the transaction will fall into one of the asset classes described above. [BCBS, April 2014 (SA-CCR), par 151]

112. For more complex trades that may have more than one risk driver (eg multi-asset or hybrid derivatives), institutions must take sensitivities and volatility of the underlying into account for determining the primary risk driver.

OSFI may also require more complex trades to be allocated to more than one asset class, resulting in the same position being included in multiple classes. In this case, for each asset class to which the position is allocated, institutions must determine appropriately the sign and delta adjustment of the relevant risk driver.

[BCBS, April 2014 (SA-CCR), par 152]

4.1.6.6. General steps for calculating the add-on

113. For each transaction, the primary risk factor or factors need to be determined and attributed to one or more of the five asset classes: interest rate, foreign exchange, credit, equity or commodity. The add-on for each asset class is calculated using asset-class-specific formulas that represent a stylised Effective EPE calculation under the assumption that all trades in the asset class have zero current mark-to-market value (i.e. they are at-the-money). [BCBS, April 2014 (SA-CCR), par 153]

114. Although the add-on formulas are asset class-specific, they have a number of features in common. To determine the add-on, transactions in each asset class are subject to adjustment in the following general steps:

- An adjusted notional amount based on actual notional or price is calculated at the trade level. For interest rate and credit derivatives, this adjusted notional amount also incorporates a supervisory measure of duration;

- A maturity factor $MF_i^{(type)}$ reflecting the time horizon appropriate for the type of transaction is calculated at the trade level (see paragraph 124 for details) and is applied to the adjusted notional. Two types of maturity factor are defined, one for margined transactions ($MF_i^{(margined)}$) and one for unmargined transactions ($MF_i^{(unmargined)}$);
- A supervisory delta adjustment is made to this trade-level adjusted notional amount based on the position (long or short) and whether the trade is an option, CDO tranche or neither, resulting in an effective notional amount;
- A supervisory factor is applied to each effective notional amount to reflect volatility; and
- The trades within each asset class are separated into hedging sets and an aggregation method is applied to aggregate all the trade-level inputs at the hedging set level and finally at the asset-class level. For credit, equity and commodity derivatives, this involves the application of a supervisory correlation parameter to capture important basis risks and diversification.

Each input is described, generally and by asset class, in more detail below.
[BCBS, April 2014 (SA-CCR), par 154]

4.1.6.7. Period of Date Parameters M_i, E_i, S_i, and T_i

115. There are four dates that appear in the SA-CCR:

- For all asset classes, the maturity M_i of a contract is the latest date when the contract may still be active. This date appears in the maturity factor defined in paragraph 124 that scales down adjusted notional for unmargined trades for all asset classes. If a derivative contract has another derivative contract as its underlying (for example, a swaption) and may be physically exercised into the underlying contract (i.e. an institution would assume a position in the underlying contract in the event of exercise), then maturity of the contract is the final settlement date of the underlying derivative contract.
- For interest rate and credit derivatives, the start date S_i of the time period referenced by an interest rate or credit contract. If the derivative references the value of another interest rate or credit instrument (e.g. swaption or bond option), the time period must be determined on the basis of the underlying instrument. This date appears in the definition of supervisory duration defined in paragraph 117.
- For interest rate and credit derivatives, the end date E_i of the time period referenced by an interest rate or credit contract. If the derivative references the value of another interest rate or credit instrument (e.g. swaption or bond option), the time period must be determined on the basis of the underlying instrument. This date appears in the definition of supervisory duration defined in paragraph 117. In addition, this date specifies the maturity category for an interest rate contract in paragraph 126.
- For options in all asset classes, the latest contractual exercise date T_i as referenced by the contract. This period shall be used for the determination of the option delta in paragraph 119.
- Unless otherwise specified, time periods between dates should be measured in years.

[BCBS, April 2014 (SA-CCR), par 155 and BCBS, August 2015, question #2]

116. Table 1 includes example transactions and provides each transaction's related maturity M_i, start date S_i and end date E_i. In addition, the option delta in paragraph 119 depends on the latest contractual exercise date T_i (not separately shown in the table).

Table 1

Instrument	M_i	S_i	E_i
Interest rate or credit default swap maturing in 10 years	10 years	0	10 years
10-year interest rate swap, forward starting in 5 years	15 years	5 years	15 years
Forward rate agreement for time period starting in 6 months and ending in 12 months	1 year	0.5 year	1 year
Cash-settled European swaption referencing 5-year interest rate swap with exercise date in 6 months	0.5 year	0.5 year	5.5 years
Physically-settled European swaption referencing 5-year interest rate swap with exercise date in 6 months	5.5 years	0.5 year	5.5 years
10-year Bermudan swaption with annual exercise dates	10 years	1 year	10 years
Interest rate cap or floor specified for semi-annual interest rate with maturity 5 years	5 years	0	5 years
Option on a bond maturing in 5 years with the latest exercise date in 1 year	1 year	1 year	5 years
3-month Eurodollar futures that matures in 1 year[25]	1 year	1 year	1.25 years
Futures on 20-year treasury bond that matures in 2 years	2 years	2 years	22 years
6-month option on 2-year futures on 20-year treasury bond	2 years	2 years	22 years

[BCBS, April 2014 (SA-CCR), par 156]

4.1.6.8. Trade-level Adjusted Notional (for trade I of asset class a): $d_i^{(a)}$

117. These parameters are defined at the trade level and take into account both the size of a position and its maturity dependency, if any. Specifically, the adjusted notional amounts are calculated as follows:

- For interest rate and credit derivatives, the trade-level adjusted notional is the product of the trade notional amount, converted to the domestic currency, and the supervisory duration SD_i which is given by the following formula:

[25] Eurodollar example does not include the effect of margining or settlement and would apply only in the case where a futures contract were neither margined nor settled. Concerning the end date (E_i), the value of 1.25 years applies. Note that per paragraph 126, the parameter E_i defines the maturity bucket for the purpose of netting. This means that the trade of this example will be attributed to the intermediate maturity bucket "between one and five years" and not to the short maturity bucket "less than one year" irrespective of daily settlement

$$SD_i = \frac{\exp(-0.05 * S_i) - \exp(-0.05 * E_i)}{0.05}$$

where S_i and E_i are the start and end dates, respectively, of the time period referenced by the interest rate or credit derivative (or, where such a derivative references the value of another interest rate or credit instrument, the time period determined on the basis of the underlying instrument), floored by ten business days[26]. If the start date has occurred (e.g. an ongoing interest rate swap), S_i must be set to zero.

- For foreign exchange derivatives, the adjusted notional is defined as the notional of the foreign currency leg of the contract, converted to the domestic currency. If both legs of a foreign exchange derivative are denominated in currencies other than the domestic currency, the notional amount of each leg is converted to the domestic currency and the leg with the larger domestic currency value is the adjusted notional amount.
- For equity and commodity derivatives, the adjusted notional is defined as the product of the current price of one unit of the stock or commodity (e.g. a share of equity or barrel of oil) and the number of units referenced by the trade.
  [BCBS, April 2014 (SA-CCR), par 157]

118. In many cases the trade notional amount is stated clearly and fixed until maturity. When this is not the case, institutions must use the following rules to determine the trade notional amount.

- For transactions with multiple payoffs that are state contingent such as digital options or target redemption forwards, an institution must calculate the trade notional amount for each state and use the largest resulting calculation.
- Where the notional is a formula of market values, the institution must enter the current market values to determine the trade notional amount.
- For variable notional swaps such as amortising and accreting swaps, institutions must use the average, time weighted, notional over the remaining life of the swap as the trade notional amount.
- Leveraged swaps must be converted to the notional of the equivalent unleveraged swap, that is, where all rates in a swap are multiplied by a factor, the stated notional must be multiplied by the factor on the interest rates to determine the trade notional amount.
- For a derivative contract with multiple exchanges of principal, the notional is multiplied by the number of exchanges of principal in the derivative contract to determine the trade notional amount.
- For a derivative contract that is structured such that on specified dates any outstanding exposure is settled and the terms are reset so that the fair value of the contract is zero, the remaining maturity equals the time until the next reset date.
- Consistent with the above point, trades with daily settlement should be treated as unmargined transactions with a maturity factor given by the first formula in paragraph

[26] Note there is a distinction between the time period of the underlying transaction and the remaining maturity of the derivative contract. For example, a European interest rate swaption with expiry of 1 year and the term of the underlying swap of 5 years has S_i = 1 year and E_i = 6 years.

124 with the parameter M_i set to its floor value of 10 business days. For trades subject to daily margining, the maturity factor is given by the second formula of paragraph 124 depending on the margin period of risk (MPOR), which can be as low as five business days. Per paragraph 126, the parameter E_i defines the maturity bucket for the purpose of netting.

Calculation of effective notional for options

For the purposes of effective notional calculations, **single-payment options** must be treated as follows:

- For European, Asian, American and Bermudan put and call options, the supervisory delta must be calculated using the simplified Black-Scholes formula in paragraph 119. In the case of Asian options, the underlying price must be set equal to the current value of the average used in the payoff. In the case of American and Bermudan options, the latest allowed exercise date must be used as the exercise date T_i in the formula. For Bermudan swaptions, the start date S_i must be equal to the earliest allowed exercise date, while the end date E_i must be equal to the end date of the underlying swap.
- For digital options (also known as binary options), The payoff of each digital option (bought or sold) with strike K_i must be approximated via the "collar" combination of bought and sold European options of the same type (call or put) with the strikes set equal to $0.95 \cdot K_i$ and $1.05 \cdot K_i$. The size of the position in the collar components must be such that the digital payoff is reproduced exactly outside of the region between the two strikes. The effective notional is then computed for the bought and sold European components of the collar separately, using the option formulas for the supervisory delta in paragraph 119 (the exercise date T_i and the current value of the underlying P_i of the digital option must be used). The absolute value of the digital option effective notional must be capped by the ratio of the digital payoff to the relevant supervisory factor.
- If a trade's payoff can be represented as a combination of European option payoffs (eg: collar, butterfly/calendar spread, straddle, strangle, etc.), each European option component must be treated as a separate trade.

For the purposes of effective notional calculations, **multi-payment options** must be treated as follows:

- Multiple-payment options may be represented as a combination of single-payment options. In particular, interest rate caps/floors may be represented as the portfolio of individual caplets/floorlets, each of which is a European option on the floating interest rate over a specific coupon period. For each caplet/floorlet, the start date S_i and the exercise date T_i must be set equal to the start of the coupon period, while the end date E_i must be set equal to the end of the coupon period.

[BCBS, April 2014 (SA-CCR), par 158; BCBS, August 2015, question #12; and BCBS, March 2018, questions #4.2 and #4.3]

4.1.6.9. Supervisory delta adjustments: δ_i

119. These parameters are also defined at the trade level and are applied to the adjusted notional amounts to reflect the direction of the transaction and its non-linearity. More specifically, the delta adjustments for all derivatives are defined as follows:

δ_i	**Long in the primary risk factor**[27]	**Short in the primary risk factor**[28]
Instruments that are not options or CDO tranches	+1	-1

δ_i	***Bought***	***Sold***
Call Options[29]	$+\Phi\left(\frac{\ln\left(\frac{P_i}{K_i}\right)+0.5*\sigma^2*T_i}{\sigma_i*\sqrt{T_i}}\right)$	$-\Phi\left(\frac{\ln\left(\frac{P_i}{K_i}\right)+0.5*\sigma^2*T_i}{\sigma_i*\sqrt{T_i}}\right)$
Put Options	$-\Phi\left(-\frac{\ln\left(\frac{P_i}{K_i}\right)+0.5*\sigma^2*T_i}{\sigma_i*\sqrt{T_i}}\right)$	$+\Phi\left(-\frac{\ln\left(\frac{P_i}{K_i}\right)+0.5*\sigma^2*T_i}{\sigma_i*\sqrt{T_i}}\right)$
With the following parameters that institutions must determine appropriately: P_i : Underlying price (spot, forward, average, etc.) K_i : Strike price T_i : Latest contractual exercise date of the option The supervisory volatility of an option is specified on the basis of supervisory factor applicable to the trade (see Table 2 in paragraph 143).		

δ_i	***Purchased (long protection)***	***Sold (short protection)***
CDO tranche	$+\frac{15}{(1+14*A_i)*(1+14*D_i)}$	$-\frac{15}{(1+14*A_i)*(1+14*D_i)}$
With the following parameters that institutions must determine appropriately: A_i : Attachment point of the CDO tranche D_i : Detachment point of the CDO tranche		

Whenever appropriate, the forward (rather than spot) value of the underlying in the supervisory delta adjustments formula should be used in order to account for the risk-free rate as well as for possible cash flows prior to the option expiry (such as dividends).

[BCBS, April 2014 (SA-CCR), par 159 and BCBS, August 2015, question #5]

[27] "Long in the primary risk factor" means that the market value of the instrument increases when the value of the primary risk factor increases.

[28] "Short in the primary risk factor" means that the market value of the instrument decreases when the value of the primary risk factor increases.

[29] The symbol Φ in these equations represents the standard normal cumulative distribution function.

For cases where the term P/K is either zero or negatives such that the term In(P/K) cannot be computed, the following adjustments should be made:

- institutions must incorporate a shift in the price value and strike value by adding λ, where λ represents the presumed lowest possible extent to which interest rates in the respective currency can become negative[30]. Therefore, the Delta δ_i for a transaction *i* in such cases is calculated as:

Delta(δ)	**Bought**	**Sold**
Call Options	$+\Phi\left(\frac{\ln\left(\left(P_i+\lambda_j\right)/\left(K_i+\lambda_j\right)\right)+0.5*\sigma_i{}^2*T_i}{\sigma_i*\sqrt{T_i}}\right)$	$-\Phi\left(\frac{\ln\left(\left(P_i+\lambda_j\right)/\left(K_i+\lambda_j\right)\right)+0.5*\sigma_i{}^2*T_i}{\sigma_i*\sqrt{T_i}}\right)$
Put Options	$-\Phi\left(\frac{-\ln\left(\left(P_i+\lambda_j\right)/\left(K_i+\lambda_j\right)\right)-0.5*\sigma_i{}^2*T_i}{\sigma_i*\sqrt{T_i}}\right)$	$+\Phi\left(\frac{-\ln\left(\left(P_i+\lambda_j\right)/\left(K_i+\lambda_j\right)\right)-0.5*\sigma_i{}^2*T_i}{\sigma_i*\sqrt{T_i}}\right)$

The same parameter must be used consistently for all interest rate options in the same currency. Institutions should select a value of λ_j, which is low but still gives a positive $K_i+\lambda_j$ value.
[BCBS, March 2018, question #4.1]

4.1.6.10. Supervisory Factors: $SF_i^{(a)}$

120. A factor or factors specific to each asset class is used to convert the effective notional amount into Effective EPE based on the measured volatility of the asset class. Each factor has been calibrated to reflect the Effective EPE of a single at-the-money linear trade of unit notional and one-year maturity. This includes the estimate of realised volatilities assumed by supervisors for each underlying asset class. [BCBS, April 2014, par 160]

4.1.6.11. Hedging Sets

121. The hedging sets in the different asset classes are defined as follows, except for those described in paragraphs 122 and 123.

- Interest rate derivatives consist of a separate hedging set for each currency;
- FX derivatives consist of a separate hedging set for each currency pair;
- Credit derivatives consist of a single hedging set;
- Equity derivatives consist of a single hedging set;

[30] This assumes for the strike price that $K_i + \lambda_j$ is also greater than zero, otherwise a greater value needs to be chosen for λ_j. λ adjustment values which are unique to each currency.

- Commodity derivatives consist of four hedging sets defined for broad categories of commodity derivatives: energy, metals, agricultural and other commodities.

[BCBS, April 2014 (SA-CCR), par 161]

122. Derivatives that reference the basis between two risk factors and are denominated in a single currency[31] (basis transactions) must be treated within separate hedging sets within the corresponding asset class. There is a separate hedging set[32] for each pair of risk factors (ie for each specific basis). Examples of specific bases include three-month Libor versus six-month Libor, three-month Libor versus three-month T-Bill, one-month Libor versus OIS rate, Brent Crude oil versus Henry Hub gas. For hedging sets consisting of basis transactions, the supervisory factor applicable to a given asset class must be multiplied by one-half. Basket equity derivatives comprised of ten (10) or less effective constituents[33] may be decomposed into their underlying constituents. Baskets comprised of more than ten (10) effective constituents should be treated as indices. [BCBS, April 2014 (SA-CCR), par 162]

123. Derivatives that reference the volatility of a risk factor (volatility transactions) must be treated within separate hedging sets within the corresponding asset class. Volatility hedging sets must follow the same hedging set construction outlined in paragraph 121 (for example, all equity volatility transactions form a single hedging set). Examples of volatility transactions include variance and volatility swaps, options on realised or implied volatility. For hedging sets consisting of volatility transactions, the supervisory factor applicable to a given asset class must be multiplied by a factor of five.

For equity and commodity volatility transactions, the underlying volatility or variance referenced by the transaction should replace the unit price and contractual notional should replace the number of units. [BCBS, April 2014 (SA-CCR), par 163 and BCBS, August 2015, question #6]

4.1.6.12. Time Risk Horizons

124. The minimum time risk horizons for the SA-CCR include:

- The lesser of one year and remaining maturity of the derivative contract for unmargined transactions, floored at ten business days. Therefore, the adjusted notional at the trade level of an unmargined transaction must be multiplied by:

$$MF_i^{(umargined)} = \sqrt{\frac{min\{M_i; 1\ year\}}{1\ year}}$$

where is the transaction M_i remaining maturity floored by 10 business days.

[31] Derivatives with two floating legs that are denominated in different currencies (such as cross-currency swaps) are not subject to this treatment; rather, they should be treated as non-basis foreign exchange contracts.

[32] Within this hedging set, long and short positions are determined with respect to the basis.

[33] Number of effective constituents = $\left(\frac{(\sum_i share\ price_i \times number\ of\ shares_i)^2}{\sum_i (share\ price_i \times number\ of\ shares_i)^2}\right)$

- For margined transactions, the minimum margin period of risk is determined as follows:
    - At least ten business days for non-centrally-cleared derivative transactions subject to daily margin agreements.
    - Five business days for centrally cleared derivative transactions subject to daily margin agreements that clearing members[34] have with their clients.
    - 20 business days for netting sets consisting of 5,000 transactions that are not with a central counterparty or client cleared trades.
    - Doubling the margin period of risk for netting sets with outstanding disputes consistent with paragraph 48[35].

Therefore, the adjusted notional at the trade level of a margined transaction should be multiplied by:

$$MF_i^{(margined)} = \frac{3}{2} * \sqrt{\frac{MPOR_i}{1\ year}}$$

where $MPOR_i$ is the margin period of risk appropriate for the margin agreement containing the transaction *i*.
[BCBS, April 2014 (SA-CCR), par 164]

4.1.6.13. Supervisory correlation parameters: $\rho_i^{(a)}$

125. These parameters only apply to the PFE add-on calculation for equity, credit and commodity derivatives. For these asset classes, the supervisory correlation parameters are derived from a single-factor model and specify the weight between systematic and idiosyncratic components. This weight determines the degree of offset between individual trades, recognising that imperfect hedges provide some, but not perfect, offset. Supervisory correlation parameters do not apply to interest rate and foreign exchange derivatives. [BCBS, April 2014 (SA-CCR), par 165]

4.1.6.14. Add-on for interest rate derivatives

126. The add-on for interest rate derivatives captures the risk of interest rate derivatives of different maturities being imperfectly correlated. To address this risk, the SA-CCR divides interest rate derivatives into maturity categories (also referred to as "buckets") based on the end date (as described in paragraphs 115 and 117) of the transactions. The three relevant maturity categories are: less than one year, between one and five years and more than five years. The SA-CCR allows full recognition of offsetting positions within a maturity category. Across maturity categories, the SA-CCR recognises partial offset. [BCBS, April 2014 (SA-CCR), par 166]

[34] This treatment also applies to higher level clients in a multi client structure.
[35] See paragraphs 47, 48 and 167 for circumstances requiring an extended margin period of risk.

127. The add-on for interest rate derivatives is the sum of the add-ons for each hedging set of interest rates derivatives transacted with a counterparty in a netting set. The add-on for a hedging set of interest rate derivatives is calculated in two steps. [BCBS, April 2014 (SA-CCR), par 167]

128. In the first step, the effective notional $D_{jk}^{(IR)}$ is calculated for time bucket *k* of hedging set (i.e. currency) *j* according to:

$$D_{jk}^{(IR)} = \sum_{i\epsilon\{Ccy_j, MB_k\}} \delta_i * d_i^{(IR)} * MF_i^{(type)}$$

Where notation $i\epsilon\{Ccy_j, MB_k\}$ refers to trades of currency *j* that belong to maturity bucket *k*. That is, the effective notional for each time bucket and currency is the sum of the trade-level adjusted notional amounts (cf. paragraphs 117-118 multiplied by the supervisory delta adjustments (cf. paragraph 119) and the maturity factor (cf. paragraph 124). [BCBS, April 2014 (SA-CCR), par 168]

129. In the second step, aggregation across maturity buckets for each hedging set is calculated according to the following formula[36]:

$$EffectiveNotional_j^{(IR)} =$$
$$\left[\left(D_{j1}^{(IR)}\right)^2 + \left(D_{j2}^{(IR)}\right)^2 + \left(D_{j3}^{(IR)}\right)^2 + 1.4 * D_{j1}^{(IR)} * D_{j2}^{(IR)} + 1.4 * D_{j2}^{(IR)} * D_{j3}^{(IR)} + 0.6 * D_{j1}^{(IR)} * D_{j3}^{(IR)}\right]^{1/2}$$

The hedging set level add-on is calculated as the product of the effective notional and the interest rate supervisory factor:

$$AddOn_j^{(IR)} = SF_j^{(IR)} * Effective\ Notional_j^{(IR)}$$

Aggregation across hedging sets is performed via simple summation:

$$AddOn^{(IR)} = \sum_j AddOn_j^{(IR)}$$

[BCBS, April 2014 (SA-CCR), par 169]

4.1.6.15. Add-on for foreign exchange derivatives

130. The add-on formula for foreign exchange derivatives shares many similarities with the add-on formula for interest rates. Similar to interest rate derivatives, the effective notional of a

[36] Banks may choose not to recognize offset across maturity buckets. In this case, the relevant formula is:

$$EffectiveNotional_i^{(IR)} = \left|D_{j1}^{(IR)}\right| + \left|D_{j2}^{(IR)}\right| + \left|D_{j3}^{(IR)}\right|$$

hedging set is defined as the sum of all the trade-level adjusted notional amounts multiplied by their supervisory delta. The add-on for a hedging set is the product of:

- The absolute value of its effective notional amount; and
- The supervisory factor (same for all FX hedging sets).

[BCBS, April 2014 (SA-CCR), par 170]

131. In the case of foreign exchange derivatives, the adjusted notional amount is maturity-independent and given by the notional of the foreign currency leg of the contract, converted to the domestic currency. Mathematically:

$$AddOn^{(FX)} = \sum_j AddOn_{HS_j}^{(FX)}$$

where the sum is taken over all the hedging sets HS_j included in the netting set. The add-on and the effective notional of the hedging set HS_j are respectively given by:

$$AddOn_{HS_j}^{(FX)} = SF_j^{(FX)} * \left|Effective\ Notional_j^{(FX)}\right|$$

$$EffectiveNotional_j^{(FX)} = \sum_{i \epsilon HS_j} \delta_i * d_i^{(FX)} * MF_i^{(type)}$$

Where $i \epsilon HS_j$ refers to of hedging set HS_j. That is, the effective notional for each currency pair is the sum of the trade-level adjusted notional amounts (cf. paragraphs 117-118) multiplied by the supervisory delta adjustments (cf. paragraph 119) and the maturity factor (cf. paragraph 124).

[BCBS, April 2014 (SA-CCR), par 171]

4.1.6.16. Add-on for credit derivatives

132. There are two levels of offsetting benefits for credit derivatives. First, all credit derivatives referencing the same entity (either a single entity or an index) are allowed to offset each other fully to form an entity-level effective notional amount:

$$EffectiveNotional_j^{(Credit)} = \sum_{i \epsilon Entity_k} \delta_i * d_i^{(Credit)} * MF_i^{(type)}$$

Where $i \epsilon Entity_k$ refers to trades of entity k. That is, the effective notional for each entity is the sum of the trade-level adjusted notional amounts (cf. paragraphs 117-118) multiplied by the supervisory delta adjustments (cf. paragraph 119) and the maturity factor (cf. paragraph 124).

The add-on for all the positions referencing this entity is defined as the product of its effective notional amount and the supervisory factor $SF_k^{(Credit)}$, i.e.:

$$AddOn(Entity_k) = SF_k^{(Credit)} * EffectiveNotional_k^{(Credit)}$$

For single name entities, $SF_k^{(Credit)}$ is determined by the reference name's credit rating. For index entities, $SF_k^{(Credit)}$ is determined by whether the index is investment grade or speculative grade.

Second, all the entity-level add-ons are grouped within a single hedging set (except for basis and volatility transactions) in which full offsetting between two different entity-level add-ons is not permitted. Instead, a single-factor model has been used to allow partial offsetting between the entity-level add-ons by dividing the risk of the credit derivatives asset class into a systematic component and an idiosyncratic component.
[BCBS, April 2014 (SA-CCR), par 172]

133. The entity-level add-ons are allowed to offset each other fully in the systematic component; whereas, there is no offsetting benefit in the idiosyncratic component. These two components are weighted by a correlation factor which determines the degree of offsetting/hedging benefit within the credit derivatives asset class. The higher the correlation factor, the higher the importance of the systemic component, hence the higher the degree of offsetting benefits. Derivatives referencing credit indices are treated as though they were referencing single names, but with a higher correlation factor applied. Mathematically:

$$AddOn^{(Credit)} = \left[\left(\sum_k \rho_k^{(Credit)} * AddOne(Entity_k)\right)^2 + \sum_k \left(1 - \left(\rho_k^{(Credit)}\right)^2\right) * (AddOn(Entity_k))^2\right]^{1/2}$$

Where $\rho_k^{(Credit)}$ is the appropriate correlation factor corresponding to Entity k.
[BCBS, April 2014 (SA-CCR), par 173]

134. It should be noted that a higher or lower correlation does not necessarily mean a higher or lower capital charge. For portfolios consisting of long and short credit positions, a high correlation factor would reduce the charge. For portfolios consisting exclusively of long positions (or short positions), a higher correlation factor would increase the charge. If most of the risk consists of systematic risk, then individual reference entities would be highly correlated and long and short positions should offset each other. If, however, most of the risk is idiosyncratic to a reference entity, then individual long and short positions would not be effective hedges for each other. [BCBS, April 2014 (SA-CCR), par 174]

135. The use of a single hedging set for credit derivatives implies that credit derivatives from different industries and regions are equally able to offset the systematic component of an exposure, although they would not be able to offset the idiosyncratic portion. This approach recognises that meaningful distinctions between industries and/or regions are complex and difficult to analyse for global conglomerates. [BCBS, April 2014 (SA-CCR), par 175]

4.1.6.17. Add-on for equity derivatives

136. The add-on formula for equity derivatives shares many similarities with the add-on formula for credit derivatives. The approach also uses a single factor model to divide the risk into a systematic component and an idiosyncratic component for each reference entity (a single entity or an index). Derivatives referencing equity indices are treated as though they were referencing single entities, but with a higher correlation factor used for the systematic component. Offsetting

is allowed only for the systematic components of the entity-level add-ons, while full offsetting of transactions within the same reference entity is permitted. The entity-level add-ons are proportional to the product of two items: the effective notional amount of the entity (similar to credit derivatives) and the supervisory factor appropriate to the entity. [BCBS, April 2014 (SA-CCR), par 176]

137. The calibration of the supervisory factors for equity derivatives rely on estimates of the market volatility of equity indices, with the application of a conservative beta factor[37] to translate this estimate into an estimate of individual volatilities. Institutions are not permitted to make any modelling assumptions in the calculation of the PFE add-ons, including estimating individual volatilities or taking publicly available estimates of beta. This is a pragmatic approach to ensure a consistent implementation across jurisdictions but also to keep the add-on calculation relatively simple and prudent. Therefore, only two values of supervisory factors have been defined for equity derivatives, one for single entities and one for indices.

In summary, the formula is as follows:

$$AddOn^{(Equity)} = \left[\left(\sum_k \rho_k^{(Equity)} * AddOne(Entity_k)\right)^2 + \sum_k \left(1 - \left(\rho_k^{(Equity)}\right)^2\right) * (AddOn(Entity_k))^2\right]^{1/2}$$

where $\rho_k^{(Equity)}$ is the appropriate correlation factor corresponding to the entity *k*. The add-on for all the positions referencing entity *k* and its effective notional are given by:

$$AddOn(Entity_k) = SF_k^{(Equity)} * EffectiveNotional_k^{(Equity)}$$

and

$$EffectiveNotional_j^{(Equity)} = \sum_{i \epsilon Entity_k} \delta_i * d_i^{(Equity)} * MF_i^{(type)}$$

Where $i \epsilon Entity_k$ refers to trades of entity *k*. That is, the effective notional for each entity is the sum of the trade-level adjusted notional amounts (cf. paragraphs 117-118) multiplied by the supervisory delta adjustments (cf. paragraph 119) and the maturity factor (cf. paragraph 124). [BCBS, April 2014 (SA-CCR), par 177]

4.1.6.18. Add-on for commodity derivatives

138. The add-on for the asset class is given by:

$$AddOn^{(Com)} = \sum_j AddOn_{HS_j}^{(Com)}$$

[37] The beta of an individual equity measures the volatility of the stock relative to a broad market index. A value of beta greater than one means the individual equity is more volatile than the index. The greater the beta is, the more volatile the stock. The beta is calculated by running a linear regression of the stock on the broad index.

where the sum is taken over all hedging sets.
[BCBS, April 2014 (SA-CCR), par 178]

139. Within each hedging set, a single factor model is used to divide the risk of the same type of commodities into a systematic component and an idiosyncratic component, consistent with the approach taken for credit and equity derivatives. Full offsetting/hedging benefits is allowed between all derivative transactions referencing the same type of commodity, forming a commodity type-level effective notional. Partial offsetting/hedging benefits is allowed within each hedging set between the same type of commodities (supervisory correlation factors are defined for each) while no offsetting/hedging benefits is permitted between hedging sets. In summary, we have:

$$AddOn_{HS_j}^{(Com)} = \left[\left(\rho_j^{(Com)} * \sum_k AddOne(Type_k^j)\right)^2 + \left(1 - \left(\rho_j^{(Com)}\right)^2\right) * \sum_k \left(AddOn(Type_k^j)\right)^2\right]^{1/2}$$

where $\rho_j^{(Com)}$ is the appropriate correlation factor corresponding to the hedging set *j*. The add-on and the effective notional of the commodity type k are respectively given by:

$$AddOn(Type_k^j) = SF_{Type_k^j}^{(Com)} * EffectiveNotional_k^{(Com)}$$

and

$$EffectiveNotional_k^{(Com)} = \sum_{i \epsilon Type_k^j} \delta_i * d_i^{(Com)} * MF_i^{(type)}$$

Where $i \epsilon Type_k^j$ refers to trades of commodity type *k* in hedging set *j*. That is, the effective notional for each commodity type is the sum of the trade-level adjusted notional amounts (cf. paragraph 117-118) multiplied by the supervisory delta adjustments (cf. paragraph 119) and the maturity factor (cf. paragraph 124).
[BCBS, April 2014 (SA-CCR), par 179]

140. This approach assumes that the four broad categories of commodity derivatives cannot be used to hedge one another (e.g. a forward contract on crude oil cannot hedge a forward contract on corn). However, within each category, the different commodity types are more likely to demonstrate some stable, meaningful joint dynamics. [BCBS, April 2014 (SA-CCR), par 180]

141. Defining individual commodity types is operationally difficult. In fact, it is impossible to fully specify all relevant distinctions between commodity types so that all basis risk is captured. For example crude oil could be a commodity type within the energy hedging set, but in certain cases this definition could omit a substantial basis risk between different types of crude oil (West Texas Intermediate, Brent, Saudi Light, etc.). [BCBS, April 2014 (SA-CCR), par 181]

142. Commodity type hedging sets have been defined without regard to characteristics such as location and quality. For example, the energy hedging set contains commodity types such as crude oil, electricity, natural gas and coal. [BCBS, April 2014 (SA-CCR), par 182]

143. Table 2 includes the supervisory factors, correlations and supervisory option volatility add-ons for each asset class and subclass.

Table 2 – Summary Table of Supervisory Parameters

Asset Class	Subclass	Supervisory factor	Correlation	Supervisory option volatility[38]
Interest Rate		0.50%	N/A	50%
Foreign Exchange		4.0%	N/A	15%
Credit, Single Name	AAA	0.38%	50%	100%
	AA	0.38%	50%	100%
	A	0.42%	50%	100%
	BBB	0.54%	50%	100%
	BB	1.06%	50%	100%
	B	1.6%	50%	100%
	CCC	6.0%	50%	100%
Credit, Index	IG	0.38%	80%	80%
	SG	1.06%	80%	80%
Equity, Single Name		32%	50%	120%
Equity, Index		20%	80%	75%
Commodity	Electricity	40%	40%	150%
	Oil/Gas	18%	40%	70%
	Metals	18%	40%	70%
	Agricultural	18%	40%	70%
	Other	18%	40%	70%

For credit derivatives where the institution is the protection seller and that are outside netting and margin agreements, the EAD may be capped to the amount of unpaid premiums. Institutions have the option to remove such credit derivatives from their legal netting sets and treat them as individual un-margined transactions in order to apply the cap. For add-on factors, refer to Table 2 of paragraph 143.

First-to-default, second-to-default and subsequent-to-default transactions should be treated as CDO tranches under SA-CCR. For a nth-to-default transaction on a pool of m reference names, institutions must use an attachment point of $A=(n-1)/m$ and a detachment point of $D=n/m$ in order to calculate the supervisory delta formula set out in paragraph 119 of this chapter.

[BCBS, April 2014 (SA-CCR), par 183; BCBS August 2015, question #7; and BCBS, March 2018, question #4.4]

144. For a basis transaction hedging set, the supervisory factor applicable to its relevant asset class must be multiplied by one-half. For a volatility transaction hedging set, the supervisory factor

[38] For swaptions for all currencies, a 50% supervisory option volatility should be used.

applicable to its relevant asset class must be multiplied by a factor of five. [BCBS, April 2014 (SA-CCR), par 184]

4.1.6.19. Treatment of multiple margin agreements and multiple netting sets

145. If multiple CSAs apply to an individual netting set (for example: one Credit Support Annex [CSA] for VM and one for Initial Margin [IM]), all collateral collected against the netting set in question can be used to offset exposures as if it were collected in a single netting set, provided the institution has performed sufficient legal review to ensure the requirements of paragraph 94 are satisfied.

When multiple CSAs apply to an individual netting set, the RC and PFE are calculated as follows:

<u>RC</u>

- The V and C terms should consider all transactions within a netting set, across all CSAs; and
- The TH + MTA - NICA is the sum of the thresholds and MTAs across all CSA agreement.

<u>PFE</u>

- In the multiplier term, similarly to RC, the V and C terms should consider all transactions in the netting set across all CSA agreements; and
- The margin period of risk applied to calculate effective notionals is specific to the individual CSA to which a trade belongs.

146. If a single margin agreement applies to several netting sets, special treatment is necessary because it is problematic to allocate the common collateral to individual netting sets. The replacement cost at any given time is determined by the sum of two terms. The first term is equal to the unmargined current exposure of the institution to the counterparty aggregated across all netting sets within the margin agreement reduced by the positive current net collateral (ie collateral is subtracted only when the institution is a net holder of collateral). The second term is non-zero only when the institution is a net poster of collateral: it is equal to the current net posted collateral (if there is any) reduced by the unmargined current exposure of the counterparty to the institution aggregated across all netting sets within the margin agreement. Net collateral available to the institution should include both VM and NICA. Mathematically, RC for the entire margin agreement is:

$$RC_{MA} = max\left\{\sum_{NS\in MA} max\{V_{NS};0\} - max\{C_{MA};0\};0\right\} + max\left\{\sum_{NS\in MA} min\{V_{NS};0\} - min\{C_{MA};0\};0\right\}$$

where the summation $NS \in MA$is across the netting sets covered by the margin agreement (hence the notation), V_{NS} is the current mark-to-market value of the netting set NS and C_{MA} is the cash equivalent value of all currently available collateral under the margin agreement.

[BCBS, April 2014 (SA-CCR), par 186] and [BCBS, August 2015, technical amendment]

Eligible collateral taken outside a netting set, which is available to a institution to offset losses due to counterparty default on more than one netting set, should be treated as collateral taken under a

margin agreement applicable to multiple netting sets. If eligible collateral is available to offset losses on non-derivative exposures as well as exposures determined using the SA-CCR, only that portion of the collateral assigned to the derivatives may be used to reduce the derivatives exposure.
[BCBS, March 2018, question #4.5]

147. Where a single margin agreement applies to several netting sets as described in paragraph 146, collateral will be exchanged based on mark-to-market values that are netted across all transactions covered under the margin agreement, irrespective of netting sets. That is, collateral exchanged on a net basis may not be sufficient to cover *PFE*.

In this situation, therefore, the *PFE* add-on must be calculated according to the unmargined methodology. Netting set-level *PFE*s are then aggregated. Mathematically:

$$PFE_{MA} = \sum_{NS \in MA} PFE_{NS}^{(unmargined)}$$

where $PFE_{NS}^{(unmargined)}$ is the PFE add-on for the netting set *NS* calculated according to the unmargined requirements.
[BCBS, April 2014 (SA-CCR), par 187]

4.1.6.20. Treatment of trades subject to Specific Wrong-Way Risk

148. The requirements for trades where SWWR has been identified outlined in paragraph 73 also apply to trades where the exposure is measured using the SA-CCR. Institutions have until the first quarter of 2020 to comply with the requirments of this paragraph.

4.1.7. CVA Risk Capital Charge

149. In addition to the default risk capital requirements for counterparty credit risk determined based on the standardised or internal ratings-based (IRB) approaches for credit risk, an institution must add a capital charge to cover the risk of mark-to-market losses on the expected counterparty risk (such losses being known as credit value adjustments, CVA) to OTC derivatives. The CVA capital charge will be calculated in the manner set forth below depending on the institution's approved method of calculating capital charges for counterparty credit risk and specific interest rate risk. An institution is not required to include in this capital charge (i) transactions with a QCCP; and (ii) securities financing transactions (SFT), unless their supervisor determines that the institution's CVA loss exposures arising from SFT transactions are material. [BCBS June 2011 Annex 4 par 97]

150. The introduction of the SA-CCR to calculate derivatives exposure also impacts the CVA capital charge. Further, OSFI intends to implement the revised CVA framework in 2022[39]. Introducing multiple changes to a framework can introduce volatility in capital requirements in a short period of time. As such, from the beginning of the first fiscal quarter of 2019 until the end of the fourth fiscal quarter of 2021, banks may apply a scalar of 0.7 to the SA-CCR exposure amounts that enter into the formulas described in paragraphs 151 and 157.

[39] See the section on minimum capital requirements for CVA risk at https://www.bis.org/bcbs/publ/d424.htm.

4.1.7.1. Institutions with IMM approval and Specific Interest Rate Risk VaR model[40] approval for bonds: Advanced CVA risk capital charge

151. Institutions 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 this additional 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 155 and 156, using the institution's VaR model for bonds. This VaR model is restricted to changes in the counterparties' credit spreads and does not model the sensitivity of CVA to changes in other market factors, such as changes in the value of the reference asset, commodity, currency or interest rate of a derivative. Regardless of the accounting valuation method a institution uses for determining CVA, the CVA capital charge calculation must be based on the following formula for the CVA of each counterparty:

$$CVA = (LGD_{MKT}) \times \sum_{i=1}^{T} MAX\left[0; \exp\left(-\frac{s_{i-1} \times t_{i-1}}{LGD_{MKT}}\right) - \exp\left(-\frac{s_i \times t_i}{LGD_{MKT}}\right)\right] \times \left(\frac{EE_{i-1} \times D_{i-1} + EE_i \times D_i}{2}\right)$$

Where

- t_i is the time of the i-th revaluation time bucket, starting from t0=0;
- t_T is the longest contractual maturity across the netting sets with the counterparty;
- s_i is the credit spread of the counterparty at tenor ti, used to calculate the CVA of the counterparty. Whenever the CDS spread of the counterparty is available, this must be used. Whenever such a CDS spread is not available, the institution must use a proxy spread that is appropriate based on the rating, industry and region of the counterparty;
- LGD_{MKT} is the loss given default of the counterparty and should be based on the spread of a market instrument of the counterparty (or where a counterparty instrument is not available, based on the proxy spread that is appropriate based on the rating, industry and region of the counterparty). It should be noted that this LGD_{MKT}, which inputs into the calculation of the CVA risk capital charge, is different from the LGD that is determined for the IRB and CCR default risk charge, as this LGD_{MKT} is a market assessment rather than an internal estimate;
- the first factor within the sum represents an approximation of the market implied marginal probability of a default occurring between times t_{i-1} and t_i. Market implied default probability (also known as risk neutral probability) represents the market price of buying protection against a default and is in general different from the real-world likelihood of a default;
- EE_i is the expected exposure to the counterparty at revaluation time t_i, as defined in paragraph 35 (regulatory expected exposure), where exposures of different netting sets for such counterparty are added, and where the longest maturity of each netting set is given by the longest contractual maturity inside the netting set;

[40] "VaR model" refers to the internal model approach to market risk.

- D_i is the default risk-free discount factor at time t_i, where $D_0 = 1$.

[BCBS June 2011 Annex 4 par 98]

152. The formula in paragraph 151 must be the basis for all inputs into the institution's approved VaR model for bonds when calculating the CVA risk capital charge for a counterparty. For example, if this approved VaR model is based on full repricing, then the formula must be used directly. If the institution's approved VaR model is based on credit spread sensitivities for specific tenors, the institution must base each credit spread sensitivity on the following formula[41]:

$$Regulatory\ CS01_i = 0.0001 \times t_i \times exp\left(-\frac{s_i \times t_i}{LGD_{MKT}}\right) \times \left(\frac{EE_{i-1} \times D_{i-1} - EE_{i+1} \times D_{i+1}}{2}\right)$$

If the institution's approved VaR model uses credit spread sensitivities to parallel shifts in credit spreads (Regulatory CS01), then the institution must use the following formula[42]:

$$Regulatory\ CS01 = 0.0001 \times \sum_{i}^{T}\left(t_i \times exp\left(-\frac{s_i \times t_i}{LGD_{MKT}}\right) - t_{i-1} \times exp\left(-\frac{s_{i-1} \times t_{i-1}}{LGD_{MKT}}\right)\right) \times \left(\frac{EE_{i-1} \times D_{i-1} + EE_i \times D_i}{2}\right)$$

If the bank's approved VaR model uses second-order sensitivities to shifts in credit spreads (spread gamma), the gammas must be calculated based on the formula in paragraph 151.

Institutions with IMM approval for the majority of their businesses, but which use SA-CCR for certain smaller portfolios, and which have approval to use the market risk internal models approach for the specific interest rate risk of bonds, will include these non-IMM netting sets into the CVA risk capital charge, according to paragraph 151, unless OSFI decides that paragraph 157 should apply for these portfolios. Non-IMM netting sets are included into the advanced CVA risk capital charge by assuming a constant EE profile, where EE is set equal to the EAD as computed under SA-CCR for a maturity equal to the maximum of (i) half of the longest maturity occurring in the netting set and (ii) the notional weighted average maturity of all transactions inside the netting set. The same approach applies where the IMM model does not produce an expected exposure profile.

For exposures to certain counterparties, the institution's approved market risk VaR model may not reflect the risk of credit spread changes appropriately, because the institution's market risk VaR model does not appropriately reflect the specific risk of debt instruments issued by the counterparty. For such exposures, the institution is not allowed to use the advanced CVA risk charge. Instead, for these exposures the institution must determine the CVA risk charge by application of the standardised method in paragraph 157. Only exposures to counterparties for

[41] This derivation assumes positive marginal default probabilities before and after time bucket t_i and is valid for i<T. For the final time bucket i=T, the corresponding formula is:

$$Regulatory\ CS01_T = 0.0001 \times t_T \times exp\left(-\frac{s_T \times t_T}{LGD_{MKT}}\right) \times \left(\frac{EE_{T-1} \times D_{T-1} + EE_T \times D_T}{2}\right)$$

[42] This derivation assumes positive marginal default probabilities.

which the institution has supervisory approval for modelling the specific risk of debt instruments are to be included into the advanced CVA risk charge. [BCBS June 2011 Annex 4 par 99]

153. The CVA risk capital charge consists of both general and specific credit spread risks, including Stressed VaR but excluding IRC (incremental risk charge). The VaR figure should be determined in accordance with the quantitative standards described in paragraph 198 of chapter 9. It is thus determined as the sum of (i) the non-stressed VaR component and (ii) the stressed VaR component.

i. when calculating the non-stressed VaR, current parameter calibrations for expected exposure must be used;

ii. when calculating the stressed VaR future counterparty EE profiles (according to the stressed exposure parameter calibrations as defined in paragraph 76) must be used. The period of stress for the credit spread parameters should be the most severe one-year stress period contained within the three year stress period used for the exposure parameters[43].

[BCBS June 2011 Annex 4 par 100]

154. This additional CVA risk capital charge is the stand alone market risk charge, calculated on the set of CVAs (as specified in paragraph 151) for all OTC derivatives counterparties, collateralised and uncollateralised, together with eligible CVA hedges. Within this standalone CVA risk capital charge, no offset against other instruments on the institution's balance sheet will be permitted (except as otherwise expressly provided herein). [BCBS June 2011 Annex 4 par 101]

155. Only hedges used for the purpose of mitigating CVA risk, and managed as such, are eligible to be included in the VaR model used to calculate the above CVA capital charge or in the standardised CVA risk capital charge set forth in paragraph 157. For example, if a credit default swap (CDS) referencing an issuer is in the institution's inventory and that issuer also happens to be an OTC counterparty but the CDS is not managed as a hedge of CVA, then such a CDS is not eligible to offset the CVA within the standalone VaR calculation of the CVA risk capital charge. [BCBS June 2011 Annex 4 par 102]

156. The only eligible hedges that can be included in the calculation of the CVA risk capital charge under paragraphs 151 or 157 are single-name CDSs, single-name contingent CDSs, other equivalent hedging instruments referencing the counterparty directly, and index CDSs. In case of index CDSs, the following restrictions apply:

- the basis between any individual counterparty spread and the spreads of index CDS hedges must be reflected in the VaR. This requirement also applies to cases where a proxy is used for the spread of a counterparty, since idiosyncratic basis still needs to be reflected in such situations. For all counterparties with no available spread, the institution must use reasonable basis time series out of a representative bucket of similar names for which a spread is available;
- if the basis is not reflected to OSFI's satisfaction, then the institution must reflect only 50% of the notional amount of index hedges in the VaR.

[43] Note that the three-times multiplier inherent in the calculation of a bond VaR and a stressed VaR will apply to these calculations.

Other types of counterparty risk hedges must not be reflected within the calculation of the CVA capital charge, and these other hedges must be treated as any other instrument in the institution's inventory for regulatory capital purposes. Tranched or n^{th} to- default CDSs are not eligible CVA hedges. Eligible hedges that are included in the CVA capital charge must be removed from the institution's market risk capital charge calculation.

Although market risk hedges of CVA are not recognized in the CVA capital charge, market risk hedges used for the purposes of mitigating CVA risk and managed as such, are exempt from market risk capital requirements.

[BCBS June 2011 Annex 4 par 103]

4.1.7.2. All other institutions: standardised CVA risk capital charge

157. When an institution does not have the required approvals to use paragraph 151 to calculate a CVA capital charge for its counterparties, the institution must calculate a portfolio capital charge using the following formula:

$$K = 2.33 \times \sqrt{h} \times \sqrt{\left(\sum_i 0.5 \times w_i \times \left(M_i \times EAD_i^{total} - M_i^{hedge} \times B_i\right) - \sum_{ind} w_{ind} \times M_{ind} \times B_{ind}\right)^2 + \sum_i 0.75 \times w_i^2 \times \left(M_i \times EAD_i^{total} - M_i^{hedge} \times B_i\right)^2}$$

Where

- h is the one-year risk horizon (in units of a year), h = 1;
- w_i is the weight applicable to counterparty 'i'. Counterparty 'i' must be mapped to one of the seven weights w_i based on its external rating, as shown in the table of this paragraph below. When a counterparty does not have an external rating, the institution must, subject to supervisory approval, map the internal rating of the counterparty to one of the external ratings. If the institution does not have an approved rating system, then any unrated counterparty will receive a weight of 2.0%;
- EAD_i^{total} is the exposure at default of counterparty 'i' (summed across its netting sets), including the effect of collateral as per the existing IMM or SA-CCR rules as applicable to the calculation of counterparty risk capital charges for such counterparty by the institution. For non-IMM institutions the exposure should be discounted by applying the factor $(1-\exp(-0.05*M_i))/(0.05*M_i)$. For IMM institutions, no such discount should be applied as the discount factor is already included in M_i;
- B_i is the notional of purchased single name CDS hedges (summed if more than one position) referencing counterparty 'i', and used to hedge CVA risk. This notional amount should be discounted by applying the factor $(1-\exp(-0.05*M_i^{hedge}))/(0.05*M_i^{hedge})$;
- B_{ind} is the full notional of one or more index CDS of purchased protection, used to hedge CVA risk. This notional amount should be discounted by applying the factor $(1-\exp(-0.05*M_{ind}))/(0.05*M_{ind})$;
- w_{ind} is the weight applicable to index hedges. The institution must map indices to one of the seven weights wi based on the average spread of index 'ind';

- M_i is the effective maturity of the transactions with counterparty 'i'. For IMM institutions, M_i is to be calculated as per paragraph 43. For non-IMM institutions, M_i is the notional weighted average maturity as referred to in the third bullet point of paragraph 121 of chapter 6. However, for this purpose, M_i should not be capped at 5 years;
- M_i^{hedge} is the maturity of the hedge instrument with notional B_i (the quantities M_i^{hedge} x B_i are to be summed if these are several positions);
- M^{ind} is the maturity of the index hedge 'ind'. In case of more than one index hedge position, it is the notional weighted average maturity.

For any counterparty that is also a constituent of an index on which a CDS is used for hedging counterparty credit risk, the notional amount attributable to that single name (as per its reference entity weight) may, with supervisory approval, be subtracted from the index CDS notional amount and treated as a single name hedge (B_i) of the individual counterparty with maturity based on the maturity of the index.

The weights are given in this table, and are based on the external rating of the counterparty[44]:

Rating	**Weight W_i**
AAA	0.7%
AA	0.7%
A	0.8%
BBB	1.0%
BB	2.0%
B	3.0%
CCC	10.0%

Similarly to institutions using the advanced CVA capital charge, market risk hedges used for the purposes of mitigating CVA risk and managed as such, are exempt from market risk capital requirements.

[BCBS June 2011 Annex 4 par 104]

4.1.8. Calculation of the aggregate CCR and CVA risk capital charges

158. This paragraph deals with the aggregation of the default risk capital charge and the CVA risk capital charge for potential mark-to-market losses. Note that outstanding EAD referred to in the default risk capital charges below is net of incurred CVA losses according to paragraph 12, which affects all items "i" below. In this paragraph, "IMM capital charge" refers to the default risk capital charge for CCR based on the RWAs obtained when multiplying the outstanding EAD of each counterparty under the IMM approach by the applicable credit risk weight (under the Standardised or IRB approach), and summing across counterparties. Equally, "SA-CCR capital

[44] The notations follow the methodology used by one institution, Standard & Poor's. The use of Standard & Poor's credit ratings is an example only; those of some other approved external credit assessment institutions could be used on an equivalent basis. The ratings used throughout this document, therefore, do not express any preferences or determinations on external assessment institutions by OSFI.

charge" refers to the default risk capital charges where outstanding EADs for all counterparties in the portfolio are determined based on the SA-CCR. [BCBS June 2011 Annex 4 par 105]

4.1.8.1. Institutions with IMM approval and market-risk internal-models approval for the specific interest-rate risk of bonds

159. The total CCR capital charge for such an institution is determined as the sum of the following components:

i. the higher of (a) its IMM capital charge based on current parameter calibrations for EAD and (b) its IMM capital charge based on stressed parameter calibrations for EAD. For IRB institutions, the risk weights applied to OTC derivative exposures should be calculated with the full maturity adjustment as a function of PD with M capped at 1 in Chapter 6 – Credit Risk – Internal Ratings Based Approach paragraph 81, provided the institution can demonstrate to its national supervisor that its specific VaR model applied in paragraph 151 contains the effect of rating migrations. If the institution cannot demonstrate this to the satisfaction of its national supervisor, the full maturity adjustment function, given by the formula

$$(1 - 1.5 \times b)^{-1} \times (1 + (M - 2.5) \times b)$$ [45] should apply;

ii. the advanced CVA risk capital charge determined pursuant to paragraphs 151 to 156.
[BCBS June 2011 Annex 4 par 105]

4.1.8.2. Institutions with IMM approval and without Specific Risk VaR approval for bonds

160. The total CCR capital charge for such an institution is determined as the sum of the following components:

i. the higher of (a) the IMM capital charge based on current parameter calibrations for EAD and (b) the IMM capital charge based on stressed parameter calibrations for EAD;

ii. the standardised CVA risk capital charge determined by paragraph 157.
[BCBS June 2011 Annex 4 par 105]

4.1.8.3. All other institutions

161. The total CCR capital charge for such institutions is determined as the sum of the following two components:

i. the sum over all counterparties of the SA-CCR based capital charge with EADs determined by paragraph 87;

ii. the standardised CVA risk capital charge determined by paragraph 157.
[BCBS June 2011 Annex 4 par 105]

[45] Where "M" is the effective maturity and "b" is the maturity adjustment as a function of the PD, as defined in paragraph 81 of chapter 6 of the CAR A-1 Guideline.

4.1.9. Central Counterparties

162. Regardless of whether a CCP is classified as a QCCP, an institution retains the responsibility to ensure that it maintains adequate capital for its exposures. Under Pillar 2 of Basel II, an institution should consider whether it might need to hold capital in excess of the minimum capital requirements if, for example, (i) its dealings with a CCP give rise to more risky exposures or (ii) where, given the context of that institution's dealings, it is unclear that the CCP meets the definition of a QCCP. [BCBS, April 2014 (CCPs), Annex 4 par 188]

163. Where the institution is acting as a clearing member, the institution should assess through appropriate scenario analysis and stress testing whether the level of capital held against exposures to a CCP adequately addresses the inherent risks of those transactions. This assessment will include potential future or contingent exposures resulting from future drawings on default fund commitments, and/or from secondary commitments to take over or replace offsetting transactions from clients of another clearing member in case of this clearing member defaulting or becoming insolvent. [BCBS, April 2014 (CCPs), Annex 4 par 189]

164. An institution must monitor and report to senior management on a regular basis all of its exposures to CCPs, including exposures arising from trading through a CCP and exposures arising from CCP membership obligations such as default fund contributions. [BCBS, April 2014 (CCPs), Annex 4 par 190]

165. Where an institution is clearing derivative, SFT and/or long settlement transactions through a Qualifying CCP (QCCP) as defined in Annex 4, Section I, A. General Terms, then paragraphs 166 to 183 of this Chapter will apply. In the case of non-qualifying CCPs, paragraphs 184 and 185 of this Chapter will apply. Within three months of a central counterparty ceasing to qualify as a QCCP, unless OSFI requires otherwise, the trades with a former QCCP may continue to be capitalised as though they are with a QCCP. After that time, the bank's exposures with such a central counterparty must be capitalised according to paragraphs 184 and 185 of this Chapter. [BCBS, April 2014 (CCPs), Annex 4 par 191]

4.1.9.1. Exposures to Qualifying CCPs

A. Trade exposures

(i) Clearing member exposures to CCPs

166. Where an institution acts as a clearing member of a CCP for its own purposes, a risk weight of 2% must be applied to the institution's trade exposure to the CCP in respect of OTC derivatives, exchange-traded derivative transactions, SFTs and long-settlement transactions. Where the clearing member offers clearing services to clients, the 2% risk weight also applies to the clearing member's trade exposure to the CCP that arises when the clearing member is obligated to reimburse the client for any losses suffered due to changes in the value of its transactions in the event that the CCP defaults. The risk weight applied to collateral posted to the CCP by the institution must be determined in accordance with paragraphs 174-176. [BCBS, April 2014 (CCPs), Annex 4 par 192]

167. The exposure amount for such trade exposure is to be calculated in accordance with this chapter using the IMM or the SA-CCR, as consistently applied by such an institution to such an exposure in the ordinary course of its business, or Chapter 5 for collateralised transactions[46].

The 20-day floor for the margin period of risk (MPOR) as established in the first bullet point of paragraph 47 dealing with the number of transactions will not apply, provided that the netting set does not contain illiquid collateral or exotic trades and provided there are no disputed trades. This refers to exposure calculations under the IMM and the SA-CCR as well as for the holding periods entering the exposure calculation of repo-style transactions in paragraphs 46 and 115 of Chapter 5.

In all cases, a minimum MPOR of 10 days must be used for the calculation of trade exposures to CCPs for OTC derivatives.

Where CCPs retain variation margin against certain trades (e.g. where CCPs collect and hold variation margin against positions in exchange-traded or OTC forwards), and the member collateral is not protected against the insolvency of the CCP, the minimum time risk horizon applied to institutions' trade exposures on those trades must be the lesser of one year and the remaining maturity of the transaction, with a floor of 10 business days.
[BCBS, April 2014 (CCPs), Annex 4 par 193]

168. Where settlement is legally enforceable on a net basis in an event of default and regardless of whether the counterparty is insolvent or bankrupt, the total replacement cost of all contracts relevant to the trade exposure determination can be calculated as a net replacement cost if the applicable close-out netting sets meet the requirements set out in:

- Paragraphs 63 and, where applicable, also 64 of Chapter 5 in the case of repo-style transactions,
- Paragraph 94 of this Chapter in the case of derivative transactions, and
- Paragraphs 13 to 22 of this Chapter in the case of cross-product netting.

To the extent that the rules referenced above include the term "master agreement" or the phrase "a netting contract with a counterparty or other agreement", this terminology must be read as including any enforceable arrangement that provides legally enforceable rights of set-off[47]. If the institution cannot demonstrate that netting agreements meet these requirements, each single transaction will be regarded as a netting set of its own for the calculation of trade exposure.
[BCBS, April 2014 (CCPs), Annex 4 par 194]

[46] In particular, see paragraph 50 or 100 of Chapter 5 for OTC derivatives and standard supervisory haircuts or own estimates for haircuts, respectively; and for SFTs, see paragraph 112 for simple VaR model.

[47] This is to take account of the fact that netting arrangements for CCPs are not as standardized as those for OTC netting agreements in the context of bilateral trading; however, netting is generally provided for in CCP rules.

(ii) Clearing member exposures to clients

169. The clearing member will always capitalise its exposure (including potential CVA risk exposure) to clients as bilateral trades, irrespective of whether the clearing member guarantees the trade or acts as an intermediary between the client and the CCP. However, to recognise the shorter close-out period for cleared client transactions, clearing members can capitalise the exposure to their clients applying a margin period of risk of at least five days in IMM or SA-CCR[48]. [BCBS, April 2014 (CCPs), Annex 4 par 195]

170. If a clearing member collects collateral from a client for client cleared trades and this collateral is passed on to the CCP, the clearing member may recognise this collateral for both the CCP-clearing member leg and the clearing member-client leg of the client cleared trade. Therefore, initial margin posted by clients to their clearing member mitigates the exposure the clearing member has against these clients. The same treatment applies, in an analogous fashion, to multi-level client structures (between a higher level client and a lower level client). [BCBS, April 2014 (CCPs), Annex 4 par 196]

(iii) Client exposures

171. Where an institution is a client of a clearing member, and enters into a transaction with the clearing member acting as a financial intermediary (i.e. the clearing member completes an offsetting transaction with a CCP), the client's exposures to the clearing member may receive the treatment in paragraphs 166 to 168 if the two conditions below are met. Likewise, where a client enters into a transaction with the CCP, with a clearing member guaranteeing its performance, the client's exposures to the CCP may receive the treatment in paragraph 166 to 168 if the conditions in (a) and (b) below are met.

The treatment in paragraphs 166 to 168 may also apply to exposures of lower level clients to higher level clients in a multi-level client structure, provided that for all client levels in-between the conditions in (a) and (b) below are met.

a. The offsetting transactions are identified by the CCP as client transactions and collateral to support them is held by the CCP and/or the clearing member, as applicable, under arrangements that prevent any losses to the client due to: (i) the default or insolvency of the clearing member, (ii) the default or insolvency of the clearing member's other clients, and (iii) the joint default or insolvency of the clearing member and any of its other clients[49].

   The client must have conducted a sufficient legal review (and undertake such further review as necessary to ensure continuing enforceability) and have a well-founded basis to

[48] The reduced EAD should also be used for the calculation of both the Advanced and Standardized CVA capital charge.

[49] That is, upon the insolvency of the clearing member, there is no legal impediment (other than the need to obtain a court order to which the client is entitled) to the transfer of the collateral belonging to clients of a defaulting clearing member to the CCP, to one or more other surviving clearing members or to the client or the client's nominee. OSFI should be consulted to determine whether this is achieved based on particular facts.

conclude that, in the event of legal challenge, the relevant courts and administrative authorities would find that such arrangements mentioned above would be legal, valid, binding and enforceable under the relevant laws of the relevant jurisdiction(s).

(b) Relevant laws, regulation, rules, contractual, or administrative arrangements provide that the offsetting transactions with the defaulted or insolvent clearing member are highly likely to continue to be indirectly transacted through the CCP, or by the CCP, if the clearing member defaults or becomes insolvent[50]. In such circumstances, the client positions and collateral with the CCP will be transferred at market value unless the client requests to close out the position at market value.

[BCBS, April 2014 (CCPs), Annex 4 par 197]

172. Where a client is not protected from losses in the case that the clearing member and another client of the clearing member jointly default or become jointly insolvent, but all other conditions in the preceding paragraph are met, a risk weight of 4% will apply to the client's exposure to the clearing member, or to the higher level client, respectively. [BCBS, April 2014 (CCPs), Annex 4 par 198]

173. Where the institution is a client of the clearing member and the requirements in paragraphs 171 to 172 are not met, the institution will capitalise its exposure (including potential CVA risk exposure) to the clearing member as a bilateral trade. [BCBS, April 2014 (CCPs), Annex 4 par 199]

(iv) Treatment of posted collateral

174. In all cases, any assets or collateral posted must, from the perspective of the institution posting such collateral, receive the risk weights that otherwise applies to such assets or collateral under the capital adequacy framework, regardless of the fact that such assets have been posted as collateral[51]. Where assets or collateral of a clearing member or client are posted with a CCP or a clearing member and are not held in a bankruptcy remote manner, the institution posting such assets or collateral must also recognise credit risk based upon the assets or collateral being exposed to risk of loss based on the creditworthiness of the entity holding such assets or collateral. [BCBS, April 2014 (CCPs), Annex 4 par 200]

175. Where the entity holding such assets or collateral is the CCP, a risk-weight of 2% applies to collateral included in the definition of trade exposures. The relevant risk-weight of the CCP will apply to assets or collateral posted for other purposes. Where institutions use the SA-CCR to

[50] If there is a clear precedent for transactions being ported at a CCP and industry intent for this practice to continue, then these factors must be considered when assessing if trades are highly likely to be ported. The fact that CCP documentation does not prohibit client trades from being ported is not sufficient to say they are highly likely to be ported.

[51] Collateral posted must receive the banking book or trading book treatment it would receive if it had not been posted to the CCP. In addition, this collateral is subject to the CCR framework of the Basel rules, regardless of whether it is in the banking or trading book. This includes the increase due to haircuts under either the standardized supervisory haircuts or the own estimates.

calculate exposures, collateral posted which is not held in a bankruptcy remote manner must be accounted for in the NICA term in accordance with paragraphs 101 to 105. For institutions using IMM models, the alpha multiplier must be applied to the exposure on posted collateral. [BCBS, April 2014 (CCPs), Annex 4 par 201]

176. All collateral posted by the clearing member (including cash, securities, other pledged assets, and excess initial or variation margin, also called overcollateralization), that is held by a custodian[52], and is bankruptcy remote from the CCP, is not subject to a capital requirement for counterparty credit risk exposure to such bankruptcy remote custodian (i.e. the related risk weight or EAD is equal to zero). [BCBS, April 2014 (CCPs), Annex 4 par 202]

177. Collateral posted by a client, that is held by a custodian, and is bankruptcy remote from the CCP, the clearing member and other clients, is not subject to a capital requirement for counterparty credit risk. If the collateral is held at the CCP on a client's behalf and is not held on a bankruptcy remote basis, a 2% risk-weight must be applied to the collateral if the conditions established in paragraph 171 are met; or 4% if the conditions in paragraph 172 are met. [BCBS, April 2014 (CCPs), Annex 4 par 203]

B. Default fund exposures

178. Where a default fund is shared between products or types of business with settlement risk only (e.g. equities and bonds) and products or types of business which give rise to counterparty credit risk ie OTC derivatives, exchange-traded derivatives, SFTs or long settlement transactions, all of the default fund contributions will receive the risk weight determined according to the formulae and methodology set forth below, without apportioning to different classes or types of business or products. However, where the default fund contributions from clearing members are segregated by product types and only accessible for specific product types, the capital requirements for those default fund exposures determined according to the formulae and methodology set forth below must be calculated for each specific product giving rise to counterparty credit risk. In case the CCP's prefunded own resources are shared among product types, the CCP will have to allocate those funds to each of the calculations, in proportion to the respective product specific EAD. [BCBS, April 2014 (CCPs), Annex 4 par 204]

179. Whenever an institution is required to capitalise for exposures arising from default fund contributions to a qualifying CCP, clearing member institutions will apply the following approach. [BCBS, April 2014 (CCPs), Annex 4 par 205]

180. Clearing member institutions will apply a risk weight to their default fund contributions determined according to a risk sensitive formula that considers (i) the size and quality of a qualifying CCP's financial resources, (ii) the counterparty credit risk exposures of such CCP, and (iii) the application of such financial resources via the CCP's loss bearing waterfall, in the case of one or more clearing member defaults. The clearing member institution's risk sensitive capital

[52] In this paragraph, the word "custodian" may include a trustee, agent, pledgee, secured creditor or any other person that holds property in a way that does not give such person a beneficial interest in such property and will not result in such property being subject to legally-enforceable claims by such persons creditors, or to a court-ordered stay of the return of such property, if such person becomes insolvent or bankrupt.

requirement for its default fund contribution (K_{CM_i}) must be calculated using the formulae and methodology set forth below. This calculation may be performed by a CCP, institution, supervisor or other body with access to the required data, as long as the conditions in paragraph 181 are met. [BCBS, April 2014 (CCPs), Annex 4 par 206]

181. The steps for calculation will be the following:

1) First, calculate the hypothetical capital requirement of the CCP due to its counterparty credit risk exposures to all of its clearing members and their clients[53]. This is calculated using the formula for K_{CCP}:

$$K_{CCP} = \sum_{CM_i} EAD_i * RW * capital\ ratio$$

where

RW is a risk weight of 20%[54].

Capital ratio means 8%.

EAD_i is the exposure amount of the CCP to CM 'i', including both the CM's own transactions and client transactions guaranteed by the CM, and all values of collateral held by the CCP (including the CM's prefunded default fund contribution) against these transactions, relating to the valuation at the end of the regulatory reporting date before the margin called on the final margin call of that day is exchanged.

The sum is over all clearing member accounts.

Where clearing members provide client clearing services, and client transactions and collateral are held in separate (individual or omnibus) sub-accounts to the clearing member's proprietary business, each such client sub-account should enter the sum separately, ie the member EAD in the formula above is then the sum of the client sub-account EADs and any house sub-account EAD. This will ensure that client collateral cannot be used to offset the CCP's exposures to clearing members' proprietary activity in the calculation of K_{CCP}. If any of these sub-accounts contains both derivatives and SFTs, the EAD of that sub-account is the sum of the derivative EAD and the SFT EAD.

In the case that collateral is held against an account containing both SFTs and derivatives, the prefunded initial margin provided by the member or client must be allocated to the SFT and derivatives exposures in proportion to the respective product specific EADs, calculated

[53] K_{CCP} is a hypothetical capital requirement for a CCP, calculated on a consistent basis for the sole purpose of determining the capitalisation of clearing member default fund contributions; it does not represent the actual capital requirements for a CCP which may be determined by a CCP and its supervisor.

[54] The 20% risk weight is a minimum requirement. As with other parts of the capital adequacy framework, OSFI may increase the risk weight. An increase in such risk weight would be appropriate if, for example, the clearing members in a CCP are not highly rated. Any such increase in risk weight is to be communicated by the affected institutions to the person completing this calculation.

according to paragraphs 63 to 67 in Chapter 5 for SFTs and the SA-CCR (without including the effects of collateral) for derivatives.

If the default fund contributions of the member (DF_i) are not split with regard to client and house sub-accounts, they must be allocated per sub-account according to the respective fraction the initial margin of that sub-account has in relation to the total initial margin posted by or for the account of the clearing member.

- For derivatives, EAD_i is calculated as the bilateral trade exposure the CCP has against the clearing member using the SA-CCR[55,56]. All collateral held by a CCP to which that CCP has a legal claim in the event of the default of the member or client, including default fund contributions of that member (DF_i), is used to offset the CCP's exposure to that member or client, through inclusion in the PFE multiplier in accordance with paragraphs 108-109 of this Chapter.

- For SFTs, EAD is equal to max($EBRM_i$ – IM_i – DF_i; 0), where

    - $EBRM_i$ denotes the exposure value to clearing member 'i' before risk mitigation under paragraphs 63 to 67 of Chapter 5; where, for the purposes of this calculation, variation margin that has been exchanged (before the margin called on the final margin call of that day) enters into the mark-to-market value of the transactions;

    - IM_i is the initial margin collateral posted by the clearing member with the CCP;

    - DF_i is the prefunded default fund contribution by the clearing member that will be applied upon such clearing member's default, either along with or immediately following such member's initial margin, to reduce the CCP loss.

Any haircuts to be applied for SFTs must be the paragraph 50 standard supervisory haircuts in Chapter 5.

As regards the calculation in this first step:

i. The holding periods for SFT calculations in paragraphs 54 to 56 of Chapter 5 and those for derivatives in paragraph 47 of this Chapter remain even if more than 5000 trades are within one netting set, i.e. the first bullet point of paragraph 47 of this Chapter will not apply in this context.

ii. The netting sets that are applicable to regulated clearing members are the same as those referred to in paragraph 168. For all other clearing members, they need to

[55] A MPOR of 10 days must be used to calculate the CCP's potential future exposure to its clearing members on derivatives transactions

[56] For exposures to QCCPs located in jurisdictions where the SA-CCR has not been implemented the EAD may be computed using the current exposure method as described *https://www.bis.org/publ/bcbs227.pdf.*

follow the netting rules as laid out by the CCP based upon notification of each of its clearing members. OSFI can demand more granular netting sets than laid out by the CCP.

2) Second, calculate the capital requirement for each clearing member:

$$K_{CM_i} = max\left(K_{CCP} * \left(\frac{DF_i^{pref}}{DF_{CCP} + DF_{CM}^{pref}}\right); 8\% * 2\% * DF_i^{pref}\right)$$

where

- K_{CM_i} is the capital requirements on the default contribution of member *i;*
- DF_{CM}^{pref} is the total prefunded default fund contributions from clearing members;
- DF_{CCP} is the CCP's prefunded own resources (eg contributed capital, retained earnings, etc), which are contributed to the default waterfall, where these are junior or *pari passu* to prefunded member contributions; and
- DF_i^{pref} is the prefunded default fund contributions provided by clearing member *i*. This approach puts a floor on the default fund exposure risk weight of 2%.

[BCBS, April 2014 (CCPs), Annex 4 par 207]

182. The CCP, institution, OSFI or other body with access to the required data, must make a calculation of K_{CCP}, DF_{CM}^{pref}, and DF_{CCP} in such a way to permit the supervisor of the CCP to oversee those calculations, and it must share sufficient information of the calculation results to permit each clearing member to calculate their capital requirement for the default fund and for the supervisor of such clearing member to review and confirm such calculations.

K_{CCP} must be calculated on a quarterly basis at a minimum; although national supervisors may require more frequent calculations in case of material changes (such as the CCP clearing a new product). The CCP, institution, supervisor or other body that did the calculations must make available to the home supervisor of any clearing member sufficient aggregate information about the composition of the CCP's exposures to clearing members and information provided to the clearing member for the purposes of the calculation of K_{CCP}, DF_{CM}^{pref}, and DF_{CCP}.

Such information must be provided no less frequently than OSFI would require for monitoring the risk of the clearing member that it supervises. K_{CCP} and K_{CM_i} must be recalculated at least quarterly, and should also be recalculated when there are material changes to the number or exposure of cleared transactions or material changes to the financial resources of the CCP.

[BCBS, April 2014 (CCPs), Annex 4 par 208]

C. Cap with regard to QCCPs

183. Where the sum of an institutions's capital charges for exposures to a qualifying CCP due to its trade exposure and default fund contribution is higher than the total capital charge that would be applied to those same exposures if the CCP were for a non-qualifying CCP, as outlined in

paragraphs 184 and 185 of this Chapter, the latter total capital charge shall be applied. [BCBS, April 2014 (CCPs), Annex 4 par 209]

4.1.9.2. Exposures to Non-qualifying CCPs

184. Institutions must apply the Standardised Approach for credit risk in the main framework, according to the category of the counterparty, to their trade exposure to a non-qualifying CCP. [BCBS, April 2014 (CCPs), Annex 4 par 210]

185. Institutions must apply a risk weight of 1250% to their default fund contributions to a non-qualifying CCP. For the purposes of this paragraph, the default fund contributions of such institutions will include both the funded and the unfunded contributions which are liable to be paid should the CCP so require. Where there is a liability for unfunded contributions (i.e. unlimited binding commitments) OSFI will determine in its Pillar 2 assessments the amount of unfunded commitments to which a 1250% risk weight should apply. [BCBS, April 2014 (CCPs), Annex 4 par 211]

4.2. Capital treatment for failed trades and non-DvP transactions

[previously Annex 3]

186. The capital requirement for failed trades and non-DvP transactions outlined in this Chapter applies in addition to (i.e. it does not replace) the requirements for the transactions themselves under this framework.

4.2.1. Overarching principles

187. Institutions should continue to develop, implement and improve systems for tracking and monitoring the credit risk exposures arising from unsettled and failed transactions as appropriate for producing management information that facilitates action on a timely basis. [BCBS June 2006 Annex 3 par 1]

188. Transactions settled through a delivery-versus-payment system (DvP)[57], providing simultaneous exchanges of securities for cash, expose firms to a risk of loss on the difference between the transaction valued at the agreed settlement price and the transaction valued at current market price (i.e. positive current exposure). Transactions where cash is paid without receipt of the corresponding receivable (securities, foreign currencies, gold, or commodities) or, conversely, deliverables were delivered without receipt of the corresponding cash payment (non-DvP, or free-delivery) expose firms to a risk of loss on the full amount of cash paid or deliverables delivered. The current rules set out specific capital charges that address these two kinds of exposures. [BCBS June 2006 Annex 3 par 2]

[57] For the purpose of this guideline, DvP transactions include payment-versus-payment (PvP) transactions.

189. The following capital treatment is applicable to all transactions on securities, foreign exchange instruments, and commodities that give rise to a risk of delayed settlement or delivery. This includes transactions through recognised clearing houses and central counterparties that are subject to daily mark-to-market and payment of daily variation margins and that involve a mismatched trade[58]. Repurchase and reverse-repurchase agreements as well as securities lending and borrowing that have failed to settle are excluded from this capital treatment[59]. [BCBS June 2006 Annex 3 par 3] and [BCBS July 2012, Annex 3, par 3]

190. In cases of a system wide failure of a settlement, clearing system or central counterparty, a national supervisor may use its discretion to waive capital charges until the situation is rectified. [BCBS June 2006 Annex 3 par 4] and [BCBS July 2012, Annex 3, par 4]

191. Failure of a counterparty to settle a trade in itself will not be deemed a default for purposes of credit risk under this guideline. [BCBS June 2006 Annex 3 par 5]

192. In applying a risk weight to failed free-delivery exposures, institutions using the IRB approach for credit risk may assign PDs to counterparties for which they have no other banking book exposure on the basis of the counterparty's external rating. Institutions using the Advanced IRB approach may use a 45% LGD in lieu of estimating LGDs so long as they apply it to all failed trade exposures. Alternatively, institutions using the IRB approach may opt to apply the standardised approach risk weights or a 100% risk weight. [BCBS June 2006 Annex 3 par 6]

4.2.2. Capital requirements

193. For DvP transactions, if the payments have not yet taken place five business days after the settlement date, firms must calculate a capital charge by multiplying the positive current exposure of the transaction by the appropriate factor, according to the Table 3.

Table 3

Number of working days after the agreed settlement date	Corresponding risk multiplier
From 5 to 15	8%
From 16 to 30	50%
From 31 to 45	75%
46 or more	100%

[58] An exposure value of zero for counterparty credit risk can be attributed to payment transactions (e.g. funds transfer transactions) and other spot transactions that are outstanding with a central counterparty (e.g. a clearing house), when the central counterparty CCR exposures with all participants in its arrangements are fully collateralised on a daily basis.

[59] All repurchase and reverse-repurchase agreements as well as securities lending and borrowing, including those that have failed to settle, are treated in accordance with Section 4.1 or the sections on credit risk mitigation of this guideline.

194. A reasonable transition period may be allowed for firms to upgrade their information system to be able to track the number of days after the agreed settlement date and calculate the corresponding capital charge. [BCBS June 2006 Annex 3 par 7]

195. For non-DvP transactions (i.e. free deliveries), after the first contractual payment/delivery leg, the institution that has made the payment will treat its exposure as a loan if the second leg has not been received by the end of the business day[60]. This means that an institution under the IRB approach will apply the appropriate IRB formula set out in this guideline, for the exposure to the counterparty, in the same way as it does for all other banking book exposures. Similarly, institutions under the standardised approach will use the standardised risk weights set forth in this guideline. However, when exposures are not material, institutions may choose to apply a uniform 100% risk-weight to these exposures, in order to avoid the burden of a full credit assessment. If five business days after the second contractual payment/delivery date the second leg has not yet effectively taken place, the institution that has made the first payment leg will deduct from capital the full amount of the value transferred plus replacement cost, if any. This treatment will apply until the second payment/delivery leg is effectively made. [BCBS June 2006 Annex 3, par 8]

[60] If the dates when two payment legs are made are the same according to the time zones where each payment is made, it is deemed that they are settled on the same day. For example, if a bank in Tokyo transfers Yen on day X (Japan Standard Time) and receives corresponding US Dollar via CHIPS on day X (US Eastern Standard Time), the settlement is deemed to take place on the same value date.