Quaternion™ approach to XVA (Family) Calculation

The credit crisis of 2007 made it clear that banks had not been taking the risks and associated costs of financial derivatives into account correctly. Since then, a large number of value adjustments (XVAs) have emerged:

- Credit/debit value adjustments (CVA/DVA), which are required by regulators and accounting standards. CVA/DVA reflect the expected losses from one party's default.
- Funding value adjustment (FVA), which an ever growing number of banks report in their quarterly statements, and which is expected to become part of the accounting standards in the future. FVA represents the expected future funding costs and benefits of collateral.
- Capital value adjustment (KVA), which many banks are already computing for internal use. KVA is the expected value of future capital costs.
- Margin value adjustment (MVA), which is becoming more and more important with mandatory initial margin for cleared and OTC derivatives. MVA estimates the expected funding costs of initial margin.

Computation of the XVAs requires the ability to project credit losses (due to default), funding costs of posted and received collateral, capital costs and initial margin requirements at future points in time until the maturity of a given derivatives portfolio. The basis for this calculation are risk factor evolution (RFE) models that simulate each driver of market value ("risk factor") into the future. The next step is the calculation of the future exposure, which drives CVA/DVA and FVA. The final step is to compute the market risk at a simulated future point in time, which is needed for MVA and KVA. These simulations require robust and fast calculation and pricing methods to deliver the value adjustments in acceptable time.

Built on Open Source Risk, Quaternion has developed ORE+ with its fast, sophisticated RFE models for all asset classes and a wide financial product range. It has been successfully used to validate RFE models as well as to calculate future exposure in commercial and investment banks. The methods used are described in the book "*Modern Derivatives Pricing and Credit Exposure Analysis*", written by three of Quaternion's partners.

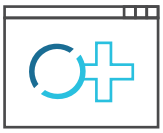
CLIENT MODEL

A client's internal model has been developed by the risk or technical units based on the existing frameworks of the organisation itself

OPEN SOURCE RISK

ORE

Open Source Risk provides an Open Source engine under an open BSD license providing a fully transparent, cutting edge platform for the Quaternion product suite



ORE+

Quaternion has developed a series of libraries integrating with Open Source Risk to deliver superior results in terms of speed and breadth

Features

- Coverage of all asset classes
- Large coverage of derivatives products
- Speed and accuracy
- Open Source Quantlib libraries an integral part

Benefits

- Transparency of the core model
- Independent model validation
- Regulatory compliance
- Extending Open Source Risk
- Developed by Quaternion experts

Quaternion™ Risk Management

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