**Annex IIIa and IIIb-A**

**Examples of calculation of default risk exposure under the SA-CCR approach**

- The counterparty of the derivative contracts in each of the cases below is an unrated corporate and the AI concerned has not made use of any recognized guarantee or recognized credit derivative contract to mitigate the default risk exposure to the corporate arising from these contracts.

## Case 1: Unmargined contracts not covered by recognized netting

In this case, since the derivative contracts entered into by the AI with the corporate are not covered by recognized netting, each contract forms a single netting set. Also, neither the AI nor the counterparty has posted collateral for the contracts.

Netting set A

| **Contract** | **Type of contract** | **Base currency** | **Notional** (HK$'000) | **Residual maturity** (in year) | **Pay** | **Receive** | **Market value** (HK$'000) |
|---|---|---|---|---|---|---|---|
| A1 | Interest rate swap | HKD | 10,000 | 0.25 | Fixed | Floating | 10 |

Netting set B

| **Contract** | **Type of contract** | **Base currency** | **Notional** (HK$'000) | **Residual maturity** (in year) | **Pay** | **Receive** | **Market value** (HK$'000) |
|---|---|---|---|---|---|---|---|
| A2 | Interest rate swap | HKD | 10,000 | 5 | Floating | Fixed | -25 |

Netting set C

| **Contract** | **Type of contract** | **Base currency** | **Notional** (HK$'000) | **Residual maturity** (in year) | **Reference entity** | **ECAI issuer rating of reference entity** | **Position of the AI** | **Market value** (HK$'000) |
|---|---|---|---|---|---|---|---|---|
| A3 | Credit default swap | HKD | 10,000 | 2 | Firm X | BBB | Protection seller | 50 |

## I. Calculation of default risk exposure

Step 1: Calculation of replacement cost (*RC*) at the level of netting set

$$RC \quad = max \ (V - C; 0)$$

$RC_{netting\ set\ A} = \max(10 - 0; 0) = 10$

$RC_{netting\ set\ B} = \max(-25 - 0; 0) = 0$

$RC_{netting\ set\ C} = \max(50 - 0; 0) = 50$

Step 2: Calculation of add-on at the level of netting set

*Step 2.1: Calculation of contract-level adjusted notional amount ($d_i$)*

| **Contract** | **Hedging Set** | $S_i$ | $E_i$ | **Notional amount** (HK$'000) (a) | **Supervisory duration ($SD_i$)** (b) | **Adjusted notional amount ($d_i$)** (HK$'000) = (a) × (b) |
|---|---|---|---|---|---|---|
| A1 | HKD | 0 | 0.25 | 10,000 | 0.248 | 2,484 |
| A2 | HKD | 0 | 5 | 10,000 | 4.424 | 44,240 |
| A3 | NA | 0 | 2 | 10,000 | 1.903 | 19,033 |

The supervisory duration of contract *i*, which is subject to a floor of 10 business days, is calculated as follows:

$$SD_i = \frac{exp(-0.05 * S_i) - exp(-0.05 * E_i)}{0.05}$$

$SD_{A1} = \frac{exp(-0.05*0) - exp(-0.05*0.25)}{0.05} = 0.248$

$SD_{A2} = \frac{exp(-0.05*0) - exp(-0.05*5)}{0.05} = 4.424$

$SD_{A3} = \frac{exp(-0.05*0) - exp(-0.05*2)}{0.05} = 1.903$

*Step 2.2: Calculation of effective notional amount ($D_i$) at the level of hedging set*

For unmargined contract *i* not subject to recognized netting, the effective notional amount of a hedging set is equivalent to the effective notional amount of contract *i* and is given by the following formula:

$$D_i = \delta_i * d_i * MF_i^{(unmargined)}$$

where $MF_i^{(unmargined)}$ is the maturity factor applicable to contract *i* given by the following formula ($M_i$ is subject to a floor of 10 business days):

$$MF_i^{(unmargined)} = \sqrt{\frac{min\{M_i; 1\ year\}}{1\ year}}$$

$$MF_{A1}^{(unmargined)} = \sqrt{\frac{min\{0.25; 1\}}{1}} = 0.5$$

$$MF_{A2}^{(unmargined)} = \sqrt{\frac{min\{5; 1\}}{1}} = 1$$

$$MF_{A3}^{(unmargined)} = \sqrt{\frac{min\{2; 1\}}{1}} = 1$$

| **Contract** | **Residual maturity ($M_i$)** | **Supervisory delta ( $\delta_i$)** (a) | **Adjusted notional amount ($d_i$)** (HK$'000) (b) | **Maturity factor ($MF_i$)** (c) | **Effective notional amount ($D_i$)** (HK$'000) = (a) × (b) × (c) |
|---|---|---|---|---|---|
| A1 | 0.25 | +1 | 2,484 | 0.5 | 1,242 |
| A2 | 5 | -1 | 44,240 | 1 | -44,240 |
| A3 | 2 | -1 | 19,033 | 1 | -19,033 |

*Step 2.3: Calculation of add-on at the level of netting set*

For an interest rate[1] or credit-related[2] derivative contract not covered by recognized netting, the add-on for the netting set concerned is calculated as follows:

$$AddOn = SF * |D_i|$$

| **Netting set** | **Contract** | **Absolute value of effective notional amount ($\|D_i\|$)** (HK$'000) (a) | **Supervisory factor (*SF*)** (b) | **Add-on** (HK$'000) = (a) × (b) |
|---|---|---|---|---|
| A | A1 | 1,242 | 0.5% | 6.21 |
| B | A2 | 44,240 | 0.5% | 221.20 |
| C | A3 | 19,033 | 0.54% | 102.78 |

Step 3: Calculation of potential future exposure (PFE) and default risk exposure at the level of netting set

$$PFE \quad = multiplier * AddOn$$

$$Default \;\; Risk \;\; Exposure \quad = alpha * \left(RC \quad + PFE \quad\right)$$

[1] For a netting set that contains only one contract, if the contract is an interest rate contract, Formulas 23AS and 23AT in §226BU(2) of the BCR should result in the same effective notional amount for the contract. That is-

$$Effective \;\; Notional^{(IR)} = \;\; \left|D^{(MB)}\right|$$

where $D^{(MB)}$ is the effective notional amount for the maturity bucket in which the contract falls. However, since there is only one maturity bucket in the netting set, the actual calculation does not require allocation of the contract into a maturity bucket.

[2] For a netting set that contains only one contract, if the contract is a credit-related derivative contract, Formula 23AQ in §226BT(3) of the BCR will be reduced to –

$$AddOn^{(credit)} = [AddOn(Entity_k)^2]^{0.5} \;\; = AddOn(Entity_k) = SF_k^{(Credit)} * Effective \;\; Notional_k^{(Credit)}$$

| **Netting set** | **RC** (HK$'000)<br><br>(a) | **Multiplier**<br><br>(b) | **Add-on** (HK$'000)<br><br>(c) | **PFE** (HK$'000)<br><br>(d) = (b) × (c) | **Default risk exposure** (HK$'000)<br>=1.4*((a) + (d)) |
|---|---|---|---|---|---|
| A | 10 | 1 | 6.21 | 6.21 | 22.69 |
| B | 0 | 0.945 | 221.20 | 209.03 | 292.65 |
| C | 50 | 1 | 102.78 | 102.78 | 213.89 |
| | | | | **Total** | **529.23** |

The multiplier applied to each of the above netting sets is calculated as follows:

$$multiplier = \min\left\{1; Floor + (1 - Floor) * exp\left(\frac{V - C}{2 * (1 - Floor) * AddOn}\right)\right\}$$

For both netting sets A and C, since the current market value of the netting set is positive and no net collateral is held by the AI, the multiplier is equal to 1.

For netting set B–

$$multiplier_{netting\ set\ B} = \min\left\{1; 5\% + (1 - 5\%) * exp\left(\frac{-25}{2*(1-5\%)*221.2}\right)\right\} = 0.945$$

## II. Reporting arrangement

Division A - RWA

a. Part IIIa

(in HK$'000)

| Item | Nature of item | On-balance sheet exposures | Off-balance sheet exposures | | | | |
|---|---|---|---|---|---|---|---|
| | | Principal Amount (A1) | Principal Amount / Notional Amount (A2) | Credit Equivalent Amount (A3) | Default Risk Exposure (A4) | Risk-weight % (A5) | Risk-weighted Amount (A6) = (A1+A3+A4) x A5 |
| **Class VIII** | **Other Exposures** | | | | | | |
| 29a. | Exposures to corporates or individuals not elsewhere reported | | 30,000 | | 529 | 100 | 529 |
| 29b. | Holdings of equity or other forms of capital instruments issued by, and non-capital LAC liabilities of, financial sector entities subject to 100% risk-weight | | | | | 100 | |
| 29h. | Other exposures not elsewhere reported | | | | | | |
| 29h(1). | | | | | | | |
| 29h(2). | | | | | | | |
| 29h(3). | | | | | | | |
| 29h(4). | | | | | | | |
| | **SUBTOTAL** | | **30,000** | | **529** | | **529** |

b. Part IIIb

(in HK$'000)

| Item | Nature of item | On-balance sheet exposures | | Off-balance sheet exposures | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Principal Amount (A1) | Principal Amount after CRM (A2) | Principal Amount / Notional Amount (A3) | Credit Equivalent Amount after CRM (A4) | Default Risk Exposure after CRM (A5) | Risk-weight % (A6) | Risk-weighted Amount (A7) = (A2+A4+A5) x A6 |
| **Class VI** | **Corporate Exposures** | | | | | | | |
| 9a. | Risk-weight 20% | | | | | | 20 | |
| 9b. | Risk-weight 30% | | | | | | 30 | |
| 9c. | Risk-weight 50% | | | | | | 50 | |
| 9d. | Risk-weight 100% | | | 30,000 | | 529 | 100 | 529 |
| 9e. | Risk-weight 150% | | | | | | 150 | |
| | **SUBTOTAL** | | | **30,000** | | **529** | | **529** |

## Division B – Default risk exposure amount

### a. Part IIIa Division B - III

(in HK$'000)

| Item | Nature of item | | | | | | |
|---|---|---|---|---|---|---|---|
| 18. | Unmargined contracts not covered by recognized netting | | | | | | |
| | Type of Contract | Total Notional Amount (B17) | Total Replacement Cost (B18) | Total Potential Future Exposure (B19) | Total Default Risk Exposure (B20) | Out of which: Sovereign exposures (B21) | Out of which: Exposures to corporates or individuals (B25) |
| 18a. | Interest rate contracts | 20,000 | 10 | 215 | 315 | | 315 |
| 18b. | Exchange rate contracts | | | | | | |
| 18c. | Credit-related derivative contracts | 10,000 | 50 | 103 | 214 | | 214 |
| 18d. | Equity-related derivative contracts | | | | | | |
| 18e. | Commodity-related derivative contracts | | | | | | |
| | SUBTOTAL | 30,000 | 60 | 318 | 529 | | 529 |

### b. Part IIIb Division B - II

(in HK$'000)

| Item | Nature of item | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 11. | Unmargined contracts not covered by recognized netting | | | | | | | |
| | Type of Contract | Total Notional Amount (B13) | Total Replacement Cost (B14) | Total Potential Future Exposure (B15) | Total Default Risk Exposure (B16) | Out of which: Sovereign exposures (B17) | Out of which: Corporate exposures (B22) | Out of which: Regulatory retail exposures (B23) |
| 11a. | Interest rate contracts | 20,000 | 10 | 215 | 315 | | 315 | |
| 11b. | Exchange rate contracts | | | | | | | |
| 11c. | Credit-related derivative contracts | 10,000 | 50 | 103 | 214 | | 214 | |
| 11d. | Equity-related derivative contracts | | | | | | | |
| 11e. | Commodity-related derivative contracts | | | | | | | |
| | SUBTOTAL | 30,000 | 60 | 318 | 529 | | 529 | |

## Case 2: Margined contracts not covered by recognized netting

In this case, the netting sets include netting sets A and B in Case 1 and the following netting sets:

Netting set D

| **Contract** | **Type of contract** | **Entity** | **Number of units referenced by the contract** | **Strike** (HK$) | **Residual maturity** (in year) | **Current price of underlying** (HK$) | **Market value** (HK$'000) |
|---|---|---|---|---|---|---|---|
| A4 | Bought equity call option (European style) | Firm B | 1,000 | 245 | 0.25 | 234 | 11 |

Netting set E

| **Contract** | **Type of contract** | **Notional** (US$'000) | **Contract rate** | **Residual maturity** (in year) | **Market value** (HK$'000) |
|---|---|---|---|---|---|
| A5 | Long FX forward (USD/CNH) | 1,000 | 6.6248 | 0.4 | 16 |

The four netting sets are subject to the same margin agreement with the following details:

(in HK$'000)

| **Margining frequency** | **Threshold** | **Min. Transfer Amount** | **Independent Amount** | **Haircut value of net collateral held by the AI** |
|---|---|---|---|---|
| daily | 0 | 5 | 450 | 500 |

## I. Calculation of default risk exposure

Step 1: Calculation of replacement cost (RC) of netting sets covered by margin agreement MA

$$RC_{MA} = max\left\{\sum_{NS \in MA} max\{V_{NS}; 0\} - max\{C_{MA}; 0\}; 0\right\}$$

$$+ max\left\{\sum_{NS \in MA} min\{V_{NS}; 0\} - min\{C_{MA}; 0\}; 0\right\}$$

| **Contract** | **max{$V_{NS}$; 0}** | **min{$V_{NS}$; 0}** |
|---|---|---|
| A1 | 10 | 0 |
| A2 | 0 | -25 |
| A4 | 11 | 0 |
| A5 | 16 | 0 |
| **Total** | **37** | **-25** |

$= \max\{37 - \max\{500; 0\}; 0\} + \max\{-25 - \min\{500; 0\}; 0\}$

= max (37 - 500; 0) + max (-25; 0)

= 0

Step 2: Calculation of add-on at the level of netting set

*Step 2.1: Calculation of contract-level adjusted notional amount ($d_i$)*

| **Contract** | **Hedging Set** | **USD leg** (HK$'000) | **CNH leg** (HK$'000) | **Number of units referenced by the contract** | **Current price of one unit of the underlying assets** (HK$) | **Adjusted notional amount ($d_i$)** (HK$'000) |
|---|---|---|---|---|---|---|
| A4 | Firm B | NA | NA | 1,000 | 234 | 234 |
| A5 | USD/CNH | 7,774 | 7,881 | NA | NA | 7,881 |

*Step 2.2: Calculation of effective notional amount ($D_i$) at the level of hedging set*

| **Contract** | **Residual maturity ($M_i$)** | **Supervisory delta ( $\delta_i$)** (a) | **Adjusted notional amount ($d_i$)** (HK$'000) (b) | **Maturity factor ($MF_i$)** (c) | **Effective notional amount ($D_i$)** (HK$'000) = (a) × (b) × (c) |
|---|---|---|---|---|---|
| A4 | 0.25 | +0.588 | 234 | 0.5000 | 69 |
| A5 | 0.40 | +1 | 7,881 | 0.6325 | 4,984 |

The supervisory delta adjustment of Contract A4 is calculated in accordance with §226BZB(2) and (3) of the BCR. Spot price of the underlying equity is used in the calculation for illustrative purposes.

$$\delta_{A4} = +N\left(\frac{In\left(\frac{P}{K}\right) + 0.5 \cdot \sigma^2 \cdot T}{\sigma \cdot \sqrt{T}}\right)$$

$$\delta_{A4} = +N\left(\frac{In\left(\frac{234}{245}\right) + 0.5 \cdot 120\%^2 \cdot 0.25}{120\% \cdot \sqrt{0.25}}\right)$$

= +0.588

As there are multiple netting sets covered by the same variation margin agreement, the potential future exposure of each of Contract A4 and Contract A5 must be calculated in a manner as if the contracts were unmargined contracts (see §226BS of the BCR). Accordingly, the maturity factor of each of the contracts is calculated by using the formula for unmargined contracts.

$$MF_i^{(unmargined)} = \sqrt{\frac{min\{M_i; 1\ year\}}{1\ year}}$$

$$MF_{A4}^{(unmargined)} = \sqrt{\frac{min\{0.25; 1\}}{1}} = 0.5$$

$$MF_{A5}^{(unmargined)} = \sqrt{\frac{min\{0.4; 1\}}{1}} = 0.6325$$

*Step 2.3: Calculation of add-on at the level of netting set*

| **Contract** | **Effective notional amount ($D_i$)** (HK$'000) (a) | **Supervisory factor (*SF*)** (b) | **Add-on**[3] (HK$'000) = (a) × (b) |
|---|---|---|---|
| A4 | 69 | 32% | 22.03 |
| A5 | 4,984 | 4% | 199.36 |

[3] See footnote 2 above.

Step 3: Calculation of potential future exposure (PFE) of netting sets covered by margin agreement MA

*Step 3.1: Calculation of multiplier of each netting set*

As the same collateral is shared by four netting sets and the AI in this example is a net receiver of collateral (C>0), netting sets with positive market values must first be allocated collateral up to the amount of those market values. Only after all positive market values have been compensated may surplus collateral be attributed freely among all netting sets. Also, the allocated parts must add up to the total collateral available for the margin agreement. Apart from these limitations, AIs may allocate available collateral at their discretion. The following table shows the multipliers calculated by using one of the possible collateral allocations.

| **Netting set** | **Market value** (HK$'000) | **Collateral allocated*** (HK$'000) | **Multiplier** |
|---|---|---|---|
| A | 10 | 22.65 | 0.375 |
| B | -25 | 0 | 0.945 |
| D | 11 | 55.90 | 0.375 |
| E | 16 | 421.44 | 0.376 |

*The allocation is for illustrative purpose only and does not represent any preference of the HKMA.

From Case 1, the multiplier of netting set B is 0.945. The multipliers of other netting sets are calculated as follows:

$$multiplier_{netting\ set\ A} = \min\left\{1; 5\% + (1-5\%) * exp\left(\frac{10-22.65}{2*(1-5\%)*6.21}\right)\right\} = 0.375$$

$$multiplier_{netting\ set\ D} = \min\left\{1; 5\% + (1-5\%) * exp\left(\frac{11-55.90}{2*(1-5\%)*22.03}\right)\right\} = 0.375$$

$$multiplier_{netting\ set\ E} = \min\left\{1; 5\% + (1-5\%) * exp\left(\frac{16-421.44}{2*(1-5\%)*199.36}\right)\right\} = 0.376$$

*Step 3.2: Calculation of PFE of each netting set on unmargined basis*

| **Netting set** | **AddOn** (HK$'000) (a) | **Multiplier** (b) | **PFE (unmargined)** (HK$'000) = (a)×(b) |
|---|---|---|---|
| A | 6.21 | 0.375 | 2.33 |

| **Netting set** | **AddOn** (HK$'000) (a) | **Multiplier** (b) | **PFE (unmargined)** (HK$'000) = (a)×(b) |
|---|---|---|---|
| B | 221.20 | 0.945 | 209.06 |
| D | 22.03 | 0.375 | 8.26 |
| E | 199.36 | 0.376 | 74.91 |
| | | **Total** | **294.56** |

$$PFE_{MA} = \sum_{NS \in MA} PFE_{NS}^{(unmargined)}$$

= 294.56

Step 4: Calculation of default risk exposure of netting sets covered by margin agreement MA

$$Default\ \ risk\ \ exposure_{MA} = alpha * (RC_{MA} + PFE_{MA}) = 1.4 * (0 + 294.56) = 412$$

## II. Reporting arrangement

Division A - RWA

a. Part IIIa

(in HK$'000)

| Item | Nature of item | On-balance sheet exposures: Principal Amount (A1) | Off-balance sheet exposures: Principal Amount / Notional Amount (A2) | Credit Equivalent Amount (A3) | Default Risk Exposure (A4) | Risk-weight % (A5) | Risk-weighted Amount (A6) = (A1+A3+A4) x A5 |
|---|---|---|---|---|---|---|---|
| Class VIII Other Exposures | | | | | | | |
| 29a. | Exposures to corporates or individuals not elsewhere reported | | 28,008 | | 412 | 100 | 412 |
| 29b. | Holdings of equity or other forms of capital instruments issued by, and non-capital LAC liabilities of, financial sector entities subject to 100% risk-weight | | | | | 100 | |
| 29h. | Other exposures not elsewhere reported | | | | | | |
| 29h(1). | | | | | | | |
| 29h(2). | | | | | | | |
| 29h(3). | | | | | | | |
| 29h(4). | | | | | | | |
| | SUBTOTAL | | 28,008 | | 412 | | 412 |

b. Part IIIb

(in HK$'000)

| Item | Nature of item | On-balance sheet exposures: Principal Amount (A1) | On-balance sheet exposures: Principal Amount after CRM (A2) | Off-balance sheet exposures: Principal Amount / Notional Amount (A3) | Off-balance sheet exposures: Credit Equivalent Amount after CRM (A4) | Off-balance sheet exposures: Default Risk Exposure after CRM (A5) | Risk-weight % (A6) | Risk-weighted Amount (A7) = (A2+A4+A5) x A6 |
|---|---|---|---|---|---|---|---|---|
| **Class VI** | **Corporate Exposures** | | | | | | | |
| 9a. | Risk-weight 20% | | | | | | 20 | |
| 9b. | Risk-weight 30% | | | | | | 30 | |
| 9c. | Risk-weight 50% | | | | | | 50 | |
| 9d. | Risk-weight 100% | | | 28,008 | | 412 | 100 | 412 |
| 9e. | Risk-weight 150% | | | | | | 150 | |
| | **SUBTOTAL** | | | **28,008** | | **412** | | **412** |

Division B – Default risk exposure amount

In this example, the stated notional amount of the FX forward contract is USD1,000. The notional amount reported in the CAR return is the HKD equivalent of USD1,000, instead of the adjusted notional amount of the contract.

a. Part IIIa Division B – III

(in HK$'000)

| Item | Nature of item | | | | | | |
|---|---|---|---|---|---|---|---|
| 19. | Margined contracts not covered by recognized netting | | | | | | |
| | Type of Contract | Total Notional Amount (B17) | Total Replacement Cost (B18) | Total Potential Future Exposure (B19) | Total Default Risk Exposure (B20) | Out of which: Sovereign exposures (B21) | Out of which: Exposures to corporates or individuals (B25) |
| 19a. | Interest rate contracts | 20,000 | | | | | |
| 19b. | Exchange rate contracts | 7,774 | | | | | |
| 19c. | Credit-related derivative contracts | | | | | | |
| 19d. | Equity-related derivative contracts | 234 | | | | | |
| 19e. | Commodity-related derivative contracts | | | | | | |
| 19f. | Multiple netting sets covered by single variation margin agreement | | 0 | 294 | 412 | | 412 |
| | **SUBTOTAL** | **28,008** | **0** | **294** | **412** | | **412** |

b. Part IIIb Division B - II

(in HK$'000)

| Item | Nature of item | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 12. | Margined contracts not covered by recognized netting | | | | | | | |
| | | | | | | Out of which: | | |
| | Type of Contract | Total Notional Amount (B13) | Total Replacement Cost (B14) | Total Potential Future Exposure (B15) | Total Default Risk Exposure (B16) | Sovereign exposures (B17) | Corporate exposures (B22) | Regulatory retail exposures (B23) |
| 12a. | Interest rate contracts | 20,000 | | | | | | |
| 12b. | Exchange rate contracts | 7,774 | | | | | | |
| 12c. | Credit-related derivative contracts | | | | | | | |
| 12d. | Equity-related derivative contracts | 234 | | | | | | |
| 12e. | Commodity-related derivative contracts | | | | | | | |
| 12f. | Multiple netting sets covered by single variation margin agreement | | 0 | 294 | 412 | | 412 | |
| | **SUBTOTAL** | **28,008** | **0** | **294** | **412** | | **412** | |

## Case 3: Unmargined contracts covered by recognized netting

In this case, the contracts involved are the same as contracts A1, A2 and A3 in Case 1, except that the three contracts are covered by recognized netting and therefore fall within the same netting set. Also, neither the AI nor the counterparty has posted collateral for the contracts.

### I. Calculation of default risk exposure

Step 1: Calculation of replacement cost (RC) at the level of netting set

$RC = max\ (V - C; 0) = max\ (10 - 25 + 50; 0) = 35$

Step 2: Calculation of add-on at the level of netting set

*Step 2.1: Calculation of effective notional amount ($D_i$) at the level of hedging set*

From Case 1, we have the following information on each of the derivative contracts:

| **Contract** | **Maturity bucket** | **Residual maturity ($M_i$)** | **Supervisory delta ( $\delta_i$)** (a) | **Adjusted notional amount ($d_i$)** (HK$'000) (b) | **Maturity factor ($MF_i$)** (c) | **Effective notional amount ($D_i$)** (HK$'000) = (a) × (b) × (c) |
|---|---|---|---|---|---|---|
| A1 | 1 | 0.25 | +1 | 2,484 | 0.5 | 1,242 |
| A2 | 2 | 5 | -1 | 44,240 | 1 | -44,240 |
| A3 | NA | 2 | -1 | 19,033 | 1 | -19,033 |

The effective notional amount of the hedging set that contains contracts A1 and A2 is calculated by using Formula 23AS in §226BU(2) of the BCR as follows:

$Effective\ \ Notional_{hedging\ set} = [(D_{A1})^2 + (D_{A2})^2 + 1.4 \cdot D_{A1} \cdot D_{A2}]^{0.5}$

$= [(1{,}242)^2 + (-44{,}240)^2 + 1.4 * (1{,}242) * (-44{,}240)]^{0.5} = 43{,}379.67$

*Step 2.2: Calculation of add-on at the level of asset class*

Given the effective notional amounts calculated under Step 2.1, the add-on for each asset class is calculated as follows:

| **Asset class** | **Effective notional amount** (HK$'000) (a) | **Supervisory factor** (b) | **Add-on**[4] (HK$'000) = (a) × (b) |
|---|---|---|---|
| Interest rate contracts | 43,380 | 0.5% | 216.90 |
| Credit-related derivative contracts | 19,033 | 0.54% | 102.78 |

*Step 2.3: Calculation of add-on at the level of netting set*

$$AddOn^{(aggregate)} = AddOn^{(IR)} + AddOn^{(Credit)} = 216.90 + 102.78 = 319.68$$

Step 3: Calculation of potential future exposure at the level of netting set

$$multiplier = \min\left\{1; Floor + (1 - Floor) * exp\left(\frac{V - C}{2 * (1 - Floor) * AddOn^{(aggregate)}}\right)\right\}$$

$$= \min\left\{1; 5\% + (1 - 5\%) * exp\left(\frac{(10 - 25 + 50) - 0}{2 * (1 - 5\%) * 319.68}\right)\right\}$$

= 1

$$PFE = multiplier * Addon^{(aggregate)} = 1 * (319.68) = 319.68$$

Step 4: Calculation of default risk exposure of the netting set

$$Default\ \ Risk\ \ Exposure = alpha * (RC + PFE) = 1.4 * (35 + 319.68) = 496.55$$

[4] Also see footnote 2.

## II. Reporting arrangement

### Division A - RWA

#### a. Part IIIa

(in HK$'000)

| Item | Nature of item | On-balance sheet exposures | Off-balance sheet exposures | | | | |
|---|---|---|---|---|---|---|---|
| | | Principal Amount (A1) | Principal Amount / Notional Amount (A2) | Credit Equivalent Amount (A3) | Default Risk Exposure (A4) | Risk-weight % (A5) | Risk-weighted Amount (A6) = (A1+A3+A4) x A5 |
| **Class VIII** | **Other Exposures** | | | | | | |
| 29a. | Exposures to corporates or individuals not elsewhere reported | | 30,000 | | 497 | 100 | 497 |
| 29b. | Holdings of equity or other forms of capital instruments issued by, and non-capital LAC liabilities of, financial sector entities subject to 100% risk-weight | | | | | 100 | |
| 29h. | Other exposures not elsewhere reported | | | | | | |
| 29h(1). | | | | | | | |
| 29h(2). | | | | | | | |
| 29h(3). | | | | | | | |
| 29h(4). | | | | | | | |
| | **SUBTOTAL** | | **30,000** | | **497** | | **497** |

#### b. Part IIIb

(in HK$'000)

| Item | Nature of item | On-balance sheet exposures | | Off-balance sheet exposures | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Principal Amount (A1) | Principal Amount after CRM (A2) | Principal Amount / Notional Amount (A3) | Credit Equivalent Amount after CRM (A4) | Default Risk Exposure after CRM (A5) | Risk-weight % (A6) | Risk-weighted Amount (A7) = (A2+A4+A5) x A6 |
| **Class VI** | **Corporate Exposures** | | | | | | | |
| 9a. | Risk-weight 20% | | | | | | 20 | |
| 9b. | Risk-weight 30% | | | | | | 30 | |
| 9c. | Risk-weight 50% | | | | | | 50 | |
| 9d. | Risk-weight 100% | | | 30,000 | | 497 | 100 | 497 |
| 9e. | Risk-weight 150% | | | | | | 150 | |
| | **SUBTOTAL** | | | **30,000** | | **497** | | **497** |

## Division B – Default risk exposure amount

### a. Part IIIa Division B – III

(in HK$'000)

| Item | Nature of item | | | | | | |
|---|---|---|---|---|---|---|---|
| 20. | Contracts covered by recognized netting | | | | | | |
| | Type of Contract | Total Notional Amount (B17) | Total Replacement Cost (B18) | Total Potential Future Exposure (B19) | Total Default Risk Exposure (B20) | Out of which: Sovereign exposures (B21) | Out of which: Exposures to corporates or individuals (B25) |
| 20a. | Interest rate contracts | 20,000 | | | | | |
| 20b. | Exchange rate contracts | | | | | | |
| 20c. | Credit-related derivative contracts | | | | | | |
| 20d. | Equity-related derivative contracts | 10,000 | | | | | |
| 20e. | Commodity-related derivative contracts | | | | | | |
| | **SUBTOTAL** | **30,000** | **35** | **320** | **497** | | **497** |

### b. Part IIIb Division B - II

(in HK$'000)

| Item | Nature of item | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 13. | Contracts covered by recognized netting | | | | | | | |
| | Type of Contract | Total Notional Amount (B13) | Total Replacement Cost (B14) | Total Potential Future Exposure (B15) | Total Default Risk Exposure (B16) | Out of which: Sovereign exposures (B17) | Out of which: Corporate exposures (B22) | Out of which: Regulatory retail exposures (B23) |
| 13a. | Interest rate contracts | 20,000 | | | | | | |
| 13b. | Exchange rate contracts | | | | | | | |
| 13c. | Credit-related derivative contracts | 10,000 | | | | | | |
| 13d. | Equity-related derivative contracts | | | | | | | |
| 13e. | Commodity-related derivative contracts | | | | | | | |
| | **SUBTOTAL** | **30,000** | **35** | **320** | **497** | | **497** | |

## Case 4: Margined contracts covered by recognized netting

In this case, the contracts involved are the same as Case 2 and subject to the same margin agreement as described in Case 2, except that the contracts are covered by the same valid bilateral netting agreement and therefore fall within the same netting set.

## I. Calculation of default risk exposure

Step 1: Calculation of replacement cost (RC) at the level of netting set

$$RC = max(V - C; TH + MTA - NICA; 0)$$

$$V = 10 - 25 + 11 + 16 = 12$$

$$RC = \max(12 - 500 ; 0 + 5 - 450; 0) = 0$$

Step 2: Calculation of add-on at the level of netting set

*Step 2.1: Calculation of contract-level effective notional amount ($D_i$)*

From Cases 1 and 2, we have the following information on each of the derivative contracts:

| **Contract** | **Maturity bucket** | **Supervisory delta ( $\delta_i$)**<br>(a) | **Adjusted notional amount ($d_i$)**<br>(HK$'000)<br>(b) | **Maturity factor ($MF_i$)**<br>(c) | **Effective notional amount ($D_i$)**<br>(HK$'000)<br>= (a) × (b) × (c) |
|---|---|---|---|---|---|
| A1 | 1 | +1 | 2,484 | 0.3 | 745.33 |
| A2 | 2 | -1 | 44,240 | 0.3 | -13,271.95 |
| A4 | NA | +0.588 | 234 | 0.3 | 41.31 |
| A5 | NA | +1 | 7,881 | 0.3 | 2,364.17 |

The maturity factor for margined transactions depends on the margin period of risk (MPOR). For daily re-margining, the MPOR is at least 10 business days. In this example, the contracts are not centrally cleared and the requirements in §226BZE(3), (4) and (6) do not apply to the contracts. Hence, the maturity factor for the contracts in the netting set is as follows (the convention of 250 business days in a year is used):

$$MF_i^{(margined)} = \frac{3}{2}\sqrt{\frac{MPOR_i}{1\ year}} = 1.5 * \sqrt{\frac{10}{250}} = 0.3$$

*Step 2.2: Calculation of effective notional amount ($D_i$) at the level of hedging set*

Contracts A1 and A2 are in the same hedging set but in different maturity buckets. The effective notional amount of the hedging set is calculated by using Formula 23AS in §226BU(2) of the BCR as follows:

$$Effective\ \ Notional\ \ = [(D_{A1})^2 + (D_{A2})^2 + 1.4 \cdot D_{A1} \cdot D_{A2}]^{0.5}$$

$$= [(745.33)^2 + (-13{,}271.95)^2 + 1.4 * (745.33) * (-13{,}271.95)]^{0.5} = 12{,}761.33$$

In the case of Contracts A4 and A5, each contract forms its own hedging set. Hence, the effective notional amount of each hedging set is same as the contract-level effective notional amount.

*Step 2.3: Calculation of add-on at the level of asset class*

Given the effective notional amounts calculated under Step 2.2, the add-on for each asset class is calculated as follows:

| **Asset class** | **Effective notional amount** (HK$'000) (a) | **Supervisory factor** (b) | **Add-on**[5] (HK$'000) = (a) × (b) |
|---|---|---|---|
| Interest rate contract | 12,761.33 | 0.5% | 63.81 |
| Equity-related derivative contract | 41.31 | 32% | 13.22 |
| Exchange rate contract | 2,364.17 | 4% | 94.57 |

*Step 2.4: Calculation of add-on at the level of netting set*

$$AddOn^{(aggregate)} = AddOn^{(IR)} + AddOn^{(Equity)} + AddOn^{(FX)}$$

$$= 63.81 + 13.22 + 94.57 = 171.59$$

[5] See footnote 2, which also applies in the case of equity-related derivative contracts.

Step 3: Calculation of potential future exposure at the level of netting set

$$multiplier = \min\left\{1; Floor + (1 - Floor) * exp\left(\frac{V - C}{2 * (1 - Floor) * AddOn^{(aggregate)}}\right)\right\}$$

$$= \min\left\{1; 5\% + (1 - 5\%) * exp\left(\frac{12 - 500}{2 * (1 - 5\%) * 171.59}\right)\right\}$$

= 0.2627

$$PFE = multiplier * Addon^{(aggregate)} = 0.2627 * (171.59) = 45.07$$

Step 4: Calculation of default risk exposure of the netting set

$$Default\ \ Risk\ \ Exposure = alpha * (RC + PFE) = 1.4 * (0 + 45.07) = 63$$

## II. Reporting arrangement

Division A - RWA

a. Part IIIa

(in HK$'000)

| Item | Nature of item | On-balance sheet exposures: Principal Amount (A1) | Off-balance sheet exposures: Principal Amount / Notional Amount (A2) | Off-balance sheet exposures: Credit Equivalent Amount (A3) | Off-balance sheet exposures: Default Risk Exposure (A4) | Risk-weight % (A5) | Risk-weighted Amount (A6) = (A1+A3+A4) x A5 |
|---|---|---|---|---|---|---|---|
| **Class VIII Other Exposures** | | | | | | | |
| 29a. | Exposures to corporates or individuals not elsewhere reported | | 28,008 | | 63 | 100 | 63 |
| 29b. | Holdings of equity or other forms of capital instruments issued by, and non-capital LAC liabilities of, financial sector entities subject to 100% risk-weight | | | | | 100 | |
| 29h. | Other exposures not elsewhere reported | | | | | | |
| 29h(1). | | | | | | | |
| 29h(2). | | | | | | | |
| 29h(3). | | | | | | | |
| 29h(4). | | | | | | | |
| | **SUBTOTAL** | | **28,008** | | 63 | | 63 |

b. Part IIIb

(in HK$'000)

| Item | Nature of item | On-balance sheet exposures: Principal Amount (A1) | On-balance sheet exposures: Principal Amount after CRM (A2) | Off-balance sheet exposures: Principal Amount / Notional Amount (A3) | Off-balance sheet exposures: Credit Equivalent Amount after CRM (A4) | Off-balance sheet exposures: Default Risk Exposure after CRM (A5) | Risk-weight % (A6) | Risk-weighted Amount (A7) = (A2+A4+A5) x A6 |
|---|---|---|---|---|---|---|---|---|
| **Class VI** | **Corporate Exposures** | | | | | | | |
| 9a. | Risk-weight 20% | | | | | | 20 | |
| 9b. | Risk-weight 30% | | | | | | 30 | |
| 9c. | Risk-weight 50% | | | | | | 50 | |
| 9d. | Risk-weight 100% | | | 28,008 | | 63 | 100 | 63 |
| 9e. | Risk-weight 150% | | | | | | 150 | |
| | **SUBTOTAL** | | | **28,008** | | **63** | | **63** |

## Division B – Default risk exposure amount

a. Part IIIa Division B – III

(in HK$'000)

| Item | Nature of item | | | | | | |
|---|---|---|---|---|---|---|---|
| 20. | Contracts covered by recognized netting | | | | | | |
| | Type of Contract | Total Notional Amount (B17) | Total Replacement Cost (B18) | Total Potential Future Exposure (B19) | Total Default Risk Exposure (B20) | Out of which: Sovereign exposures (B21) | Out of which: Exposures to corporates or individuals (B25) |
| 20a. | Interest rate contracts | 20,000 | | | | | |
| 20b. | Exchange rate contracts | 7,774 | | | | | |
| 20c. | Credit-related derivative contracts | | | | | | |
| 20d. | Equity-related derivative contracts | 234 | | | | | |
| 20e. | Commodity-related derivative contracts | | | | | | |
| | **SUBTOTAL** | **28,008** | | **45** | **63** | | **63** |

b. Part IIIb Division B – II

(in HK$'000)

| Item | Nature of item | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 13. | Contracts covered by recognized netting | | | | | | | |
| | Type of Contract | Total Notional Amount (B13) | Total Replacement Cost (B14) | Total Potential Future Exposure (B15) | Total Default Risk Exposure (B16) | Out of which: Sovereign exposures (B17) | Out of which: Corporate exposures (B22) | Out of which: Regulatory retail exposures (B23) |
| 13a. | Interest rate contracts | 20,000 | | | | | | |
| 13b. | Exchange rate contracts | 7,774 | | | | | | |
| 13c. | Credit-related derivative contracts | | | | | | | |
| 13d. | Equity-related derivative contracts | 234 | | | | | | |
| 13e. | Commodity-related derivative contracts | | | | | | | |
| | **SUBTOTAL** | **28,008** | **0** | **45** | **63** | | **63** | |