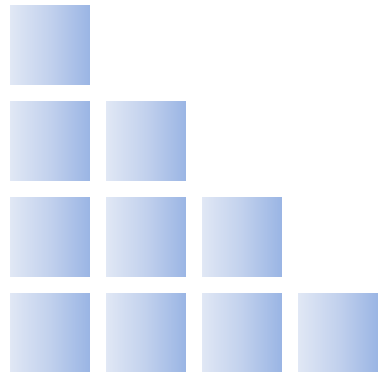

SA-CCR: Introduction

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Approaches to Managing Counterparty Risk (SA-CCR)

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Disclaimer

The document author is Arthur Rabatin and all views expressed in this document are his own and not those of his employer.

All errors and omissions are those of the author

Arthur Rabatin, London, June 2016

SOURCES

BIS, April 2014 - The standardised approach for measuring counterparty credit risk exposures

BIS, August 2014, Working Paper No 26: Foundations of the standardised approach for measuring counterparty credit risk exposures

What is SA-CCR – BCBS 279

- Replaces CEM, SA
- Introduces Risk Sensitive Treatment of Collateral and recognition of initial margin. Margining (Variation and Excess Margin through Initial Margin) impacts both Replacement cost and PFE Add-on
- Defines “Hedging Sets” that categorise asset classes within which risk netting is allowable (with no diversification allowance across asset classes)
- Prescribes workflow to calculate PFE Add-ons, reducing the discretion of local regulators.
- Recognises negative MTM and introduces new supervisory factors reflecting post crisis volatility

Key Definitions of SA-CCR Components

Exposure at Default = $1.4 * (\text{Replacement Cost}(RC) + \text{Potential Future Exposure} (PFE))$

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

$PFE = \text{Multiplier} * \text{AddOn}^{\text{aggregate}}$

V *Mark to Market Value*

C *Haircut value of Collateral (i.e. Cash Equivalent)*

TH *Threshold Amount (For Collateralisation)*

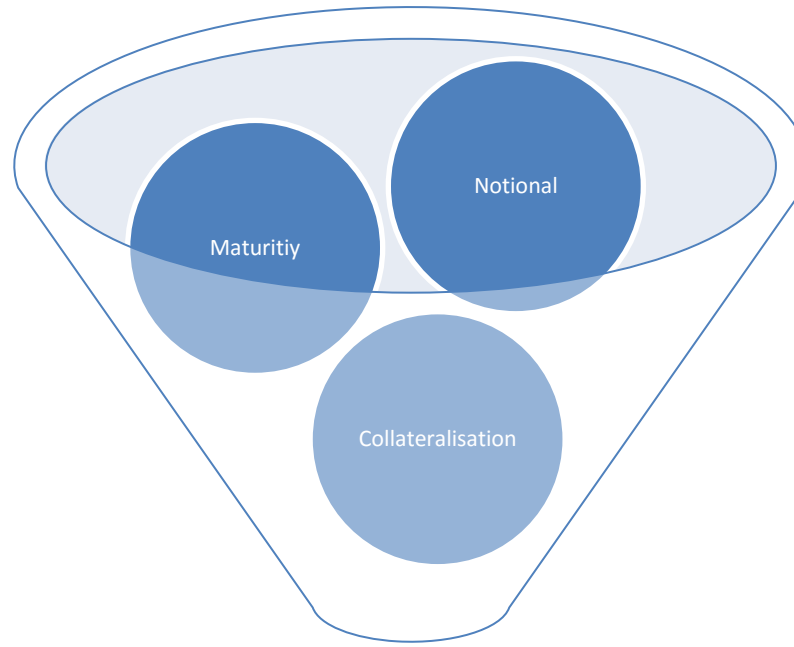
MTA *Minimum Transfer Amount of Collateral*

NICA *Net Independent Collateral Amount - defined as {Collateral Received minus unsegregated Collateral Posted}*

Multiplier (≤ 1) allows for reduction of exposure due to overcollateralization (initial margin), with a floor of 5% of V.

AddOn^{aggregate} : sum of all add-ons per asset class. No netting across asset classes allowed.

SA-CCR requires 'Standardisation before Aggregation'



Standardised Derivative Position
PFE

Workflow - Calculating the standardised PFE 'Add On'

Disaggregate Transactions

- Determine transactions in netting set
- Determine primary risk driver (asset class) per trade and create trade level view per asset class
- Decide treatment of hybrid transactions (either define primary risk driver or agree split of exposure with local regulator)

Define trade level notional and Maturity Factors

- Apply supervisory duration (IR and Credit Derivatives only)
- Standardise trade notional
- Unmargined - Apply standardised maturity factors
- Margined – Calculate standardised Margin Period of Risk
- Apply Supervisory Delta

Aggregate back into Netting Set level Exposure Add-on

- Calculate Effective Notional by aggregating delta adjusted notional per bucket defined in hedging set
- Multiply Effective Notional with Supervisory factor per asset class -> yields the add-on per hedging set
- Simple Summation of all add-ons per hedging yields Add-on (aggregate)

Generic Add-On Formula

$$\text{AddOn} = \text{SF} * \text{EffectiveNotional}$$

$$\text{EffectiveNotional} = \sum \text{adjusted notional amounts}_{(i)} * \text{delta adjustments}_{(i)} * \text{Maturity Factor}_{(i)}$$

Where (i) = each item per netting set

Table 2

Summary table of supervisory parameters

Asset Class	Subclass	Supervisory factor	Correlation	Supervisory option volatility
Interest rate		0.50%	N/A	50%
Foreign exchange		4.0%	N/A	15%
Credit, Single Name	AAA	0.38%	50%	100%
	AA	0.38%	50%	100%
	A	0.42%	50%	100%
	BBB	0.54%	50%	100%
	BB	1.06%	50%	100%
	B	1.6%	50%	100%
Credit, Index	CCC	6.0%	50%	100%
	IG	0.38%	80%	80%
	SG	1.06%	80%	80%
Equity, Single Name		32%	50%	120%
Equity, Index		20%	80%	75%
Commodity	Electricity	40%	40%	150%
	Oil/Gas	18%	40%	70%
	Metals	18%	40%	70%
	Agricultural	18%	40%	70%
	Other	18%	40%	70%

Maturity Factor

SA-CCR maturity takes margining into account:

Unmargined

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

Floored at 10 business days

Margined

$$MF_i^{(\text{margined})} = \frac{3}{2} \sqrt{\frac{MPOR_i}{1\text{ year}}}$$

Margin Period of Risk (MPOR)

Daily Margining: MPOR = 10 Days

Margining with period of N Days: MPOR = 10 Days + N Days = 1 Day.

Example: Weekly margining, MPOR = 10 + 5 - 1 = 14

Delta Adjustment

Linear Instruments (ie non options or CDO Tranches): Delta = 1 or -1

Options – Standard Black Scholes

δ_i	<i>Bought</i>	<i>Sold</i>
Call Options ¹³	$+\Phi\left(\frac{\ln(P_i / K_i) + 0.5 * \sigma_i^2 * T_i}{\sigma_i * \sqrt{T_i}}\right)$	$-\Phi\left(\frac{\ln(P_i / K_i) + 0.5 * \sigma_i^2 * T_i}{\sigma_i * \sqrt{T_i}}\right)$
Put Options ⁷	$-\Phi\left(-\frac{\ln(P_i / K_i) + 0.5 * \sigma_i^2 * T_i}{\sigma_i * \sqrt{T_i}}\right)$	$+\Phi\left(-\frac{\ln(P_i / K_i) + 0.5 * \sigma_i^2 * T_i}{\sigma_i * \sqrt{T_i}}\right)$
<p>With the following parameters that banks must determine appropriately: P_i : Underlying price (spot, forward, average, etc) K_i : Strike price T_i : Latest contractual exercise date of the option The supervisory volatility σ_i of an option is specified on the basis of supervisory factor applicable to the trade (see Table 2 in paragraph 183).</p>		

Interest Rate Add-On

Adjusted Notional $d_i^{(\text{IR})} = \bar{N}_i \cdot \text{SD}_i$

N = average swap notional over lifetime

SD = Supervisory duration

$$\text{SD}_i = \int_{S_i}^{E_i} \exp(-rt) dt = \frac{\exp(-rS_i) - \exp(-rE_i)}{r}$$

with the interest rate set to $r = 0.05$.

Hedging sets for IR products are defined in 3 buckets:

- $E \leq 1$ year
- $1 \text{ year} < E \leq 5$ years
- $E > 5$ years

Total Add-on per CCY for each Maturity Bucket accounting for regulatory correlations

$$\text{AddOn}_m^{(\text{CCY})} = \left[\left(\text{AddOn}_1^{(\text{MB})} \right)^2 + \left(\text{AddOn}_2^{(\text{MB})} \right)^2 + \left(\text{AddOn}_3^{(\text{MB})} \right)^2 + 1.4 \cdot \text{AddOn}_1^{(\text{MB})} \cdot \text{AddOn}_2^{(\text{MB})} + 1.4 \cdot \text{AddOn}_2^{(\text{MB})} \cdot \text{AddOn}_3^{(\text{MB})} + 0.6 \cdot \text{AddOn}_1^{(\text{MB})} \cdot \text{AddOn}_3^{(\text{MB})} \right]^{\frac{1}{2}}$$

FX Add-On

Adjusted Notional $d_i^{(FX)} = N_i^{\text{foreign}}$

N(foreign) = value of foreign CCY leg in domestic (when both legs non domestic convert both and chose max)

Hedging sets defined per currency pair

Credit Add-On

Adjusted Notional follows same supervisory duration approach as IR

Correlations fixed at

- 50% for SN entities
- 80% for Indices

Pairwise correlation therefore:

- 25% between single names
- 40% between single name and index
- 64% between indices

$$\text{AddOn}_{\text{CD}} = \left(\left[\sum_j \rho_j \cdot \text{AddOn}_j^{(\text{Entity})} \right]^2 + \sum_j (1 - \rho_j^2) \cdot (\text{AddOn}_j^{(\text{Entity})})^2 \right)^{\frac{1}{2}}$$

Hedging sets defined per underlying name

Equities Add-On

Same Add-On approach as Credit

Correlations fixed at

- 50% for SN entities
- 80% for Indices

As with credit markets, add-on calculation recognises that equity markets 'move together' but offset of different names limited

Commodities Add-On

Add-on calculation using same approach as equities and credit, but correlation set to fixed 40%

Defined Commodity Hedging Sets:

- Energy
- Metals
- Agriculture
- Other

Instrument Data Requirements

- Instrument Data are key to correct calculation:
 - Identification of Asset Classes and Sub Asset Classes via Primary Risk Drivers
 - Identification of Hedging Sets
 - Maturity dates of Option Underlies
 - Index Composition
- Instrument Reference Data often exist in multiple Systems
- Lack of true “Golden Sources” across Front Office and Control Functions cause operational risk and costs
- Multiple “Translation” and “Mapping” Layers to convert between different reference data repositories – creating operational risk

Client Data Requirements

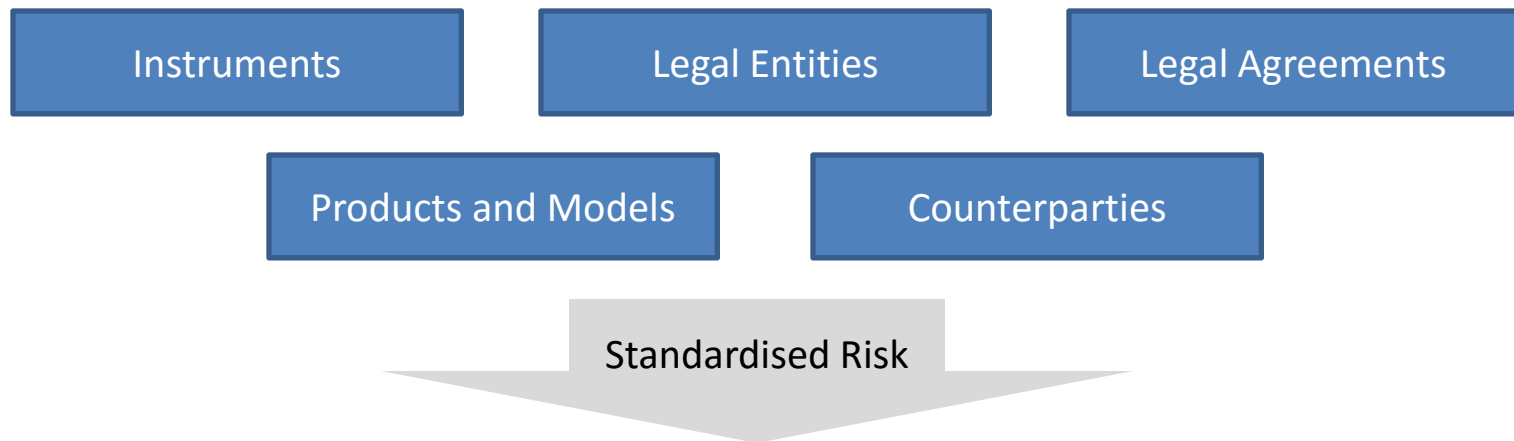
- Details of CSA matter
 - Threshold Amounts
 - MTA
 - Initial Margin
 - Collateral Segregation
- Many CSA Agreements were signed before CSAs became relevant for pricing (CSA Discounting, xVA Pricing)
- Data Quality around CSA generally seen as issue when automating processes (Many legal agreements exist as PDF docs with manual corrections)
- Interpretation of Legal Agreement data in the organisation has evolved as use of CSAs and Legal Agreements has become more relevant to Pricing and Risk Management

Adoption Strategy

- Early Business Engagement and early collaboration between Credit Risk, Collateral, Trading, Operations, Technology, and Chief Data Office
- Front Office Awareness and Acceptance of Risk Factor Standardisation and Mapping
- Identify trading book asset classes – define primary risk drivers in hybrid books and sub-asset classes in commodities
- Expect Iterative Development and Testing Process - and expect testing time to be significant longer than development time.
- Separate rule definition from calculation implementation (helped by prescriptive nature of SA-CCR) – allows prototyping of calculations on smaller subset of data and testing of marginal calculations

Strong Reference Data Hygiene

- Creates the framework for consistent, enterprise level risk



- Risk Aggregation without *prior* standardisation on common and coherent reference data is possible but very, very expensive

Enterprise Wide Data Culture

- Data Consistency and Data Quality are business problems, not technology problems.
- Data must be “trusted”. When we stop trusting, we will start duplicating. Data are trusted if they are being used in anger and have a business owner
- Do not (read: do not) duplicate data. When we duplicate, we stop trusting data. When we duplicate, we lose control
- Bring applications to data, not data to applications
- Answer this question: Do I need to store data? Can I re-calculate data?

Opportunities – Benefits for getting it right

- Sensitivities based calculations will remain a key requirement for other regulatory calculations:
 - FRTB SA for Market Risk
 - Initial Margining for Uncleared OTC
- Sensitivities and clean reference data for traded instruments will be key to comply with reporting regulations, such as Volcker/RENT-D, BCBS 239
- Correct client reference data (such as CSA and netting agreements) only continue to gain in importance for active pricing and risk management
 - CVA / FVA Calculation
 - Collateral Value Adjustment
 - Competitive Cross Margining
 - CSA based Discounting
 - Most cost effective collateral