



VectorRisk

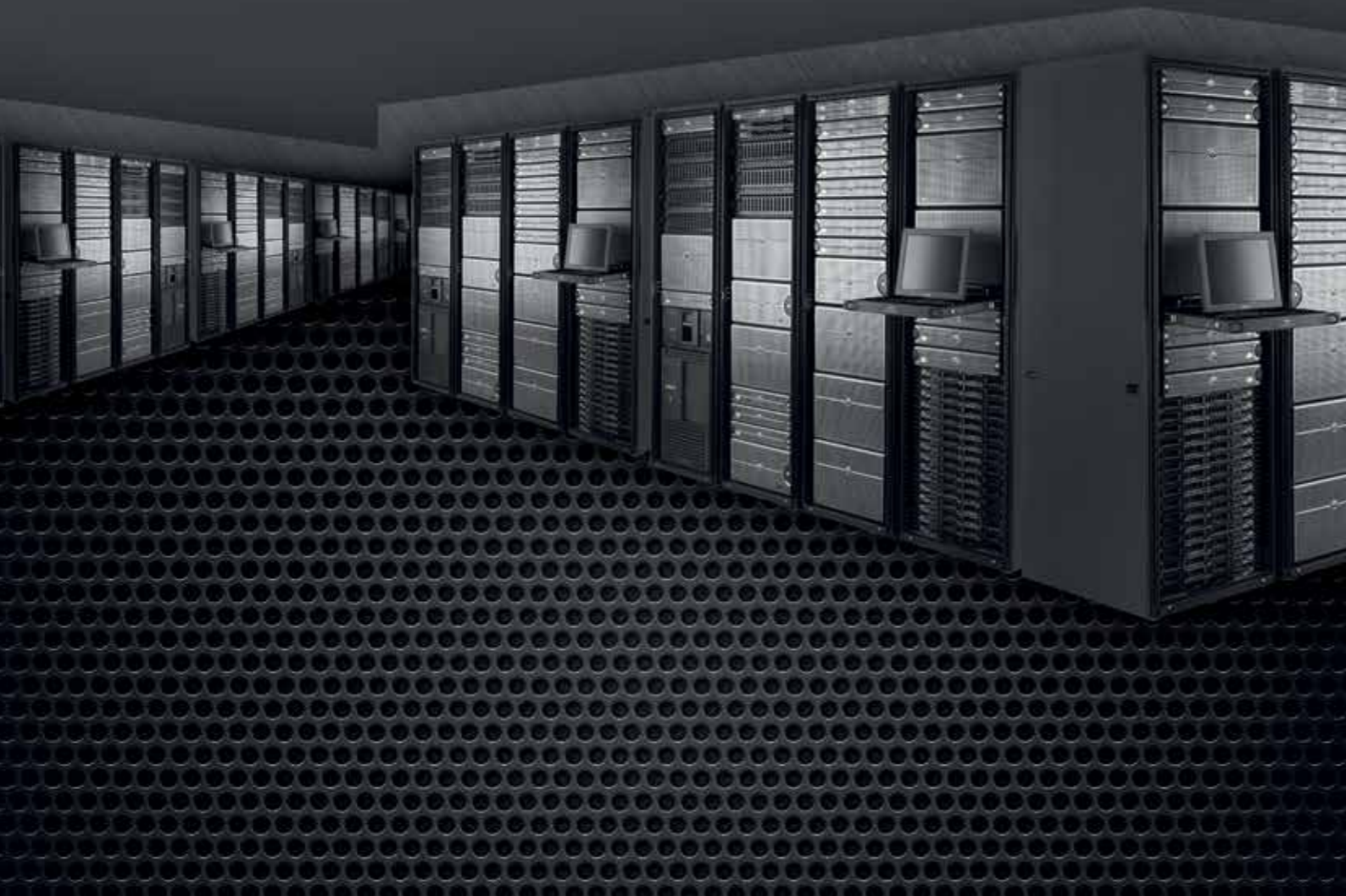
XVA Fact Sheet



Vector Risk Fact Sheet

VectorRisk is an Australian company with customers in Australia, New Zealand, Singapore and the United States that provides cloud based risk software solutions to banks, hedge funds, government and corporate treasuries.

Our risk system calculates market and credit risk exposures in real-time. Our clients have implemented the system as the engine behind credit limit monitoring, collateral stress testing, market VAR and stress, and CVA.



- Vector Risk offers a comprehensive xVA service for regulatory and trading requirements, covering all the main derivative asset classes and products.
- Our multi-tenancy cloud solution (Microsoft Azure) vastly reduces IT costs, implementation timeframes and project risk. Put simply, the solution is inexpensive.
- Calculation of xVA measures such as CVA, Bilateral CVA, DVA, FVA, Counterparty FVA using market standard modelling
- Extremely efficient calculation of xVA sensitivities and stress testing; and SA-CVA.
- Clients can also use their own market data (private rates)
- The architecture fully separates the risk engine from the workflow and GUI via web services. So you can use the workflow to organize all the calculations for, e.g., a daily process, or call directly into the risk engine for stateless, real-time calculations.
- xVA calculations are available now for impact assessment or subscription.
- The pricing and risk analytics are proven inside large banks and used by Big 5 accounting firms, such as KPMG, for auditing
- We also have comprehensive internal model offerings for credit risk capital, IMM and PFE (Potential Future Exposure); and our solution now offers comprehensive Basel III support, including SACCR, FRTB SMA, IMA and SA-CVA.



FIGURE 1:
VECTOR RISK DAILY WORKFLOW – SAMPLE TASK LIST
WITH XVA TASKS

Market Standard XVA Modelling

TaskID	Task Name	Status	Description	Type	Started (UTC)	Ended (UTC)	Elapsed (min)	Deper
20	LoadCounterparties	Success	Load all counterparties	LoadCounterparty	02-05-2016 11:14 AM	02-05-2016 11:14 AM	0:01	10
30	LoadRates	Success	Load all private rates	LoadRate	25-04-2016 12:59 PM	25-04-2016 12:59 PM	0:02	10
40	LoadTrades	Success	Load all trades	LoadTrade	11-05-2016 2:36 PM	11-05-2016 2:36 PM	0:13	10
50	ReconcileTrades	Success	Reconcile all trades	MarketMarket	11-05-2016 2:36 PM	11-05-2016 2:36 PM	0:41	30,40
55	Decomposition	Success	Decompose P&L	Decomposition	11-05-2016 2:36 PM	11-05-2016 2:37 PM	1:10	50
62	LoadParameters	Success	Load Funding Curve Parameters	LoadCurveEvol	25-04-2016 1:03 PM	25-04-2016 1:03 PM	0:02	
75	ReadyForCredit	Success	Prerequisites for credit completed	Milestone	11-05-2016 2:36 PM	11-05-2016 2:36 PM	0:00	20,50
80	ReadyForMarket	Success	Prerequisites for market risk complete	Milestone	11-05-2016 2:37 PM	11-05-2016 2:37 PM	0:00	50
90	VaR	Success	Run VaR and Expected Shortfall	MarketVar	11-05-2016 2:37 PM	11-05-2016 2:39 PM	2:03	80
95	TradeStressUSD	Success	Run stress on trades USD base	MarketStress	11-05-2016 2:40 PM	11-05-2016 2:40 PM	0:19	80
110	StressUSD	Success	Run stress tests with USD base	MarketStress	11-05-2016 2:41 PM	11-05-2016 2:41 PM	1:23	80
120	XVA	Success	Run XVA - Risk Neutral Sim - All CPTTs	CreditExposure	11-05-2016 2:41 PM	11-05-2016 2:44 PM	2:56	75
125	PFE	Success	PFE - Real World Sim - All CPTTs	CreditExposure	11-05-2016 2:44 PM	11-05-2016 2:46 PM	2:18	75
127	XVA - Drilldown	Success	XVA Drilldown Example	CreditExposure	11-05-2016 2:47 PM	11-05-2016 2:47 PM	0:53	75
129	Margining	Success	Run Margin on IR Swaps	Margining	11-05-2016 2:48 PM	11-05-2016 2:48 PM	0:21	75
140	CVA VaR	Success	Run CVA VaR calculations	CvaVar	11-05-2016 2:48 PM	11-05-2016 3:06 PM	17:44	75
150	XVA Sensitivities	Success	XVA Sensitivities	CreditExposureStress	11-05-2016 3:06 PM	11-05-2016 3:07 PM	1:21	75
160	XVA Stress Testing	Success	XVA Stress Testing	CreditExposureStress	11-05-2016 3:07 PM	11-05-2016 3:08 PM	1:00	75
900	Publish	Success	Publish all reports	Publish	23-05-2016 5:29 AM	23-05-2016 5:29 AM	0:08	50,55,90,95,105,1

The Vector Risk cloud-based risk analytics service provides industry standard portfolio xVA calculations, correctly taking into account netting/economic offset legal agreements, collateral and margining, within a full Monte Carlo framework, across all major asset classes and product types:

- Risk neutral evolution for risk factors where implied volatilities are available
- Correlated default (wrong way risk) modelling
- Dynamical (path-dependent) collateral (CSA) and margining agreement handling
- Automated switchover to OIS-flavoured single and cross-currency zero curves for margined or CSA managed trades/pools
- Correct path handling within the MC framework for trades with triggers, barriers, fixings, etc.
- Detailed drilldown allows the user to investigate evolved rates and trade valuations to analyse unexpected results and to provide regulatory transparency

Integrated Market Data

And Risk Factor Management

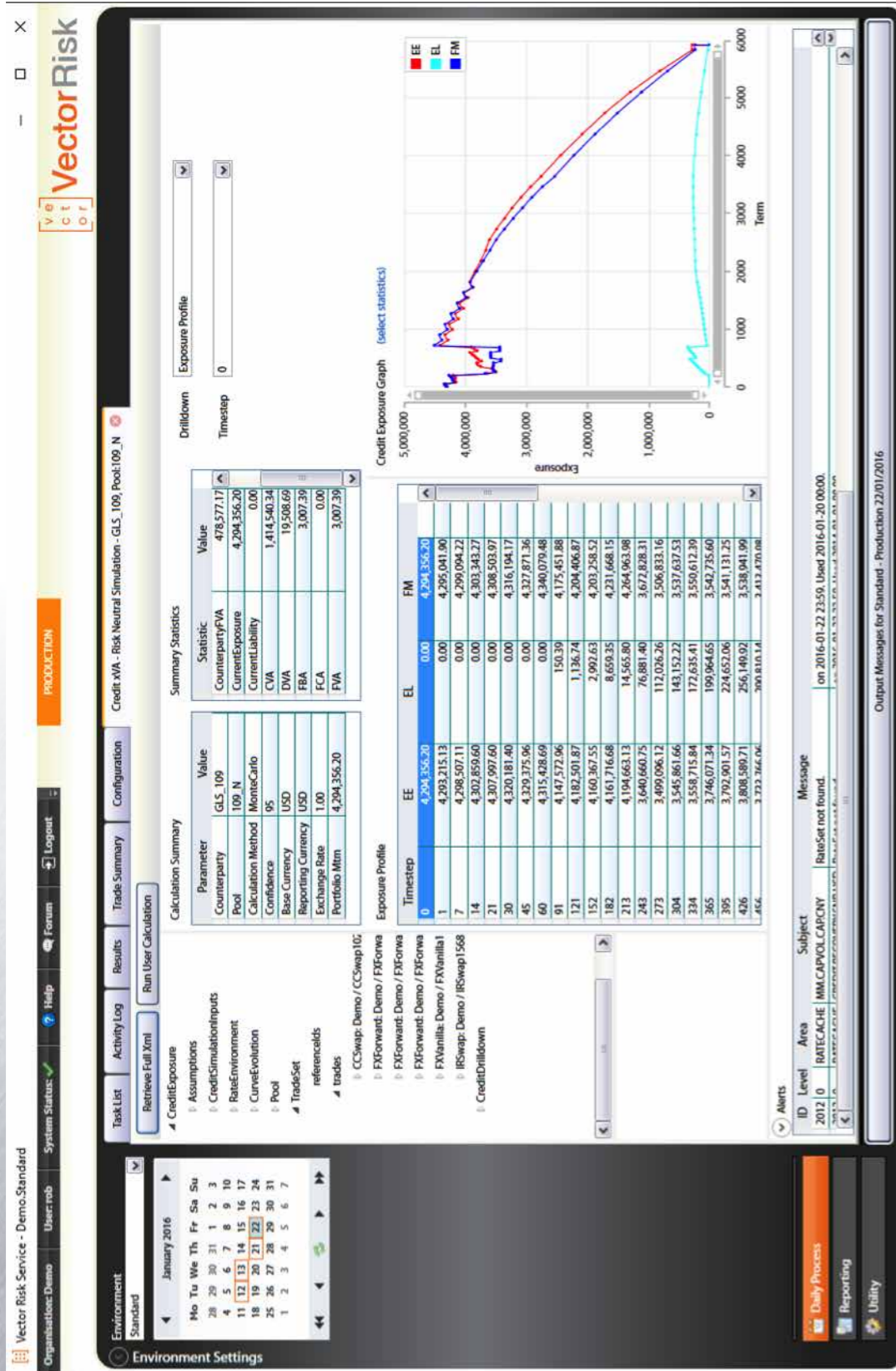
xVA calculations require market data streams such as credit spreads, and implied volatilities which may be new to vanilla derivative houses. In addition, substantial historical data can be required in order to parameterise stochastic processes for risk factors where risk neutral evolution isn't possible. Finally, there is a lot of work required in order to determine stochastic processes and parameters for the relevant risk factors, and to deal with data gaps and curve redirection and proxying. Subscribers to the Vector Risk service can take advantage of our integrated curve building, parameter and correlation estimation and risk factor management support:

- Automated curve building:
 - Swap and bond zero curves
 - Single currency basis (projection) curves
 - FX zero curves
 - OIS flavoured discount curves
- Risk neutral process calibration
- Parameter and correlation estimation from historical data
- Automated curve redirection: proxy, override and basis (driver) curve rules

FIGURE 2:
XVA SUMMARY REPORT

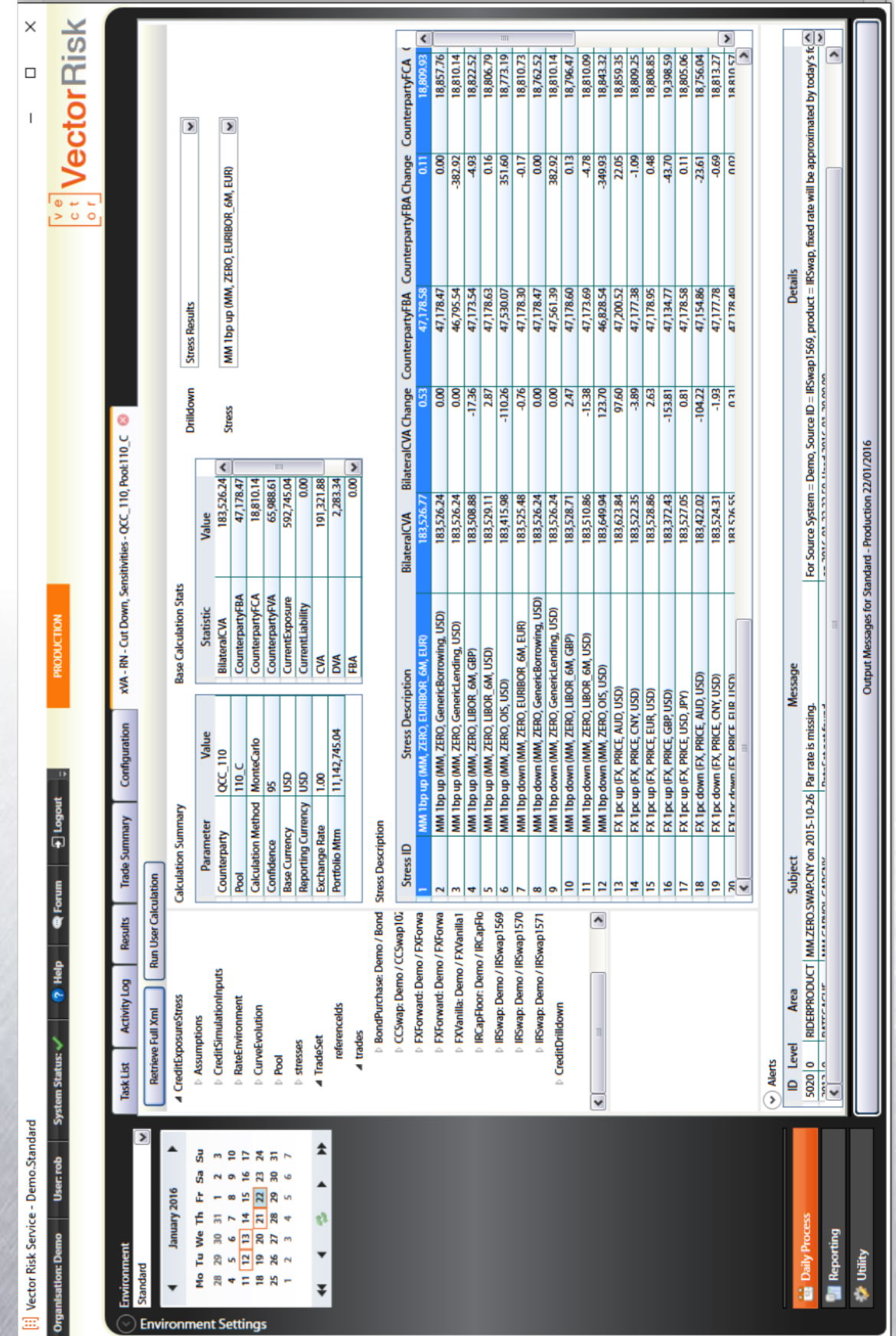


FIGURE 3: XVA SAMPLE LEGAL ENTITY LEVEL DETAILS SCREEN



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FIGURE 4: XVA SENSITIVITIES SAMPLE DETAILS SCREEN



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FIGURE 5: XVA STRESS TESTING SAMPLE DETAILS SCREEN

Unrivalled Performance

For Full Portfolio XVA Simulations

The Vector Risk cloud-based risk analytics service is based on industry leading vector code. All aspects of the simulation are vectorised to achieve unrivalled performance. Cloud delivery means that cost of ownership is reduced even further: our clients get the power they need, when they need it, at a fraction of the price that they would have to pay for internal deployments

CVA benchmark (5000 path Monte Carlo):

Counterparties:	2000
Trades:	150,000 (60% swaps, 10% options, 30% FX)
Trade valuations:	32,709,985,689
Cashflow valuations:	698,835,209,270
CPU cores:	80
Run time:	22 MINUTES

[EFFICIENT XVA STRESS TESTING AND SENSITIVITIES]

By making efficient re-use of calculations, we are able to run hundreds of xVA stress tests or sensitivities in a fraction of the time that brute force re-calculation would require. For example, in a large counterparty portfolio, the xVA measures may depend on around one hundred risk factors: spot rates, interest rate curves, volatilities, credit spreads, etc. However, the time taken to compute all of the xVA sensitivities (bumping each of the risk factors up and down, for instance), is only around five times as long as the original xVA calculation. This makes the calculation of xVA sensitivities, stress tests and VaR, as well as regulatory CVA capital calculations, very feasible and affordable, even for banks with hundreds of thousands of contracts.

“Private Cloud” options are also available.

The screenshot displays a detailed view of an XVA stress test. It includes a 'Calculation Summary' table with parameters like Counterparty (Apple Inc), Pool (111_N), and Calculation Method (MonteCarlo). A 'Summary Statistics' table shows values for BilateralCVA (736,691.84) and CurrentExposure (4,972,720.43). Below these are two large tables: 'Path Trade MTM' listing various source systems and their MTM differences, and 'Rates for Selected Trade and Path' showing curve descriptions and keys for different legs of the trade.

All Vector Risk details screens allow the user to modify any of the counterparty, trade, market or assumption data in the tree and re-run the calculation; and to drill down into the calculations to see details of every evolved rate and trade valuation, along every simulation path, at every credit node (maturity) and under every stress test:

This screenshot shows the configuration and results of an XVA stress test. On the left, there's a tree view for 'CreditExposureStress' with expandable sections for Assumptions, Simulation Inputs, and Collateral Details. The main area is divided into 'Calculation Summary' (parameters like Counterparty: QCC_110, Pool: 110_C), 'Base Calculation Stats' (statistics like BilateralCVA: 183,526.24), and a 'Stress Description' table. The stress table lists 15 different stress scenarios, such as 'FX Price -25% Vol +200%', and shows the resulting BilateralCVA and CounterpartyFBA values for each.



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