THE NON-INTERNAL MODEL METHOD FOR CAPITALISING COUNTERPARTY CREDIT RISK EXPOSURES

NIMM - BNPP ANSWER TO BCBS 254

BNP Paribas welcomes the Basel Committee consultative paper on the proposed replacement of the current exposure method (CEM) and standardised method (SM) for counterparty credit risk exposures by the non-internal model method (NIMM). We believe that the new proposed methodology is a great improvement over CEM and SM and attempts to address all the identified shortcomings of those two methodologies.

Bearing in mind that NIMM should be both:

- risk sensitive, with exposures outcome commensurate to the risk faced though with a level of conservatism compared to internal models,
- while remaining fairly simple to implement.

We believe that there is room in some areas for improvements. Our main concerns are:

- The treatment of replacement cost and collateral in the proposed framework is unsatisfactory when replacement cost or net collateral is negative.
- NIMM introduces the possibility of regulatory arbitrage as the framework makes it possible to reduce the add-on without changing the risk profile of the portfolio.
- Some elements of diversification are disregarded, in particular within interest rates hedging sets and foreign exchanges currency pairs.
- Some supervisory factors and correlations appear to be overly conservative.
- Some technical aspects of the asset classes' add-ons could be improved without adding extra complexity to increase risk sensitivity.

Over/under collateralisation

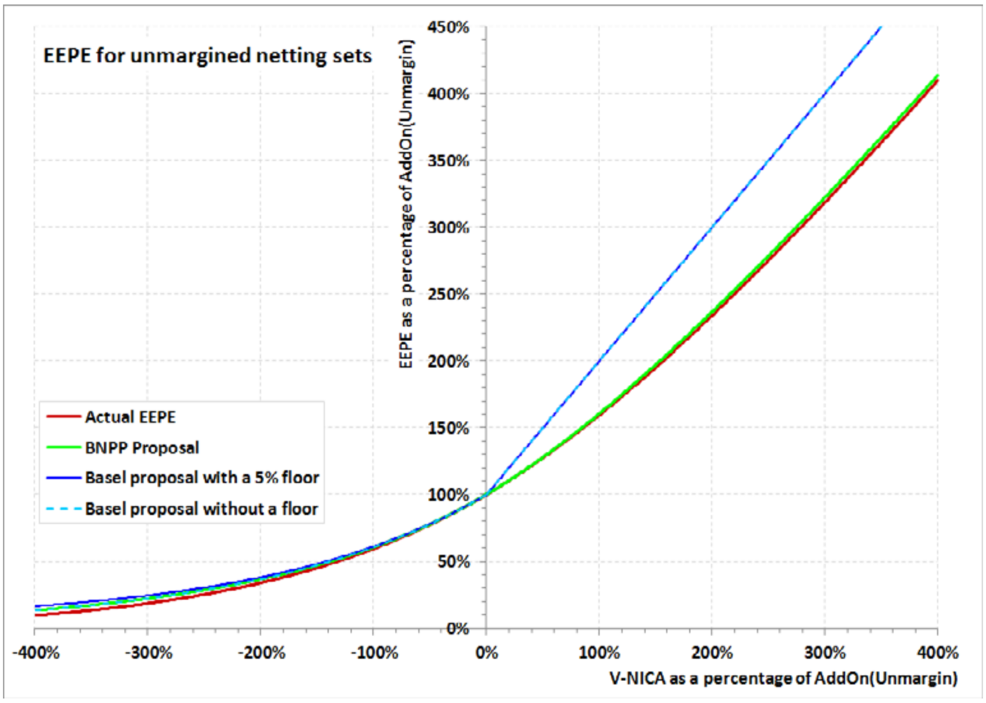
We welcome the Basel proposal attempt to account for over collateralisation in a way consistent to internal models. However we believe that there is room for some improvements as the proposal:

- Does not treat symmetrically under collateralisation (negative replacement cost). While a one unit of overcollateralization results in an effective expected exposure decrease of roughly one half, an under collateralisation of one unit leads to an increased EEPE of one.
- For margined netting sets, thresholds and minimum transfer amounts impact on EEPE can be either too low or too high. If the net independent collateral amount is large, the effect of threshold and MTA is nil while if NICA is small or negative, there is a one to one increase of EEPE. Besides, there is no limit to the effect of threshold and MTA which means that margined netting sets might be attributed a higher EEPE than un-margined netting sets.

We would like to propose a framework that builds-up on the NIMM multiplier method which would capture the effect of over/under collateralization properly as well as the impact of thresholds and minimum transfer amounts for collateralised netting sets. In designing our framework, we will be using the same assumption as the Basel Committee of normally distributed netting set future values [CP point 86].

For un-margined netting sets, it appears that an adequate approximation of EEPE is given by the below formula. This formula is similar to the one of the Basel Committee for over collateralised netting sets with the exception of the removal of the floor which is not warranted as the formula is already conservative to the actual EEPE. However, the proposed formula correctly apprehend the effect of under collateralisation unlike the current Basel Committee proposal.

$$EEPE_{unmargined}^{aggregate} = \underbrace{\mathrm{Max}(0; V - NICA)}_{RC} + \underbrace{AddOn_{unmargined}^{aggregate} \cdot Exp\left(-\frac{1}{2}\cdot\left|\frac{V - NICA}{AddOn_{unmargined}^{aggregate}}\right|\right)}_{PFE}$$



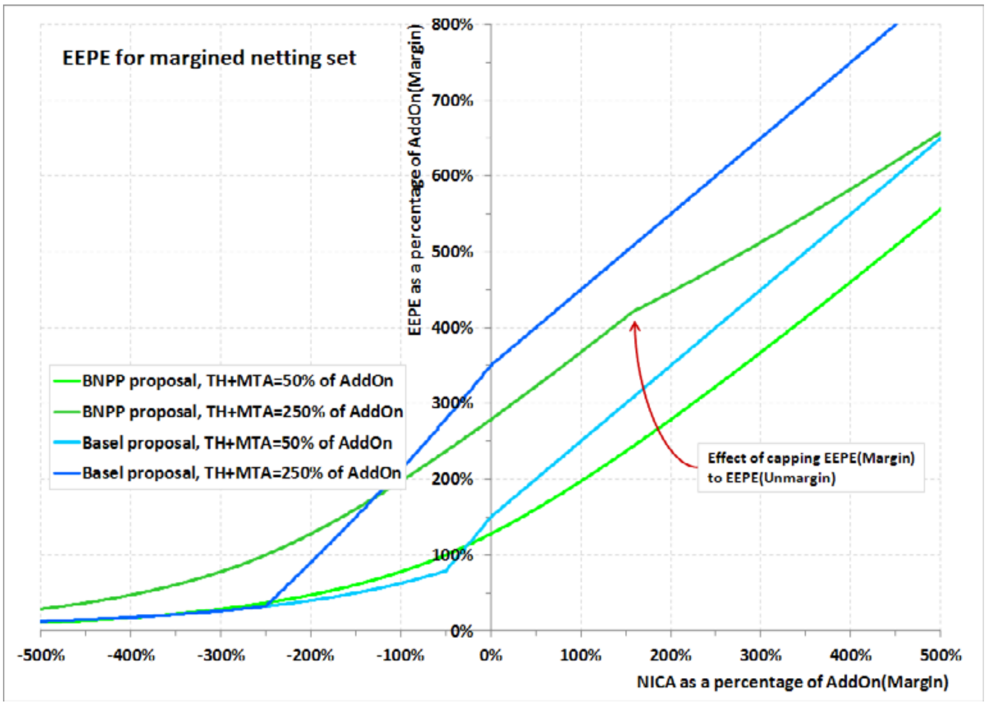
For margined netting sets, we will make the conservative assumption that at any point of time, the portfolio value net of variation margin is equal to its maximum: the sum of threshold and minimum transfer amount. Given this assumption, the expression of the effective expected exposure can be derived in the same way as for un-margined netting sets.

$$EEPE_{Margined} = \underbrace{\mathrm{Max}(0; TH + MTA - NICA)}_{RC} + \underbrace{AddOn_{Margined}^{Aggregate} \cdot Exp\left(-\frac{1}{2}\cdot\left|\frac{TH + MTA - NICA}{AddOn_{Margined}^{Aggregate}}\right|\right)}_{PFE}$$

However, the conservative assumption that we made is only valid when threshold and MTA are small. As they get larger, the conservativeness of the assumption increases to a point that the calculated EEPE will become larger than what it would be if the netting set was un-margined. This undesirable property can be alleviate by imposing that the margined EEPE is cap to the EEPE assuming that the netting set is un-margined.

In any circumstances, due to the assumption made, our proposal is conservative to what EEPE should actually be. It also exhibits desirable property as compared to the current Basel Committee proposal:

- Threshold and MTA do not result in an EEPE increasing by more than if they represented posted ICA.
- Threshold and MTA always increases EEPE, even if large amount of initial margins are collected.
- The effect of Threshold and MTA is cap to the difference between an un-margined netting set and a margined netting set EEPE.



Regulatory arbitrage opportunities

Though the proposed NIMM provides great improvements in term of risk sensitivities it also introduces some risk of regulatory arbitrage. We see arbitrage opportunities in two aspects of NIMM: the supervisory delta adjustment for non-linear instruments and the full netting across instruments irrespective of their expiries.

Options supervisory deltas

We welcome the Basel Committee recognition of options deltas. This is an important improvement from CEM. We however have concerns with respect to the application of a fixed 0.5 delta. Delta can vary significantly from near zero for far out of the money options to 1 for deep in the money options. Here we referred only to standard options, but more exotic options can have delta above 1 (but that is potentially accounted for through an increased notional).

One side effect of a fixed 0.5 delta is the potential regulatory arbitrage whereas positions could be taken up via deep in the money options rather than with linear products.

We would welcome the ability to use actual deltas for those institutions that wish to do so consistently. It is the only way to properly reflect options delta. We do not see this as a fundamental contradiction with the nature of NIMM: a “standard” universal way to calculate counterparty credit risk exposures. The modelling introduced is only on the products adjusted notional not on the way products net or diversify with one another.

Actually, the current regulation authorises the use of actual deltas in the Standardised Method [BCBS-128 Annex IV points 76 to 78]. We do not understand why the NIMM proposed framework shall depart from a practice that makes sense.

If however the Basel Committee rules out the use of actual deltas, a more risk sensitive delta would be a great improvement over a fixed delta. One possibility could be to define a formulaic delta based on Black-Scholes greeks for European calls and puts. Setting the risk free rate and dividend payment to zero and

using a volatility derived from NIMM supervisory factors we could express delta with the cumulative normal distribution. Though, we do not foresee any impediment in using the cumulative normal distribution, an even simpler bounded linear expression of delta could be derived.

- Long in the underlying (typically long Calls and short Puts):

$$\delta_i \approx \Phi\left(\frac{x}{\sigma_{SF}\cdot\sqrt{\tau}}+\frac{\sigma_{SF}\cdot\sqrt{\tau}}{2}\right)\approx \mathrm{Max}\left\{\mathrm{Min}\left\{0.5+0.2\cdot\sigma_{SF}\cdot\sqrt{\tau}+\frac{0.4}{\sigma_{SF}\cdot\sqrt{\tau}}\cdot x;1\right\};0\right\}$$

- Short in the underlying (typically short Calls and long Puts):

$$\delta_i \approx \Phi\left(\frac{-x}{\sigma_{SF}\cdot\sqrt{\tau}}+\frac{\sigma_{SF}\cdot\sqrt{\tau}}{2}\right)-1\approx \mathrm{Max}\left\{\mathrm{Min}\left\{-0.5+0.2\cdot\sigma_{SF}\cdot\sqrt{\tau}-\frac{0.4}{\sigma_{SF}\cdot\sqrt{\tau}}\cdot x;0\right\};-1\right\}$$

Where:

- x is relative the degree of moneyness.
  - For a Call option, $x=(Spot\text{-}Strike)/Strike$
  - For a Put option, $x=(Strike\text{-}Spot)/Strike$
- σ_{SF} is the supervisory annual volatility derived from the supervisory factors, assuming a Brownian distribution we could set $\sigma_{SF}=3/(2\cdot\phi(0))\cdot SF\approx 3.75\cdot SF$
- τ is the time to the option earliest exercise date

Netting across maturities

The non-accounting of the derivative expiry date for the calculation of the add-on may result in significantly under or over estimation of the add-on. NIMM implicitly assumes a flat adjusted notional exposure over the one year period on which EEPE is calculated while in reality the expected exposures might vary significantly.

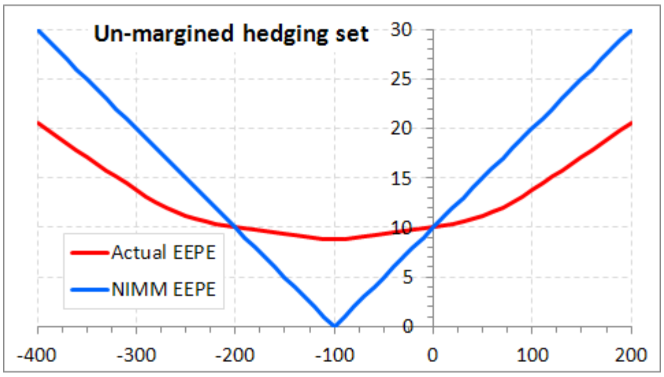
The below tables and charts illustrate the effect of not accounting derivative redemptions. We have built a hedging set made of one derivative with 100 adjusted notional maturing in more than 1 year and another derivative of varying adjusted notional and maturing in three months.

- For an un-margined hedging set, NIMM under-estimates the add-on when the short term derivative hedges the long term derivative. On the other hand, if the short term derivative creates, together with the long term derivative, an open position of size in excess of the long term derivative on its own, NIMM over estimates the add-on.

Hedging set:
- 1 position of over 1 year maturity and adjusted signed notional d1=100
- 1 position of 3 mths maturity and adjusted signed notional d2 as below

Supervisory factor no margin SF=10%

	Portfolio adjusted signed notional		Effective EPE		NIMM EEPE under/over
d2	0-3 Mth	3-12 Mth	Actual	NIMM	estimation
-250	-150	100	11.2	15.0	34%
-200	-100	100	10.0	10.0	0%
-150	-50	100	9.4	5.0	-47%
-100	0	100	8.8	0.0	-100%
-50	50	100	9.4	5.0	-47%
0	100	100	10.0	10.0	0%
50	150	100	11.2	15.0	34%



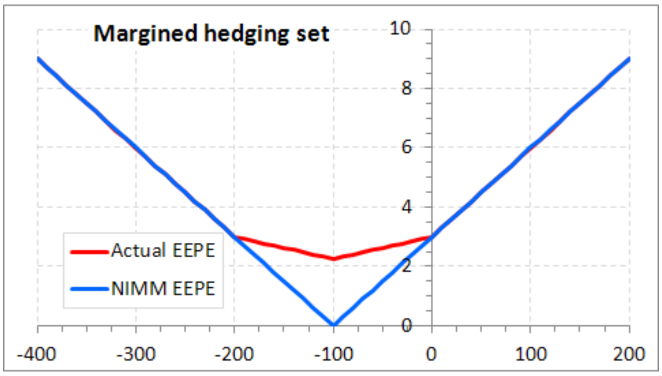
- On a margined hedging set, NIMM under-estimates the add-on for a short term position that hedges the long term position. However, due to the non-declining profile of expected exposures on which the EEPE is calculated, there is no over-estimation of the add-on when the short position is large in absolute term.

Hedging set:

- 1 position of over 1 year maturity and adjusted signed notional d1=100
- 1 position of 3 mths maturity and adjusted signed notional d2 as below

Supervisory factor no margin SF=10% (margined SF=3%)

	Portfolio adjusted signed notional		Effective EPE		NIMM EEPE under/over estimation
d2	0-3 Mth	3-12 Mth	Actual	NIMM	
-250	-150	100	4.5	4.5	0%
-200	-100	100	3.0	3.0	0%
-150	-50	100	2.6	1.5	-43%
-100	0	100	2.3	0.0	-100%
-50	50	100	2.6	1.5	-43%
0	100	100	3.0	3.0	0%
50	150	100	4.5	4.5	0%



As demonstrated above, the ability to net effective adjusted notional of all derivatives within a hedging set open the possibility of regulatory arbitrage. It suffices to add in a hedging set a short term derivative of equal adjusted notional and opposite direction.

To circumvent the proposed NIMM shortfall, there is no other possibility but to model the expected exposure profile. It could be done by calculating net adjusted exposures by redemption dates buckets. The expression of the EEPE becomes fairly complicated, in particular with respect to un-margined hedging sets. Below, we have chosen to use two maturity buckets only: the 0 to 3 months bucket and the over 3 months bucket.

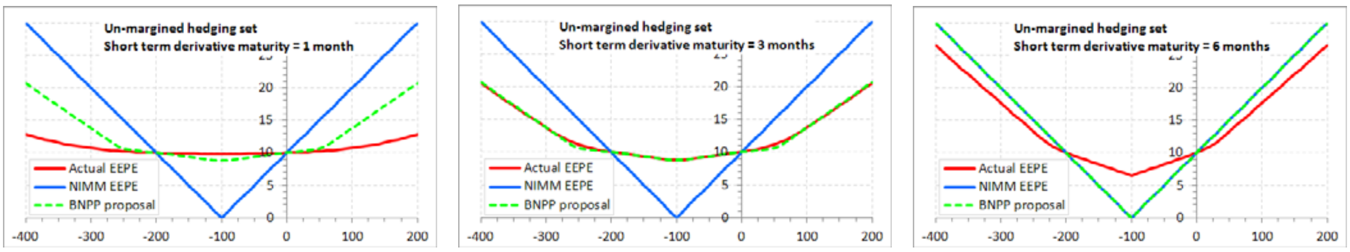
Un-margined hedging sets

Given some approximations, the expression of the effective expected exposures turns to be (see the Annex for the derivation of this equation):

$$EEPE_{Unmargin} = SF_{1Y} \cdot \left[\frac{\left|N_{0\to\infty}\right|}{8} + \mathrm{Max}\left\{ \frac{9}{16} \cdot \left|N_{0\to\infty}\right|, \frac{7}{8} \cdot \left|N_{3M\to\infty}\right| \right\} \right]$$

Where $N_{0\to\infty}$ and $N_{3M\to\infty}$ are the adjusted notional amounts on all transactions and on transactions maturing after 3 months only respectively.

For a similar hedging set as above, i.e. consisting in a derivative maturing after 1 year and another one with shorter maturity we see the proposed NIMM improvements works well whenever the short term transaction maturity falls within the 0 to 3 months buckets. If the short term transaction has a maturity in excess of three months, the proposed improvement makes no difference with the current NIMM framework. However, in such circumstance, the add-on under-estimations is relatively smaller



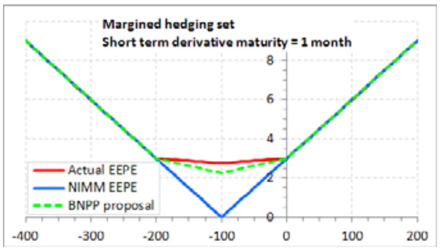
To make the proposal more effective, more buckets could be considered but it will be at the cost of additional complexity. In the Annex we provide an additional example with three buckets.

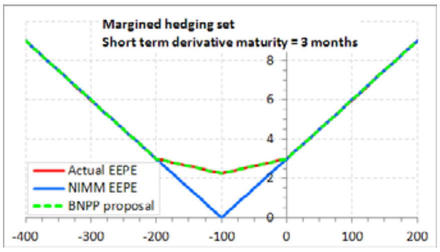
Margined hedging sets

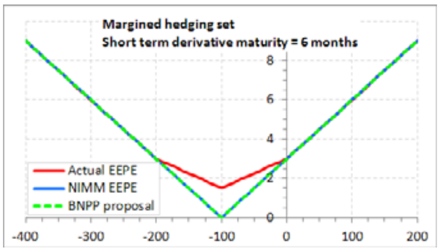
For margined netting sets, the expression of effective expected exposure is straight forward and need just to reflect the use of non-decreasing expected exposures for the calculation of EEPE.

$$EEPE_{Margin} = \frac{3}{2} \cdot SF_{1Y} \cdot \sqrt{\tau_{MPoR}} \cdot \left(\frac{1}{4} \cdot \left| N_{0\to\infty} \right| + \frac{3}{4} \cdot \mathrm{Max}\left\{ \left| N_{0\to\infty} \right| ; \left| N_{3M\to\infty} \right| \right\} \right)$$

Here again, the proposed NIMM improvement works well whenever the short term derivative maturity falls within the first bucket but we revert to the present proposed framework when the maturity falls in the second bucket.







For margined hedging sets, extending the formula to more buckets is straightforward. The Annex provide an example with three time buckets.

Diversification intra and inter asset classes

Under NIMM, some diversification effect is not recognised. This is particularly true for some intra-asset classes, namely:

- Interest rates derivatives of different currency.
- Currency pairs.
- Commodity broad categories.

We understand that it would far-fetched to allow some netting between those intra-asset class hedging sets. Indeed, risk factors correlations are difficult to predict, in particular in time of market stresses. On the other hand, we can be assured that those intra-asset class correlations are not equal to 1: there is some level of diversification. Full intra-asset classes diversification is already recognised in other parts of the Basle framework, for instance for the proposed initial margins calculations.

Consequently, we are advocating that the diversification effect of intra-asset class hedging sets is taken into account wherever the current framework does not. We propose that, the add-ons of all intra-asset class hedging sets be diversified in the same fashion as interest buckets exposures are under the approach 1 [BCBS-254 point 56], i.e. with a quadratic formula:

$$AddOn^{(a)} = \left[\sum_j \left(AddOn_j^{(a)} \right)^2 + \sum_j \sum_{k \neq j} 2 \cdot \rho_{j,k} \cdot AddOn_j^{(a)} \cdot AddOn_k^{(a)} \right]$$

Where ρ is the add-ons positive correlation which should be calibrated under stressed market conditions.

Similarly we question why the current NIMM framework does not recognise inter-asset classes diversifications. The same reasoning should apply and some level of diversification recognised. Again a quadratic formula would be well suited to represent the inter-asset classes diversification.

Calibration of supervisory factors and correlations

Considering the supervisory factors represent a measure of EEPE calibrated over a stress period, we feel that some of the SFs are overly conservative.

For instance, if we consider the single equity un-margined supervisory factor, it is set at 32%. For a stock, assumed to follow a Brownian motion, to have an EEPE equal to 32%, the yearly volatility must be around 120%. A more commensurate supervisory factor for single equity should probably not exceed 15%.

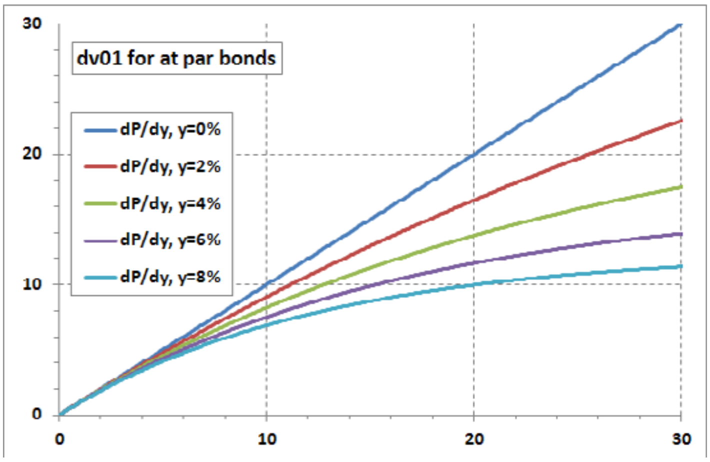
We also question the higher supervisory factor dedicated to the commodity Power. If the electricity markets does exhibit sometimes very high volatilities on very short term products (maturing within a few days), for the longer maturities (a few months), which represent the bulk of market participant exposures, the electricity market volatility is no higher than the one of other energy commodities. We therefore suggest that the Power supervisory factor is aligned with the other energy commodities supervisory factor. Alternatively, two maturity buckets could be considered: a short term bucket, say up to two weeks, with a higher supervisory factor such as the proposed 40% and a long term bucket with a supervisory factor of 15%, identical to the one of other energy commodities.

In light of the above we suggest that further analyses are carried out so as to calibrate commensurate supervisory factors and correlations.

Technical issues with some aspects of the add-ons calculation

Duration of interest rates and credit derivatives

We understand the Basel Committee choice to consider the underlying remaining time to maturity in lieu of duration has been driven by simplicity and conservatism considerations. This appears to us overly conservative though for long term instruments. For example, a swap maturing in 30 years and bearing 5% fix rate has a duration roughly half of its remaining maturity. Relying on maturities as a proxy for durations will be even more flawed for derivatives on amortising underlying instruments.



Just as we feel that actual option delta could and should be used (see section “Options supervisory deltas”), we believe that actual duration could and should be used. The same argument holds: using actual duration is not in violation of NIMM “standard” method status.

However, if the Basel Committee does not envisage allowing actual durations, we propose to use a proxy formula for durations. A bond paying continuous coupon has a simple dv01 expression in term of continuously compounded yield:

$$dv01 = -\frac{1}{y} \cdot \left(1 - e^{-y \cdot t}\right)$$

The same expression could be used in the context of NIMM. A highly liquid and available yield could be used in the expression such as a 10 years swap rate. Alternatively, a one fit all yield of say 4% could be used.

We also question the flooring of the underlying remaining maturities to one year. We do not understand the background of this element of conservatism. Short term derivatives do have a lower sensitivity to the level of interest rates and this should be recognised.

Interest rate cross bucket diversification

A principal component analysis would show that the primary driver, by far, of interest rate risk is the yield curve parallel shift. We therefore strongly support diversification across maturity buckets.

The recognition of partial offsetting with the use of a correlation matrix seems reasonable. We have however concerns with bucketing. If a position is hedged by a derivative of close but distinct maturity, the counterparty credit risk exposure will jump whenever the position or its hedge change bucket while the other side of the structure remain in the original bucket. This cliff effect could be avoided by using a more linear representation of the exposures.

Alternative method 1 – Full correlation method

The same technique of correlating positions could be applied not on a bucket by bucket basis but on a transaction by transaction basis. The only requirement is the expression of the correlation between two IR derivatives. The correlation should exhibit two features:

- The correlation should decrease as the duration gap between the two derivatives increases.
- The correlation should be lower for derivatives of short duration. The correlation between a 1 year and a 2 years derivative is lower than the correlation between a 29 years and a 30 years derivative.

We have chosen to express the correlation as:

$$\rho_{u,v} = 0.3 + 0.7 \cdot \exp\left(-\frac{0.6}{(t_u + t_v)/2} \cdot |t_u - t_v| \right)$$

Where t is the duration of the derivative.

We have compared the effective notional amount results between the Basel Committee proposed partial diversification approach and the one above and they are very close. This alternative method has the benefit of alleviating the cliff effect inherent with a bucketing solution. However it has the drawback of substantially raising the number of calculation. There are $n \cdot (n-1)/2$ correlations to be calculated. Even though the correlation expression is simple, the amount of calculations might be seen as an insurmountable obstacle. Hence, we devised another alternative method…

Alternative method 2 – Simplified correlation method

The starting idea is similar than the above alternative method. However, we are expressing the correlation between two transactions as the product of two factors, one depending only on the first transaction, the other one depending only on the second transaction.

$$\rho_{u,v} = \tilde{\rho}_u \cdot \tilde{\rho}_v$$

The partial diversification expression turns to be:

$$EffectiveNotional_j^{(IR)} = 1.1 \cdot \left[\sum_u \sum_v \tilde{\rho}_u \cdot \tilde{\rho}_v \cdot D_{j,u}^{(IR)} \cdot D_{j,v}^{(IR)} \right]^{\frac{1}{2}} = 1.1 \cdot \left| \sum_u \tilde{\rho}_u \cdot D_{j,u}^{(IR)} \right|$$

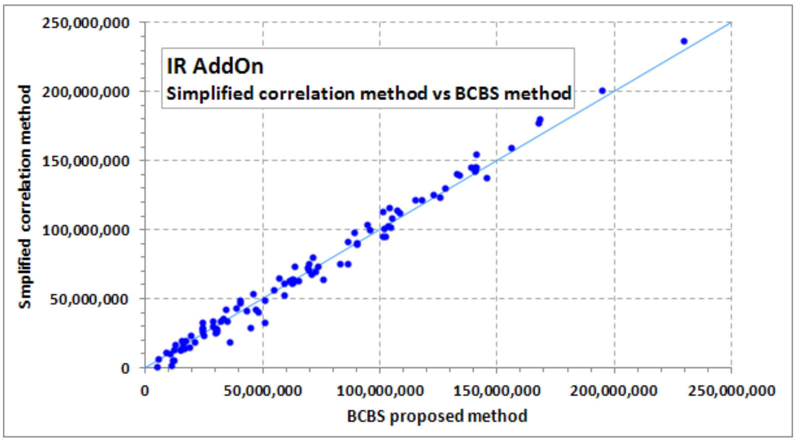
The multiplier 1.1 is introduced because of the convexity of the square function. The expression of the correlation factor attached to a transaction is inspired from the above one:

$$\tilde{\rho}_u = \sqrt{0.3 + 0.7 \cdot \exp\left(-\frac{0.6}{(t_u + T)/2} \cdot |t_u - T|\right)}$$

Where T is the average of the transactions durations.

This method gathers the benefit of removing any cliff effect while keeping the implementation simple. There are only n correlation factors to be calculated, one per transaction.

We compare this "simplified correlation method" with the Basel Committee approach on hundred theoretical portfolios, some delta neutral and some directional. We found that effective notional amounts are very close.



We therefore suggest that the Basel Committee consider using a method such as the above "Simplified correlation method" for correlating derivatives within an interest rates hedging set.

Foreign exchange triangulation

Foreign exchange derivatives hedging sets have been defined as currency pairs with no diversification between hedging sets. This approach cannot cope with triangular positions resulting in a flat position.

If we consider the following positions: long EUR vs USD, long USD vs JPY and long JPY vs EUR the end net position is flat. If we disregard the basis risk between currency pairs, the add-on should be nil. However the proposed approach will simply sum up individual currency pair add-ons.

One way to solve this issue could be to consider the net position in each currency. Hence in our above example, the net position in all three currencies would be zero properly reflecting the riskless nature of the portfolio.

Other points of attention

Perimeter

In some jurisdictions, sold options are explicitly excluded from the counterparty credit risk. For instance, in Europe, the Capital Requirement Regulation (CRR) set the scope of the counterparty credit risk to the instruments listed in Annex II [CRR Art-271] which includes only purchased options. We would like to have confirmation on whether sold options are included or excluded of the scope of counterparty credit risk in particular with respect to NIMM. Not including sold options could result in breaking hedges, artificially showing a directional position which does not exist.

Mapping to risk factors

The proposed framework requires transactions to be mapped onto one of the five asset classes. This mapping should be straight forward for a majority of transactions; however, we would like to seek clarification on derivatives with multiple primary risk drivers such as cross currency swaps or power duals.

The consultative paper leaves the doors opened for National Competent Authority (NCA) to decide on which class to map such products or whether they should map on several asset classes [CP point 44]. We would like the Basel Committee to provide guidance to avoid multiplicity of NIMM implementations across jurisdictions and maintain a level playing field among institutions in line with the stated objective of minimising national or banks discretion [CP point 12].

Also, there is some uncertainty with regard to the mapping of Gold. In the Example 3 of Annex 2, Gold has been considered as a commodity. However, the current Basel framework treats Gold as a currency. We would like to have confirmation on whether Gold should be considered a currency, a commodity or both depending on whether the derivatives settled physically or not.

Notional amounts

The definition of notional amounts is not always straightforward. This is not a novelty; the uncertainty over the definition of notional amounts for some products already exists. However, this could be a good opportunity to provide some guidance. The risk, in the absence of such guidance, is that each institution or jurisdiction uses a different definition leading to heterogeneous exposure amounts for identical portfolios. This would be in contradiction with NIMM objective and could lead to an uneven playing field.

We would like to draw the attention on some specific products:

- Single currency floating/floating interest rates swaps
  The current Basel framework sets no potential future exposure for single currency floating/floating interest rates swaps [BCBS-128 Annex IV point 92(i)]. Will NIMM have the same treatment and set the notional amount of those products to zero? It would be consistent with NIMM full netting of interest rates positions in a same currency and maturity bucket.
- Leverage products
  The current Basel framework foresees higher notional amounts for “leveraged or enhanced” products [BCBS-128 Annex IV point 92(ii)]. Will NIMM retain such provision? How products could be assessed as leveraged or enhanced and by how much should their notional be inflated?
- Commodity spread products
  Commodity derivatives can be spread derivatives: the payoff depends on the spread between two underlying commodities. What should be the notional amount of such derivatives?
  - If the two underlying commodities are of the same type, we believe that it would make sense to set the notional amount to zero to be consistent with NIMM full offsetting of derivatives referencing the same type of commodity.
  - If the two underlying commodities are not of the same type, should it give rise to two exposures, one in each underlying type?
- Cross currency swap
  The treatment of cross currency swap is unclear at this stage. Should it be considered as a foreign exchange product or an interest rate product? We believe that the main counterparty credit risk driver is foreign exchange risk and suggest that cross currency swap be map to the FX asset class. If however a cross currency swap was to be split into an FX exposure for the exchange of nominal at maturity and two interest rate exposures, one in each currency, what would be the notional amount of each IR leg and what maturity should be retained for those two legs?

- Equity dividend swaps

  What should be the notional amounts for dividend swaps? The notional amount that would be commensurate with the level of risk should be the discounted expected dividends over the life of the swap. Considering that theoretically the price of equity is the sum of all future discounted dividends, a simple rule of thumb could be the underlying equity value multiplied by a rising function of maturity capped at the equity value. For instance, the notional of dividend swaps could be set to $N \cdot (1\text{-}\exp(-\lambda \cdot t))$.
- Sold credit protection

  Credit protection sellers upside is limited to the discounted CDS fees. Consequently we suggest that a net credit protection seller on a reference entity has its add-on capped at the sum of the discounted fees.

Alpha multiplier

While we understand the logic that prevailed in the application of the alpha multiplier to the replacement cost and add-on sum we believe that setting alpha to 1.4 is overly conservative.

The role of alpha is primarily to capture the general wrong way risk. It is set conservatively to 1.4 for institutions that do not calibrate it. However, actual calibrations of the alpha multiplier show that its value is generally below that level. This has been recognised in BCBS-128, Annex-4, point 34 where calibrated alpha, expected to be lower than 1.4, is being floored at 1.2.

In the context of a “standardised method” such as NIMM, we believe that there is no need of using a conservative alpha multiplier as the other aspects of the method are already conservatively set. We therefore suggest that the IMM floor for alpha, i.e. 1.2, is used.

Answer to the consultative paper questions

Q1. Should the Basel Committee replace the CEM and SM with the NIMM in all areas of the capital framework? What are the benefits and drawbacks of using the NIMM in each of these areas?

Considering that CEM, and SM to a lesser extent, have proved to have little risk sensitivity and grossly overstate exposures, we welcome the replacement of CEM and SM by NIMM wherever those two methods are used.

However, NIMM should not preclude the use of internal model methods (IMM) in all aspects of the regulation. That is why we take the opportunity to reiterate our view that internal model methods should be allowed in the context of the large exposure framework and the CCPs’ calculation of hypothetical capital.

Q2. Is the proposed approach of retaining the general structure of the CEM with respect to replacement cost and the potential future exposure add-on appropriate? Is the division of the broad asset classes appropriate?

The general structure of expressing the exposure is not so important for as long as the end results correctly reflects the actual counterparty credit risk exposure. Breaking down the exposure in a current exposure, the replacement cost (RC), and a potential future exposure (PFE), the slippage over the margin period of risk (MPoR), has the merit of clarity and might ease the replacement of CEM. As exposed in the section “Over/under collateralisation” of this answer, an adequate methodology around this structure is perfectly possible.

The split between those five asset classes is relatively standard within the regulation. It should be suitable for most derivatives. However, as exposed in the section “Mapping to risk factors”, some clarification should be provided on the mapping of some products.

Q3. Are there specific product types that are not adequately captured in the outlined categories?

As outlined above we are questioning the mapping of gold as NIMM suggests it should be allocated to the commodity asset class while current regulations treat gold as an FX product.

Also, precious metals other than gold are often distinguished from base metals in the regulation. The Basle II counterparty credit risk framework [BCBS-128 Annex IV] sets lower supervisory factors for previous metals both within the Standardised Method [point 86] and the Current Exposure Method [point 92(i)].

Q4. Does the above approach reflect the replacement cost of margined transactions? Are there any other collateral mechanics that the Basel Committee should consider?

At first, it might seem that the replacement cost of margined transactions really is *V-VM-NICA*. However, *V-VM* really represents the first day of the regulatory margin period of risk and is therefore reflected in the add-on. On the other hand, we might make the conservative assumption that we stood the day before at the maximum portfolio value before a margin call is made. Consequently, we suggest that for margined netting set, the replacement cost is set at Max{0; *TH+MTA-NICA*} just as we did in our proposed methodology in section "Over/under collateralisation".

Q5. Of the options under consideration for recognising offset across hedging sets, which treatment is preferred? What number of maturity buckets is appropriate to consider?

As stated earlier, within a hedging set (interest rates derivatives of a given currency) there are strong correlations as parallel shift is the primary risk factor. We therefore naturally favour allowing diversification across maturity buckets, i.e. "approach 1".

The ideal number of buckets is a difficult call as simplicity has to be balanced with risk sensitivity.

However, we would like the Basel Committee to consider a solution without full offsetting of derivatives falling in a same bucket and no cliff effect (transactions moving from one bucket to the other) such as the one we proposed in section "Interest rate cross bucket diversification": the "Simplified correlation method".

Q6. Is the proposed approach of using a different methodology for determining the add-on for each asset class appropriate? Is each proposed add-on methodology for each asset class effective at capturing the main risk driver of that asset class?

We find that broadly the different methodologies proposed are adequate for estimating the add-on. The use of distinct methodology is warranted as asset classes have strong specificities. As exposed in the preceding sections, some improvements could be made, in particular with respect to:

- Appropriately reflecting the expected exposure profile over one year to avoid under or over estimation of the add-on and avoid regulatory arbitrage.
- Recognising intra-class hedging sets diversification wherever NIMM has not done so, namely:
  - Between interest rates derivatives of different currency.
  - Between foreign exchange pairs (in the current proposed framework) or currencies (as in the above alternative treatment of FX derivatives).
  - Between broad categories of commodity derivatives.

Q7. Are the proposed minimum time risk horizons for each transaction category (unmargined, non-centrally cleared, centrally cleared) appropriate? Should the Basel Committee consider factors other than the IMM for determining the appropriate time risk horizon for the NIMM (eg harmonising with other international or national legislation)?

We support aligning NIMM time risk horizon to the IMM time risk horizon.

In this respect we appreciate that the present proposal set the margin period of risk to five business days for cleared derivative transactions on the client leg [BCBS-254 point 81]. We suggest that the IMM framework is amended accordingly. For listed derivatives, the margin period of risk could actually be even lower: set to 2 or 3 business days.

Also, considering that for margined transactions the add-on is higher than for un-margined transaction if the MPoR is equal to 6 months or above (but also due to the way threshold and MTA are accounted for), we suggest that the regulation explicitly cap the margined add-on to the value of the un-margined add-on.

Q8. Do the suggested formula and 5% floor appropriately recognise the benefits of overcollateralisation?

First of all we would like to point at what is likely a typo in the expression of the multiplier. We believe that the (1+*floor*) factor should in fact be a (1-*floor*) factor.

Secondly, we do not support the introduction of a floor. It seems to be an arbitrary conservative element of the regulation. This in spite of the fact that the chosen exponential expression without the introduction of a floor is already conservative compared to what the expression of the multiplier should actually be.

Finally, the multiplier should be symmetrised as the effect of a unit of over collateralisation is identical, but of opposite direction, to the effect of a unit of under collateralisation. This is the object of the section "Over/under collateralisation".

Q9. Is the proposed approach to aggregate across asset classes appropriate?

The simple addition of cross asset class add-ons is too conservative. We would welcome the introduction of some diversification benefit.

Q10. Are there any risk factors that should be included in their own category or accounted for in another manner?

As mentioned above we are questioning the mapping of gold to the commodity asset class. We also suggest that a specific supervisory factor is granted to precious metals, lower than the one of the Metal broad category.

Q11. Is the proposal to introduce the multiplier in order to allow reduction of the PFE add-on in the IMM shortcut method appropriate?

It makes sense to adapt the IMM shortcut method to account for negative mark-to-market or overcollateralization in the same way as NIMM does.

Annex: Expected exposure profile modelling

For internal models, the effective expected positive exposure is calculated as the average of the non-declining expected exposures. We will be trying to replicate this methodology within the NIMM framework by assessing the expected exposures at different point in time in the 0 to 1 year maturity interval.

We will consider n+1 points in time, $\{T_i\}_{0\le i\le n+1}$ with T_0=0 and T_n=1, dividing the 0 to 1 year maturity range in n buckets. The expected exposure, as a function of time, within a bucket $[T_i, T_{i+1}]$ is written $ee_i(t)$ and is a function of the hedging set effective notional at time t, i.e. the effective notionals of all transactions that have not matured on or before t: $N_{t\to\infty}$. We will assume a constant hedging set effective notional over any buckets, equal to the ones that prevailed on the maturity ranges lower boundaries. We will use upper case letters to denote the non-decreasing expected exposure profile. Hence, at each point in time T_i, EE_i will be the non-decreasing expected exposure.

Non-margined hedging sets

The expression of the expected exposure for non-margined hedging sets is given by:

$$\forall i \in [0, n-1],\ t \in [T_i, T_{i+1}[:\quad ee_i(t) = \frac{3}{2}\cdot SF_{1Y}\cdot\left|N_{T_i\to\infty}\right|\cdot\sqrt{t}$$

The non-decreasing expected exposure at point in time T_i expression is:

$$\forall i \in [1, n],\quad EE_i = \mathrm{Max}\{EE_{i-1}, ee_{i-1}(T_i)\}$$

The expression of what would be the EEPE in an internal model is easily derived using the approximation that the integral of a maximum is the maximum of the integrals:

$$\begin{aligned} EEPE_{Unmargin} &= \sum_{0\le i<n}\int_{T_i}^{T_{i+1}}\mathrm{Max}\{ee_i(t); EE_i\}\cdot dt \\ &= \sum_{0\le i<n}\int_{T_i}^{T_{i+1}}\mathrm{Max}\left\{\frac{3}{2}\cdot SF_{1Y}\cdot\left|N_{T_i\to\infty}\right|\cdot\sqrt{t};\ EE_i\right\}\cdot dt \\ &\approx \sum_{0\le i<n}\mathrm{Max}\left\{\int_{T_i}^{T_{i+1}}\frac{3}{2}\cdot SF_{1Y}\cdot\left|N_{T_i\to\infty}\right|\cdot\sqrt{t}\cdot dt;\ \int_{T_i}^{T_{i+1}}EE_i\cdot dt\right\} \\ &= \sum_{0\le i<n}\mathrm{Max}\left\{SF_{1Y}\cdot\left|N_{T_i\to\infty}\right|\cdot\left(T_{i+1}^{\frac{3}{2}}-T_i^{\frac{3}{2}}\right);\ EE_i\cdot(T_{i+1}-T_i)\right\} \end{aligned}$$

If we solve the above expression with one point in time, 3 months dividing the 0 to 1 year interval in two buckets, the expression of EEPE reduces to:

$$EEPE_{Unmargin} = SF_{1Y}\cdot\left[\frac{\left|N_{0\to\infty}\right|}{8} + \mathrm{Max}\left\{\frac{9}{16}\cdot\left|N_{0\to\infty}\right|, \frac{7}{8}\cdot\left|N_{3M\to\infty}\right|\right\}\right]$$

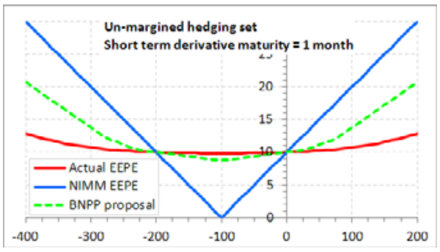
For three buckets, 0 to 3 months (1/4 year), 3 months to 9/16 year (0.5625 year) and 9/16 to 1 year, the expression of the EEPE turns to be:

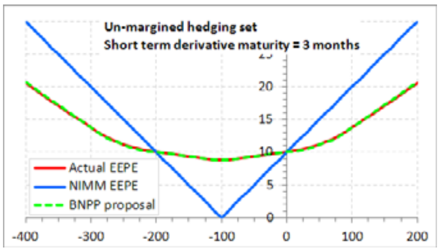
$$EEPE_{Unargin} = SF_{1Y}\cdot\left[\frac{1}{8}\cdot\left|N_{0\to\infty}\right| + \mathrm{Max}\left\{\frac{15}{64}\cdot\left|N_{0\to\infty}\right|; \frac{19}{64}\cdot\left|N_{1/4\to\infty}\right|\right\} + \mathrm{Max}\left\{\frac{21}{64}\cdot\left|N_{0\to\infty}\right|; \frac{63}{128}\cdot\left|N_{1/4\to\infty}\right|; \frac{37}{64}\left|N_{9/16\to\infty}\right|\right\}\right]$$

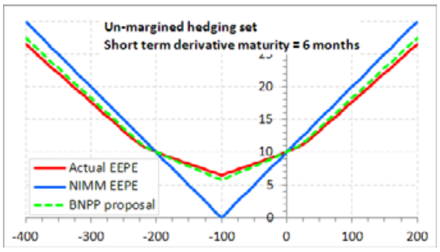
The choice of the two points in time resulted from two principles:

- Having more buckets for the short maturities then for the longer maturities
- Using the square of fractions to derive an expression with fractions of integers factors

In the core of our answer to the consultative paper we have provided the illustration of our proposal for a long maturity derivative and short maturity derivative portfolio with the two buckets expression. Below, the same charts are provided for the three buckets expression.







Margined hedging sets

The same approach is followed for a margined hedging set of margin period of risk τ_{MPoR}.

$$\forall i \in [0, n-1],\ t \in [T_i, T_{i+1}[:\quad ee_i(t) = \frac{3}{2} \cdot SF_{1Y} \cdot |N_{T_i \to \infty}| \cdot \sqrt{\tau_{MPoR}}$$

$$\forall i \in [1, n],\quad EE_i = \mathrm{Max}\{EE_{i-1}, ee_{i-1}(T_i)\}$$

$$\begin{aligned}
EEPE_{Margin} &= \sum_{0 \le i < n} \int_{T_i}^{T_{i+1}} \mathrm{Max}\{ee_i(t); EE_i\} \cdot dt \\
&= \sum_{0 \le i < n} \int_{T_i}^{T_{i+1}} \mathrm{Max}\left\{\frac{3}{2} \cdot SF_{1Y} \cdot |N_{T_i \to \infty}| \cdot \sqrt{\tau_{MPoR}};\ EE_i\right\} \cdot dt \\
&= \sum_{0 \le i < n} \mathrm{Max}\left\{\int_{T_i}^{T_{i+1}} \frac{3}{2} \cdot SF_{1Y} \cdot |N_{T_i \to \infty}| \cdot \sqrt{\tau_{MPoR}} \cdot dt;\ \int_{T_i}^{T_{i+1}} EE_i \cdot dt\right\} \\
&= \sum_{0 \le i < n} \mathrm{Max}\left\{\frac{3}{2} \cdot SF_{1Y} \cdot |N_{T_i \to \infty}| \cdot \sqrt{\tau_{MPoR}} \cdot (T_{i+1} - T_i);\ EE_i \cdot (T_{i+1} - T_i)\right\} \\
&= \frac{3}{2} \cdot SF_{1Y} \cdot \sqrt{\tau_{MPoR}} \cdot \sum_{0 \le i < n} \mathrm{Max}\{|N_{T_k \to \infty}|, k \in [0, i]\} \cdot (T_{i+1} - T_i)
\end{aligned}$$

Again we solve the expression of the EEPE for the same two or three buckets:

- Two buckets: 0 to 3 months and 3 months and over:

$$EEPE_{Margin} = \frac{3}{2} \cdot SF_{1Y} \cdot \sqrt{\tau_{MPoR}} \cdot \left(\frac{1}{4} \cdot |N_{0 \to \infty}| + \frac{3}{4} \cdot \mathrm{Max}\{|N_{0 \to \infty}|; |N_{3M \to \infty}|\}\right)$$

- Three buckets: 0 to 3 months, 3 months to 9/16 year and 9/16 year and over:

$$EEPE_{Margin} = \frac{3}{2} \cdot SF_{1Y} \cdot \sqrt{\tau_{MPoR}} \cdot \left(\frac{1}{4} \cdot |N_{0 \to \infty}| + \frac{5}{16} \cdot \mathrm{Max}\{|N_{0 \to \infty}|; |N_{1/4 \to \infty}|\} + \frac{7}{16} \cdot \mathrm{Max}\{|N_{0 \to \infty}|; |N_{1/4 \to \infty}|; |N_{9/16 \to \infty}|\}\right)$$

We have illustrated our proposal with two buckets in the core of our answer to the consultative paper. Below are the same charts for the three buckets proposal: