ISDA SIMM™[1] Methodology, version R1.0 (same as v3.15: 7 April 2016) Effective Date: September 1, 2016

Contextual Considerations

This document includes descriptions of initial margin calculations capturing Delta risk, Vega risk, Curvature risk, Inter-curve basis risk and Concentration risk.
On concentration risk, in line with the final draft ESA RTS[2] and in deviation from the international BCBS-IOSCO framework[3], the document provides a conceptual solution that is currently under review and development. Given the regulatory timelines, the concentration risk factors are not yet active.

A. General provisions

1. This document describes the calculations and methodology for calculating the initial margin under the ISDA Standard Initial Margin Model (SIMM) for non-cleared OTC derivatives.

2. SIMM uses sensitivities as inputs. Risk factors and sensitivities must meet the definitions provided within Section C.

3. Sensitivities are used as inputs into aggregation formulae which are intended to recognize hedging and diversification benefits of positions in different risk factors within an asset class. Risk weights and correlations are provided in Sections D-I.

4. This model includes complex trades, which should be handled in the same way as other trades.

B. Structure of the methodology

5. There are six risk classes:
   - Interest Rate
   - Credit (Qualifying)
   - Credit (Non-Qualifying)
   - Equity
   - Commodity
   - FX

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[2] European Supervisory Authorities, "Final draft regulatory technical standards on risk-mitigation techniques for OTC-derivative contracts not cleared by a CCP under Article 11(15) of Regulation (EU) No 648/2012", 8 March 2016
[3] BCBS-IOSCO, "Margin requirements for non-centrally cleared derivatives", March 2015

and the margin for each risk class is defined to be the sum of the Delta Margin, the Vega Margin and the Curvature Margin for that risk class. That is

$$IM_X = DeltaMargin_X + VegaMargin_X + CurvatureMargin_X,$$

for each risk class *X*.

6. There are four product classes:

- Interest Rates and Foreign Exchange (RatesFX)
- Credit
- Equity
- Commodity

Every trade is assigned to an individual product class and SIMM is considered separately for each product class. Buckets are still defined in risk terms, but within each product class the risk class takes its component risks only from trades of that product class. For example, equity derivatives would have risk in the Interest Rate risk class, as well as the Equity risk class. But all those risks are kept separate from the risks of trades in the RatesFX product class.

Within each product class, the initial margin (IM) for each of the six risk classes is calculated as in paragraph 5 above. The total margin for that product class is given by the formula:

$$SIMM_{product} = \sqrt{\sum_r IM_r^2 + \sum_r \sum_{s \neq r} \psi_{rs} IM_r IM_s},$$

where *product* is one of the four product classes, and the sums on *r* and *s* are taken over the six risk classes. The correlation matrix ψ_{rs} of correlations between the risk classes is given in Section K.

The total SIMM is the sum of these four product class SIMM values:

$$SIMM = SIMM_{RatesFX} + SIMM_{Credit} + SIMM_{Equity} + SIMM_{Commodity}.$$

7. Prior to applying the delta margin calculations in the following section, positions in identical instruments should be fully offset. Instruments, including the underlying instruments of derivative instruments are considered identical when they have the same contractual parameters. This is irrespective of whether the underlying instrument is purchased or sold according to the derivative instruments.

8. **(Interest Rate risk only)** The following step by step approach to capture delta risk should be applied to the interest-rate risk class only:

(a) Find a net sensitivity across instruments to each risk factor (*k*,*i*), where *k* is the rate tenor and *i* is the index name of the sub yield curve, as defined in Sections C.1 and C.2 for the interest-rate risk class.

(b) Weight the net sensitivity, $s_{k,i}$, to each risk factor (*k*,*i*) by the corresponding risk weight RW_k according to the vertex structure set out in Section D.

$$WS_{k,i} = RW_k s_{k,i} CR_b,$$

where *CR* is the concentration risk factor defined as:

$$CR_b = \max\left(1, \left(\frac{\left|\sum_{k,i} s_{k,i}\right|}{T_b}\right)^{\frac{1}{2}}\right),$$

for concentration threshold T_b, defined for each currency *b* in section J.

(c) The weighted sensitivities should then be aggregated within each currency. The sub-curve correlations $\phi_{i,j}$ and the tenor correlation parameters $\rho_{k,l}$ are set out in Section D.

$$K = \sqrt{\sum_{i,k} WS_{k,i}^2 + \sum_{i,k} \sum_{(j,l)\neq(i,k)} \phi_{i,j}\rho_{k,l} WS_{k,i} WS_{l,j}}\,.$$

(d) Delta Margin amounts should then be aggregated across currencies within the risk class. The correlation parameters γ_{bc} applicable are set out in Section D.

$$DeltaMargin = \sqrt{\sum_b K_b^2 + \sum_b \sum_{c\neq b} \gamma_{bc} g_{bc} S_b S_c},$$

where

$$S_b = \max\left(\min\left(\sum_{i,k} WS_{k,i}\,, K_b\right), -K_b\right) \quad \text{and} \quad g_{bc} = \frac{\min(CR_b, CR_c)}{\max(CR_b, CR_c)},$$

for all currencies *b* and *c*.

9. **(non-Interest Rate risk classes)** The following step by step approach to capture delta risk should be separately applied to each risk class other than Interest Rate:

(a) Find a net sensitivity across instruments to each risk factor *k*, which are defined in Sections C.1 and C.2 for each risk class.

(b) Weight the net sensitivity, s_k, to each risk factor *k* by the corresponding risk weight RW_k according to the bucketing structure for each risk class set out in Sections E-I.

$$WS_k = RW_k s_k CR_k,$$

where CR_k is the concentration risk factor:

$$CR_k = \max\left(1, \left(\frac{\left|\sum_j s_j\right|}{T_b}\right)^{\frac{1}{2}}\right) \quad \text{for credit spread risk,}$$

with the sum *j* taken over tenors of the same issuer/seniority curve as the risk factor *k*, and

$$CR_k = \max\left(1, \left(\frac{|s_k|}{T_b}\right)^{\frac{1}{2}}\right) \quad \text{for equity, commodity, FX risk,}$$

where T_b is the concentration threshold for the bucket *b*, as given in Section J.

(c) Weighted sensitivities should then be aggregated within each bucket. The buckets and correlation parameters applicable to each risk class are set out in Sections E-I.

$$K = \sqrt{\sum_k WS_k^2 + \sum_k \sum_{l\neq k} \rho_{kl} f_{kl} WS_k WS_l},$$

where

$$f_{kl} = \frac{\min(CR_k, CR_l)}{\max(CR_k, CR_l)}.$$

(d) Delta Margin amounts should then be aggregated across buckets within each risk class. The correlation parameters γ_{bc} applicable to each risk class are set out in Sections E-I.

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

where

$$S_b = \max\left(\min\left(\sum_{k=1}^{K} WS_k, K_b\right), -K_b\right)$$

for all risk factors in bucket b.

10. Instruments that are options or include an option, including a prepayment option or have volatility sensitivity (instruments subject to optionality) are subject to additional margin requirements for vega risk and curvature risk. Instruments not subject to optionality and with no volatility sensitivity are not subject to vega risk or curvature risk.

11. The following step by step approach to capture vega risk exposure should be separately applied to each risk class:

(a) For Interest Rate and Credit instruments, the volatility σ_{kj} of the risk factor *k* at each vol-tenor *j* is defined to be the implied at-the-money volatility of the risk factor *k*, at each vol-tenor *j*, where "vol-tenor" is the underlying swap maturity. The volatility can be quoted as normal volatility, log-normal volatility or similar.

(b) For Equity, FX and Commodity instruments, the volatility σ_{kj} of the risk factor *k* at each vol-tenor *j* is given by the following formula:

$$\sigma_{kj} = \frac{RW_k \sqrt{365/14}}{\alpha}, \quad \text{where } \alpha = \Phi^{-1}(99\%),$$

where RW_k is the corresponding delta risk weight of the risk factor *k*, and the "vol-tenor" *j* is the option expiry time, which should use the same tenor buckets as interest-rate delta risk: 2 weeks, 1 month, 3 months, 6 months, 1 year, 2 years, 3 years, 5 years, 10 years, 15 years, 20 years and 30 years. For commodity index volatilities, the risk weight to use is that of the "Other" bucket. For FX vega (which depends on a pair of currencies), the risk weight to use here is the common risk weight for FX delta sensitivity given explicitly in section I.

(c) The vega risk for each instrument *i* to risk factor *k* is estimated using the formula:

$$VR_{ik} = \sum_j \sigma_{kj} \frac{dV_i}{d\sigma},$$

where:

- σ_{kj} is the volatility defined in clauses (a) and (b);
- $dV_i/d\sigma$ is the sensitivity of the price of the instrument *i* with respect to the implied at-the-money volatility (i.e. "vega"), keeping skew and smile constant. This should be the log-normal vega (for a 1% increase in volatility), except in the case of Interest Rate and Credit risks when it can be the normal vega or log-normal vega, or similar but must match the definition used in clause (a).

For example, the 5 year Interest Rate vega is the sum of all vol-weighted interest rate caplet and swaption vegas which expire in 5 years' time; the USD/JPY FX vega is the sum of all vol-weighted USD/JPY FX vegas.

(d) Find a net vega risk exposure VR_k across instruments *i* to each risk factor *k*, which are defined in Sections C.1 and C.2, as well as the vega concentration risk factor. For interest-rate vega risk, these are given by the formulas

$$VR_k = VRW\left(\sum_i VR_{ik}\right)VCR_b, \quad \text{where} \quad VCR_b = \max\left(1, \left(\frac{\left|\sum_{ik} VR_{ik}\right|}{VT_b}\right)^{\frac{1}{2}}\right),$$

where *b* is the bucket which contains the risk factor *k*. For credit spread vega risk, the corresponding formulas are

$$VR_k = VRW\left(\sum_i VR_{ik}\right)VCR_k, \quad \text{where} \quad VCR_k = \max\left(1, \left(\frac{\left|\sum_{ij} VR_{ij}\right|}{VT_b}\right)^{\frac{1}{2}}\right),$$

where the sum *j* is taken over tenors of the same issuer/seniority curve as the risk factor *k*. For Equity, FX and Commodity vega risk, the corresponding formulas are

$$VR_k = VRW\left(\sum_i VR_{ik}\right)VCR_k, \quad \text{where} \quad VCR_k = \max\left(1, \left(\frac{\left|\sum_{i} VR_{ik}\right|}{VT_b}\right)^{\frac{1}{2}}\right).$$

Here *VRW* is the vega risk weight for the risk class concerned, set out in Sections D-I, and VT_b is the vega concentration threshold for bucket *b*, as given in section J. Note that there is special treatment for index volatilities in Credit Qualifying, Equity and Commodity risk classes.

(e) The vega risk exposure should then be aggregated within each bucket. The buckets and correlation parameters applicable to each risk class are set out in Sections D-I.

$$K_b = \sqrt{\sum_k VR_k^2 + \sum_k \sum_{l \neq k} \rho_{kl} f_{kl} VR_k VR_l},$$

where the inner correlation adjustment factors f_{kl} are defined to be identically 1 in the interest-rate risk class and for all other risk classes are defined to be:

$$f_{kl} = \frac{\min(VCR_k, VCR_l)}{\max(VCR_k, VCR_l)}.$$

(f) Vega Margin should then be aggregated across buckets within each risk class. The correlation parameters applicable to each risk class are set out in Sections D-I.

$$Vega\ Margin = \sqrt{\sum_b K_b^2 + \sum_b \sum_{c \neq b} \gamma_{bc} g_{bc} S_b S_C} + K_{residual},$$

where

$$S_b = \max\left(\min\left(\sum_{k=1}^{K} VR_k, K_b\right), -K_b\right),$$

for all risk factors in bucket *b.* The outer correlation adjustment factors g_{bc} are identically 1 for all risk classes other than interest-rates, and for interest rates they are defined to be:

$$g_{bc} = \frac{\min(VCR_b, VCR_c)}{\max(VCR_b, VCR_c)}$$

for all pairs of buckets *b*, *c*.

12. The following step by step approach to capture curvature risk exposure should be separately applied to

each risk class:

(a) The curvature risk exposure for each instrument *i* to risk factor *k* is estimated using the formula:

$$CVR_{ik} = \sum_j SF(t_{kj})\sigma_{kj}\frac{dV_i}{d\sigma},$$

where:

- σ_{kj} and $dV_i/d\sigma$ are the volatility and vega defined in paragraph 11(a-c) above.
- t_{kj} is the expiry time (in calendar days) from the valuation date until the expiry date of the standard option corresponding to this volatility and vega.
- $SF(t)$ is the value of the scaling function obtained from the linkage between vega and gamma for vanilla options.

$$SF(t) = 0.5\min\left(1, \frac{14\text{ days}}{t\text{ days}}\right).$$

The scaling function is a function of expiry only, which is independent of both vega and vol, as shown in the example table below.

Expiry	2w	1m	3m	6m	12m	2y	3y	5y	10y
SF	50.0%	23.0%	7.7%	3.8%	1.9%	1.0%	0.6%	0.4%	0.2%

Here, we convert tenors to calendar days using the convention that "12m" equals 365 calendar days, with pro-rata scaling for other tenors so that 1m = 365/12 days and 5y = 365*5 days.

(b) The curvature risk exposure CVR_{ik} then can be netted across instrument *i* to each risk factor *k*, which are defined in Sections C.1 and C.2. Note that the same special treatment as for vega applies for indexes in Credit, Equity and Commodity risk classes.

(c) The curvature risk exposure should then be aggregated within each bucket using the following formula:

$$K_b = \sqrt{\sum_k CVR_{b,k}^2 + \sum_k \sum_{l \neq k} \rho_{kl}^2 CVR_{b,k} CVR_{b,l}},$$

where

- ρ_{kl} is the assumed correlation applicable to each risk class as set out in Sections D-I. Note the use of ρ_{kl}^2 rather than ρ_{kl}.

(d) Margin should then be aggregated across buckets within each risk class:

$$\theta = \min\left(\frac{\sum_{b,k} CVR_{b,k}}{\sum_{b,k}|CVR_{b,k}|}, 0\right), \quad \text{and} \quad \lambda = (\Phi^{-1}(99.5\%)^2 - 1)(1+\theta) - \theta,$$

where the sums are taken over all the non-residual buckets in the risk class, and $\Phi^{-1}(99.5\%)$ is the 99.5th percentile of the standard normal distribution. Then the non-residual curvature margin is

$$CurvatureMargin_{non-res} = \max\left(\sum_{b,k} CVR_{b,k} + \lambda\sqrt{\sum_b K_b^2 + \sum_b \sum_{c \neq b} \gamma_{bc}^2 S_b S_c}, 0\right),$$

where

$$S_b = \max\left(\min\left(\sum_k CVR_{b,k}, K_b\right), -K_b\right).$$

Similarly, the residual equivalents are defined as

$$\theta_{residual} = \min\left(\frac{\sum_k CVR_{residual,k}}{\sum_k \left|CVR_{residual,k}\right|}, 0\right), \quad \text{and}$$

$$\lambda_{residual} = \left(\Phi^{-1}(99.5\%)^2 - 1\right)(1 + \theta_{residual}) - \theta_{residual},$$

$$CurvatureMargin_{residual} = \max\left(\sum_k CVR_{residual,k} + \lambda_{residual} K_{residual}, 0\right)$$

Here

- the correlation parameters γ_{bc} applicable to each risk class are set out in Sections D-I. Note the use of γ_{bc}^2 rather than γ_{bc}.

Then the total curvature margin is defined to be the sum of the two terms:

$$CurvatureMargin = CurvatureMargin_{non-res} + CurvatureMargin_{residual}.$$

For the interest-rate risk class only, the *CurvatureMargin* must be multiplied by a scale factor of 2.3. This provisional adjustment addresses a known weakness in the formulas which convert gamma into curvature, which will be properly addressed in a later version of the model.

C. Definition of the risk factors and the sensitivities

C.1 Definition of the risk factors

13. The **Interest Rate risk factors** are the 12 yields at the following vertices, for each currency: two weeks, 1 month, 3 months, 6 months, 1 year, 2 years, 3 years, 5 years, 10 years, 15 years, 20 years and 30 years.

The relevant yield curve is the yield curve of the currency in which an instrument is denominated.

For a given currency, there are a number of sub yield curves used, named "OIS", "Libor1m", "Libor3m", "Libor6m", "Libor12m" and (for USD only) "Prime". Each sub curve has an index name *i*. Risk should be separately bucketed by currency, tenor and curve index, expressed as risk to the outright rate of the sub curve. Any sub curve not given on the above list should be mapped to its closest equivalent.

The Interest Rate risk factors also include a flat inflation rate for each currency. When at least one contractual payment obligation depends on an inflation rate, the inflation rate for the relevant currency is used as a risk factor. All sensitivities to inflation rates for the same currency are fully offset.

14. The **Credit Qualifying risk factors** are five credit spreads for each issuer/seniority pair, separately securitizations and non-securitizations, at each of the following vertices: 1 year, 2 years, 3 years, 5 years and 10 years.

For a given issuer/seniority, if there is more than one relevant credit spread curve, then the credit spread risk at each vertex should be the net sum of risk at that vertex over all the credit spread curves of that issuer and seniority, which may differ by documentation (such as restructuring clause), or currency. Note that delta sensitivities arising from securitizations are considered different risk factors to the same issuer/seniority from non-securitizations.

For Credit Qualifying indexes and bespoke baskets (including securitizations and non-securitizations), delta sensitivities should be computed to the underlying issuer/seniority risk factors. Vega sensitivities of credit indexes need not be allocated to underlying risk factors, but rather the entire index vega risk should be classed into the appropriate Credit Qualifying bucket, using the Residual bucket for cross-sector indexes.

15. The **Credit Non-Qualifying risk factors** are five credit spreads for each issuer/tranche at each of the following vertices: 1 year, 2 years, 3 years, 5 years and 10 years.

Sensitivities should be computed to the tranche. For a given tranche, if there is more than one relevant credit spread curve, then the credit spread risk at each vertex should be the net sum of risk at that vertex over all the credit spread curves of that tranche. Vega sensitivities of credit indexes need not be allocated to underlying issuers, but rather the entire index vega should be classed into the appropriate Non-qualifying bucket, using the Residual bucket for cross-sector indexes.

16. The **Equity risk factors** are all the equity prices: each equity spot price is a risk factor. Sensitivities to equity indices, funds and ETFs can be handled in one of two ways: either (standard preferred approach) the entire delta and can be put into the "Indexes, Funds, ETFs" Equity bucket, or (alternative approach if bilaterally agreed) the delta can be allocated back to individual equities. The choice between standard and alternative approach should be made on a portfolio-level basis. Delta sensitivities to bespoke baskets should always be allocated back to individual equities. Vega sensitivities of equity indexes, funds and ETFs need not be allocated back to individual equities, but rather the entire vega risk should be classed into the "Indexes, Funds, ETFs" Equity bucket. Vega

sensitivities to bespoke baskets should be allocated back to individual equities. Note that not all institutions may be able to perform the allocation of vega for equities as described, however, it is the preferred approach.

17. The **Commodity risk factors** are all the commodity prices: each commodity spot price is a risk factor. Examples include "Coal Europe", "Precious Metals Gold" and "Livestock Lean Hogs". Risks to commodity forward prices should be allocated back to spot price risks and aggregated, assuming that each commodity forward curve moves in parallel. Sensitivities to commodity indices can be handled in one of two ways: either (standard approach) the entire delta can be put into the "Other" bucket, or (advanced approach) the delta can be allocated back to individual commodities. The choice between standard and advanced approaches should be made on a portfolio-level basis. Delta sensitivities to bespoke baskets should always be allocated back to individual commodities. Vega sensitivities of commodity indexes should not be allocated back to individual commodities, but rather the entire index vega risk should be classed into the "Other" bucket.

18. The **FX risk factors** are all the exchange rates between the reporting currency and any currency, or currency of any FX cross rate, on which the value of an instrument may depend. This excludes the reporting currency itself. The FX vega risk factors are all the currency pairs to which an instrument has FX volatility risk.

C.2 Definition of "sensitivity"

19. The following sections define the sensitivity *s* that should be used as input into the standardised framework. The forward difference is specified in each section for illustrative purposes:

For Interest Rate and Credit:

$$s = V(x + 1\text{bp}) - V(x)$$

For Equity, Commodity, and FX risk:

$$s = V(x + 1\%.x) - V(x)$$

where:

- *s* is the sensitivity to the risk factor *x*
- *V*(*x*) is the value of the instrument, given the value of the risk factor *x*.

20. However, banks may also make use of the central or backward difference methods, or use a smaller shock size and scale-up:

For Interest Rate and Credit:

$$s = V(x + 0.5\text{bp}) - V(x - 0.5\text{bp})$$
$$s = V(x) - V(x - 1\text{bp})$$
$$s = (V(x + \varepsilon.1\text{bp}) - V(x))/\varepsilon, \text{ where } 0 < |\varepsilon| \leq 1.$$

For Equity, Commodity and FX risk:

$$s = V(x + 0.5\%.x) - V(x - 0.5\%.x)$$
$$s = V(x) - V(x - 1\%.x)$$
$$s = (V(x + 1\%.\varepsilon.x) - V(x))/\varepsilon, \text{ where } 0 < |\varepsilon| \leq 1.$$

21. **For Interest Rate risk factors, the sensitivity is defined as the PV01**.

The PV01 of an instrument *i* with respect to tenor *t* of the risk free curve *r* (ie the sensitivity of instrument *i* with respect to the risk factor r_t) is defined as:

$$s(i, r_t) = V_i(r_t + 1\text{bp}, cs_t) - V_i(r_t, cs_t)$$

with

- r_t : the risk-free interest rate at tenor t
- cs_t : the credit spread at tenor t
- V_i : the market value of an instrument *i* as a function of the risk-free interest rate and credit spread curve
- 1bp: 1 basis point, ie 0.0001 or 0.01%.

For the interest rate risk factors, "market rates" (and not "zero coupon rates") should be used to construct the risk-free yield curve.

22. **For Credit non-securitisation risk factors, the sensitivity is defined as the CS01.**

The CS01 of an instrument with respect to tenor t is defined as:

$$s(i, cs_t) = V_i(r_t, cs_t + 1\text{bp}) - V_i(r_t, cs_t)$$

23. **For Credit Qualifying and Non-Qualifying securitisations, including *n*th-to-default risk factors, the sensitivity is defined as the CS01.**

If all the following criteria are met, the position is deemed to be a qualifying securitisation, and the CS01 (as defined for Credit (non-securitisations) above) should be computed with respect to the names underlying the securitisation or *n*th-to-default instrument:

- The positions are not re-securitisation positions, nor derivatives of securitisation exposures that do not provide a pro-rate share in the proceeds of a securitisation tranche
- All reference entities are single-name products, including single-name credit derivatives, for which a liquid two-way market exists (see below), including traded indices on these reference entities.
- The instrument does not reference an underlying that would be treated as a retail exposure, a residential mortgage exposure, or a commercial mortgage exposure under the standardised approach to credit risk.
- The instrument does not reference a claim on a special purpose entity

If any of these criteria are not met, the position is deemed to be non-qualifying, and then the CS01 should be calculated with respect to the spread of the instrument rather than the spread of the underlying of the instruments.

A two-way market is deemed to exist where there are independent bona fide offers to buy and sell so that a price reasonably related to the last sales price or current bona fide competitive bid and offer quotations can be determined within one day and settled at such price within a relatively short time conforming to trade custom.

24. **For Equity risk factors, the sensitivity is defined as follows:**

The value change of an instrument with respect to a 1 percentage point relative change of the equity price:

$$s_{ik} = V_i(EQ_k + 1\%.EQ_k) - V_i(EQ_k)$$

with

- k : a given equity
- EQ_k : the market value of equity k
- V_i : the market value of instrument *i* as a function of the price of equity k

25. **For Commodity risk factors, the sensitivity is defined as follows:**

The value change of an instrument with respect to a 1 percentage point relative change of the commodity price:

$$s_{ik} = V_i(CTY_k + 1\%. CTY_k) - V_i(CTY_k)$$

with

- k: a given commodity
- CTY_k : the market value of commodity k
- V_i : the market value of instrument i as a function of the price of commodity k

26. **For FX risk factors, the sensitivity is defined as follows:**

The value change of an instrument with respect to a 1 percentage point relative change of the FX rate:

$$s_{ik} = V_i(FX_k + 1\%. FX_k) - V_i(FX_k),$$

with

- k: a given currency, other than the reporting currency
- FX_k : the spot exchange rate between currency k and the reporting currency, expressed in units of the reporting currency for one unit of currency k.
- V_i : the market value of instrument i as a function of the exchange rate k

The FX sensitivity of the reporting currency itself should be excluded from the calculation.

27. When computing a first order sensitivity for instruments subject to optionality, it is recommended that the volatility under the bump is adjusted per prevailing market practice in each risk class.

D. Interest Rate risk

D.1 Interest Rate - Risk weights

28. The set of risk-free yield curves within each currency is considered to be a separate bucket.

29. The risk weights RW_k are set out in the following tables:

(1) There is one table for regular volatility currencies, which are defined to be: the US Dollar (USD), Euro (EUR), British Pound (GBP), Swiss Franc (CHF), Australian Dollar (AUD), New Zealand Dollar (NZD), Canadian Dollar (CAD), Swedish Krona (SEK), Norwegian Krone (NOK), Danish Krona (DKK), Hong Kong Dollar (HKD), South Korean Won (KRW), Singapore Dollar (SGD), and Taiwanese Dollar (TWD).

(2) There is a second table for low-volatility currencies, which are defined to be the Japanese Yen (JPY) only.

(3) There is a third table for high-volatility currencies, which are defined to be all other currencies.

Table 1: Risk weights per vertex (regular currencies)

2w	1m	3m	6m	1yr	2yr	3yr	5yr	10yr	15yr	20yr	30yr
77	77	77	64	58	49	47	47	45	45	48	56

Table 2: Risk weights per vertex (low-volatility currencies)

2w	1m	3m	6m	1yr	2yr	3yr	5yr	10yr	15yr	20yr	30yr
10	10	10	10	13	16	18	20	25	22	22	23

Table 3: Risk weights per vertex (high-volatility currencies)

2w	1m	3m	6m	1yr	2yr	3yr	5yr	10yr	15yr	20yr	30yr
89	89	89	94	104	99	96	99	87	97	97	98

The risk weight for any currency's inflation rate is 32 bps.

30. The vega risk weight, *VRW*, for the Interest Rate risk class is 0.21.

D.2 Interest Rate – Correlations

31. The correlation matrix below for risk exposures should be used

Correlations for aggregated weighted sensitivities or risk exposures

	2w	1m	3m	6m	1yr	2yr	3yr	5yr	10yr	15yr	20yr	30yr
2w		100%	100%	78.2%	61.8%	49.8%	43.8%	36.1%	27.0%	19.6%	17.4%	12.9%
1m	100%		100%	78.2%	61.8%	49.8%	43.8%	36.1%	27.0%	19.6%	17.4%	12.9%
3m	100%	100%		78.2%	61.8%	49.8%	43.8%	36.1%	27.0%	19.6%	17.4%	12.9%
6m	78.2%	78.2%	78.2%		84.0%	73.9%	66.7%	56.9%	44.4%	37.5%	34.9%	29.6%
1yr	61.8%	61.8%	61.8%	84.0%		91.7%	85.9%	75.7%	62.6%	55.5%	52.6%	47.1%
2yr	49.8%	49.8%	49.8%	73.9%	91.7%		97.6%	89.5%	74.9%	69.0%	66.0%	60.2%
3yr	43.8%	43.8%	43.8%	66.7%	85.9%	97.6%		95.8%	83.1%	77.9%	74.6%	69.0%
5yr	36.1%	36.1%	36.1%	56.9%	75.7%	89.5%	95.8%		92.5%	89.3%	85.9%	81.2%
10yr	27.0%	27.0%	27.0%	44.4%	62.6%	74.9%	83.1%	92.5%		98.0%	96.1%	93.1%

15yr	19.6%	19.6%	19.6%	37.5%	55.5%	69.0%	77.9%	89.3%	98.0%		98.9%	97.0%
20yr	17.4%	17.4%	17.4%	34.9%	52.6%	66.0%	74.6%	85.9%	96.1%	98.9%		98.8%
30yr	12.9%	12.9%	12.9%	29.6%	47.1%	60.2%	69.0%	81.2%	93.1%	97.0%	98.8%	

For aggregated weighted sensitivities or risk exposures, the correlation between the inflation rate and any yield for the same currency is 33%.

For sub-curves, the correlation $\phi_{i,j}$ between any two sub-curves of the same currency is 98.2%.

32. The parameter $\gamma_{bc} = 27\%$ should be used for aggregating across different currencies.

E. Credit Qualifying risk

E.1 Credit Qualifying : Risk weights

33. Sensitivities or risk exposures to an issuer/seniority should first be assigned to a bucket according to the following table:

Bucket number	Credit quality	Sector
1	Investment grade (IG)	Sovereigns including central banks
2		Financials including government-backed financials
3		Basic materials, energy, industrials
4		Consumer
5		Technology, telecommunications
6		Health care, utilities, local government, government-backed corporates (non- financial)
7	High yield (HY) & non-rated (NR)	Sovereigns including central banks
8		Financials including government backed financials
9		Basic materials, energy, industrials
10		Consumer
11		Technology, telecommunications
12		Health care, utilities, local government, government-backed corporates (non- financial)
Residual		

Sensitivities must be distinguished depending on whether they come from (i) non-securitisation positions or (ii) qualifying securitisation positions. No initial netting or aggregation is applied between non-securitisation position sensitivities and qualifying securitisation position sensitivities (except as then described in paragraph 36).

34. The same risk weight should be used for all vertices (1yr, 2yr, 3yr, 5yr, 10yr), according to bucket, as set out in the following table:

Bucket number	Risk weight
1	97
2	110
3	73
4	65
5	52
6	39
7	198
8	638
9	210
10	375
11	240
12	152
Residual	638

35. The vega risk weight, *VRW*, for the Credit risk class is 0.35.

E.2 Credit Qualifying : Correlations

36. The correlation parameters ρ_{kl} applying to sensitivity or risk exposure pairs within the same bucket are set out in the following table:

	Same issuer/seniority, different vertex or source	Different issuer/seniority
Aggregate sensitivities	98%	55%
Residual bucket	50%	50%

Herein source refers to whether the sensitivity is as a result of securitization or non-securitization, which will not be fully offset.

37. The correlation parameters γ_{bc} applying to sensitivity or risk exposure pairs across different non-residual buckets is set out in the following table:

Bucket	1	2	3	4	5	6	7	8	9	10	11	12
1		51%	47%	49%	46%	47%	41%	36%	45%	47%	47%	43%
2	51%		52%	52%	49%	52%	37%	41%	51%	50%	51%	46%
3	47%	52%		54%	51%	55%	37%	37%	51%	49%	50%	47%
4	49%	52%	54%		53%	56%	36%	37%	52%	51%	51%	46%
5	46%	49%	51%	53%		54%	35%	35%	49%	48%	50%	44%
6	47%	52%	55%	56%	54%		37%	37%	52%	49%	51%	48%
7	41%	37%	37%	36%	35%	37%		29%	36%	34%	36%	36%
8	36%	41%	37%	37%	35%	37%	29%		37%	36%	37%	33%
9	45%	51%	51%	52%	49%	52%	36%	37%		49%	50%	46%
10	47%	50%	49%	51%	48%	49%	34%	36%	49%		49%	46%
11	47%	51%	50%	51%	50%	51%	36%	37%	50%	49%		46%
12	43%	46%	47%	46%	44%	48%	36%	33%	46%	46%	46%	

F. Credit Non-Qualifying risk

38. Sensitivities to credit spread risk arising from non-qualifying securitisation positions are treated according to the risk weights and correlations specified in the following paragraphs.

F.1 Credit Non-Qualifying – Risk weights

39. Sensitivities or risk exposures should first be assigned to a bucket according to the following table:

Bucket number	Credit quality	Sector
1	Investment grade (IG)	RMBS/CMBS
2	High yield (HY) & non-rated (NR)	RMBS/CMBS
Residual		

If it is not possible to allocate a sensitivity or risk exposure to one of these buckets (for example, because data on categorical variables is not available), then the position must be allocated to the "Residual bucket".

40. The risk weights are set out in the following table:

Bucket number	Risk weight
1	169
2	1646
Residual	1646

41. The vega risk weight, *VRW*, for Credit Non-Qualifying is 0.35.

F.2 Credit Non-Qualifying - Correlations

42. For the other buckets, the correlation parameters ρ_{kl} applying to sensitivity or risk exposure pairs within the same bucket are set out in the following table:

	Same underlying names (more than 80% overlap in notional terms)	Different underlying names (less than 80% overlap in notional terms)
Aggregate sensitivities	60%	21%
Residual bucket	50%	50%

43. The correlation parameters γ_{bc} applying to sensitivity or risk exposure pairs across different buckets is set out in the following table:

	Correlation
Non-residual bucket to non-residual bucket	5%

G. Equity risk

G.1 Equity - Risk weights

44. Sensitivities or risk exposures should first be assigned to a bucket according to the buckets defined in the following table:

Bucket number	Size	Region	Sector
1	Large	Emerging markets	Consumer goods and services, transportation and storage, administrative and support service activities, utilities
2			Telecommunications, industrials
3			Basic materials, energy, agriculture, manufacturing, mining and quarrying
4			Financials including gov't-backed financials, real estate activities, technology
5		Developed markets	Consumer goods and services, transportation and storage, administrative and support service activities, utilities
6			Telecommunications, industrials
7			Basic materials, energy, agriculture, manufacturing, mining and quarrying
8			Financials including gov't-backed financials, real estate activities, technology
9	Small	Emerging markets	All sectors
10		Developed markets	All sectors
11	All	All	Indexes, Funds, ETFs

45. "Large" is defined as a market capitalisation equal to or greater than USD 2 billion and "small" is defined as a market capitalisation of less than USD 2 billion.

46. "Market capitalisation" is defined as the sum of the market capitalisations of the same legal entity or group of legal entities across all stock markets globally.

47. The developed markets are defined as: Canada, US, Mexico, the euro area, the non-euro area western European countries (the United Kingdom, Norway, Sweden, Denmark, and Switzerland), Japan, Oceania (Australia and New Zealand), Singapore and Hong Kong.

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

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

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

Bucket number	Risk weight
1	22
2	28
3	28
4	25
5	18
6	20
7	24
8	23
9	26
10	27
11	15
Residual	28

51. The vega risk weight, *VRW*, for the equity risk class is 0.21.

G.2 Equity – Correlations

52. The correlation parameters ρ_{kl} applying to sensitivity or risk exposure pairs within the same bucket are set out in the following table:

Bucket number	Correlation
1	14%
2	24%
3	25%
4	20%
5	26%
6	34%
7	33%
8	34%
9	21%
10	24%
11	63%
Residual	0%

53. The correlation parameters γ_{bc} applying to sensitivity or risk exposure pairs across different non-residual buckets are set out in the following table:

Buckets	1	2	3	4	5	6	7	8	9	10	11
1		17%	18%	16%	8%	10%	10%	11%	16%	8%	18%
2	17%		24%	19%	7%	10%	9%	10%	19%	7%	18%
3	18%	24%		21%	9%	12%	13%	13%	20%	10%	24%
4	16%	19%	21%		13%	17%	16%	17%	20%	13%	30%
5	8%	7%	9%	13%		28%	24%	28%	10%	23%	38%

6	10%	10%	12%	17%	28%		30%	33%	13%	26%	45%
7	10%	9%	13%	16%	24%	30%		29%	13%	25%	42%
8	11%	10%	13%	17%	28%	33%	29%		14%	27%	45%
9	16%	19%	20%	20%	10%	13%	13%	14%		11%	25%
10	8%	7%	10%	13%	23%	26%	25%	27%	11%		34%
11	18%	18%	24%	30%	38%	45%	42%	45%	25%	34%	

H. Commodity risk

H.1 Commodity - Risk weights

54. The risk weights depend on the commodity type; they are set out in the following table:

Bucket	Commodity	Risk Weight
1	Coal	9
2	Crude	19
3	Light Ends	18
4	Middle Distillates	13
5	Heavy Distillates	24
6	North America Natural Gas	17
7	European Natural Gas	21
8	North American Power	35
9	European Power	20
10	Freight	50
11	Base Metals	21
12	Precious Metals	19
13	Grains	17
14	Softs	15
15	Livestock	8
16	Other	50

55. The vega risk weight, *VRW*, for the commodity risk class is 0.36.

H.2 Commodity - Correlations

56. The correlation parameters ρ_{kl} applying to sensitivity or risk exposure pairs within the same bucket are set out in the following table:

Bucket	Correlation
1	71%
2	92%
3	97%
4	97%
5	99%
6	98%
7	100%
8	69%
9	47%
10	1%
11	67%
12	70%
13	68%
14	22%
15	50%
16	0%

57. The correlation parameters γ_{bc} applying to sensitivity or risk exposure pairs across different buckets are set out in the following table:

Buckets	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	-	11%	16%	13%	10%	6%	20%	5%	17%	3%	18%	9%	10%	5%	4%	0%
2	11%	-	95%	95%	93%	15%	27%	19%	20%	14%	30%	31%	26%	26%	12%	0%
3	16%	95%	-	92%	90%	17%	24%	14%	17%	12%	32%	26%	16%	22%	12%	0%
4	13%	95%	92%	-	90%	18%	26%	8%	17%	8%	31%	25%	15%	20%	9%	0%
5	10%	93%	90%	90%	-	18%	37%	13%	30%	21%	34%	32%	27%	29%	12%	0%
6	6%	15%	17%	18%	18%	-	7%	62%	3%	15%	0%	0%	23%	15%	7%	0%
7	20%	27%	24%	26%	37%	7%	-	7%	66%	20%	6%	6%	12%	9%	9%	0%
8	5%	19%	14%	8%	13%	62%	7%	-	9%	12%	-1%	0%	18%	11%	4%	0%
9	17%	20%	17%	17%	30%	3%	66%	9%	-	12%	10%	6%	12%	10%	10%	0%
10	3%	14%	12%	8%	21%	15%	20%	12%	12%	-	10%	7%	9%	10%	16%	0%
11	18%	30%	32%	31%	34%	0%	6%	-1%	10%	10%	-	46%	20%	26%	18%	0%
12	9%	31%	26%	25%	32%	0%	6%	0%	6%	7%	46%	-	25%	23%	14%	0%
13	10%	26%	16%	15%	27%	23%	12%	18%	12%	9%	20%	25%	-	29%	6%	0%
14	5%	26%	22%	20%	29%	15%	9%	11%	10%	10%	26%	23%	29%	-	15%	0%
15	4%	12%	12%	9%	12%	7%	9%	4%	10%	16%	18%	14%	6%	15%	-	0%
16	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-

I. Foreign Exchange risk

I.1 Foreign Exchange - Risk weights

58. A unique risk weight equal to 7.9 applies to all the FX sensitivities or risk exposures.

59. The vega risk weight, *VRW*, for FX volatility is 0.21.

I.2 Foreign Exchange - Correlations

60. A unique correlation ρ_{kl} equal to 0.5 applies to all the pairs of FX sensitivities or risk exposures. All Foreign Exchange sensitivities are considered to be within a single bucket within the FX risk class, so no inter-bucket aggregation is necessary. Note that the cross-bucket Curvature calculations of paragraph 12(d) are still required on the single bucket.

J. Concentration Thresholds

J.1 Interest Rate – Concentration Thresholds

61. The concentration thresholds for interest-rate risk are, given by currency group:

Currency Group	Concentration threshold (USD/bp)
G10 + DKK	TBD
All other currencies	TBD

J.2 Credit spread risk – Concentration Thresholds

62. The concentration thresholds for credit spread risk are, given by credit risk type:

Credit risk type	Concentration threshold (USD/bp)
Qualifying	TBD
Non-Qualifying	TBD

J.3 Equity risk – Concentration Thresholds

63. The concentration thresholds for equity risk are:

Equity risk type	Concentration threshold (USD/%)
Emerging Markets	TBD
Developed Markets	TBD
Indexes, Funds, ETFs	TBD

J.4 Commodity risk – Concentration Thresholds

64. The concentration thresholds for commodity risk are:

Commodity risk type	Concentration threshold (USD/%)
Coal, Crude, Light Ends, Middle Distillates, Heavy Distillates, NA Natural Gas, European Natural Gas	TBD
NA Power, European Power, Freight	TBD
Base Metals, Precious Metals, Grains, Softs, Livestock, Other	TBD

J.5 FX risk – Concentration Thresholds

65. The concentration thresholds for FX risk are:

Commodity risk type	Concentration threshold (USD/%)
All currencies	TBD

J.6 Vega risk – Concentration Thresholds

66. The concentration thresholds for vega risk are:

Vega risk type	Concentration threshold (USD)
All buckets	TBD

K. Correlation between risk classes within product classes

67. The correlation parameters ψ_{rs} applying to initial margin risk classes within a single product class are set out in the following table:

Risk Class	Interest Rate	Credit Qualifying	Credit Non-Qualifying	Equity	Commodity	FX
Interest Rate		9%	10%	18%	32%	27%
Credit Qualifying	9%		24%	58%	34%	29%
Credit Non-qualifying	10%	24%		23%	24%	12%
Equity	18%	58%	23%		26%	31%
Commodity	32%	34%	24%	26%		37%
FX	27%	29%	12%	31%	37%	