Title 12 —Banks and Banking
Chapter II —Federal Reserve System
Subchapter A —Board of Governors of the Federal Reserve System
Part 217 —Capital Adequacy of Bank Holding Companies, Savings and Loan Holding Companies, and State Member Banks (Regulation Q)
Subpart E —Risk-Weighted Assets—Internal Ratings-Based and Advanced Measurement Approaches
Risk-Weighted Assets for General Credit Risk

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§ 217.132 Counterparty credit risk of repo-style transactions, eligible margin loans, and OTC derivative contracts.

(a) ***Methodologies for collateral recognition.***

(1) Instead of an LGD estimation methodology, a Board-regulated institution may use the following methodologies to recognize the benefits of financial collateral in mitigating the counterparty credit risk of repo-style transactions, eligible margin loans, collateralized OTC derivative contracts and single product netting sets of such transactions, and to recognize the benefits of any collateral in mitigating the counterparty credit risk of repo-style transactions that are included in a Board-regulated institution's VaR-based measure under subpart F of this part:

(i) The collateral haircut approach set forth in paragraph (b)(2) of this section;

(ii) The internal models methodology set forth in paragraph (d) of this section; and

(iii) For single product netting sets of repo-style transactions and eligible margin loans, the simple VaR methodology set forth in paragraph (b)(3) of this section.

(2) A Board-regulated institution may use any combination of the three methodologies for collateral recognition; however, it must use the same methodology for transactions in the same category.

(3) A Board-regulated institution must use the methodology in paragraph (c) of this section, or with prior written approval of the Board, the internal model methodology in paragraph (d) of this section, to calculate EAD for an OTC derivative contract or a set of OTC derivative contracts subject to a qualifying master netting agreement. To estimate EAD for qualifying cross-product master netting agreements, a Board-regulated institution may only use the internal models methodology in paragraph (d) of this section.

(4) A Board-regulated institution must also use the methodology in paragraph (e) of this section to calculate the risk-weighted asset amounts for CVA for OTC derivatives.

(b) ***EAD for eligible margin loans and repo-style transactions*** —

(1) ***General.*** A Board-regulated institution may recognize the credit risk mitigation benefits of financial collateral that secures an eligible margin loan, repo-style transaction, or single-product netting set of such transactions by factoring the collateral into its LGD estimates for the exposure. Alternatively, a

Board-regulated institution may estimate an unsecured LGD for the exposure, as well as for any repo-style transaction that is included in the Board-regulated institution's VaR-based measure under subpart F of this part, and determine the EAD of the exposure using:

(i) The collateral haircut approach described in paragraph (b)(2) of this section;

(ii) For netting sets only, the simple VaR methodology described in paragraph (b)(3) of this section; or

(iii) The internal models methodology described in paragraph (d) of this section.

(2) ***Collateral haircut approach*** —

(i) ***EAD equation.*** A Board-regulated institution may determine EAD for an eligible margin loan, repo-style transaction, or netting set by setting EAD equal to max

$$\{0, [(\Sigma E - \Sigma C) + \Sigma(E_s \times H_s) + \Sigma(E_{fx} \times H_{fx})]\},$$

where:

(A) ΣE equals the value of the exposure (the sum of the current fair values of all instruments, gold, and cash the Board-regulated institution has lent, sold subject to repurchase, or posted as collateral to the counterparty under the transaction (or netting set));

(B) ΣC equals the value of the collateral (the sum of the current fair values of all instruments, gold, and cash the Board-regulated institution has borrowed, purchased subject to resale, or taken as collateral from the counterparty under the transaction (or netting set));

(C) E_s equals the absolute value of the net position in a given instrument or in gold (where the net position in a given instrument or in gold equals the sum of the current fair values of the instrument or gold the Board-regulated institution has lent, sold subject to repurchase, or posted as collateral to the counterparty minus the sum of the current fair values of that same instrument or gold the Board-regulated institution has borrowed, purchased subject to resale, or taken as collateral from the counterparty);

(D) H_s equals the market price volatility haircut appropriate to the instrument or gold referenced in E_s;

(E) E_{fx} equals the absolute value of the net position of instruments and cash in a currency that is different from the settlement currency (where the net position in a given currency equals the sum of the current fair values of any instruments or cash in the currency the Board-regulated institution has lent, sold subject to repurchase, or posted as collateral to the counterparty minus the sum of the current fair values of any instruments or cash in the currency the Board-regulated institution has borrowed, purchased subject to resale, or taken as collateral from the counterparty); and

(F) H_{fx} equals the haircut appropriate to the mismatch between the currency referenced in E_{fx} and the settlement currency.

(ii) ***Standard supervisory haircuts.***

(A) Under the standard supervisory haircuts approach:

(*1*) A Board-regulated institution must use the haircuts for market price volatility (H_s) in Table 1 to § 217.132, as adjusted in certain circumstances as provided in paragraphs (b)(2)(ii)(A)(*3*) and (*4*) of § 217.132;

Table 1 to § 217.132—Standard Supervisory Market Price Volatility Haircuts[1]

Residual maturity	Haircut (in percent) assigned based on:						Investment grade securitization exposures (in percent)
	Sovereign issuers risk weight under § 217.132[2] (in percent)			Non-sovereign issuers risk weight under § 217.132 (in percent)			
	Zero	20 or 50	100	20	50	100	
Less than or equal to 1 year	0.5	1.0	15.0	1.0	2.0	4.0	4.0
Greater than 1 year and less than or equal to 5 years	2.0	3.0	15.0	4.0	6.0	8.0	12.0
Greater than 5 years	4.0	6.0	15.0	8.0	12.0	16.0	24.0
Main index equities (including convertible bonds) and gold				15.0			
Other publicly traded equities (including convertible bonds)				25.0			
Mutual funds				Highest haircut applicable to any security in which the fund can invest.			
Cash collateral held				Zero			
Other exposure types				25.0			

[1] The market price volatility haircuts in Table 1 to § 217.132 are based on a 10 business-day holding period.

[2] Includes a foreign PSE that receives a zero percent risk weight.

(*2*) For currency mismatches, a Board-regulated institution must use a haircut for foreign exchange rate volatility (H_{fx}) of 8 percent, as adjusted in certain circumstances as provided in paragraphs (b)(2)(ii)(A)(*3*) and (*4*) of this section.

(*3*) For repo-style transactions and client-facing derivative transactions, a Board-regulated institution may multiply the supervisory haircuts provided in paragraphs (b)(2)(ii)(A)(*1*) and (*2*) of this section by the square root of $^1/_2$ (which equals 0.707107). If the Board-regulated institution determines that a longer holding period is appropriate for client-facing derivative transactions, then it must use a larger scaling factor to adjust for the longer holding period pursuant to paragraph (b)(2)(ii)(A)(*6*) of this section.

(*4*) A Board-regulated institution must adjust the supervisory haircuts upward on the basis of a holding period longer than ten business days (for eligible margin loans) or five business days (for repo-style transactions), using the formula provided in paragraph (b)(2)(ii)(A)(*6*) of this section where the conditions in this paragraph (b)(2)(ii)(A)(*4*) apply. If the number of trades in a netting set exceeds 5,000 at any time during a quarter, a Board-regulated institution must adjust the supervisory haircuts upward on the basis of a minimum holding period of twenty business days for the following quarter (except when a Board-regulated institution is calculating EAD for a cleared transaction under § 217.133). If a netting set contains one or more trades involving illiquid collateral, a Board-regulated institution must adjust the supervisory haircuts upward on the basis of a minimum holding period of twenty business days. If over the two previous quarters more than two margin disputes on a netting set have occurred that lasted longer than the holding period, then the Board-regulated institution must adjust the supervisory haircuts upward for that netting set on the basis of a minimum holding period that is at least two times the minimum holding period for that netting set.

(*5*)

(*i*) A Board-regulated institution must adjust the supervisory haircuts upward on the basis of a holding period longer than ten business days for collateral associated with derivative contracts (five business days for client-facing derivative contracts) using the formula provided in paragraph (b)(2)(ii)(A)(*6*) of this section where the conditions in this paragraph (b)(2)(ii)(A)(*5*)(*i*) apply. For collateral associated with a derivative contract that is within a netting set that is composed of more than 5,000 derivative contracts that are not cleared transactions, a Board-regulated institution must use a minimum holding period of twenty business days. If a netting set contains one or more trades involving illiquid collateral or a derivative contract that cannot be easily replaced, a Board-regulated institution must use a minimum holding period of twenty business days.

(*ii*) Notwithstanding paragraph (b)(2)(ii)(A)(*1*) or (*3*) or (b)(2)(ii)(A)(*5*)(*i*) of this section, for collateral associated with a derivative contract in a netting set under which more than two margin disputes that lasted longer than the holding period occurred during the two previous quarters, the minimum holding period is twice the amount provided under paragraph (b)(2)(ii)(A)(*1*) or (*3*) or (b)(2)(ii)(A)(*5*)(*i*) of this section.

(*6*) A Board-regulated institution must adjust the standard supervisory haircuts upward, pursuant to the adjustments provided in paragraphs (b)(2)(ii)(A)(*3*) through (*5*) of this section, using the following formula:

$$H_A = H_S \sqrt{\frac{T_M}{T_S}}$$

Where:

T_M equals a holding period of longer than 10 business days for eligible margin loans and derivative contracts other than client-facing derivative transactions or longer than 5 business days for repo-style transactions and client-facing derivative transactions;

Hs equals the standard supervisory haircut; and

Ts equals 10 business days for eligible margin loans and derivative contracts other than client-facing derivative transactions or 5 business days for repo-style transactions and client-facing derivative transactions.

(*7*) If the instrument a Board-regulated institution has lent, sold subject to repurchase, or posted as collateral does not meet the definition of financial collateral, the Board-regulated institution must use a 25.0 percent haircut for market price volatility (Hs).

(iii) ***Own internal estimates for haircuts.*** With the prior written approval of the Board, a Board-regulated institution may calculate haircuts (H_s and H_{fx}) using its own internal estimates of the volatilities of market prices and foreign exchange rates.

(A) To receive Board approval to use its own internal estimates, a Board-regulated institution must satisfy the following minimum quantitative standards:

(*1*) A Board-regulated institution must use a 99th percentile one-tailed confidence interval.

(*2*) The minimum holding period for a repo-style transaction is five business days and for an eligible margin loan is ten business days except for transactions or netting sets for which paragraph (b)(2)(iii)(A)(*3*) of this section applies. When a Board-regulated institution calculates an own-estimates haircut on a T_N-day holding period, which is different from the minimum holding period for the transaction type, the applicable haircut (H_M) is calculated using the following square root of time formula:

$$H_M = H_N \sqrt{\frac{T_M}{T_N}}, \text{ where}$$

(*i*) T_M equals 5 for repo-style transactions and 10 for eligible margin loans;

(*ii*) T_N equals the holding period used by the Board-regulated institution to derive H_N; and

(*iii*) H_N equals the haircut based on the holding period T_N

(*3*) If the number of trades in a netting set exceeds 5,000 at any time during a quarter, a Board-regulated institution must calculate the haircut using a minimum holding period of twenty business days for the following quarter (except when a Board-regulated institution is calculating EAD for a cleared transaction under § 217.133). If a netting set contains one or more trades involving illiquid collateral or an OTC derivative that cannot be easily replaced, a Board-regulated institution must calculate the haircut using a minimum holding period of twenty business days. If over the two previous quarters more than two margin disputes on a netting set have occurred that lasted more than the holding period, then the Board-regulated institution must calculate the haircut for transactions in that netting set on the basis of a holding period that is at least two times the minimum holding period for that netting set.

(*4*) A Board-regulated institution is required to calculate its own internal estimates with inputs calibrated to historical data from a continuous 12-month period that reflects a period of significant financial stress appropriate to the security or category of securities.

(*5*) A Board-regulated institution must have policies and procedures that describe how it determines the period of significant financial stress used to calculate the Board-regulated institution's own internal estimates for haircuts under this section and must be able to provide empirical support for the period used. The Board-regulated institution must obtain the prior approval of the Board for, and notify the Board if the Board-regulated institution makes any material changes to, these policies and procedures.

(*6*) Nothing in this section prevents the Board from requiring a Board-regulated institution to use a different period of significant financial stress in the calculation of own internal estimates for haircuts.

(*7*) A Board-regulated institution must update its data sets and calculate haircuts no less frequently than quarterly and must also reassess data sets and haircuts whenever market prices change materially.

(B) With respect to debt securities that are investment grade, a Board-regulated institution may calculate haircuts for categories of securities. For a category of securities, the Board-regulated institution must calculate the haircut on the basis of internal volatility estimates for securities in that category that are representative of the securities in that category that the Board-regulated institution has lent, sold subject to repurchase, posted as collateral, borrowed, purchased subject to resale, or taken as collateral. In determining relevant categories, the Board-regulated institution must at a minimum take into account:

(*1*) The type of issuer of the security;

(*2*) The credit quality of the security;

(*3*) The maturity of the security; and

(*4*) The interest rate sensitivity of the security.

(C) With respect to debt securities that are not investment grade and equity securities, a Board-regulated institution must calculate a separate haircut for each individual security.

(D) Where an exposure or collateral (whether in the form of cash or securities) is denominated in a currency that differs from the settlement currency, the Board-regulated institution must calculate a separate currency mismatch haircut for its net position in each mismatched currency based on estimated volatilities of foreign exchange rates between the mismatched currency and the settlement currency.

(E) A Board-regulated institution's own estimates of market price and foreign exchange rate volatilities may not take into account the correlations among securities and foreign exchange rates on either the exposure or collateral side of a transaction (or netting set) or the correlations among securities and foreign exchange rates between the exposure and collateral sides of the transaction (or netting set).

(3) ***Simple VaR methodology.*** With the prior written approval of the Board, a Board-regulated institution may estimate EAD for a netting set using a VaR model that meets the requirements in paragraph (b)(3)(iii) of this section. In such event, the Board-regulated institution must set EAD equal to max {0, [(ΣE − ΣC) + PFE]}, where:

(i) ΣE equals the value of the exposure (the sum of the current fair values of all instruments, gold, and cash the Board-regulated institution has lent, sold subject to repurchase, or posted as collateral to the counterparty under the netting set);

(ii) ΣC equals the value of the collateral (the sum of the current fair values of all instruments, gold, and cash the Board-regulated institution has borrowed, purchased subject to resale, or taken as collateral from the counterparty under the netting set); and

(iii) PFE (potential future exposure) equals the Board-regulated institution's empirically based best estimate of the 99th percentile, one-tailed confidence interval for an increase in the value of (ΣE − ΣC) over a five-business-day holding period for repo-style transactions, or over a ten-business-day holding period for eligible margin loans except for netting sets for which paragraph (b)(3)(iv) of this section applies using a minimum one-year historical observation period of price data representing the instruments that the Board-regulated institution has lent, sold subject to repurchase, posted as collateral, borrowed, purchased subject to resale, or taken as collateral. The Board-regulated institution must validate its VaR model by establishing and maintaining a rigorous and regular backtesting regime.

(iv) If the number of trades in a netting set exceeds 5,000 at any time during a quarter, a Board-regulated institution must use a twenty-business-day holding period for the following quarter (except when a Board-regulated institution is calculating EAD for a cleared transaction under § 217.133). If a netting set contains one or more trades involving illiquid collateral, a Board-regulated institution must use a twenty-business-day holding period. If over the two previous quarters more than two margin disputes on a netting set have occurred that lasted more than the holding period, then the Board-regulated institution must set its PFE for that netting set equal to an estimate over a holding period that is at least two times the minimum holding period for that netting set.

(c) ***EAD for derivative contracts*** —

(1) ***Options for determining EAD.*** A Board-regulated institution must determine the EAD for a derivative contract using the standardized approach for counterparty credit risk (SA–CCR) under paragraph (c)(5) of this section or using the internal models methodology described in paragraph (d) of this section. If a Board-regulated institution elects to use SA–CCR for one or more derivative contracts, the exposure amount determined under SA–CCR is the EAD for the derivative contract or derivatives

contracts. A Board-regulation institution must use the same methodology to calculate the exposure amount for all its derivative contracts and may change its election only with prior approval of the Board. A Board-regulated institution may reduce the EAD calculated according to paragraph (c)(5) of this section by the credit valuation adjustment that the Board-regulated institution has recognized in its balance sheet valuation of any derivative contracts in the netting set. For purposes of this paragraph (c)(1), the credit valuation adjustment does not include any adjustments to common equity tier 1 capital attributable to changes in the fair value of the Board-regulated institution's liabilities that are due to changes in its own credit risk since the inception of the transaction with the counterparty.

(2) ***Definitions.*** For purposes of this paragraph (c) of this section, the following definitions apply:

(i) ***End date*** means the last date of the period referenced by an interest rate or credit derivative contract or, if the derivative contract references another instrument, by the underlying instrument, except as otherwise provided in paragraph (c) of this section.

(ii) ***Start date*** means the first date of the period referenced by an interest rate or credit derivative contract or, if the derivative contract references the value of another instrument, by underlying instrument, except as otherwise provided in paragraph (c) of this section.

(iii) ***Hedging set*** means:

(A) With respect to interest rate derivative contracts, all such contracts within a netting set that reference the same reference currency;

(B) With respect to exchange rate derivative contracts, all such contracts within a netting set that reference the same currency pair;

(C) With respect to credit derivative contract, all such contracts within a netting set;

(D) With respect to equity derivative contracts, all such contracts within a netting set;

(E) With respect to a commodity derivative contract, all such contracts within a netting set that reference one of the following commodity categories: Energy, metal, agricultural, or other commodities;

(F) With respect to basis derivative contracts, all such contracts within a netting set that reference the same pair of risk factors and are denominated in the same currency; or

(G) With respect to volatility derivative contracts, all such contracts within a netting set that reference one of interest rate, exchange rate, credit, equity, or commodity risk factors, separated according to the requirements under paragraphs (c)(2)(iii)(A) through (E) of this section.

(H) If the risk of a derivative contract materially depends on more than one of interest rate, exchange rate, credit, equity, or commodity risk factors, the Board may require a Board-regulated institution to include the derivative contract in each appropriate hedging set under paragraphs (c)(1)(iii)(A) through (E) of this section.

(3) ***Credit derivatives.*** Notwithstanding paragraphs (c)(1) and (c)(2) of this section:

(i) A Board-regulated institution that purchases a credit derivative that is recognized under § 217.134 or § 217.135 as a credit risk mitigant for an exposure that is not a covered position under subpart F of this part is not required to calculate a separate counterparty credit risk

capital requirement under this section so long as the Board-regulated institution does so consistently for all such credit derivatives and either includes or excludes all such credit derivatives that are subject to a master netting agreement from any measure used to determine counterparty credit risk exposure to all relevant counterparties for risk-based capital purposes.

(ii) A Board-regulated institution that is the protection provider in a credit derivative must treat the credit derivative as a wholesale exposure to the reference obligor and is not required to calculate a counterparty credit risk capital requirement for the credit derivative under this section, so long as it does so consistently for all such credit derivatives and either includes all or excludes all such credit derivatives that are subject to a master netting agreement from any measure used to determine counterparty credit risk exposure to all relevant counterparties for risk-based capital purposes (unless the Board-regulated institution is treating the credit derivative as a covered position under subpart F of this part, in which case the Board-regulated institution must calculate a supplemental counterparty credit risk capital requirement under this section).

(4) ***Equity derivatives.*** A Board-regulated institution must treat an equity derivative contract as an equity exposure and compute a risk-weighted asset amount for the equity derivative contract under §§ 217.151–217.155 (unless the Board-regulated institution is treating the contract as a covered position under subpart F of this part). In addition, if the Board-regulated institution is treating the contract as a covered position under subpart F of this part, and under certain other circumstances described in § 217.155, the Board-regulated institution must also calculate a risk-based capital requirement for the counterparty credit risk of an equity derivative contract under this section.

(5) ***Exposure amount.***

(i) The exposure amount of a netting set, as calculated under paragraph (c) of this section, is equal to 1.4 multiplied by the sum of the replacement cost of the netting set, as calculated under paragraph (c)(6) of this section, and the potential future exposure of the netting set, as calculated under paragraph (c)(7) of this section.

(ii) Notwithstanding the requirements of paragraph (c)(5)(i) of this section, the exposure amount of a netting set subject to a variation margin agreement, excluding a netting set that is subject to a variation margin agreement under which the counterparty to the variation margin agreement is not required to post variation margin, is equal to the lesser of the exposure amount of the netting set calculated under paragraph (c)(5)(i) of this section and the exposure amount of the netting set calculated under paragraph (c)(5)(i) of this section as if the netting set were not subject to a variation margin agreement.

(iii) Notwithstanding the requirements of paragraph (c)(5)(i) of this section, the exposure amount of a netting set that consists of only sold options in which the premiums have been fully paid by the counterparty to the options and where the options are not subject to a variation margin agreement is zero.

(iv) Notwithstanding the requirements of paragraph (c)(5)(i) of this section, the exposure amount of a netting set in which the counterparty is a commercial end-user is equal to the sum of replacement cost, as calculated under paragraph (c)(6) of this section, and the potential future exposure of the netting set, as calculated under paragraph (c)(7) of this section.

(v) For purposes of the exposure amount calculated under paragraph (c)(5)(i) of this section and all calculations that are part of that exposure amount, a Board-regulated institution may elect to treat a derivative contract that is a cleared transaction that is not subject to a variation margin

agreement as one that is subject to a variation margin agreement, if the derivative contract is subject to a requirement that the counterparties make daily cash payments to each other to account for changes in the fair value of the derivative contract and to reduce the net position of the contract to zero. If a Board-regulated institution makes an election under this paragraph (c)(5)(v) for one derivative contract, it must treat all other derivative contracts within the same netting set that are eligible for an election under this paragraph (c)(5)(v) as derivative contracts that are subject to a variation margin agreement.

(vi) For purposes of the exposure amount calculated under paragraph (c)(5)(i) of this section and all calculations that are part of that exposure amount, a Board-regulated institution may elect to treat a credit derivative contract, equity derivative contract, or commodity derivative contract that references an index as if it were multiple derivative contracts each referencing one component of the index.

(6) ***Replacement cost of a netting set*** —

(i) ***Netting set subject to a variation margin agreement under which the counterparty must post variation margin.*** The replacement cost of a netting set subject to a variation margin agreement, excluding a netting set that is subject to a variation margin agreement under which the counterparty is not required to post variation margin, is the greater of:

(A) The sum of the fair values (after excluding any valuation adjustments) of the derivative contracts within the netting set less the sum of the net independent collateral amount and the variation margin amount applicable to such derivative contracts;

(B) The sum of the variation margin threshold and the minimum transfer amount applicable to the derivative contracts within the netting set less the net independent collateral amount applicable to such derivative contracts; or

(C) Zero.

(ii) ***Netting sets not subject to a variation margin agreement under which the counterparty must post variation margin.*** The replacement cost of a netting set that is not subject to a variation margin agreement under which the counterparty must post variation margin to the Board-regulated institution is the greater of:

(A) The sum of the fair values (after excluding any valuation adjustments) of the derivative contracts within the netting set less the sum of the net independent collateral amount and variation margin amount applicable to such derivative contracts; or

(B) Zero.

(iii) ***Multiple netting sets subject to a single variation margin agreement.*** Notwithstanding paragraphs (c)(6)(i) and (ii) of this section, the replacement cost for multiple netting sets subject to a single variation margin agreement must be calculated according to paragraph (c)(10)(i) of this section.

(iv) ***Netting set subject to multiple variation margin agreements or a hybrid netting set.*** Notwithstanding paragraphs (c)(6)(i) and (ii) of this section, the replacement cost for a netting set subject to multiple variation margin agreements or a hybrid netting set must be calculated according to paragraph (c)(11)(i) of this section.

(7) ***Potential future exposure of a netting set.*** The potential future exposure of a netting set is the product of the PFE multiplier and the aggregated amount.

(i) ***PFE multiplier.*** The PFE multiplier is calculated according to the following formula:

$$PFE\ multiplier = min\left\{1; 0.05 + 0.95 * e^{\left(\frac{V-C}{1.9*A}\right)}\right\}$$

Where:

V is the sum of the fair values (after excluding any valuation adjustments) of the derivative contracts within the netting set;

C is the sum of the net independent collateral amount and the variation margin amount applicable to the derivative contracts within the netting set; and

A is the aggregated amount of the netting set.

(ii) ***Aggregated amount.*** The aggregated amount is the sum of all hedging set amounts, as calculated under paragraph (c)(8) of this section, within a netting set.

(iii) ***Multiple netting sets subject to a single variation margin agreement.*** Notwithstanding paragraphs (c)(7)(i) and (ii) of this section and when calculating the potential future exposure for purposes of total leverage exposure under § 217.10(c)(2)(ii)(B), the potential future exposure for multiple netting sets subject to a single variation margin agreement must be calculated according to paragraph (c)(10)(ii) of this section.

(iv) ***Netting set subject to multiple variation margin agreements or a hybrid netting set.*** Notwithstanding paragraphs (c)(7)(i) and (ii) of this section and when calculating the potential future exposure for purposes of total leverage exposure under § 217.10(c)(2)(ii)(B), the potential future exposure for a netting set subject to multiple variation margin agreements or a hybrid netting set must be calculated according to paragraph (c)(11)(ii) of this section.

(8) ***Hedging set amount*** —

(i) ***Interest rate derivative contracts.*** To calculate the hedging set amount of an interest rate derivative contract hedging set, a Board-regulated institution may use either of the formulas provided in paragraphs (c)(8)(i)(A) and (B) of this section:

(A) Formula 1 is as follows:

$$Hedging\ set\ amount = [(AddOn_{TB1}^{IR})^2 + (AddOn_{TB2}^{IR})^2 + (AddOn_{TB3}^{IR})^2 + 1.4 * AddOn_{TB1}^{IR} * AddOn_{TB2}^{IR} + 1.4 * AddOn_{TB2}^{IR} * AddOn_{TB3}^{IR} + 0.6 * AddOn_{TB1}^{IR} * AddOn_{TB3}^{IR})]^{\frac{1}{2}}; \text{ or}$$

(B) Formula 2 is as follows:

$$Hedging\ set\ amount = |AddOn^{IR}_{TB1}| + |AddOn^{IR}_{TB2}| + |AddOn^{IR}_{TB3}|.$$

Where in paragraphs (c)(8)(i)(A) and (B) of this section:

$AddOn^{IR}_{TB1}$ is the sum of the adjusted derivative contract amounts, as calculated under paragraph (c)(9) of this section, within the hedging set with an end date of less than one year from the present date;

$AddOn^{IR}_{TB2}$ is the sum of the adjusted derivative contract amounts, as calculated under paragraph (c)(9) of this section, within the hedging set with an end date of one to five years from the present date; and

$AddOn^{IR}_{TB3}$ is the sum of the adjusted derivative contract amounts, as calculated under paragraph (c)(9) of this section, within the hedging set with an end date of more than five years from the present date.

(ii) ***Exchange rate derivative contracts.*** For an exchange rate derivative contract hedging set, the hedging set amount equals the absolute value of the sum of the adjusted derivative contract amounts, as calculated under paragraph (c)(9) of this section, within the hedging set.

(iii) ***Credit derivative contracts and equity derivative contracts.*** The hedging set amount of a credit derivative contract hedging set or equity derivative contract hedging set within a netting set is calculated according to the following formula:

$$Hedging\ set\ amount = [(\sum_{k=1}^{K} \rho_k * AddOn(Ref_k))^2 + \sum_{k=1}^{K}(1 - (\rho_k)^2) * (AddOn(Ref_k))^2\ ]^{\frac{1}{2}}$$

Where:

k is each reference entity within the hedging set.

K is the number of reference entities within the hedging set.

$AddOn(Ref_k)$ equals the sum of the adjusted derivative contract amounts, as determined under paragraph (c)(9) of this section, for all derivative contracts within the hedging set that reference reference entity *k*.

ρ_k equals the applicable supervisory correlation factor, as provided in Table 3 to this section.

(iv) ***Commodity derivative contracts.*** The hedging set amount of a commodity derivative contract hedging set within a netting set is calculated according to the following formula:

Hedging set amount

$$= \left[\left(\rho * \sum_{k=1}^{K} AddOn\left(Type_k\right)\right)^2 + \left(1 - (\rho)^2\right) * \sum_{k=1}^{K} \left(AddOn\left(Type_k\right)\right)^2\right]^{\frac{1}{2}}$$

Where:

k is each commodity type within the hedging set.

K is the number of commodity types within the hedging set.

AddOn(*Type*$_k$) equals the sum of the adjusted derivative contract amounts, as determined under paragraph (c)(9) of this section, for all derivative contracts within the hedging set that reference reference commodity type.

ρ equals the applicable supervisory correlation factor, as provided in Table 3 to this section.

(v) ***Basis derivative contracts and volatility derivative contracts.*** Notwithstanding paragraphs (c)(8)(i) through (iv) of this section, a Board-regulated institution must calculate a separate hedging set amount for each basis derivative contract hedging set and each volatility derivative contract hedging set. A Board-regulated institution must calculate such hedging set amounts using one of the formulas under paragraphs (c)(8)(i) through (iv) that corresponds to the primary risk factor of the hedging set being calculated.

(9) ***Adjusted derivative contract amount*** —

(i) ***Summary.*** To calculate the adjusted derivative contract amount of a derivative contract, a Board-regulated institution must determine the adjusted notional amount of derivative contract, pursuant to paragraph (c)(9)(ii) of this section, and multiply the adjusted notional amount by each of the supervisory delta adjustment, pursuant to paragraph (c)(9)(iii) of this section, the maturity factor, pursuant to paragraph (c)(9)(iv) of this section, and the applicable supervisory factor, as provided in Table 3 to this section.

(ii) ***Adjusted notional amount.***

(A)

(*1*) For an interest rate derivative contract or a credit derivative contract, the adjusted notional amount equals the product of the notional amount of the derivative contract, as measured in U.S. dollars using the exchange rate on the date of the calculation, and the supervisory duration, as calculated by the following formula:

$$\text{Supervisory duration} = max\left\{\frac{e^{-0.05*\left(\frac{S}{250}\right)}-e^{-0.05*\left(\frac{E}{250}\right)}}{0.05}, 0.04\right\}$$

Where:

S is the number of business days from the present day until the start date of the derivative contract, or zero if the start date has already passed; and

E is the number of business days from the present day until the end date of the derivative contract.

(*2*) For purposes of paragraph (c)(9)(ii)(A)(*1*) of this section:

(*i*) For an interest rate derivative contract or credit derivative contract that is a variable notional swap, the notional amount is equal to the time-weighted average of the contractual notional amounts of such a swap over the remaining life of the swap; and

(*ii*) For an interest rate derivative contract or a credit derivative contract that is a leveraged swap, in which the notional amount of all legs of the derivative contract are divided by a factor and all rates of the derivative contract are multiplied by the same factor, the notional amount is equal to the notional amount of an equivalent unleveraged swap.

(B)

(*1*) For an exchange rate derivative contract, the adjusted notional amount is the notional amount of the non-U.S. denominated currency leg of the derivative contract, as measured in U.S. dollars using the exchange rate on the date of the calculation. If both legs of the exchange rate derivative contract are denominated in currencies other than U.S. dollars, the adjusted notional amount of the derivative contract is the largest leg of the derivative contract, as measured in U.S. dollars using the exchange rate on the date of the calculation.

(*2*) Notwithstanding paragraph (c)(9)(ii)(B)(*1*) of this section, for an exchange rate derivative contract with multiple exchanges of principal, the Board-regulated institution must set the adjusted notional amount of the derivative contract equal to the notional amount of the derivative contract multiplied by the number of exchanges of principal under the derivative contract.

(C)

(*1*) For an equity derivative contract or a commodity derivative contract, the adjusted notional amount is the product of the fair value of one unit of the reference instrument underlying the derivative contract and the number of such units referenced by the derivative contract.

(*2*) Notwithstanding paragraph (c)(9)(ii)(C)(*1*) of this section, when calculating the adjusted notional amount for an equity derivative contract or a commodity derivative contract that is a volatility derivative contract, the Board-regulated institution must replace the unit price with the underlying volatility referenced by the volatility derivative contract and replace the number of units with the notional amount of the volatility derivative contract.

(iii) ***Supervisory delta adjustments.***

(A) For a derivative contract that is not an option contract or collateralized debt obligation tranche, the supervisory delta adjustment is 1 if the fair value of the derivative contract increases when the value of the primary risk factor increases and −1 if the fair value of the derivative contract decreases when the value of the primary risk factor increases.

(B)

(*1*) For a derivative contract that is an option contract, the supervisory delta adjustment is determined by the following formulas, as applicable:

Table 2 to §217.132--Supervisory Delta Adjustment for Options Contracts

	Bought	Sold
Call Options	$\Phi\left(\frac{\ln\left(\frac{P+\lambda}{K+\lambda}\right)+0.5*\sigma^2*T/250}{\sigma*\sqrt{T/250}}\right)$	$-\Phi\left(\frac{\ln\left(\frac{P+\lambda}{K+\lambda}\right)+0.5*\sigma^2*T/250}{\sigma*\sqrt{T/250}}\right)$
Put Options	$-\Phi\left(-\frac{\ln\left(\frac{P+\lambda}{K+\lambda}\right)+0.5*\sigma^2*T/250}{\sigma*\sqrt{T/250}}\right)$	$\Phi\left(-\frac{\ln\left(\frac{P+\lambda}{K+\lambda}\right)+0.5*\sigma^2*T/250}{\sigma*\sqrt{T/250}}\right)$

(*2*) As used in the formulas in Table 2 to this section:

(*i*) Φ is the standard normal cumulative distribution function;

(*ii*) P equals the current fair value of the instrument or risk factor, as applicable, underlying the option;

(*iii*) K equals the strike price of the option;

(*iv*) T equals the number of business days until the latest contractual exercise date of the option;

(*v*) λ equals zero for all derivative contracts except interest rate options for the currencies where interest rates have negative values. The same value of λ must be used for all interest rate options that are denominated in the same currency. To determine the value of λ for a given currency, a Board-regulated institution

must find the lowest value L of P and K of all interest rate options in a given currency that the Board-regulated institution has with all counterparties. Then, λ is set according to this formula: λ = *max*{−*L* + 0.1%, 0}; and

(*vi*) σ equals the supervisory option volatility, as provided in Table 3 to this section.

(C)

(*1*) For a derivative contract that is a collateralized debt obligation tranche, the supervisory delta adjustment is determined by the following formula:

$$\text{Supervisory delta adjustment} = \frac{15}{(1+14*\text{A})*(1+14*\text{D})}$$

(*2*) As used in the formula in paragraph (c)(9)(iii)(C)(*1*) of this section:

(*i*) A is the attachment point, which equals the ratio of the notional amounts of all underlying exposures that are subordinated to the Board-regulated institution's exposure to the total notional amount of all underlying exposures, expressed as a decimal value between zero and one;[30]

(*ii*) D is the detachment point, which equals one minus the ratio of the notional amounts of all underlying exposures that are senior to the Board-regulated institution's exposure to the total notional amount of all underlying exposures, expressed as a decimal value between zero and one; and

(*iii*) The resulting amount is designated with a positive sign if the collateralized debt obligation tranche was purchased by the Board-regulated institution and is designated with a negative sign if the collateralized debt obligation tranche was sold by the Board-regulated institution.

(iv) ***Maturity factor.***

(A)

(*1*) The maturity factor of a derivative contract that is subject to a variation margin agreement, excluding derivative contracts that are subject to a variation margin agreement under which the counterparty is not required to post variation margin, is determined by the following formula:

$$\text{Maturity factor} = \frac{3}{2}\sqrt{\frac{MPOR}{250}}$$

Where MPOR refers to the period from the most recent exchange of collateral covering a netting set of derivative contracts with a defaulting counterparty until the derivative contracts are closed out and the resulting market risk is re-hedged.

[30] In the case of a first-to-default credit derivative, there are no underlying exposures that are subordinated to the Board-regulated institution's exposure. In the case of a second-or-subsequent-to-default credit derivative, the smallest (n−1) notional amounts of the underlying exposures are subordinated to the Board-regulated institution's exposure.

(*2*) Notwithstanding paragraph (c)(9)(iv)(A)(*1*) of this section:

(*i*) For a derivative contract that is not a client-facing derivative transaction, MPOR cannot be less than ten business days plus the periodicity of re-margining expressed in business days minus one business day;

(*ii*) For a derivative contract that is a client-facing derivative transaction, cannot be less than five business days plus the periodicity of re-margining expressed in business days minus one business day; and

(*iii*) For a derivative contract that is within a netting set that is composed of more than 5,000 derivative contracts that are not cleared transactions, or a netting set that contains one or more trades involving illiquid collateral or a derivative contract that cannot be easily replaced, MPOR cannot be less than twenty business days.

(*3*) Notwithstanding paragraphs (c)(9)(iv)(A)(*1*) and (*2*) of this section, for a netting set subject to more than two outstanding disputes over margin that lasted longer than the MPOR over the previous two quarters, the applicable floor is twice the amount provided in paragraphs (c)(9)(iv)(A)(*1*) and (*2*) of this section.

(B) The maturity factor of a derivative contract that is not subject to a variation margin agreement, or derivative contracts under which the counterparty is not required to post variation margin, is determined by the following formula:

$$\text{Maturity factor} = \sqrt{\frac{\min\{M;250\}}{250}}$$

Where M equals the greater of 10 business days and the remaining maturity of the contract, as measured in business days.

(C) For purposes of paragraph (c)(9)(iv) of this section, if a Board-regulated institution has elected pursuant to paragraph (c)(5)(v) of this section to treat a derivative contract that is a cleared transaction that is not subject to a variation margin agreement as one that is subject to a variation margin agreement, the Board-regulated institution must treat the derivative contract as subject to a variation margin agreement with maturity factor as determined according to (c)(9)(iv)(A) of this section, and daily settlement does not change the end date of the period referenced by the derivative contract.

(v) ***Derivative contract as multiple effective derivative contracts.*** A Board-regulated institution must separate a derivative contract into separate derivative contracts, according to the following rules:

(A) For an option where the counterparty pays a predetermined amount if the value of the underlying asset is above or below the strike price and nothing otherwise (binary option), the option must be treated as two separate options. For purposes of paragraph (c)(9)(iii)(B) of this section, a binary option with strike K must be represented as the combination of one bought European option and one sold European option of the same type as the original option (put or call) with the strikes set equal to 0.95 * K and 1.05 * K so

that the payoff of the binary option is reproduced exactly outside the region between the two strikes. The absolute value of the sum of the adjusted derivative contract amounts of the bought and sold options is capped at the payoff amount of the binary option.

(B) For a derivative contract that can be represented as a combination of standard option payoffs (such as collar, butterfly spread, calendar spread, straddle, and strangle), a Board-regulated institution must treat each standard option component as a separate derivative contract.

(C) For a derivative contract that includes multiple-payment options, (such as interest rate caps and floors), a Board-regulated institution may represent each payment option as a combination of effective single-payment options (such as interest rate caplets and floorlets).

(D) A Board-regulated institution may not decompose linear derivative contracts (such as swaps) into components.

(10) ***Multiple netting sets subject to a single variation margin agreement*** —

(i) ***Calculating replacement cost.*** Notwithstanding paragraph (c)(6) of this section, a Board-regulated institution shall assign a single replacement cost to multiple netting sets that are subject to a single variation margin agreement under which the counterparty must post variation margin, calculated according to the following formula:

$$Replacement\ Cost = max\ \{\Sigma_{NS} max\{V_{NS}; 0\} - max\{C_{MA}; 0\}; 0\} + max\{\Sigma_{NS} min\{V_{NS}; 0\} - min\{C_{MA}; 0\}; 0\}$$

Where:

NS is each netting set subject to the variation margin agreement MA;

V_{NS} is the sum of the fair values (after excluding any valuation adjustments) of the derivative contracts within the netting set NS; and

C_{MA} is the sum of the net independent collateral amount and the variation margin amount applicable to the derivative contracts within the netting sets subject to the single variation margin agreement.

(ii) ***Calculating potential future exposure.*** Notwithstanding paragraph (c)(5) of this section, a Board-regulated institution shall assign a single potential future exposure to multiple netting sets that are subject to a single variation margin agreement under which the counterparty must post variation margin equal to the sum of the potential future exposure of each such netting set, each calculated according to paragraph (c)(7) of this section as if such nettings sets were not subject to a variation margin agreement.

(11) ***Netting set subject to multiple variation margin agreements or a hybrid netting set*** —

(i) ***Calculating replacement cost.*** To calculate replacement cost for either a netting set subject to multiple variation margin agreements under which the counterparty to each variation margin agreement must post variation margin, or a netting set composed of at least one derivative contract subject to variation margin agreement under which the counterparty must post variation margin and at least one derivative contract that is not subject to such a variation margin agreement, the calculation for replacement cost is provided under paragraph (c)(6)(i) of

this section, except that the variation margin threshold equals the sum of the variation margin thresholds of all variation margin agreements within the netting set and the minimum transfer amount equals the sum of the minimum transfer amounts of all the variation margin agreements within the netting set.

(ii) ***Calculating potential future exposure.***

(A) To calculate potential future exposure for a netting set subject to multiple variation margin agreements under which the counterparty to each variation margin agreement must post variation margin, or a netting set composed of at least one derivative contract subject to variation margin agreement under which the counterparty to the derivative contract must post variation margin and at least one derivative contract that is not subject to such a variation margin agreement, a Board-regulated institution must divide the netting set into sub-netting sets (as described in paragraph (c)(11)(ii)(B) of this section) and calculate the aggregated amount for each sub-netting set. The aggregated amount for the netting set is calculated as the sum of the aggregated amounts for the sub-netting sets. The multiplier is calculated for the entire netting set.

(B) For purposes of paragraph (c)(11)(ii)(A) of this section, the netting set must be divided into sub-netting sets as follows:

(*1*) All derivative contracts within the netting set that are not subject to a variation margin agreement or that are subject to a variation margin agreement under which the counterparty is not required to post variation margin form a single sub-netting set. The aggregated amount for this sub-netting set is calculated as if the netting set is not subject to a variation margin agreement.

(*2*) All derivative contracts within the netting set that are subject to variation margin agreements in which the counterparty must post variation margin and that share the same value of the MPOR form a single sub-netting set. The aggregated amount for this sub-netting set is calculated as if the netting set is subject to a variation margin agreement, using the MPOR value shared by the derivative contracts within the netting set.

Table 3 to § 217.132—Supervisory Option Volatility, Supervisory Correlation Parameters, and Supervisory Factors for Derivative Contracts

Asset class	Category	Type	Supervisory option volatility (percent)	Supervisory correlation factor (percent)	Supervisory factor[1] (percent)
Interest rate	N/A	N/A	50	N/A	0.50
Exchange rate	N/A	N/A	15	N/A	4.0
Credit, single name	Investment grade	N/A	100	50	0.46
	Speculative grade	N/A	100	50	1.3
	Sub-speculative	N/A	100	50	6.0

Asset class	Category	Type	Supervisory option volatility (percent)	Supervisory correlation factor (percent)	Supervisory factor[1] (percent)
	grade				
Credit, index	Investment Grade	N/A	80	80	0.38
	Speculative Grade	N/A	80	80	1.06
Equity, single name	N/A	N/A	120	50	32
Equity, index	N/A	N/A	75	80	20
Commodity	Energy	Electricity	150	40	40
		Other	70	40	18
	Metals	N/A	70	40	18
	Agricultural	N/A	70	40	18
	Other	N/A	70	40	18

[1] The applicable supervisory factor for basis derivative contract hedging sets is equal to one-half of the supervisory factor provided in this Table 3, and the applicable supervisory factor for volatility derivative contract hedging sets is equal to 5 times the supervisory factor provided in this Table 3.

(d) ***Internal models methodology.***

(1)

(i) With prior written approval from the Board, a Board-regulated institution may use the internal models methodology in this paragraph (d) to determine EAD for counterparty credit risk for derivative contracts (collateralized or uncollateralized) and single-product netting sets thereof, for eligible margin loans and single-product netting sets thereof, and for repo-style transactions and single-product netting sets thereof.

(ii) A Board-regulated institution that uses the internal models methodology for a particular transaction type (derivative contracts, eligible margin loans, or repo-style transactions) must use the internal models methodology for all transactions of that transaction type. A Board-regulated institution may choose to use the internal models methodology for one or two of these three types of exposures and not the other types.

(iii) A Board-regulated institution may also use the internal models methodology for derivative contracts, eligible margin loans, and repo-style transactions subject to a qualifying cross-product netting agreement if:

(A) The Board-regulated institution effectively integrates the risk mitigating effects of cross-product netting into its risk management and other information technology systems; and

(B) The Board-regulated institution obtains the prior written approval of the Board.

(iv) A Board-regulated institution that uses the internal models methodology for a transaction type must receive approval from the Board to cease using the methodology for that transaction type or to make a material change to its internal model.

(2) ***Risk-weighted assets using IMM.*** Under the IMM, a Board-regulated institution uses an internal model to estimate the expected exposure (EE) for a netting set and then calculates EAD based on that EE. A Board-regulated institution must calculate two EEs and two EADs (one stressed and one unstressed) for each netting set as follows:

(i) $EAD_{unstressed}$ is calculated using an EE estimate based on the most recent data meeting the requirements of paragraph (d)(3)(vii) of this section;

(ii) $EAD_{stressed}$ is calculated using an EE estimate based on a historical period that includes a period of stress to the credit default spreads of the Board-regulated institution's counterparties according to paragraph (d)(3)(viii) of this section;

(iii) The Board-regulated institution must use its internal model's probability distribution for changes in the fair value of a netting set that are attributable to changes in market variables to determine EE; and

(iv) Under the internal models methodology, EAD = Max (0, α × effective EPE − CVA), or, subject to the prior written approval of Board as provided in paragraph (d)(10) of this section, a more conservative measure of EAD.

(A) CVA equals the credit valuation adjustment that the Board-regulated institution has recognized in its balance sheet valuation of any OTC derivative contracts in the netting set. For purposes of this paragraph (d), CVA does not include any adjustments to common equity tier 1 capital attributable to changes in the fair value of the Board-regulated institution's liabilities that are due to changes in its own credit risk since the inception of the transaction with the counterparty.

(B) $$Effective\ EPE_{t_k} = \sum_{k=1}^{n} Effective\ EE_k \times \Delta t_k$$

(that is, effective EPE is the time-weighted average of effective EE where the weights are the proportion that an individual effective EE represents in a one-year time interval)

where:

(1) $EffectiveEE_{t_k} = \max\left(EffectiveEE_{t_{k-1}}, EE_{t_k}\right)$ (that is, for a specific date t_k, effective EE is the greater of EE at that date or the effective EE at the previous date); and

(2) t_k represents the k^{th} future time period in the model and there are n time periods represented in the model over the first year, and

(C) α = 1.4 except as provided in paragraph (d)(6) of this section, or when the Board has determined that the Board-regulated institution must set α higher based on the Board-regulated institution's specific characteristics of counterparty credit risk or model performance.

(v) A Board-regulated institution may include financial collateral currently posted by the counterparty as collateral (but may not include other forms of collateral) when calculating EE.

(vi) If a Board-regulated institution hedges some or all of the counterparty credit risk associated with a netting set using an eligible credit derivative, the Board-regulated institution may take the reduction in exposure to the counterparty into account when estimating EE. If the Board-regulated institution recognizes this reduction in exposure to the counterparty in its estimate of EE, it must also use its internal model to estimate a separate EAD for the Board-regulated institution's exposure to the protection provider of the credit derivative.

(3) ***Prior approval relating to EAD calculation.*** To obtain Board approval to calculate the distributions of exposures upon which the EAD calculation is based, the Board-regulated institution must demonstrate to the satisfaction of the Board that it has been using for at least one year an internal model that broadly meets the following minimum standards, with which the Board-regulated institution must maintain compliance:

(i) The model must have the systems capability to estimate the expected exposure to the counterparty on a daily basis (but is not expected to estimate or report expected exposure on a daily basis);

(ii) The model must estimate expected exposure at enough future dates to reflect accurately all the future cash flows of contracts in the netting set;

(iii) The model must account for the possible non-normality of the exposure distribution, where appropriate;

(iv) The Board-regulated institution must measure, monitor, and control current counterparty exposure and the exposure to the counterparty over the whole life of all contracts in the netting set;

(v) The Board-regulated institution must be able to measure and manage current exposures gross and net of collateral held, where appropriate. The Board-regulated institution must estimate expected exposures for OTC derivative contracts both with and without the effect of collateral agreements;

(vi) The Board-regulated institution must have procedures to identify, monitor, and control wrong-way risk throughout the life of an exposure. The procedures must include stress testing and scenario analysis;

(vii) The model must use current market data to compute current exposures. The Board-regulated institution must estimate model parameters using historical data from the most recent three-year period and update the data quarterly or more frequently if market conditions warrant. The Board-regulated institution should consider using model parameters based on forward-looking measures, where appropriate;

(viii) When estimating model parameters based on a stress period, the Board-regulated institution must use at least three years of historical data that include a period of stress to the credit default spreads of the Board-regulated institution's counterparties. The Board-regulated institution must review the data set and update the data as necessary, particularly for any material changes in its counterparties. The Board-regulated institution must demonstrate, at least quarterly, and maintain documentation of such demonstration, that the stress period coincides with increased CDS or other credit spreads of the Board-regulated institution's

counterparties. The Board-regulated institution must have procedures to evaluate the effectiveness of its stress calibration that include a process for using benchmark portfolios that are vulnerable to the same risk factors as the Board-regulated institution's portfolio. The Board may require the Board-regulated institution to modify its stress calibration to better reflect actual historic losses of the portfolio;

(ix) A Board-regulated institution must subject its internal model to an initial validation and annual model review process. The model review should consider whether the inputs and risk factors, as well as the model outputs, are appropriate. As part of the model review process, the Board-regulated institution must have a backtesting program for its model that includes a process by which unacceptable model performance will be determined and remedied;

(x) A Board-regulated institution must have policies for the measurement, management and control of collateral and margin amounts; and

(xi) A Board-regulated institution must have a comprehensive stress testing program that captures all credit exposures to counterparties, and incorporates stress testing of principal market risk factors and creditworthiness of counterparties.

(4) ***Calculating the maturity of exposures.***

(i) If the remaining maturity of the exposure or the longest-dated contract in the netting set is greater than one year, the Board-regulated institution must set M for the exposure or netting set equal to the lower of five years or M(EPE), where:

(A) $$M(EPE) = 1 + \frac{\sum_{t_k > 1\,year}^{maturity} EE_k \times \Delta t_k \times df_k}{\sum_{t_k \le 1\,year} effectiveEE_k \times \Delta t_k \times df_k};$$

(B) df_k is the risk-free discount factor for future time period t_k; and

(C) $\Delta t_k = t_k - t_{k-1}$.

(ii) If the remaining maturity of the exposure or the longest-dated contract in the netting set is one year or less, the Board-regulated institution must set M for the exposure or netting set equal to one year, except as provided in § 217.131(d)(7).

(iii) Alternatively, a Board-regulated institution that uses an internal model to calculate a one-sided credit valuation adjustment may use the effective credit duration estimated by the model as M(EPE) in place of the formula in paragraph (d)(4)(i) of this section.

(5) ***Effects of collateral agreements on EAD.*** A Board-regulated institution may capture the effect on EAD of a collateral agreement that requires receipt of collateral when exposure to the counterparty increases, but may not capture the effect on EAD of a collateral agreement that requires receipt of collateral when counterparty credit quality deteriorates. Two methods are available to capture the effect of a collateral agreement, as set forth in paragraphs (d)(5)(i) and (ii) of this section:

(i) With prior written approval from the Board, a Board-regulated institution may include the effect of a collateral agreement within its internal model used to calculate EAD. The Board-regulated institution may set EAD equal to the expected exposure at the end of the margin period of risk. The margin period of risk means, with respect to a netting set subject to a collateral agreement, the time period from the most recent exchange of collateral with a counterparty until the next required exchange of collateral, plus the period of time required to sell and realize the proceeds of the least liquid collateral that can be delivered under the terms of the collateral agreement and, where applicable, the period of time required to re-hedge the resulting market risk upon the default of the counterparty. The minimum margin period of risk is set according to paragraph (d)(5)(iii) of this section; or

(ii) As an alternative to paragraph (d)(5)(i) of this section, a Board-regulated institution that can model EPE without collateral agreements but cannot achieve the higher level of modeling sophistication to model EPE with collateral agreements can set effective EPE for a collateralized netting set equal to the lesser of:

(A) An add-on that reflects the potential increase in exposure of the netting set over the margin period of risk, plus the larger of:

(*1*) The current exposure of the netting set reflecting all collateral held or posted by the Board-regulated institution excluding any collateral called or in dispute; or

(*2*) The largest net exposure including all collateral held or posted under the margin agreement that would not trigger a collateral call. For purposes of this section, the add-on is computed as the expected increase in the netting set's exposure over the margin period of risk (set in accordance with paragraph (d)(5)(iii) of this section); or

(B) Effective EPE without a collateral agreement plus any collateral the Board-regulated institution posts to the counterparty that exceeds the required margin amount.

(iii) For purposes of this part, including paragraphs (d)(5)(i) and (ii) of this section, the margin period of risk for a netting set subject to a collateral agreement is:

(A) Five business days for repo-style transactions subject to daily remargining and daily marking-to-market, and ten business days for other transactions when liquid financial collateral is posted under a daily margin maintenance requirement, or

(B) Twenty business days if the number of trades in a netting set exceeds 5,000 at any time during the previous quarter (except if the Board-regulated institution is calculating EAD for a cleared transaction under § 217.133) or contains one or more trades involving illiquid collateral or any derivative contract that cannot be easily replaced. If over the two previous quarters more than two margin disputes on a netting set have occurred that lasted more than the margin period of risk, then the Board-regulated institution must use a margin period of risk for that netting set that is at least two times the minimum margin period of risk for that netting set. If the periodicity of the receipt of collateral is N-days, the minimum

margin period of risk is the minimum margin period of risk under this paragraph (d) plus N minus 1. This period should be extended to cover any impediments to prompt re-hedging of any market risk.

(C) Five business days for an OTC derivative contract or netting set of OTC derivative contracts where the Board-regulated institution is either acting as a financial intermediary and enters into an offsetting transaction with a CCP or where the Board-regulated institution provides a guarantee to the CCP on the performance of the client. A Board-regulated institution must use a longer holding period if the Board-regulated institution determines that a longer period is appropriate. Additionally, the Board may require the Board-regulated institution to set a longer holding period if the Board determines that a longer period is appropriate due to the nature, structure, or characteristics of the transaction or is commensurate with the risks associated with the transaction.

(6) ***Own estimate of alpha.*** With prior written approval of the Board, a Board-regulated institution may calculate alpha as the ratio of economic capital from a full simulation of counterparty exposure across counterparties that incorporates a joint simulation of market and credit risk factors (numerator) and economic capital based on EPE (denominator), subject to a floor of 1.2. For purposes of this calculation, economic capital is the unexpected losses for all counterparty credit risks measured at a 99.9 percent confidence level over a one-year horizon. To receive approval, the Board-regulated institution must meet the following minimum standards to the satisfaction of the Board:

(i) The Board-regulated institution's own estimate of alpha must capture in the numerator the effects of:

(A) The material sources of stochastic dependency of distributions of fair values of transactions or portfolios of transactions across counterparties;

(B) Volatilities and correlations of market risk factors used in the joint simulation, which must be related to the credit risk factor used in the simulation to reflect potential increases in volatility or correlation in an economic downturn, where appropriate; and

(C) The granularity of exposures (that is, the effect of a concentration in the proportion of each counterparty's exposure that is driven by a particular risk factor).

(ii) The Board-regulated institution must assess the potential model uncertainty in its estimates of alpha.

(iii) The Board-regulated institution must calculate the numerator and denominator of alpha in a consistent fashion with respect to modeling methodology, parameter specifications, and portfolio composition.

(iv) The Board-regulated institution must review and adjust as appropriate its estimates of the numerator and denominator of alpha on at least a quarterly basis and more frequently when the composition of the portfolio varies over time.

(7) ***Risk-based capital requirements for transactions with specific wrong-way risk.*** A Board-regulated institution must determine if a repo-style transaction, eligible margin loan, bond option, or equity derivative contract or purchased credit derivative to which the Board-regulated institution applies the internal models methodology under this paragraph (d) has specific wrong-way risk. If a transaction

has specific wrong-way risk, the Board-regulated institution must treat the transaction as its own netting set and exclude it from the model described in § 217.132(d)(2) and instead calculate the risk-based capital requirement for the transaction as follows:

(i) For an equity derivative contract, by multiplying:

(A) K, calculated using the appropriate risk-based capital formula specified in Table 1 of § 217.131 using the PD of the counterparty and LGD equal to 100 percent, by

(B) The maximum amount the Board-regulated institution could lose on the equity derivative.

(ii) For a purchased credit derivative by multiplying:

(A) K, calculated using the appropriate risk-based capital formula specified in Table 1 of § 217.131 using the PD of the counterparty and LGD equal to 100 percent, by

(B) The fair value of the reference asset of the credit derivative.

(iii) For a bond option, by multiplying:

(A) K, calculated using the appropriate risk-based capital formula specified in Table 1 of § 217.131 using the PD of the counterparty and LGD equal to 100 percent, by

(B) The smaller of the notional amount of the underlying reference asset and the maximum potential loss under the bond option contract.

(iv) For a repo-style transaction or eligible margin loan by multiplying:

(A) K, calculated using the appropriate risk-based capital formula specified in Table 1 of § 217.131 using the PD of the counterparty and LGD equal to 100 percent, by

(B) The EAD of the transaction determined according to the EAD equation in § 217.132(b)(2), substituting the estimated value of the collateral assuming a default of the counterparty for the value of the collateral in Σc of the equation.

(8) ***Risk-weighted asset amount for IMM exposures with specific wrong-way risk.*** The aggregate risk-weighted asset amount for IMM exposures with specific wrong-way risk is the sum of a Board-regulated institution's risk-based capital requirement for purchased credit derivatives that are not bond options with specific wrong-way risk as calculated under paragraph (d)(7)(ii) of this section, a Board-regulated institution's risk-based capital requirement for equity derivatives with specific wrong-way risk as calculated under paragraph (d)(7)(i) of this section, a Board-regulated institution's risk-based capital requirement for bond options with specific wrong-way risk as calculated under paragraph (d)(7)(iii) of this section, and a Board-regulated institution's risk-based capital requirement for repo-style transactions and eligible margin loans with specific wrong-way risk as calculated under paragraph (d)(7)(iv) of this section, multiplied by 12.5.

(9) ***Risk-weighted assets for IMM exposures.***

(i) The Board-regulated institution must insert the assigned risk parameters for each counterparty and netting set into the appropriate formula specified in Table 1 of § 217.131 and multiply the output of the formula by the $EAD_{unstressed}$ of the netting set to obtain the unstressed capital requirement for each netting set. A Board-regulated institution that uses an advanced CVA approach that captures migrations in credit spreads under paragraph (e)(3) of this section must set the maturity adjustment (b) in the formula equal to zero. The sum of the unstressed capital requirement calculated for each netting set equals $K_{unstressed}$.

(ii) The Board-regulated institution must insert the assigned risk parameters for each wholesale obligor and netting set into the appropriate formula specified in Table 1 of § 217.131 and multiply the output of the formula by the $EAD_{stressed}$ of the netting set to obtain the stressed capital requirement for each netting set. A Board-regulated institution that uses an advanced CVA approach that captures migrations in credit spreads under paragraph (e)(6) of this section must set the maturity adjustment (b) in the formula equal to zero. The sum of the stressed capital requirement calculated for each netting set equals $K_{stressed}$.

(iii) The Board-regulated institution's dollar risk-based capital requirement under the internal models methodology equals the larger of $K_{unstressed}$ and $K_{stressed}$. A Board-regulated institution's risk-weighted assets amount for IMM exposures is equal to the capital requirement multiplied by 12.5, plus risk-weighted assets for IMM exposures with specific wrong-way risk in paragraph (d)(8) of this section and those in paragraph (d)(10) of this section.

(10) ***Other measures of counterparty exposure.***

(i) With prior written approval of the Board, a Board-regulated institution may set EAD equal to a measure of counterparty credit risk exposure, such as peak EAD, that is more conservative than an alpha of 1.4 times the larger of $EPE_{unstressed}$ and $EPE_{stressed}$ for every counterparty whose EAD will be measured under the alternative measure of counterparty exposure. The Board-regulated institution must demonstrate the conservatism of the measure of counterparty credit risk exposure used for EAD. With respect to paragraph (d)(10)(i) of this section:

(A) For material portfolios of new OTC derivative products, the Board-regulated institution may assume that the standardized approach for counterparty credit risk pursuant to paragraph (c) of this section meets the conservatism requirement of this section for a period not to exceed 180 days.

(B) For immaterial portfolios of OTC derivative contracts, the Board-regulated institution generally may assume that the standardized approach for counterparty credit risk pursuant to paragraph (c) of this section meets the conservatism requirement of this section.

(ii) To calculate risk-weighted assets for purposes of the approach in paragraph (d)(10)(i) of this section, the Board-regulated institution must insert the assigned risk parameters for each counterparty and netting set into the appropriate formula specified in Table 1 of § 217.131, multiply the output of the formula by the EAD for the exposure as specified above, and multiply by 12.5.

(e) ***Credit valuation adjustment (CVA) risk-weighted assets*** —

(1) ***In general.*** With respect to its OTC derivative contracts, a Board-regulated institution must calculate a CVA risk-weighted asset amount for its portfolio of OTC derivative transactions that are subject to the CVA capital requirement using the simple CVA approach described in paragraph (e)(5) of this section or, with prior written approval of the Board, the advanced CVA approach described in paragraph (e)(6) of this section. A Board-regulated institution that receives prior Board approval to calculate its CVA risk-weighted asset amounts for a class of counterparties using the advanced CVA approach must continue to use that approach for that class of counterparties until it notifies the Board in writing that the Board-regulated institution expects to begin calculating its CVA risk-weighted asset amount using the simple CVA approach. Such notice must include an explanation of the Board-regulated institution's rationale and the date upon which the Board-regulated institution will begin to calculate its CVA risk-weighted asset amount using the simple CVA approach.

(2) ***Market risk Board-regulated institutions.*** Notwithstanding the prior approval requirement in paragraph (e)(1) of this section, a market risk Board-regulated institution may calculate its CVA risk-weighted asset amount using the advanced CVA approach if the Board-regulated institution has Board approval to:

(i) Determine EAD for OTC derivative contracts using the internal models methodology described in paragraph (d) of this section; and

(ii) Determine its specific risk add-on for debt positions issued by the counterparty using a specific risk model described in § 217.207(b).

(3) ***Recognition of hedges.***

(i) A Board-regulated institution may recognize a single name CDS, single name contingent CDS, any other equivalent hedging instrument that references the counterparty directly, and index credit default swaps (CDS_{ind}) as a CVA hedge under paragraph (e)(5)(ii) of this section or paragraph (e)(6) of this section, provided that the position is managed as a CVA hedge in accordance with the Board-regulated institution's hedging policies.

(ii) A Board-regulated institution shall not recognize as a CVA hedge any tranched or n^{th}-to-default credit derivative.

(4) ***Total CVA risk-weighted assets.*** Total CVA risk-weighted assets is the CVA capital requirement, K_{CVA}, calculated for a Board-regulated institution's entire portfolio of OTC derivative counterparties that are subject to the CVA capital requirement, multiplied by 12.5.

(5) ***Simple CVA approach.***

(i) Under the simple CVA approach, the CVA capital requirement, K_{CVA}, is calculated according to the following formula:

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

Where:

$$A = \sum_i 0.75 \times w_i^2 \times \left(M_i \times EAD_i^{total} - M_i^{hedge} \times B_i \right)^2$$

(A) w_i = the weight applicable to counterparty *i* under Table 4 to this section;

(B) M_i = the EAD-weighted average of the effective maturity of each netting set with counterparty *i* (where each netting set's effective maturity can be no less than one year.)

(C) EAD_i^{total} = the sum of the EAD for all netting sets of OTC derivative contracts with counterparty *i* calculated using the standardized approach to counterparty credit risk described in paragraph (c) of this section or the internal models methodology described in paragraph (d) of this section. When the Board-regulated institution calculates EAD under paragraph (c) of this section, such EAD may be adjusted for purposes of calculating EAD_i^{total} by multiplying EAD by $(1-\exp(-0.05 \times M_i))/(0.05 \times M_i)$, where "exp" is the exponential function. When the Board-regulated institution calculates EAD under paragraph (d) of this section, EAD_i^{total} equals $EAD_{unstressed}$.

(D) M_i^{hedge} = the notional weighted average maturity of the hedge instrument.

(E) B_i = the sum of the notional amounts of any purchased single name CDS referencing counterparty *i* that is used to hedge CVA risk to counterparty *i* multiplied by $(1\text{-}\exp(-0.05 \times M_i^{hedge}))/(0.05 \times M_i^{hedge})$.

(F) M_{ind} = the maturity of the CDS_{ind} or the notional weighted average maturity of any CDS_{ind} purchased to hedge CVA risk of counterparty *i*.

(G) B_{ind} = the notional amount of one or more CDS_{ind} purchased to hedge CVA risk for counterparty *i* multiplied by $(1\text{-}\exp(-0.05 \times M_{ind}))/(0.05 \times M_{ind})$

(H) w_{ind} = the weight applicable to the CDS_{ind} based on the average weight of the underlying reference names that comprise the index under Table 4 to this section.

(ii) The Board-regulated institution may treat the notional amount of the index attributable to a counterparty as a single name hedge of counterparty *i* (B_i,) when calculating K_{CVA}, and subtract the notional amount of B_i from the notional amount of the $CDS_{ind.}$ A Board-regulated institution must treat the CDS_{ind} hedge with the notional amount reduced by B_i as a CVA hedge.

Table 4 to § 217.132—Assignment of Counterparty Weight

Internal PD (in percent)	Weight w_i (in percent)
0.00–0.07	0.70
>0.070–0.15	0.80
>0.15–0.40	1.00
>0.40–2.00	2.00
>2.00–6.00	3.00
>6.00	10.00

(6) ***Advanced CVA approach.***

(i) A Board-regulated institution may use the VaR model that it uses to determine specific risk under § 217.207(b) or another VaR model that meets the quantitative requirements of § 217.205(b) and § 217.207(b)(1) to calculate its CVA capital requirement for a counterparty by modeling the impact of changes in the counterparties' credit spreads, together with any recognized CVA hedges, on the CVA for the counterparties, subject to the following requirements:

(A) The VaR model must incorporate only changes in the counterparties' credit spreads, not changes in other risk factors. The VaR model does not need to capture jump-to-default risk;

(B) A Board-regulated institution that qualifies to use the advanced CVA approach must include in that approach any immaterial OTC derivative portfolios for which it uses the standardized approach to counterparty credit risk in paragraph (c) of this section according to paragraph (e)(6)(viii) of this section; and

(C) A Board-regulated institution must have the systems capability to calculate the CVA capital requirement for a counterparty on a daily basis (but is not required to calculate the CVA capital requirement on a daily basis).

(ii) Under the advanced CVA approach, the CVA capital requirement, K_{CVA}, is calculated according to the following formulas:

$$K_{CVA} = 3 \times \left(VaR^{CVA}_{Unstressed} + VaR^{CVA}_{Stressed}\right)$$

where VaR^{CVA}_{j} is the 99% VaR reflecting changes of CVA_j and fair value of eligible hedges (aggregated across all counterparties and eligible hedges) resulting from simulated changes of credit spreads over a 10-day time horizon. CVA_j for a given counterparty must be calculated according to

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

Where

(A) t_i = the time of the i-th revaluation time bucket starting from $t_0 = 0$.

(B) t_T = the longest contractual maturity across the OTC derivative contracts with the counterparty.

(C) s_i = the CDS spread for the counterparty at tenor t_i used to calculate the CVA for the counterparty. If a CDS spread is not available, the Board-regulated institution must use a proxy spread based on the credit quality, industry and region of the counterparty.

(D) LGD_{MKT} = the loss given default of the counterparty based on the spread of a publicly traded debt instrument of the counterparty, or, where a publicly traded debt instrument spread is not available, a proxy spread based on the credit quality, industry, and region of the counterparty. Where no market information and no reliable proxy based on the credit quality, industry, and region of the counterparty are available to determine LGD_{MKT}, a Board-regulated institution may use a conservative estimate when determining LGD_{MKT}, subject to approval by the Board.

(E) EE_i = the sum of the expected exposures for all netting sets with the counterparty at revaluation time t_i, calculated according to paragraphs (e)(6)(iv)(A) and (e)(6)(v)(A) of this section.

(F) D_i = the risk-free discount factor at time t_i, where $D_0 = 1$.

(G) Exp is the exponential function.

(H) The subscript j refers either to a stressed or an unstressed calibration as described in paragraphs (e)(6)(iv) and (v) of this section.

(iii) Notwithstanding paragraphs (e)(6)(i) and (e)(6)(ii) of this section, a Board-regulated institution must use the formulas in paragraphs (e)(6)(iii)(A) or (e)(6)(iii)(B) of this section to calculate credit spread sensitivities if its VaR model is not based on full repricing.

(A) If the VaR model is based on credit spread sensitivities for specific tenors, the Board-regulated institution must calculate each credit spread sensitivity according to the following formula:

Regulatory CS01 =

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

For the final time bucket i = T, the corresponding formula is

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

(B) If the VaR model uses credit spread sensitivities to parallel shifts in credit spreads, the [BANK] must calculate each credit spread sensitivity according to the following formula:

Regulatory CS01 =

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

(iv) To calculate the $CVA_{Unstressed}$ measure for purposes of paragraph (e)(6)(ii) of this section, the Board-regulated institution must:

(A) Use the EE_i calculated using the calibration of paragraph (d)(3)(vii) of this section, except as provided in § 217.132(e)(6)(vi), and

(B) Use the historical observation period required under § 217.205(b)(2).

(v) To calculate the $CVA_{Stressed}$ measure for purposes of paragraph (e)(6)(ii) of this section, the Board-regulated institution must:

(A) Use the EE_i calculated using the stress calibration in paragraph (d)(3)(viii) of this section except as provided in paragraph (e)(6)(vi) of this section.

(B) Calibrate VaR model inputs to historical data from the most severe twelve-month stress period contained within the three-year stress period used to calculate EE_i. The Board may require a Board-regulated institution to use a different period of significant financial stress in the calculation of the $CVA_{Stressed}$ measure.

(vi) If a Board-regulated institution captures the effect of a collateral agreement on EAD using the method described in paragraph (d)(5)(ii) of this section, for purposes of paragraph (e)(6)(ii) of this section, the Board-regulated institution must calculate EE_i using the method in paragraph (d)(5)(ii) of this section and keep that EE constant with the maturity equal to the maximum of:

(A) Half of the longest maturity of a transaction in the netting set, and

(B) The notional weighted average maturity of all transactions in the netting set.

(vii) For purposes of paragraph (e)(6) of this section, the Board-regulated institution's VaR model must capture the basis between the spreads of any CDS_{ind} that is used as the hedging instrument and the hedged counterparty exposure over various time periods, including benign and stressed environments. If the VaR model does not capture that basis, the Board-regulated institution must reflect only 50 percent of the notional amount of the CDS_{ind} hedge in the VaR model.

(viii) If a Board-regulated institution uses the standardized approach for counterparty credit risk pursuant to paragraph (c) of this section to calculate the EAD for any immaterial portfolios of OTC derivative contracts, the Board-regulated institution must use that EAD as a constant EE in the formula for the calculation of CVA with the maturity equal to the maximum of:

(A) Half of the longest maturity of a transaction in the netting set; and

(B) The notional weighted average maturity of all transactions in the netting set.

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