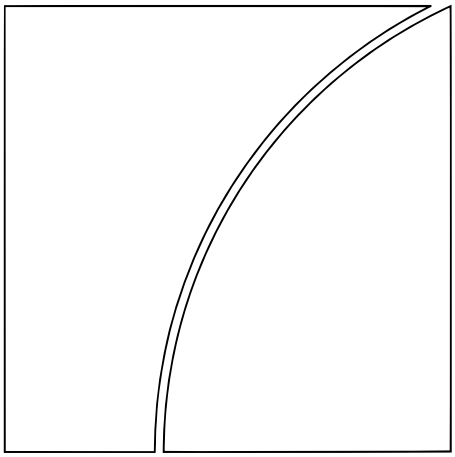
Basel Committee on Banking Supervision

MAR

Calculation of RWA for market risk

MAR50



Credit valuation adjustment framework

This chapter sets out how to calculate capital requirements to cover credit valuation adjustment risk.

Version effective as of 01 January 2023

New framework that is more risk-sensitive, more robust and consistent with revisions to the market risk requirements, updated to take account of the revised implementation date announced on 27 March 2020.

BANK FOR INTERNATIONAL SETTLEMENTS

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Definitions and application

50.1

The risk-weighted assets for credit value adjustment risk are determined by multiplying the capital requirements calculated as set out in this chapter by 12.5.

50.2

In the context of this document, CVA stands for credit valuation adjustment specified at a counterparty level. CVA reflects the adjustment of default risk-free prices of derivatives and securities financing transactions (SFTs) due to a potential default of the counterparty.

50.3

Unless explicitly specified otherwise, the term CVA in this document means regulatory CVA. Regulatory CVA may differ from CVA used for accounting purposes as follows:

1. regulatory CVA excludes the effect of the bank's own default; and
2. several constraints reflecting best practice in accounting CVA are imposed on calculations of regulatory CVA. .

50.4

CVA risk is defined as the risk of losses arising from changing CVA values in response to changes in counterparty credit spreads and market risk factors that drive prices of derivative transactions and SFTs.

50.5

The capital requirements for CVA risk must be calculated by all banks involved in covered transactions in both banking book and trading book. Covered transactions include:

1. all derivatives except those transacted directly with a qualified central counterparty; and
2. SFTs that are fair-valued by a bank for accounting purposes.

50.6

The CVA risk capital requirements are calculated for a bank's "CVA portfolio" on a standalone basis. The CVA portfolio includes CVA for a bank's entire portfolio of covered transactions and eligible CVA hedges.

50.7

Two approaches are available for calculating CVA capital requirements: the standardised approach (SA-CVA) and the basic approach (BA-CVA). Banks must use the BA-CVA unless they receive approval from their relevant supervisory authority to use the SA-CVA.

50.8

Banks that have received approval of their supervisory authority to use the SA-CVA may carve out from the SA-CVA calculations any number of netting sets. CVA capital requirements for all carved-out netting sets must be calculated using the BA-CVA. When applying the carve-out, a legal netting set may also be split into two synthetic netting sets, one containing the carved-out transactions subject to the BA-CVA and the other subject to the SA-CVA, subject to one or

both of the following conditions:

1. the split is consistent with the treatment of the legal netting set used by the bank for calculating accounting CVA (eg where certain transactions are not processed by the front office/accounting exposure model); or
2. supervisory approval to use the SA-CVA is limited and does not cover all transactions within a legal netting set.

50.9

Banks that are below the materiality threshold specified in MAR50.9(1) may opt not to calculate its CVA capital requirements using the SA-CVA or BA-CVA and instead choose an alternative treatment.

1. Any bank whose aggregate notional amount of non-centrally cleared derivatives is less than or equal to 100 billion euro is deemed as being below the materiality threshold.
2. Any bank below the materiality threshold may choose to set its CVA capital requirement equal to 100% of the bank's capital requirement for counterparty credit risk (CCR).
3. CVA hedges are not recognised under this treatment.
4. If chosen, this treatment must be applied to the bank's entire portfolio instead of the BA-CVA or the SA-CVA.
5. A bank's relevant supervisory authority, however, can remove this option if it determines that CVA risk resulting from the bank's derivative positions materially contributes to the bank's overall risk.

50.10

Eligibility criteria for CVA hedges are specified in MAR50.17 to MAR50.19 for the BA-CVA and in MAR50.37 to MAR50.39 for the SA-CVA.

50.11

CVA hedging instruments can be external (ie with an external counterparty) or internal (ie with one of the bank's trading desks).

1. All external CVA hedges (including both eligible and ineligible external CVA hedges) that are covered transactions must be included in the CVA calculation of the counterparty providing to the hedge.
2. All eligible external CVA hedges must be excluded from a bank's market risk capital requirement calculations under MAR10 through MAR40.
3. Ineligible external CVA hedges are treated as trading book instruments and are capitalised under MAR10 through MAR40.
4. An internal CVA hedge involves two perfectly offsetting positions: one of the CVA desk and the opposite position of the trading desk:
    1. If an internal CVA hedge is ineligible, both positions belong to the trading book where they cancel each other, so there is no impact on either the CVA portfolio or the trading book.
    2. If an internal CVA hedge is eligible, the CVA desk's position is part of the CVA portfolio where it is capitalised as set out in this chapter, while the trading desk's position is part of the trading book where it is capitalised as set out in MAR10 through MAR40.

5. If an internal CVA hedge involves an instrument that is subject to curvature risk, default risk charge or the residual risk add-on under the standardised approach as set out in MAR20 to MAR23, it can be eligible only if the trading desk that is the CVA desk's internal counterparty executes a transaction with an external counterparty that exactly offsets the trading desk's position with the CVA desk.

50.12

Banks that use the BA-CVA or the SA-CVA for calculating CVA capital requirements may cap the maturity adjustment factor at 1 for all netting sets contributing to CVA capital requirements when they calculate CCR capital requirements under the Internal Ratings Based (IRB) approach.

Basic approach for credit valuation adjustment risk

50.13

The BA-CVA calculations may be performed either via the reduced version or the full version. A bank under the BA-CVA approach can choose whether to implement the full version or the reduced version at its discretion. However, all banks using the BA-CVA must calculate the reduced version of BA-CVA capital requirements as the reduced BA-CVA is also part of the full BA-CVA capital calculations as a conservative means to limit hedging recognition.

1. The full version recognises counterparty credit spread hedges and is intended for banks that hedge CVA risk.
2. The reduced version eliminates the element of hedging recognition from the full version. The reduced version is designed to simplify BA-CVA implementation for less sophisticated banks that do not hedge CVA.

Reduced version of the BA-CVA (hedges are not recognised)

50.14

The capital requirements for CVA risk under the reduced version of the BA-CVA ($K_{reduced}$) are calculated as follows (where the summations are taken over all counterparties that are within scope of the CVA charge), where:

1. $SCVA_c$ is the CVA capital requirement that counterparty c would receive if considered on a stand-alone basis (referred to as "stand-alone CVA capital" below). See MAR50.15 for its calculation;
2. ρ = 50%. It is the supervisory correlation parameter. Its square, ρ2=25%, represents the correlation between credit spreads of any two counterparties. In the formula below, the effect of ρ is to recognise the fact that the CVA risk to which a bank is exposed is less than the sum of the CVA risk for each counterparty, given that the credit spreads of counterparties are typically not perfectly correlated; and
3. The first term under the square root in the formula below aggregates the systematic components of CVA risk, and the second term under the square root aggregates the idiosyncratic components of CVA risk.

$$K_{reduced} = \sqrt{\left(\rho . \sum_C SCVA_C\right)^2 + \left(1-\rho^2\right) . \sum_C SCVA_C^2}$$

50.15

The stand-alone CVA capital requirements for counterparty c that are used in the formula in MAR50.14 ($SCVA_c$) are calculated as follows (where the summation is across all netting sets with the counterparty), where:

1. RW_c is the risk weight for counterparty c that reflects the volatility of its credit spread. These risk weights are based on a combination of sector and credit quality of the counterparty as prescribed in MAR50.16.
2. M_{NS} is the effective maturity for the netting set NS. For banks that have supervisory approval to use the IMM, M_{NS} is calculated as per CRE53.20 and CRE53.21, with the exception that the five year cap in CRE53.20 is not applied. For banks that do not have supervisory approval to use the IMM, M_{NS} is calculated according to CRE32.46 to CRE32.54, with the exception that the five-year cap in CRE32.46 is not applied.
3. EAD_{NS} is the exposure at default (EAD) of the netting set NS, calculated in the same way as the bank calculates it for minimum capital requirements for CCR.
4. DF_{NS} is a supervisory discount factor. It is 1 for banks using the IMM to calculate EAD, and is $\frac{1-e^{-0.05 \cdot M_{NS}}}{0.05 \cdot M_{NS}}$ for banks not using the IMM.
5. $$SCVA_C = \frac{1}{\alpha} \cdot RW_C \cdot \sum_{NS} M_{NS} \cdot EAD_{NS} \cdot DF_{NS}$$
   α = 1.4.

50.16

The supervisory risk weights (RW_C) are given in Table 1. Credit quality is specified as either investment grade (IG), high yield (HY), or not rated (NR). Where there are no external ratings or where external ratings are not recognised within a jurisdiction, banks may, subject to supervisory approval, map the internal rating to an external rating and assign a risk weight corresponding to either IG or HY. Otherwise, the risk weights corresponding to NR is to be applied.

Supervisory risk weights, RW_C — Table 1

Sector of counterparty	Credit quality of counterparty	
	IG	HY and NR
Sovereigns including central banks and multilateral development banks	0.5%	3.0%
Local government, government-backed non-financials, education and public administration	1.0%	4.0%
Financials including government-backed financials	5.0%	12.0%
Basic materials, energy, industrials, agriculture, manufacturing, mining and quarrying	3.0%	7.0%

Consumer goods and services, transportation and storage, administrative and support service activities	3.0%	8.5%
Technology, telecommunications	2.0%	5.5%
Health care, utilities, professional and technical activities	1.5%	5.0%
Other sector	5.0%	12.0%

Full version of the BA-CVA (hedges are recognised)

50.17

As set out in MAR50.13(1) the full version of the BA-CVA recognises the effect of counterparty credit spread hedges. Only transactions used for the purpose of mitigating the counterparty credit spread component of CVA risk, and managed as such, can be eligible hedges.

50.18

Only single-name credit default swaps (CDS), single-name contingent CDS and index CDS can be eligible CVA hedges.

50.19

Eligible single-name credit instruments must:

1. reference the counterparty directly; or
2. reference an entity legally related to the counterparty, where legally related refers to cases where the reference name and the counterparty are either a parent and its subsidiary or two subsidiaries of a common parent; or
3. reference an entity that belongs to the same sector and region as the counterparty.

50.20

Banks that intend to use the full version of BA-CVA must calculate the reduced version ($K_{reduced}$) as well. Under the full version, capital requirements for CVA risk K_{full} is calculated as follows, where β=0.25 and β is the supervisory parameter that is used to provide a floor that limits the extent to which hedging can reduce the capital requirements for CVA risk:

$$K_{full} = \beta \cdot K_{reduced} + \left(1 - \beta\right) \cdot K_{hedged}$$

50.21

The part of capital requirements that recognises eligible hedges (K_{hedged}) is calculated as follows (where the summations are taken over all counterparties c that are within scope of the CVA charge), where:

1. Both the stand-alone CVA capital ($SCVA_c$) and the correlation parameter (ρ) are defined in exactly the same way as for the reduced version calculation of the BA-CVA.
2. SNH_c is a quantity that gives recognition to the reduction in CVA risk of the counterparty c arising from the bank's use of single-name hedges of credit spread risk. See MAR50.23

for its calculation.

3. IH is a quantity that gives recognition to the reduction in CVA risk across all counterparties arising from the bank's use of index hedges. See MAR50.24 for its calculation.
4. HMA_C is a quantity characterising hedging misalignment, which is designed to limit the extent to which indirect hedges can reduce capital requirements given that they will not fully offset movements in a counterparty's credit spread. That is, with indirect hedges present, K_{hedged} cannot reach zero. See MAR50.25 for its calculation.

$$K_{hedged} = \sqrt{\left(\rho \cdot \sum_C \left(SCVA_C - SNH_C\right) - IH\right)^2 + \left(1-\rho^2\right) \cdot \sum_C \left(SCVA_C - SNH_C\right)^2 + \sum_C HMA_C}$$

50.22

The formula for K_{hedged} in MAR50.21 comprises three main terms as below:

1. The first term $(\rho \cdot \sum_c (SCVA_c - SNH_c) - IH)^2$ aggregates the systematic components of CVA risk arising from the bank's counterparties, the single-name hedges and the index hedges.
2. The second term $(1-\rho^2) \cdot \sum_c (SCVA_c - SNH_c)^2$ aggregates the idiosyncratic components of CVA risk arising from the bank's counterparties and the single-name hedges.
3. The third term $\sum_c HMA_c$ aggregates the components of indirect hedges that are not aligned with counterparties' credit spreads.

50.23

The quantity SNH_c is calculated as follows (where the summation is across all single name hedges h that the bank has taken out to hedge the CVA risk of counterparty c), where:

1. r_{hc} is the supervisory prescribed correlation between the credit spread of counterparty c and the credit spread of a single-name hedge h of counterparty c. The value of r_{hc} is set out in the Table 2 of MAR50.26. It is set at 100% if the hedge directly references the counterparty c, and set at lower values if it does not.
2. M_h^{SN} is the remaining maturity of single-name hedge h.
3. B_h^{SN} is the notional of single-name hedge h. For single-name contingent CDS, the notional is determined by the current market value of the reference portfolio or instrument.
4. DF_h^{SN} is the supervisory discount factor calculated as $\frac{1-e^{-0.05 \cdot M_h^{SN}}}{0.05 \cdot M_h^{SN}}$.
5. RW_h is the supervisory risk weight of single-name hedge h that reflects the volatility of the credit spread of the reference name of the hedging instrument. These risk weights are based on a combination of the sector and the credit quality of the reference name of the hedging instrument as prescribed in Table 1 of MAR50.16.

$$SNH_c = \sum_{h \in c} r_{hc} \cdot RW_h \cdot M_h^{SN} \cdot B_h^{SN} \cdot DF_h^{SN}$$

50.24

The quantity IH is calculated as follows (where the summation is across all index hedges i that the bank has taken out to hedge CVA risk), where:

1. M_i^{ind} is the remaining maturity of index hedge i.
2. B_i^{ind} is the notional of the index hedge i.
3. DF_i^{ind} is the supervisory discount factor calculated as $\frac{1-e^{-0.05 \cdot M_i^{ind}}}{0.05 \cdot M_i^{ind}}$
4. RW_i is the supervisory risk weight of the index hedge i. RW_i is taken from the Table 1 of MAR50.16 based on the sector and the credit quality of the index constituents and adjusted as follows:
    1. For an index where all index constituents belong to the same sector and are of the same credit quality, the relevant value in the Table 1 of MAR50.16 is multiplied by 0.7 to account for diversification of idiosyncratic risk within the index.
    2. For an index spanning multiple sectors or with a mixture of investment grade constituents and other grade constituents, the name-weighted average of the risk weights from the Table 1 of MAR50.16 should be calculated and then multiplied by 0.7.

$$IH = \sum_i RW_i \cdot M_i^{ind} \cdot B_i^{ind} \cdot DF_i^{ind}$$

50.25

The quantity HMA_c is calculated as follows (where the summation is across all single name hedges h that have been taken out to hedge the CVA risk of counterparty c), where r_{hc}, M_h^{SN}, B_h^{SN}, DF_h^{SN} and RW_h have the same definitions as set out in MAR50.23.

$$HMA_c = \sum_{h \in c} \left(1 - r_{hc}^2\right) \cdot \left(RW_h \cdot M_h^{SN} \cdot B_h^{SN} \cdot DF_h^{SN}\right)^2$$

50.26

The supervisory prescribed correlations r_{hc} between the credit spread of counterparty c and the credit spread of its single-name hedge h are set in Table 2 as follows:

Correlations between credit spread of counterparty and single-name hedge — Table 2

Single-name hedge h of counterparty c	Value of r_{hc}
references counterparty c directly	100%
has legal relation with counterparty c	80%
shares sector and region with counterparty c	50%

Standardised approach for credit valuation adjustment risk

50.27

The SA-CVA is an adaptation of the standardised approach for market risk set out in MAR20 to MAR23. The primary differences of the SA-CVA from the standardised approach for market risk are:

1. the SA-CVA features a reduced granularity of market risk factors;
2. the SA-CVA does not include default risk and curvature risk;
3. the SA-CVA uses a more conservative risk aggregation; and
4. the SA-CVA uses the conservativeness multiplier m_{CVA}.

50.28

Under the SA-CVA, capital requirements must be calculated and reported to supervisors at the same monthly frequency as for the market risk standardised approach. In addition, banks using the SA-CVA must have the ability to produce SA-CVA capital requirement calculations at the request of their supervisors and must accordingly provide the calculations.

50.29

The SA-CVA uses as inputs the sensitivities of regulatory CVA to counterparty credit spreads and market risk factors driving the values of covered transactions. Sensitivities must be computed by banks in accordance with the prudent valuation standards set out in CAP50.

50.30

For a bank to be considered eligible for the use of SA-CVA by its relevant supervisor as set out in MAR50.7, the bank must meet the following criteria at the minimum.

1. A bank must be able to model exposure and calculate, on at least a monthly basis, CVA and CVA sensitivities to the market risk factors specified in MAR50.54 to MAR50.77.
2. A bank must have a CVA desk (or a similar dedicated function) responsible for risk management and hedging of CVA.

Regulatory CVA calculations

50.31

A bank must calculate regulatory CVA for each counterparty with which it has at least one covered position for the purpose of the CVA risk capital requirements.

50.32

Regulatory CVA at a counterparty level must be calculated according to the following principles. A bank must demonstrate its compliance to the principles to its relevant supervisor.

1. Regulatory CVA must be calculated as the expectation of future losses resulting from default of the counterparty under the assumption that the bank itself is free from the default risk.
2. The calculation must be based on at least the following three sets of inputs:
    1. term structure of market-implied probability of default (PD);

2. market-consensus expected loss-given-default (ELGD);
3. simulated paths of discounted future exposure.

3. The term structure of market-implied PD must be estimated from credit spreads observed in the markets. For counterparties whose credit is not actively traded (ie illiquid counterparties), the market-implied PD must be estimated from proxy credit spreads estimated for these counterparties according to the following requirements:
    1. A bank must estimate the credit spread curves of illiquid counterparties from credit spreads observed in the markets of the counterparty's liquid peers via an algorithm that discriminates on at least the following three variables: a measure of credit quality (eg rating), industry, and region.
    2. In certain cases, mapping an illiquid counterparty to a single liquid reference name can be allowed. A typical example would be mapping a municipality to its home country (ie setting the municipality credit spread equal to the sovereign credit spread plus a premium). A bank must justify to its supervisor each case of mapping an illiquid counterparty to a single liquid reference name.
    3. When no credit spreads of any of the counterparty's peers is available due to the counterparty's specific type (eg project finance, funds), a bank is allowed to use a more fundamental analysis of credit risk to proxy the spread of an illiquid counterparty. However, where historical PDs are used as part of this assessment, the resulting spread cannot be based on historical PD only – it must relate to credit markets.
4. The market-consensus ELGD value must be the same as the one used to calculate the risk-neutral PD from credit spreads unless the bank can demonstrate that the seniority of the exposure resulting from covered positions differs from the seniority of senior unsecured bonds. Collateral provided by the counterparty does not change the seniority of the exposure.
5. The simulated paths of discounted future exposure are produced by pricing all derivative transactions with the counterparty along simulated paths of relevant market risk factors and discounting the prices to today using risk-free interest rates along the path.
6. All market risk factors material for the transactions with a counterparty must be simulated as stochastic processes for an appropriate number of paths defined on an appropriate set of future time points extending to the maturity of the longest transaction.
7. For transactions with a significant level of dependence between exposure and the counterparty's credit quality, this dependence should be taken into account.
8. For margined counterparties, collateral is permitted to be recognised as a risk mitigant under the following conditions:
    1. Collateral management requirements outlined in CRE53.39 and CRE53.40 are satisfied.
    2. All documentation used in collateralised transactions must be binding on all parties and legally enforceable in all relevant jurisdictions. Banks must have conducted sufficient legal review to verify this and have a well founded legal basis to reach this conclusion, and undertake such further review as necessary to ensure continuing enforceability.
9. For margined counterparties, the simulated paths of discounted future exposure must capture the effects of margining collateral that is recognised as a risk mitigant along each exposure path. All the relevant contractual features such as the nature of the margin agreement (unilateral vs bilateral), the frequency of margin calls, the type of collateral, thresholds, independent amounts, initial margins and minimum transfer amounts must be appropriately captured by the exposure model. To determine collateral

available to a bank at a given exposure measurement time point, the exposure model must assume that the counterparty will not post or return any collateral within a certain time period immediately prior to that time point. The assumed value of this time period, known as the margin period of risk (MPoR), cannot be less than a supervisory floor. For derivative transactions, the supervisory floor for the MPoR is equal to 9 + N business days, where N is the re-margining period specified in the margin agreement (in particular, for margin agreements with daily or intra-daily exchange of margin, the minimum MPoR is 10 business days). For SFTs, the supervisory floor for the MPoR is equal to 4+N business days.

50.33

The simulated paths of discounted future exposure are obtained via the exposure models used by a bank for calculating front office/accounting CVA, adjusted (if needed) to meet the requirements imposed for regulatory CVA calculation. Model calibration process (with the exception of the MPoR), market and transaction data used for regulatory CVA calculation must be the same as the ones used for accounting CVA calculation.

50.34

The generation of market risk factor paths underlying the exposure models must satisfy and a bank must demonstrate to its relevant supervisors its compliance to the following requirements:

1. Drifts of risk factors must be consistent with a risk-neutral probability measure. Historical calibration of drifts is not allowed.
2. The volatilities and correlations of market risk factors must be calibrated to market data whenever sufficient data exist in a given market. Otherwise, historical calibration is permissible.
3. The distribution of modelled risk factors must account for the possible non-normality of the distribution of exposures, including the existence of leptokurtosis (“fat tails”), where appropriate.

50.35

Netting recognition is the same as in the accounting CVA calculations used by the bank. In particular, netting uncertainty can be modelled.

50.36

A bank must satisfy and demonstrate to its relevant supervisors its compliance to the following requirements:

1. Exposure models used for calculating regulatory CVA must be part of a CVA risk management framework that includes the identification, measurement, management, approval and internal reporting of CVA risk. A bank must have a credible track record in using these exposure models for calculating CVA and CVA sensitivities to market risk factors.
2. Senior management should be actively involved in the risk control process and must regard CVA risk control as an essential aspect of the business to which significant resources need to be devoted.
3. A bank must have a process in place for ensuring compliance with a documented set of internal policies, controls and procedures concerning the operation of the exposure system used for accounting CVA calculations.

4. A bank must have an independent control unit that is responsible for the effective initial and ongoing validation of the exposure models. This unit must be independent from business credit and trading units (including the CVA desk), must be adequately staffed and must report directly to senior management of the bank.
5. A bank must document the process for initial and ongoing validation of its exposure models to a level of detail that would enable a third party to understand how the models operate, their limitations, and their key assumptions; and recreate the analysis. This documentation must set out the minimum frequency with which ongoing validation will be conducted as well as other circumstances (such as a sudden change in market behaviour) under which additional validation should be conducted. In addition, the documentation must describe how the validation is conducted with respect to data flows and portfolios, what analyses are used and how representative counterparty portfolios are constructed.
6. The pricing models used to calculate exposure for a given path of market risk factors must be tested against appropriate independent benchmarks for a wide range of market states as part of the initial and ongoing model validation process. Pricing models for options must account for the non-linearity of option value with respect to market risk factors.
7. An independent review of the overall CVA risk management process should be carried out regularly in the bank's own internal auditing process. This review should include both the activities of the CVA desk and of the independent risk control unit.
8. A bank must define criteria on which to assess the exposure models and their inputs and have a written policy in place to describe the process to assess the performance of exposure models and remedy unacceptable performance.
9. Exposure models must capture transaction-specific information in order to aggregate exposures at the level of the netting set. A bank must verify that transactions are assigned to the appropriate netting set within the model.
10. Exposure models must reflect transaction terms and specifications in a timely, complete, and conservative fashion. The terms and specifications must reside in a secure database that is subject to formal and periodic audit. The transmission of transaction terms and specifications data to the exposure 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 the exposure system correctly or at least conservatively.
11. The current and historical market data must be acquired independently of the lines of business and be compliant with accounting. They must be fed into the exposure models in a timely and complete fashion, and maintained in a secure database subject to formal and periodic audit. A bank must also have a well-developed data integrity process to handle the data of erroneous and/or anomalous observations. In the case where an exposure model relies on proxy market data, a bank must set internal policies to identify suitable proxies and the bank must demonstrate empirically on an ongoing basis that the proxy provides a conservative representation of the underlying risk under adverse market conditions.

Eligible hedges

50.37

Only whole transactions that are used for the purpose of mitigating CVA risk, and managed as such, can be eligible hedges. Transactions cannot be split into several effective transactions.

50.38

Eligible hedges can include:

1. instruments that hedge variability of the counterparty credit spread; and
2. instruments that hedge variability of the exposure component of CVA risk.

50.39

Instruments that are not eligible for the internal models approach for market risk under MAR30 to MAR33 (eg tranched credit derivatives) cannot be eligible CVA hedges.

Multiplier

50.40

To compensate for a higher level of model risk in calculation of CVA sensitivities in comparison to sensitivities of market value of trading book instruments, aggregated capital requirements are to be scaled up by the multiplier $m_{CVA.}$

50.41

The multiplier m_{CVA} is set at 1.25. A bank's relevant supervisor may increase the multiplier if it determines that the bank's CVA model risk warrants it (eg the dependence between the bank's exposure to a counterparty and the counterparty's credit quality is not appropriately taken into account in its CVA calculations).

Calculations

50.42

The SA-CVA capital requirements are calculated as the sum of the capital requirements for delta and vega risks calculated for the entire CVA portfolio (including eligible hedges).

50.43

The capital requirements for delta risk are calculated as the simple sum of delta capital requirements calculated independently for the following six risk classes:

1. interest rate risk;
2. foreign exchange (FX) risk;
3. counterparty credit spread risk;
4. reference credit spread risk (ie credit spreads that drive the CVA exposure component);
5. equity risk; and
6. commodity risk.

50.44

If an instrument is deemed as an eligible hedge for credit spread delta risk, it must be assigned in its entirety (see MAR50.37) either to the counterparty credit spread or to the reference credit spread risk class. Instruments must not be split between the two risk classes.

50.45

The capital requirements for vega risk are calculated as the simple sum of vega capital requirements calculated independently for the following five risk classes. There is no vega capital requirements for counterparty credit spread risk.

1. interest rate risk;
2. FX risk;
3. reference credit spread risk;
4. equity risk; and
5. commodity risk.

50.46

Delta and vega capital requirements are calculated in the same manner using the same procedures set out in MAR50.47 to MAR50.53.

50.47

For each risk class, (i) the sensitivity of the aggregate CVA, S_k^{CVA}, and (ii) the sensitivity of the market value of all eligible hedging instruments in the CVA portfolio, S_k^{Hdg}, to each risk factor k in the risk class are calculated. The sensitivities are defined as the ratio of the change of the value in question (ie (i) aggregate CVA or (ii) market value of all CVA hedges) caused by a small change of the risk factor's current value to the size of the change. Specific definitions for each risk class are set out in MAR50.54 to MAR50.77. These definitions include specific values of changes or shifts in risk factors. However, a bank may use smaller values of risk factor shifts if doing so is consistent with internal risk management calculations.

50.48

CVA sensitivities for vega risk are always material and must be calculated regardless of whether or not the portfolio includes options. When CVA sensitivities for vega risk are calculated, the volatility shift must apply to both types of volatilities that appear in exposure models:

1. volatilities used for generating risk factor paths; and
2. volatilities used for pricing options.

50.49

If a hedging instrument is an index, its sensitivities to all risk factors upon which the value of the index depends must be calculated. The index sensitivity to risk factor k must be calculated by applying the shift of risk factor k to all index constituents that depend on this risk factor and recalculating the changed value of the index. For example, to calculate delta sensitivity of S&P500 to large financial companies, a bank must apply the relevant shift to equity prices of all large financial companies that are constituents of S&P500 and re-compute the index.

50.50

The weighted sensitivities WS_k^{CVA} and WS_k^{Hdg} for each risk factor k are calculated by multiplying the net sensitivities S_k^{CVA} and S_k^{Hdg}, respectively, by the corresponding risk weight

RW_k (the risk weights applicable to each risk class are specified in MAR50.54 to MAR50.77).

$$WS_k^{CVA} = RW_k s_k^{CVA}$$

$$WS_k^{Hdg} = RW_k s_k^{Hdg}$$

50.51

The net weighted sensitivity of the CVA portfolio s_k to risk factor k is obtained by:

$$WS_k = WS_k^{CVA} + WS_k^{Hdg}$$

50.52

The weighted sensitivities must be aggregated into a capital requirement K_b within each bucket b (the buckets and correlation parameters ρ_{kl} applicable to each risk class are specified in MAR50.54 to MAR50.77), where R is the hedging disallowance parameter, set at 0.01, that prevents the possibility of recognising perfect hedging of CVA risk.

$$K_b = \sqrt{\left(\sum_{k\in b} WS_k^2 + \sum_{k\in b}\sum_{l\in b, l\neq k} \rho_{kl} WS_k WS_l\right) + R \cdot \sum_{k\in b}\left(\left(WS_k^{Hdg}\right)^2\right)}$$

50.53

Bucket-level capital requirements must then be aggregated across buckets within each risk class (the correlation parameters γ_{bc} applicable to each risk class are specified in MAR50.54 to MAR50.77). Note that this equation differs from the corresponding aggregation equation for market risk capital requirements in MAR21.4 by replacing S_b with K_b and including the multiplier, m_{CVA}.

$$K = m_{CVA}\sqrt{\sum_b K_b^2 + \sum_b \sum_{c\neq b} \gamma_{bc} K_b K_c}$$

Interest rate buckets, risk factors, sensitivities, risk weights and correlations

50.54

For interest rate delta and vega risks, buckets must be set per individual currencies.

50.55

For interest rate delta and vega risks, cross-bucket correlation γ_{bc} is set at 0.5 for all currency pairs.

50.56

The interest rate delta risk factors for a bank's reporting currency and for the following currencies USD, EUR, GBP, AUD, CAD, SEK or JPY:

1. The interest rate delta risk factors are the absolute changes of the inflation rate and of

the risk-free yields for the following five tenors: 1 year, 2 years, 5 years, 10 years and 30 years.

2. The sensitivities to the abovementioned risk-free yields are measured by changing the risk-free yield for a given tenor for all curves in a given currency by 1 basis point (0.0001 in absolute terms) and dividing the resulting change in the aggregate CVA (or the value of CVA hedges) by 0.0001. The sensitivity to the inflation rate is obtained by changing the inflation rate by 1 basis point (0.0001 in absolute terms) and dividing the resulting change in the aggregate CVA (or the value of CVA hedges) by 0.0001.
3. The risk weights RW_k are set as follows:

Risk weight for interest rate risk (specified currencies) — Table 3

Risk factor	1 year	2 years	5 years	10 years	30 years	Inflation
Risk weight	1.59%	1.33%	1.06%	1.06%	1.06%	1.59%

4. The correlations between pairs of risk factors ρ_{kl} are set as follows:

Correlations for interest rate risk factors (specified currencies) — Table 4

	1 year	2 years	5 years	10 years	30 years	Inflation
1 year	100%	91%	72%	55%	31%	40%
2 years		100%	87%	72%	45%	40%
5 years			100%	91%	68%	40%
10 years				100%	83%	40%
30 years					100%	40%
Inflation						100%

50.57

The interest rate delta risk factors for other currencies not specified in MAR50.56:

1. The interest rate risk factors are the absolute change of the inflation rate and the parallel shift of the entire risk-free yield curve for a given currency.
2. The sensitivity to the yield curve is measured by applying a parallel shift to all risk-free yield curves in a given currency by 1 basis point (0.0001 in absolute terms) and dividing the resulting change in the aggregate CVA (or the value of CVA hedges) by 0.0001. The sensitivity to the inflation rate is obtained by changing the inflation rate by 1 basis point (0.0001 in absolute terms) and dividing the resulting change in the aggregate CVA (or the value of CVA hedges) by 0.0001.

3. The risk weights for both the risk-free yield curve and the inflation rate RW_k are set at 2.25%.
4. The correlations between the risk-free yield curve and the inflation rate ρ_{kl} are set at 40%.

50.58

The interest rate vega risk factors for all currencies:

1. The interest rate vega risk factors are a simultaneous relative change of all volatilities for the inflation rate and a simultaneous relative change of all interest rate volatilities for a given currency.
2. The sensitivity to (i) the interest rate volatilities or (ii) inflation rate volatilities is measured by respectively applying a simultaneous shift to (i) all interest rate volatilities or (ii) inflation rate volatilities by 1% relative to their current values and dividing the resulting change in the aggregate CVA (or the value of CVA hedges) by 0.01.
3. The risk weights for both the interest rate volatilities and the inflation rate volatilities RW_k are set to $RW_k = RW_\sigma \cdot \sqrt{6}$, where RW_σ is set at 55%.
4. Correlations between the interest rate volatilities and the inflation rate volatilities ρ_{kl} are set at 40%.

Foreign exchange buckets, risk factors, sensitivities, risk weights and correlations

50.59

For FX delta and vega risks, buckets must be set per individual currencies except for a bank's own reporting currency.

50.60

For FX delta and vega risks, the cross-bucket correlation γ_{bc} is set at 0.6 for all currency pairs.

50.61

The FX delta risk factors for all currencies:

1. The single FX delta risk factor is defined as the relative change of the FX spot rate between a given currency and a bank's reporting currency, where the FX spot rate is the current market price of one unit of another currency expressed in the units of the bank's reporting currency.
2. Sensitivities to FX spot rates are measured by shifting the exchange rate between the bank's reporting currency and another currency (ie the value of one unit of another currency expressed in units of the reporting currency) by 1% relative to its current value and dividing the resulting change in the aggregate CVA (or the value of CVA hedges) by 0.01. For transactions that reference an exchange rate between a pair of non-reporting currencies, the sensitivities to the FX spot rates between the bank's reporting currency and each of the referenced non-reporting currencies must be measured.
3. The risk weights for all exchange rates between the bank's reporting currency and another currency are set at 21%.

50.62

The FX vega risk factors for all currencies:

1. The single FX vega risk factor is a simultaneous relative change of all volatilities for an exchange rate between a bank's reporting currency and another given currency.
2. The sensitivities to the FX volatilities are measured by simultaneously shifting all volatilities for a given exchange rate between the bank's reporting currency and another currency by 1% relative to their current values and dividing the resulting change in the aggregate CVA (or the value of CVA hedges) by 0.01. For transactions that reference an exchange rate between a pair of non-reporting currencies, the volatilities of the FX spot rates between the bank's reporting currency and each of the referenced non-reporting currencies must be measured.
3. The risk weights for FX volatilities RW_k are set to $RW_k = RW_\sigma \cdot \sqrt{4}$, where RW_σ is set at 55%.

Counterparty credit spread buckets, risk factors, sensitivities, risk weights and correlations

50.63

Counterparty credit spread risk is not subject to vega risk capital requirements. Buckets for delta risk are set as follows:

Buckets for counterparty credit spread delta risk — Table 5

Bucket number	Sector
1	a) Sovereigns including central banks, multilateral development banks
	b) Local government, government-backed non-financials, education and public administration
2	Financials including government-backed financials
3	Basic materials, energy, industrials, agriculture, manufacturing, mining and quarrying
4	Consumer goods and services, transportation and storage, administrative and support service activities
5	Technology, telecommunications
6	Health care, utilities, professional and technical activities
7	Other sector

50.64

For counterparty credit spread delta risk, the cross-bucket correlations γ_{bc} are set as follows:

Cross-bucket correlations for counterparty credit spread delta risk							Table 6
Bucket	1	2	3	4	5	6	7
1	100%	10%	20%	25%	20%	15%	0%
2		100%	5%	15%	20%	5%	0%
3			100%	20%	25%	5%	0%
4				100%	25%	5%	0%
5					100%	5%	0%
6						100%	0%
7							100%

50.65

The counterparty credit spread delta risk factors for a given bucket:

1. The counterparty credit spread delta risk factors are absolute shifts of credit spreads of individual entities (counterparties and reference names for counterparty credit spread hedges) for the following tenors: 0.5 years, 1 year, 3 years, 5 years and 10 years.
2. For each entity and each tenor point, the sensitivities are measured by shifting the relevant credit spread by 1 basis point (0.0001 in absolute terms) and dividing the resulting change in the aggregate CVA (or the value of CVA hedges) by 0.0001.
3. The risk weights RW_k are set as follows depending on the entity's bucket, where IG, HY and NR represent "investment grade", "high yield" and "not rated" as specified for the BA-CVA in MAR50.16. The same risk weight for a given bucket and given credit quality applies to all tenors.

Risk weights for counterparty credit spread delta risk								Table 7
Bucket	1 a)	1 b)	2	3	4	5	6	7
IG names	0.5%	1.0%	5.0%	3.0%	3.0%	2.0%	1.5%	5.0%
HY and NR names	3.0%	4.0%	12.0%	7.0%	8.5%	5.5%	5.0%	12.0%

4. The correlations ρ_{kl} between different tenors for the same entity are set at 90%.
5. For unrelated entities of the same credit quality (ie IG and IG or HY/NR and HY/NR):

   (a) The correlations ρ_{kl} between the same tenors are set at 50%.

   (b) The correlations ρ_{kl} between different tenors are set at 45%.

6. For unrelated entities of different credit quality (ie IG and HY/NR):

   (a) The correlations ρ_{kl} between the same tenors are set at 40%.

   (b) Correlations ρ_{kl} between different tenors are set at 36%.

7. For entities that are legally related:

   (a) The correlations ρ_{kl} between the same tenors are set at 90%.

   (b) The correlations ρ_{kl} between different tenors are set at 81%.

Reference credit spread buckets, risk factors, sensitivities, risk weights and correlations

50.66

Reference credit spread risk is subject to both delta and vega risk capital requirements. Buckets for delta and vega risks are set as follows, where IG, HY and NR represent “investment grade”, “high yield” and “not rated” as specified for the BA-CVA in MAR50.16:

Buckets for reference credit spread risk — Table 8

Bucket number	Credit quality	Sector
1	IG	Sovereigns including central banks, multilateral development banks
2		Local government, government-backed non-financials, education and public administration
3		Financials including government-backed financials
4		Basic materials, energy, industrials, agriculture, manufacturing, mining and quarrying
5		Consumer goods and services, transportation and storage, administrative and support service activities
6		Technology, telecommunications
7		Health care, utilities, professional and technical activities

8	HY and NR	Sovereigns including central banks, multilateral development banks
9		Local government, government-backed non-financials, education and public administration
10		Financials including government-backed financials
11		Basic materials, energy, industrials, agriculture, manufacturing, mining and quarrying
12		Consumer goods and services, transportation and storage, administrative and support service activities
13		Technology, telecommunications
14		Health care, utilities, professional and technical activities
15	(Not applicable)	Other sector

50.67

For reference credit spread delta and vega risks, the cross-bucket correlations γ_{bc} are set as follows:

1. The cross-bucket correlations γ_{bc} between buckets of the same credit quality (ie either IG or HY/NR) are set as follows:

Cross-bucket correlations for reference credit spread risk — Table 9

Bucket	1/8	2/9	3/10	4/11	5/12	6/13	7/14	15
1/8	100%	75%	10%	20%	25%	20%	15%	0%
2/9		100%	5%	15%	20%	15%	10%	0%
3/10			100%	5%	15%	20%	5%	0%
4/11				100%	20%	25%	5%	0%
5/12					100%	25%	5%	0%
6/13						100%	5%	0%
7/14							100%	0%
15								100%

2. For cross-bucket correlations γ_{bc} between buckets of different credit quality (ie IG and

HY/NR), the correlations γ_{bc} specified in MAR50.67(1) are divided by 2.

50.68

Reference credit spread delta risk factors for a given bucket:

1. The single reference credit spread delta risk factor is a simultaneous absolute shift of the credit spreads of all tenors for all reference names in the bucket.
2. The sensitivity to reference credit spread delta risk is measured by simultaneously shifting the credit spreads of all tenors for all reference names in the bucket by 1 basis point (0.0001 in absolute terms) and dividing the resulting change in the aggregate CVA (or the value of CVA hedges) by 0.0001.
3. The risk weights RW_k are set as follows depending on the reference name's bucket:

Risk weights for reference credit spread delta risk — Table 10

IG bucket	1	2	3	4	5	6	7
Risk weight	0.5%	1.0%	5.0%	3.0%	3.0%	2.0%	1.5%

HY/NR bucket	8	9	10	11	12	13	14	15
Risk weight	3.0%	4.0%	12.0%	7.0%	8.5%	5.5%	5.0%	12.0%

50.69

Reference credit spread vega risk factors for a given bucket:

1. The single reference credit spread vega risk factor is a simultaneous relative shift of the volatilities of credit spreads of all tenors for all reference names in the bucket.
2. The sensitivity to the reference credit spread vega risk factor is measured by simultaneously shifting the volatilities of credit spreads of all tenors for all reference names in the bucket by 1% relative to their current values and dividing the resulting change in the aggregate CVA (or the value of CVA hedges) by 0.01.
3. Risk weights for reference credit spread volatilities RW_k are set to $RW_k = RW_\sigma \cdot \sqrt{12}$ where RW_σ is set at 55%.

Equity buckets, risk factors, sensitivities, risk weights and correlations

50.70

For equity delta and vega risks, buckets are set as follows, where:

1. Market capitalisation (“market cap”) is defined as the sum of the market capitalisations of the same legal entity or group of legal entities across all stock markets globally. The reference to “group of legal entities” covers cases where the listed entity is a parent company of a group of legal entities. Under no circumstances should the sum of the

market capitalisations of multiple related listed entities be used to determine whether a listed entity is “large market cap” or “small market cap”.

2. “Large market cap” is defined as a market capitalisation equal to or greater than USD 2 billion and “small market cap” is defined as a market capitalisation of less than USD 2 billion.
3. The advanced economies are Canada, the United States, Mexico, the euro area, the non-euro area western European countries (the United Kingdom, Norway, Sweden, Denmark and Switzerland), Japan, Oceania (Australia and New Zealand), Singapore and Hong Kong SAR.
4. To assign a risk exposure to a sector, banks must rely on a classification that is commonly used in the market for grouping issuers by industry sector. The bank must assign each issuer to one of the sector buckets in the table above and it must assign all issuers from the same industry to the same sector. Risk positions from any issuer that a bank cannot assign to a sector in this fashion must be assigned to the “other sector” (ie bucket 11). For multinational multi-sector equity issuers, the allocation to a particular bucket must be done according to the most material region and sector in which the issuer operates.

Buckets for equity risk — Table 11

Bucket number	Size	Region	Sector
1	Large	Emerging market economies	Consumer goods and services, transportation and storage, administrative and support service activities, healthcare, utilities
2			Telecommunications, industrials
3			Basic materials, energy, agriculture, manufacturing, mining and quarrying
4			Financials including government-backed financials, real estate activities, technology
5		Advanced economies	Consumer goods and services, transportation and storage, administrative and support service activities, healthcare, utilities
6			Telecommunications, industrials
7			Basic materials, energy, agriculture, manufacturing, mining and quarrying
8			Financials including government-backed financials, real estate activities, technology

1	Large	Emerging market economies	Consumer goods and services, transportation and storage, administrative and support service activities, healthcare, utilities
2			Telecommunications, industrials
3			Basic materials, energy, agriculture, manufacturing, mining and quarrying
4			Financials including government-backed financials, real estate activities, technology
5		Advanced economies	Consumer goods and services, transportation and storage, administrative and support service activities, healthcare, utilities
6			Telecommunications, industrials
7			Basic materials, energy, agriculture, manufacturing, mining and quarrying
8			Financials including government-backed financials, real estate activities, technology
9	Small	Emerging market economies	All sectors described under bucket numbers 1, 2, 3, and 4
10		Advanced economies	All sectors described under bucket numbers 5, 6, 7, and 8
11	(Not applicable)		Other sector

50.71

For equity delta and vega risks, cross-bucket correlation γ_{bc} is set at 15% for all cross-bucket pairs that fall within bucket numbers 1 to 10. γ_{bc} is set at 0% for all cross-bucket pairs that include bucket 11.

50.72

Equity delta risk factors for a given bucket:

1. The single equity delta risk factor is a simultaneous relative shift of equity spot prices for

all reference names in the bucket.

2. The sensitivity to the equity delta risk factor is measured by simultaneously shifting the equity spot prices for all reference names in the bucket by 1% relative to their current values and dividing the resulting change in the aggregate CVA (or the value of CVA hedges) by 0.01.
3. Risk weights RW_k are set as follows depending on the reference name's bucket:

Risk weights for equity delta risk — Table 12

Bucket number	Risk weight
1	55%
2	60%
3	45%
4	55%
5	30%
6	35%
7	40%
8	50%
9	70%
10	50%
11	70%

50.73

Equity vega risk factors for a given bucket:

1. The single equity vega risk factor is a simultaneous relative shift of the volatilities for all reference names in the bucket.
2. The sensitivity to the equity vega risk factor is measured by simultaneously shifting the volatilities for all reference names in the bucket by 1% relative to their current values and dividing the resulting change in the aggregate CVA (or the value of CVA hedges) by 0.01.
3. The risk weights for equity volatilities RW_k are set to $RW_k = RW_\sigma \cdot \sqrt{2}$ for large market capitalisation buckets and to $RW_k = RW_\sigma \cdot \sqrt{6}$ for small market capitalisation buckets, where RW_σ is set at 55%.

50.74

For commodity delta and vega risks, buckets are set as follows:

Buckets for commodity risk — Table 13

Bucket number	Commodity group	Examples
1	Energy – Solid combustibles	coal, charcoal, wood pellets, nuclear fuel (such as uranium)
2	Energy – Liquid combustibles	crude oil (such as Light-sweet, heavy, West Texas Intermediate and Brent); biofuels (such as bioethanol and biodiesel); petrochemicals (such as propane, ethane, gasoline, methanol and butane); refined fuels (such as jet fuel, kerosene, gasoil, fuel oil, naphtha, heating oil and diesel)
3	Energy – Electricity and carbon trading	electricity (such as spot, day-ahead, peak and off-peak); carbon emissions trading (such as certified emissions reductions, in-delivery month EU allowance, Regional Greenhouse Gas Initiative CO2 allowance and renewable energy certificates)
4	Freight	dry-bulk route (such as Capesize, Panamax, Handysize and Supramax); liquid-bulk/gas shipping route (such as Suezmax, Aframax and very large crude carriers)
5	Metals – non-precious	base metal (such as aluminium, copper, lead, nickel, tin and zinc); steel raw materials (such as steel billet, steel wire, steel coil, steel scrap and steel rebar, iron ore, tungsten, vanadium, titanium and tantalum); minor metals (such as cobalt, manganese, molybdenum)
6	Gaseous combustibles	natural gas; liquefied natural gas
7	Precious metals (including gold)	gold; silver; platinum; palladium
8	Grains & oilseed	corn; wheat; soybean (such as soybean seed, soybean oil and soybean meal); oats; palm oil; canola; barley; rapeseed (such as rapeseed seed, rapeseed oil, and rapeseed meal); red bean, sorghum; coconut oil; olive oil; peanut oil; sunflower oil; rice

9	Livestock & dairy	cattle (such live and feeder); hog; poultry; lamb; fish; shrimp; dairy (such as milk, whey, eggs, butter and cheese)
10	Softs and other agriculturals	cocoa; coffee (such as arabica and robusta); tea; citrus and orange juice; potatoes; sugar; cotton; wool; lumber and pulp; rubber
11	Other commodity	industrial minerals (such as potash, fertiliser and phosphate rocks), rare earths; terephthalic acid; flat glass

50.75

For commodity delta and vega risks, cross-bucket correlation γ_{bc} is set at 20% for all cross-bucket pairs that fall within bucket numbers 1 to 10. γ_{bc} is set at 0% for all cross-bucket pairs that include bucket 11.

50.76

Commodity delta risk factors for a given bucket:

1. The single commodity delta risk factor is a simultaneous relative shift of the commodity spot prices for all commodities in the bucket.
2. The sensitivities to commodity delta risk factors are measured by simultaneously shifting the spot prices of all commodities in the bucket by 1% relative to their current values and dividing the resulting change in the aggregate CVA (or the value of CVA hedges) by 0.01.
3. The risk weights RW_k are set as follows depending on the reference name's bucket:

Risk weights for commodity delta risk — Table 14

Bucket number	1	2	3	4	5	6	7	8	9	10	11
RW	30%	35%	60%	80%	40%	45%	20%	35%	25%	35%	50%

50.77

Commodity vega risk factors for a given bucket:

1. The single commodity vega risk factor is a simultaneous relative shift of the volatilities for all commodities in the bucket.
2. The sensitivity to the commodity vega risk factor is measured by simultaneously shifting the volatilities for all commodities in the bucket by 1% relative to their current values and dividing the resulting change in the aggregate CVA (or the value of CVA hedges) by 0.01.
3. The risk weights for commodity volatilities RW_k are set to $RW_k = RW_\sigma \cdot \sqrt{12}$, where RW_σ is set at 55%.