

Basel Committee on Banking Supervision

MAR

Calculation of RWA for
market risk

MAR50

Credit valuation adjustment
framework

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framework.



BANK FOR INTERNATIONAL SETTLEMENTS

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Credit valuation adjustment risk capital requirement

50.1 The risk-weighted assets (RWA) for credit valuation adjustment (CVA) risk are determined by multiplying the capital requirements calculated as set out in this chapter by 12.5.

50.2 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, a bank must add a capital requirement to cover the risk of mark-to-market losses on the expected counterparty risk (such losses being known as CVA) to over-the-counter (OTC) derivatives. The CVA capital requirement will be calculated in the manner set forth below depending on the bank's approved method of calculating capital requirements for counterparty credit risk and specific interest rate risk. A bank is not required to include in this capital requirement:

- (1) transactions with a qualifying central counterparty; and
- (2) securities financing transactions (SFTs), unless their supervisor determines that the bank's CVA loss exposures arising from SFT transactions are material.

Advanced CVA risk capital requirement

50.3 Banks with internal models method (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 requirement 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 [MAR50.12](#) to [MAR50.14](#), using the bank's VaR model for bonds. This value-at-risk (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 bank uses for determining CVA, the CVA capital requirement calculation must be based on the following formula for the CVA of each counterparty, where:

- (1) t_i is the time of the i -th revaluation time bucket, starting from $t_0=0$.
- (2) t_T is the longest contractual maturity across the netting sets with the counterparty.

- (3) s_i is the credit spread of the counterparty at tenor t_i , used to calculate the CVA of the counterparty. Whenever the credit default swap (CDS) spread of the counterparty is available, this must be used. Whenever such a CDS spread is not available, the bank must use a proxy spread that is appropriate based on the rating, industry and region of the counterparty.
- (4) 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 requirement, is different from the loss-given-default (LGD) that is determined for the IRB and counterparty credit risk (CCR) default risk charge, as this LGD_{MKT} is a market assessment rather than an internal estimate.
- (5) 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.
- (6) EE_i is the expected exposure to the counterparty at revaluation time t_i , as defined in [CRE53.12](#) (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.
- (7) D_i is the default risk-free discount factor at time t_i , where $D_0 = 1$.

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

50.4 The formula in [MAR50.3](#) must be the basis for all inputs into the bank's approved VaR model for bonds when calculating the CVA risk capital requirement for a counterparty. For example, if this approved VaR model is based on full repricing, then the formula must be used directly. If the bank's approved VaR model is based on credit spread sensitivities for specific tenors, the bank must base each credit spread sensitivity on the following formula:

$$\text{Regulatory CS01}_i = 0.0001 \cdot t_i \cdot \exp\left(-\frac{s_i \cdot t_i}{LGD_{MKT}}\right) \cdot \left(\frac{EE_{i-1} \cdot D_{i-1} - EE_{i+1} \cdot D_{i+1}}{2}\right)$$

50.5 This derivation of the formula in [MAR50.3](#) 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 as follows:

$$\text{Regulatory CS01}_T = 0.0001 \cdot t_T \cdot \exp\left(-\frac{s_T \cdot t_T}{LGD_{MKT}}\right) \cdot \left(\frac{EE_{T-1} \cdot D_{T-1} + EE_T \cdot D_T}{2}\right)$$

50.6 If the bank's approved VaR model uses credit spread sensitivities to parallel shifts in credit spreads (Regulatory CS01), then the bank must use the following formula (the derivation of which assumes positive marginal default probabilities):

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

50.7 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 [MAR50.3](#).

50.8 Banks with IMM approval for the majority of their businesses, but which use the standardised approach for counterparty credit risk (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 requirement, according to [MAR50.3](#), unless the national supervisor decides that [MAR50.15](#) should apply for these portfolios. Non-IMM netting sets are included into the advanced CVA risk capital requirement by assuming a constant expected exposure (EE) profile, where EE is set equal to the exposure-at-default (EAD) as computed under the 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 EE profile.

50.9 For exposures to certain counterparties, the bank's approved market risk VaR model may not reflect the risk of credit spread changes appropriately, because the bank's market risk VaR model does not appropriately reflect the specific risk of debt instruments issued by the counterparty. For such exposures, the bank is not allowed to use the advanced CVA risk charge. Instead, for these exposures the bank must determine the CVA risk charge by application of the standardised method in [MAR50.15](#) and [MAR50.16](#). Only exposures to counterparties for which the bank has supervisory approval for modelling the specific risk of debt instruments are to be included into the advanced CVA risk charge.

50.10 The CVA risk capital requirement consists of both general and specific credit spread risks, including stressed VaR but excluding the incremental risk capital requirement. The VaR figure should be determined in accordance with the quantitative standards described in [MAR30.12](#) to [MAR30.15](#). It is thus determined as the sum of the non-stressed VaR component and the stressed VaR component. For the calculation of each component:

- (1) When calculating the non-stressed VaR, current parameter calibrations for expected exposure must be used.
- (2) When calculating the stressed VaR future counterparty EE profiles (according to the stressed exposure parameter calibrations as defined in [CRE53.51](#)) 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.^{[1](#)}

Footnotes

^{[1](#)} *Note that the three-times multiplier inherent in the calculation of a bond VaR and a stressed VaR will apply to these calculations.*

50.11 This additional CVA risk capital requirement is the standalone market risk charge, calculated on the set of CVAs (as specified in [MAR50.3](#)) for all OTC derivatives counterparties, collateralised and uncollateralised, together with eligible CVA hedges. Within this standalone CVA risk capital requirement, no offset against other instruments on the bank's balance sheet will be permitted (except as otherwise expressly provided herein).

50.12 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 requirement or in the standardised CVA risk capital requirement set forth in [MAR50.15](#) and [MAR50.16](#). For example, if a CDS referencing an issuer is in the bank'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 requirement.

50.13 The only eligible hedges that can be included in the calculation of the CVA risk capital requirement under [MAR50.3](#) or [MAR50.15](#) and [MAR50.16](#) 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:

- (1) 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 bank must use reasonable basis time series out of a representative bucket of similar names for which a spread is available.
- (2) If the basis is not reflected to the satisfaction of the supervisor, then the bank must reflect only 50% of the notional amount of index hedges in the VaR.

50.14 Other types of counterparty risk hedges (ie those not listed in [MAR50.13](#)) must not be reflected within the calculation of the CVA capital requirement, and these other hedges must be treated as any other instrument in the bank's inventory for regulatory capital purposes. Tranched or nth-to-default CDSs are not eligible CVA hedges. Eligible hedges that are included in the CVA capital requirement must be removed from the bank's market risk capital requirement calculation.

Standardised CVA risk capital requirement

50.15 When a bank does not have the required approvals to use [MAR50.3](#) to calculate a CVA capital requirement for its counterparties, the bank must calculate a portfolio capital requirement using the following formula, where:

- (1) h is the one-year risk horizon (in units of a year), $h = 1$.

- (2) 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 below. When a counterparty does not have an external rating, the bank must, subject to supervisory approval, map the internal rating of the counterparty to one of the external ratings.
- (3) EAD_i^{total} is the EAD 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 requirements for such counterparty by the bank. For non-IMM banks the exposure should be discounted by applying the factor $\frac{(1 - e^{-0.05 \times M_i})}{(0.05 \times M_i)}$. For IMM banks, no such discount should be applied as the discount factor is already included in M_i .
- (4) 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 $\frac{(1 - e^{-0.05 \times M_i^{hedge}})}{(0.05 \times M_i^{hedge})}$.
- (5) 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 $\frac{(1 - e^{-0.05 \times M_{ind}})}{(0.05 \times M_{ind})}$.
- (6) w_{ind} is the weight applicable to index hedges. The bank must map indices to one of the seven weights w_i based on the average spread of index 'ind'.
- (7) M_i is the effective maturity of the transactions with counterparty 'i'. For IMM-banks, M_i is to be calculated as per [CRE53.20](#). For non-IMM banks, M_i is the notional weighted average maturity as referred to in [CRE32.44](#). However, for this purpose, M_i should not be capped at 5 years.

- (8) M_i^{hedg} is the maturity of the hedge instrument with notional B_i (the quantities $M_i^{hedg} \times B_i$ are to be summed if these are several positions).
- (9) 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.
- (10) For any counterparty that is also a constituent of an index on which a CDS is used for hedging CCR, 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.

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

50.16 The weights referenced in [MAR50.15](#) above are set out in the following table, and are based on the external rating of the counterparty:²

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%

Footnotes

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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 the Committee.