



Implementing a cross asset class CVA and xVA Framework

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Passion to Perform

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- Global Universal Bank with in excess of EUR 1.6 tn of assets
- Over 98,000 full time staff, with over half of them outside Germany
- Recent awards:
 - *Bank Risk Manager of the Year*
 - *Single Dealer Platform of the Year*
 - *Interest Rate Derivatives House of the Year*



The Challenge of Derivatives Counterparty Exposure

- Derivatives Counterparty Exposure is not a constant
- PV of a derivative is zero at inception
- Credit Risk is intrinsically linked to Market Risk
- What is the loss if a counterparty defaults?

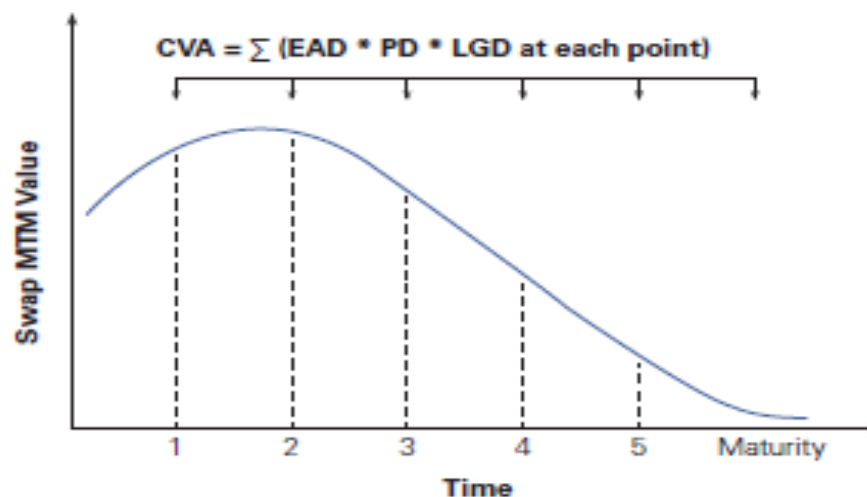


CVA Is the Answer!

- CVA = Credit Valuation Ajustment

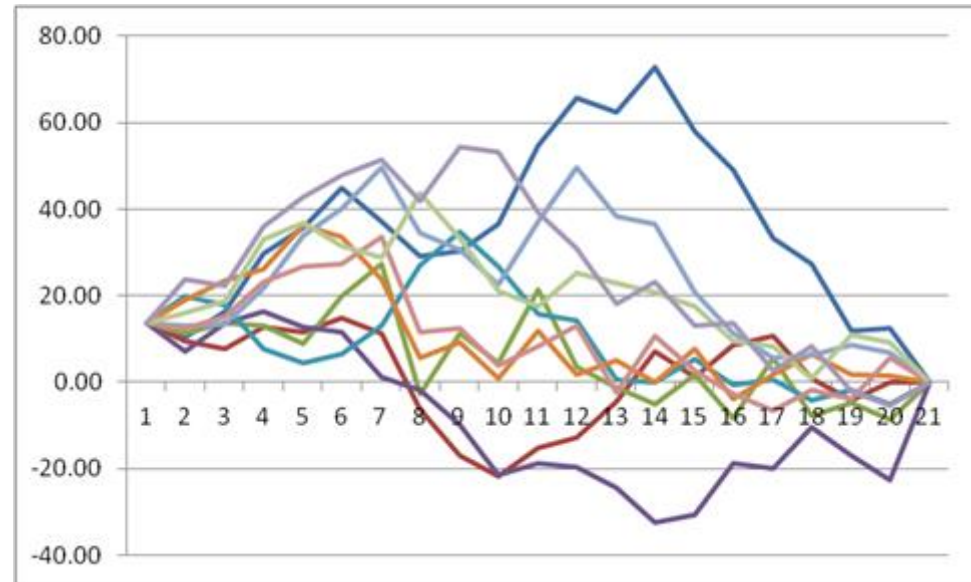
“What is the PV of my derivative if I take the default probability of the counterparty into account”

- Derivatives exposure over lifetime of trade
- Application of default probability and recovery rate provides risk adjusted value

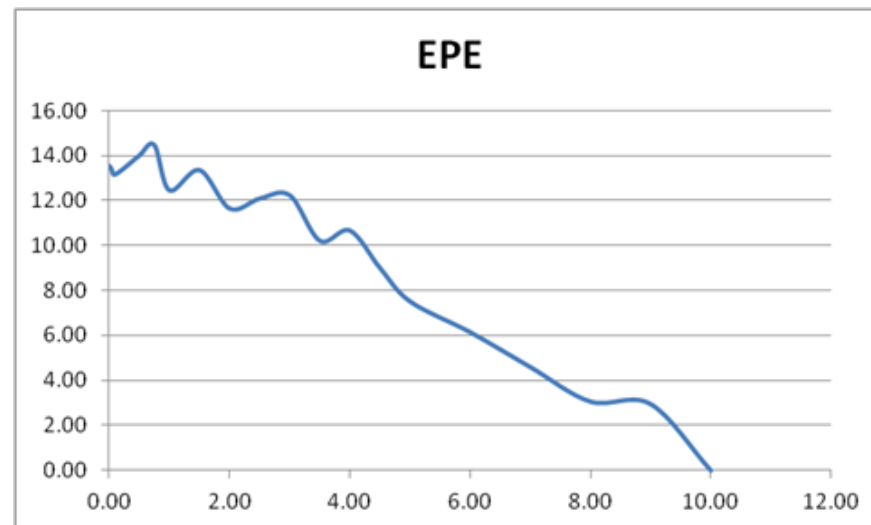


... and a more realistic picture

- Forward PVs simulated in Monte Carlo process



- Expected Positive Exposure over time



CVA as a balance sheet item



- CVA is the “PV” of counterparty risk
- Change in CVA is P&L. CVA Amount is reserved
- Since CVA is sensitive to Market prices and credit curves, CVA has multiple risk factors, which are separately hedgable in the market
- CVA P&L can be explained using CVA Sensitivities
- CVA Volatility attracts VaR and RWA

Inputs into CVA Calculation

- Simulated Forward PVs (with a volatility and correlation assumption)
- CDS curve mapping for counterparty (either actual traded CDS or assumed proxy mapping)
- Recovery Rate assumption (might differ from CDS RR assumption)
- Collateralisation agreement (CSA Agreement), with collateral types, thresholds, payment frequency
- Netting Agreements

The Technology Challenge – Consistency



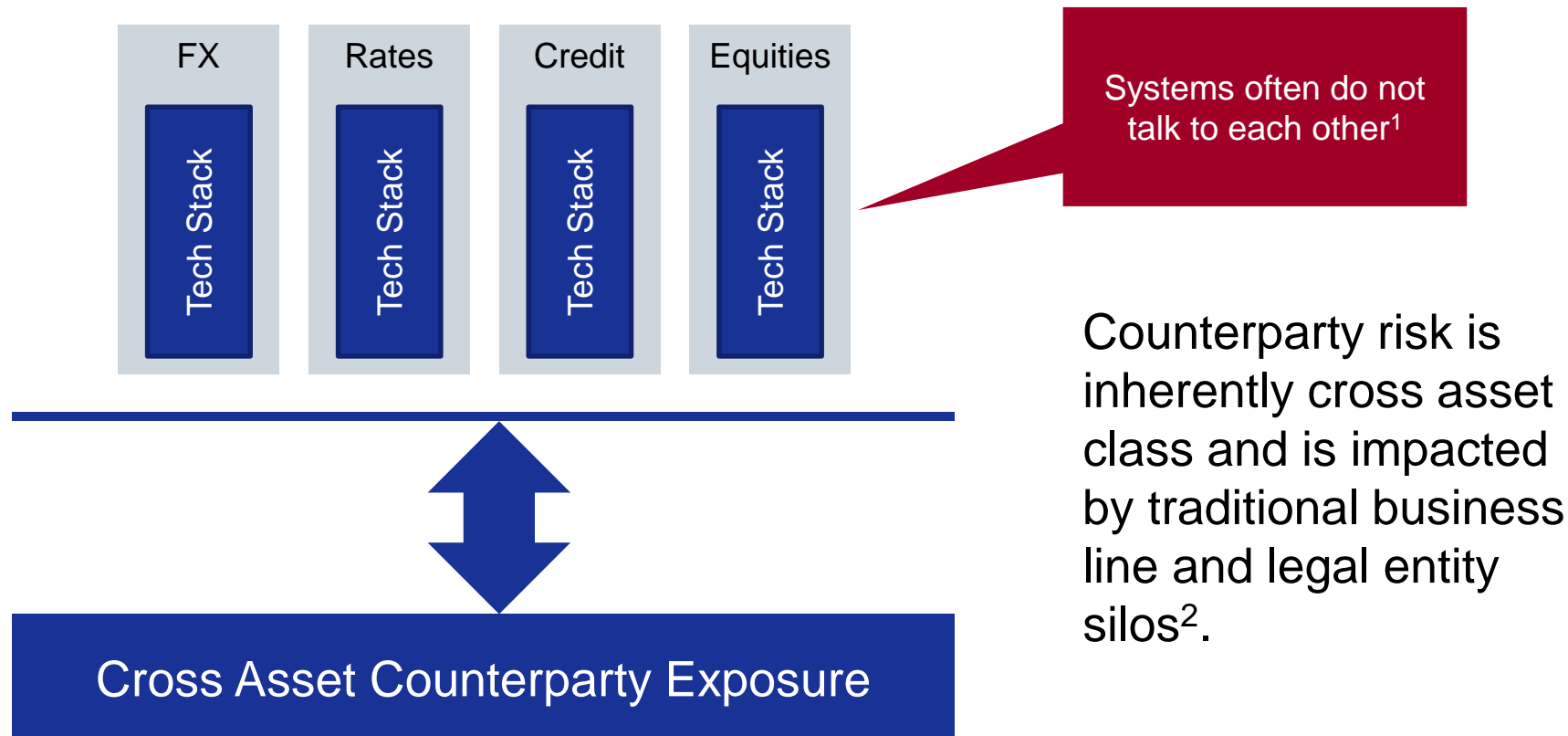
- Lack of consistency in pricing model between Front Office (FO) pricing and risk management and CVA calculation
- In many firms, group-wide regulatory risk calculators were implemented separately to front office pricing. Justification is the need for a control function to be independent of FO methodology.
- Does “Scenario Zero” PV match FO calculated PV of trade?
- Since 2008, with CVA/FVA pricing a trading responsibility, is a different analytics implementation between FO and Risk Control acceptable? No!
- CVA is a FO pricing, trading and hedging responsibility. Consistency of models is essential

The Technology Challenge - Computational



- CVA Calculation significantly increase demand on risk platform compared to any other trading business risk calculation
- Volume of Calculations
 - 5000 Forward PVs of 30 Tenor Points = 150,000 PVs per Trade
 - Complex Trades have calc intensive pricing models (path dependent products)
 - Volume of Results
 - Pricing of trades under simulated forward PVs will expose model limitations and result in pricing failures
- Efficient Storage of large number of data points for netting, aggregation
- Portfolio calculation – marginal calculation requires re-aggregation of large number of underlying PV sets
- CVA Sensitivities require recalculation of portfolio impact of individual risk factors

Organisational Challenge - Lack of Integration across Silos



¹ Source: BankingTech journal (<http://bit.ly/1ui5PW0>)

² See also: "Principles for effective risk data aggregation and risk reporting", <http://www.bis.org/publ/bcbs239.htm>

Data Challenge - Client and Legal Entity Reference Data Quality



- Lack of shared “golden source” data – Reference data used by different risk systems are often managed locally and are inconsistent between systems, leading to inconsistent risk or limit calculation¹
- Details of CSA agreements or netting agreements often not captured correctly in IT systems²
- Legal Entity (LE) information not complete or incorrect; prior to DVA calculation and CRD IV Leverage ratio calculation incorrect LE had less consequence³ compared to today
- What is the Reference Data source for new clients and clients with fresh negotiated CSAs?

¹ Source: Reuters (<http://reut.rs/1ui70oJ>)

² Source: WallStreet Systems (<http://ubm.io/15qwbPX>)

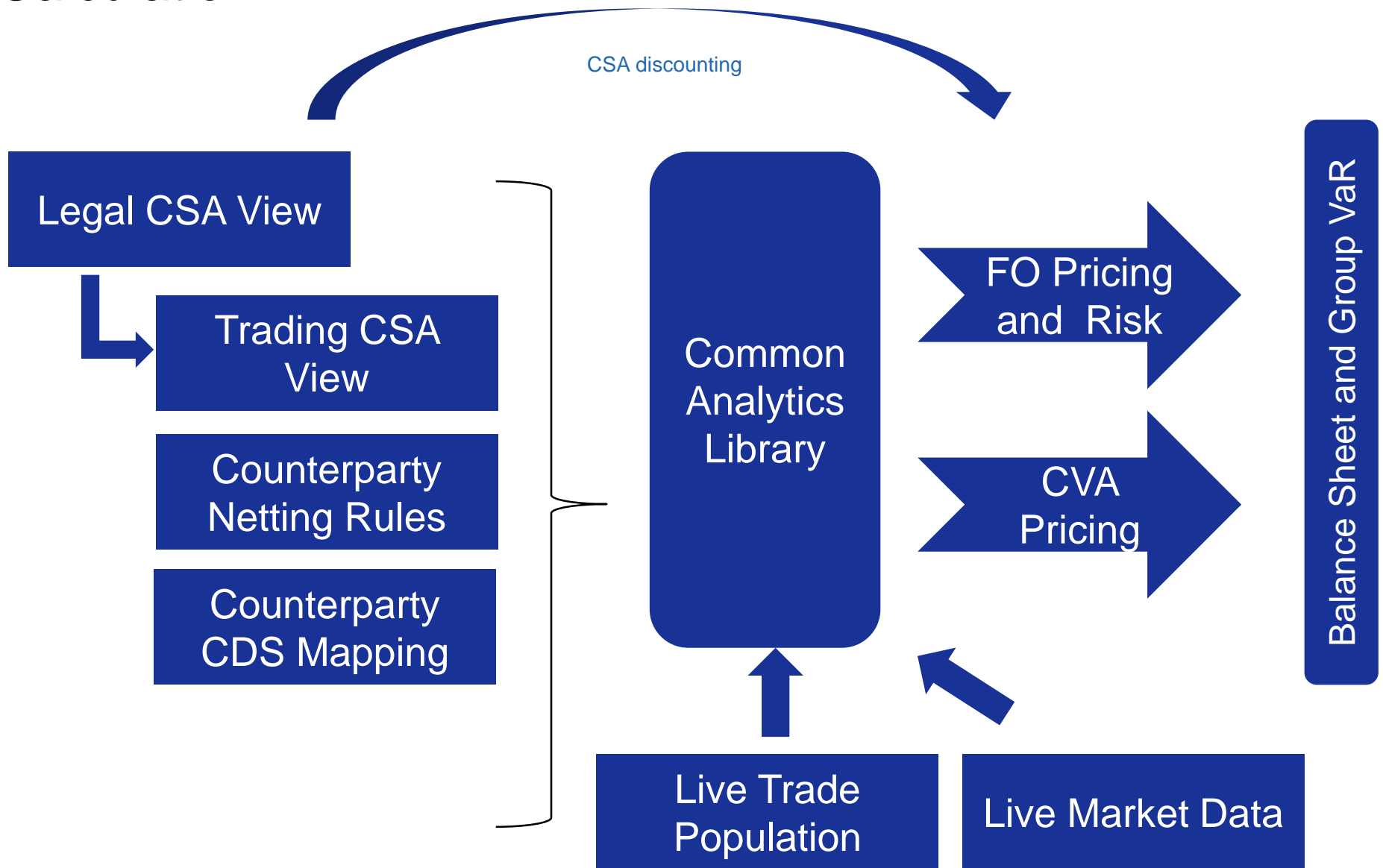
³ Source: Banque de France (<http://bit.ly/1J1KO9g>)

Architectural Principles to meet the Technology Challenges



- Consistent central analytics function to guarantee same trade pricing for FO and CVA Calculation
- “Golden Source” Client information (Client identification and CSA agreements) supported by CVA Trading capability to reset CSA data for new clients or newly negotiated CSAs
- Break dependency on asset class silo'd calculators – what are the strategic technology assets in the bank?

Architectural Blueprint for Cross Asset CVA Calculation



CVA and FVA (and xVA) are implemented similarly



Accurate understanding of collateral (for derivatives: CSA) is critical:

- Type of collateral permitted
- Payment frequency
- Collateral threshold
- Minimum transfer amount
- Rating triggers



Q & A