ct or ri sk VectorRisk

e

XVA Fact Sheet

FINTECH INNOVATION AWARDS 2016

FINALIS

4



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 realtime. Our clients have implemented the system as the engine behind credit limit monitoring, collateral stress testing, market VAR and stress, and CVA.



Vector Risk Fact Sheet

- 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.



FINTECH INNOVATION AWARDS 2016

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



Market Standard XVA Modelling

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

Control Bapeed (min) GUTCJ	model Success Load all private rates Load friet rates <thload friet="" rates<="" th=""> Load friet rates</thload>	Att the field Attention Total math Total math<	RIS		•	Deper	de	r																	95,105,1	_	-	-	_	
d (UTC) Bapeed (mi d (UTC	modulime Success Load Infrates Zood S125P MI Zood S125P MI Zood S125P MI Zood S125P MI Zool S125P MI <thzoo mi<="" s125p="" th=""> Zool S125P MI</thzoo>	Atta Anthy Lip Starting Individual Indit Indit Indit<	ctor			la In	10	10	10	30,40	50		20,50	20	8	80	80	75	75	75	75	75	75	75	50,55,90,					
0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1	modulation success Load all primate states Load finades 25-04.2016 12-35 MI 11.05.2016 235 FM 00 Reconcidentides success Reconcidentides success Reconcidentides 11.05.2016 235 FM 11.05.2016 235 FM 25 Decomposition success Reconcidentides success Reconcidentides success Reconcidentides 11.05.2016 235 FM 11.05.2016 235 FM 25 Reconcidentides success Reconcidentides success Reconcidentides 11.05.2016 237 FM 11.05.2016 237 FM 26 Totol Success Reconcidentides for market success Load function 11.05.2016 237 FM 11.05.2016 237 FM 27 Roundes Success Ran Alf-Reconcidentide Meetanee 11.05.2016 234 FM 11.05.2016 234 FM 20 Val Success Ran Alf-Reconcidentides Meetanees 11.05.2016 234 FM 11.05.2016 234 FM 21 Val Success Ran Alf-Reconcidentides Meetanees 11.05.2016 234 FM 11.05.2016 234 FM 21 Success Ran Alf-Reconcidentide	Alta Anthrutu Rearta Tablita Anthrutu Rearta Confrontinio Alta Anthrutu Rearta Contract Expertision Contract Expertision Scanta Defended (UIC) Expertision Alta Rearta Contract Expertision Contract Expertision Scanta Contract Alta Rearta Contract Expertision Contract Expertision Scanta Contract Expertision Scanta Experimentaria Experimaninia Experimentaria	Ve			Bapsed (mi	001	0.02	0:13	0.41	1:10	0.02	0:00	000	2:03	0.19	123	256	2:18	053	0.21	17:44	121	1:00	0:08					
Ende 5.06.20 5.04.20 5.04.20 1.05.20 1	20 Loodinates Success Load all preade states Loadinate Zoh 2016 Z35 PM Zoh 2016 Z36 PM Zoh 2016 Z31 PM Zoh 2016 Zah PM Zo	Tatist Anthrutog Boarts Tode Summary Confluencing arg/2016 Thirk Filles in the Fil	0 0			Ended (UTC)	2.05-20161:14 AM	NH 05-2016 12-50 PM	1-05-2016 2:36 PM	1-05-2016 2:36 PM	1-05-2016 2:37 PM	Md E019102-90-50	1-05-2016 2:36 PM	1-05-2016 2-37 PM	1-05-2016 2:39 PM	1-05-2016 2:40 PM	1-05-2016 2:41 PM	1-05-2016 2:44 PM	1-05-2016 2:46 PM	1-05-2016 2:47 PM	1-05-2016 2:48 PM	1-05-2016 3:06 PM	1-05-2016 3:07 PM	1-05-2016 3:08 PM	3-05-2016 5:29 AM					
Started (UTC) 25.04.2016 114.4M 25.04.2016 114.4M 25.04.2016 126 PM 11.05.2016 236 PM 11.05.2016 236 PM 11.05.2016 236 PM 11.05.2016 230 PM 11.05.2016 230 PM 11.05.2016 231 PM 11.05.2016 531 PM 11.05.2016 FM 11.05.2016 531 PM 11.05.2016 531 PM 11.05.2016 531 PM 11.05.2016 531 PM 11.05.2016 FM 11.05.2016 FM 11.05.20	0 Loand all private rates Loand all private Loand all private rates Loand all privates Loand all privates 20 Raund Yar Success Run WAR and Expected Shortfall Market Yares Loand all privates Loand all privates 20 VAR Success Run WAR All RAR Neutral Sim - All CPTYs Credit Exposures Loand all priporares 21 XMA Success Run MAr RAR Neutral Sim - All CPTYs Credit Exposures Loand Exposures 21 XMA Success Run	Attention List Attention List Totat List Attention List Totat List Attention List Totat List <				Started (UTC)	02-05-20161:14 AM	25-04-2016 12:59 PM 2	11-05-2016 235 PM	11-05-2016 236 PM	11-05-2016 2:36 PM	25-04-2016 1.03 PM	11-05-2016 2:36 PM	11-05-2016 237 PM	11-05-2016 237 PM	11-05-2016 2-40 PM	11-05-2016 2:40 PM	11-05-2016 241 PM	11-05-2016 2:44 PM	11-05-2016 2:47 PM	11-05-2016 247 PM	11-05-2016 248 PM	11-05-2016 3:06 PM	11-05-2016 3.07 PM	23-05-2016 5/29 AM					
Type test Combrowty LoadRate Markfoldkarket Decomposition Markettone Markettone Markettone Markettone Markettone Markettone Markettone Margining CreditExposure CreditExpos	Image: constraint of the second and primate rates Exercises Load all primate rates 0 Load Tardes Success Load all prades 20 Decomposition Success Reconcile all trades 21 Load all prades Success Reconcile all trades 22 Load all prades Success Reconcile all trades 23 ReadyForMarket Success Reconcile all trades 24 Load All Success Reconcile all trades 25 ReadyForMarket Success ReadyForMarket 26 Valk Success Run valk and Expected Shortfall 27 VAL Success Run valk and Expected Shortfall 28 Nam valk Run valk and Expected Shortfall 29 Mangin on R Sweps All 21 XVA Success Run Market and Stim - All CPTYs 29 Mangin on R Sweps Namerial Sim - All CPTYs 20 XVA Sensativities Success Run Market and Sim - All CPTYs 29 XVA Senestivities Success <	Activity Log Results Trade Summary Configuration alpha Table Sammary Configuration Trade Sammary Configuration alpha Th File Activity Log Reset Table Lock Table Export Headers alpha Tip 2 2 Activity Log Reset Table Lock Table Lock Table Export Headers alpha 1 2 2 2 2 Activity Log Lock Table				Type	LoadCounterparty (LoadRate	LoadTrade	MarkToMarket	Decomposition	LoadCurveEvol	Miestone	Milestone	MarkotVar	MarkaetStress	MarkuetStruess	CreditExposure	CreditExposure	CreditExposure	Margining	CvaVar	CreditExposureStress 1	CreditExposureStress 1	Publish					
Tade Summary Configuration Flack Export Headers Arac Export Headers Description Losd all private rates Load all private rates Load trading Curve Farmeters Reconcile all trades Recompleted Prerequisities for market rate completed Intrades Run vaR and Expected Shorthall Intrades Run vaR and Expected Shorthall Intrades Run stress on trades USD base Run stress on trades Run Ark Risk Neutral Sim - All CPTYs Run Margin on R Swaps Run Margin on R Swaps Run Margin en R Swaps Run Kates restangions XM Stress feeting Run Kates restangions Run Stress restangions	0 LoudRates Success 0 LoudRates Success 30 ReconclierFades Success 32 LoudParameters Success 33 ReconclierFades Success 34 LoudParameters Success 35 ReachFarmestics Success 36 ReachFarmestics Success 36 TradeStrestLSD Success 37 XM Success 36 VarR Success 37 XM Success 37 XM Success 37 XM Success Success 37 XM Success Success 30 XM Success Success 31 XM Success Success 30 XM Succes Success	At List Activity Log Results any 2016 Task List Activity Log Reset Task Loc Th Fr<		Trade Summary Configuration	k Task Export Headers	Description	Load all counterparties	Load all private rates	Load all trades	Reconcile all trades	Decompose P&L	Load Funding Curve Parmeters	Prerequisites for credit completed	Prenequisities for market risk complete	Run VaR and Expected Shortfall	Run stress on trades USD base	Run stress tusts with USD base	Run xMA - Risk Noutral Sim - All CPTYs (PFE - Real World Sim - All CPTYS (xVA Drilldown Example	Run Margin on IR Swaps	Run CVA VaR calculations	xVA Sensitivities	xVA Stress Testing	Publish all reports					t and t
Results Results bucces	20 Loadifades 20 Loadifades 20 Reconclerifades 25 ReadyforMarket 26 ReadyforMarket 27 XNA 28 ReadyforMarket 29 Margining 20 XNA 21 XNA 23 XNA 24 CVA VAR 20 XVA 21 XNA 22 XNA 23 XNA 24 XNA 25 Margining 40 CVA VaR 50 XVA Stress festing 60 XVA Stress festing	Attiny Log Task List Actinity Log ary 2016 T Task List Actinity Log Th Fr Sia Sig Sig Ti 2 3 Load/Parameters T Ti 2 2 Actinity Log T Ti 2 3 Load/Parameters T Ti 2 2 Actinity Log T Ti 2 3 Configures T Ti 2 3 Configures T Ti 2 5 F T Ti 2 5 Configures T Ti 2 F Configures T Ti 2 Actinities T T Ti 2 F Magniting T Ti 2 F Magniting T Ti 2 F Magniting T Ti 2 M		Results	Loc	Status	SUCCESS	Success	Success	Success	Success	Success	Success	SUCCESS	Success	Success	Success	Success	Success	SUCCESS	SUCCESS	Success	Success	Success -	Success					
Activity Log Activity Log Beaver Taxk Task Name or Commeptates or Commeptates or Commercial antificades concilerTrades concilerTrades antificades concilerTrades antificades concilerTrades antificades concilerTrades antificades concilerTrades antificades concilerTrades antificades concilerTrades antificades concilerTrades antificades concilerTrades antificades concilerTrades antificades concilerTrades antificades concilerTrades antificades concilerTrade	No. No. <td>Takklat Takklat Th Fr Sa Su 7 18 16 10 7 18 16 10 8 10</td> <td></td> <td>Activity Log</td> <td>sk Reset Task</td> <td>Task Name</td> <td>adCounterparties</td> <td>adRates</td> <td>adTrades</td> <td>concileTrades</td> <td>composition</td> <td>adParameters</td> <td>adyForCredit</td> <td>adyForMarket</td> <td>8</td> <td>deStressUSD</td> <td>OSUSSO</td> <td>A</td> <td></td> <td>A - Drilldown</td> <td>argining</td> <td>A VaR</td> <td>A Sensitivities</td> <td>A Stress Testing</td> <td>blish</td> <td></td> <td></td> <td></td> <td></td> <td></td>	Takklat Takklat Th Fr Sa Su 7 18 16 10 7 18 16 10 8 10		Activity Log	sk Reset Task	Task Name	adCounterparties	adRates	adTrades	concileTrades	composition	adParameters	adyForCredit	adyForMarket	8	deStressUSD	OSUSSO	A		A - Drilldown	argining	A VaR	A Sensitivities	A Stress Testing	blish					
Task Lids ReeRun Ta ReeRun Ta 20 Ld 21 Ld 22 Ld 23 Ld 24 Ld <		My 2016 • Th Fr 5a Su		Task List	ReRun Ta	TaskID	20 Ic	30	40 Lo	S0 Re	55 D	62 Lo	75 Re	80	80	95 Tr	110 St	120 ×	125 PF	127 ×	129 M	140 O	150 ×	160 ×	900 Pr					1.0

v e s k

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:
 - o Swap and bond zero curves
 - o Single currency basis (projection) curves
 - o FX zero curves
 - o 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



ri sk



> 600 . 52,360.20 19,508.69 291,762.42 93,958.18 106,276.55 78,904.52 276,824.65 43,818.68 735,370.93 115,476.30 ,414,540.34 ,192,894.05 1,702,418.45 1,711,278,55 622,004.05 3,254,256.68 CVA 905,461.51 0.00 769,760,53 1,043,613,76 55,993,47 1,335,037,67 -272,514,92 1,541,921,63 334,424.19 3,094,659.37 1,184,380.65 **Silateral CVA** 112_N 109_N 103_N 113_N 11_N 107_N 14_N 116_C 02_E 00 8 3 Counterparty MAN_102 Coca Cola pple Inc CHK_107 GVN_103 ISO_114 _S_109 BN

v e

s k

[www.vectorrisk.com | 07]



ri sk

FIGURE 3: XVA SAMPLE LEGAL ENTITY LEVEL DETAILS SCREEN

	b IBCanFloor: Domo / IBCanFlo	4 WW	1bp up (MM, ZERO, LIBOR_6M, GBP)	183,508.88	-17.36	47,173.54	-4.93	18,822.52
		5 MM	1bp up (MM, ZERO, LIBOR_6M, USD)	183,529.11	2.87	47,178.63	0.16	18,806.79
	IRSwap: Demo / IRSwap1569	6 MM	1bp up (MM, ZERO, OIS, USD)	183,415.98	-110.26	47,530.07	351.60	18,773.19
	IRSwap: Demo / IRSwap1570	7 MM	1bp down (MM, ZERO, EURIBOR_6M, EUR)	183,525.48	-0.76	47,178.30	-0.17	18,810.73
	IRSwap: Demo / IRSwap1571	8 MM	1bp down (MM, ZERO, GenericBorrowing, USD)	183,526.24	0.00	47,178.47	00:0	18,762.52
	h Cradit Drilldown	6 WW	1bp down (MM, ZERO, GenericLending, USD)	183,526.24	0.00	47,561.39	382.92	18,810.14
		10 MM	1bp down (MM, ZERO, LIBOR_6M, GBP)	183,528.71	2.47	47,178.60	0.13	18,796.47
		11 MM	1bp down (MM, ZERO, LIBOR_6M, USD)	183,510,86	-15.38	47,173.69	-4.78	18,810.09
		12 MM	1bp down (MM, ZERO, OIS, USD)	183,649.94	123.70	46,828.54	-349.93	18,843.32
		13 FX1	Ipc up (FX, PRICE, AUD, USD)	183,623.84	97.60	47,200.52	22.05	18,859.35
		14 FX1	Ipc up (FX, PRICE, CNY, USD)	183,522.35	-3.89	47,177.38	-1.09	18,809.25
		15 FX1	Ipc up (FX, PRICE, EUR, USD)	183,528.86	2.63	47,178.95	0.48	18,808.85
		16 FX1	Ipc up (FX, PRICE, GBP, USD)	183,372.43	-153.81	47,134.77	-43.70	19,398.59
		17 FX1	Ipc up (FX, PRICE, USD, JPY)	183,527.05	0.81	47,178.58	0.11	18,805.06
		18 FX1	pc down (FX, PRICE, AUD, USD)	183,422.02	-104.22	47,154.86	-23.61	18,756.04
		19 FX1	Ipc down (FX, PRICE, CNY, USD)	183,524.31	-1.93	47,177.78	-0.69	18,813.27
		20 EX 1	Inc down (EX_DRICE ELIR LISD)	182 576 55	031	4717840	cuu	1881057
		~	10					^
	 Alerts 							
	ID Level Area	Subject	Message			Details		
Daily Process	5020 0 RIDERPRODUCT MM.ZERO.S	WAP.CNY on 2015-1	0-26 Par rate is missing.	For Source System =	Demo, Source ID = IRSw	ap1569, product = IRSwa	p, fixed rate will be approxi	mated by today's ft 🗢
📲 Reporting		MILLIN I	Mut. C. t. a. t. C. t. a. t. a. C. t. a. t. t. t. a. t. t. t. t. t. t. t. a. t.					>
🐡 Utility			Output Messages for Sta	andard - Production 22	5/01/2016			

FIGURE 4: XVA SENSITIVITIES SAMPLE DETAILS SCREEN

s k

FIGURE 5: XVA STRESS TESTING SAMPLE DETAILS SCREEN



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:

isk List Activity Log Results Tra	de Summary	Configuration	xVA - RN - Cut Down, Regu	atoryUSD - QCC_110, Poo	£110_C 🙁	
Retrieve Full Xml Run User Calculation						
CreditExposureStress	Calculation Su	immary	Base Calculat	ion Stats	Drilldowr	Stress Resu
Assumptions	Param	eter Va	lue Stati	stic Value	Dillociti	50057005
CreditSimulationInputs	Counterpart	ty QCC_110	BilateralCV	A 183,5	26.24 A Strace	EV Drice D
RateEnvironment	Pool	110_C	Counterpa	tyFBA 47,1	78.47	FA PIKe-2
CurveEvolution	Calculation	Method MonteCar	lo Counterpa	tyFCA 18,8	10.14	
4 Pool	Confidence	95	Counterpa	tyFVA 65,9	88.61	
	Base Curren	cy USD	CurrentExp	osure 592,7	45.04	
name 110_C	Reporting C	urrency USD	CurrentLial	bility	0.00	
calcType Collateral 💌	Exchange Ra	ate 1.00	CVA	191,3	21.88	
CollateralDetails	Portfolio Mt	m 11,142,745	5.04 DVA	2,2	83.34	
mode Dynamical			FBA	FBA 0.00 🗸		
type Bilateral	Stress Descript	tion				
managingLocation New York	Stress ID	Stress Descript	ion BilateralCVA	BilateralCVA Change	CounterpartyFBA Co	unterpartvEBA
currency USD	1	FX Price -25% Vol +	2000/ 224.070		counterpartyr brt co	anterparty. bri
			200% 234.970/	12 51,444,18	61.818.49	
collateralHeld 220,000	2	FX Price -50% Vol +	200% 234,970	12 51,444.18 51 25.923.27	61,818.49 54,773.25	1
collateralHeld 220,000	2	FX Price -50% Vol + FX Price +10% Vol (200% 234,970. 200% 209,449. 0% 182.095.	51 25,923.27 27 -1,430.97	61,818.49 54,773.25 46,742.43	
collateralHeld 220,000	2 3 4	FX Price -50% Vol + FX Price +10% Vol 0 FX Price +10% Vol +	200% 234,970 200% 209,449 182,095 +200% 273,368	42 51,444.18 51 25,923.27 27 -1,430.97 20 89,841.96	61,818.49 54,773.25 46,742.43 72,616.90	
collateralHeld 220,000 ▲ counterparty initialMargin 0	2 3 4 5	FX Price -50% Vol + FX Price +10% Vol + FX Price +10% Vol + FX Price +20% Vol 0	200% 234,970 200% 209,449 0% 182,095 +200% 273,368 0% 178,686	12 51,444.18 51 25,923.27 27 -1,430.97 20 89,841.96 20 -4,840.04	61,818.49 54,773.25 46,742.43 72,616.90 45,863.45]
collateraliHeld 220,000 a counterparty initialMargin 0 independentAmount 0	2 3 4 5 6	FX Price -50% Vol + FX Price +10% Vol 0 FX Price +10% Vol 0 FX Price +20% Vol 0 FX Price +20% Vol 0	200% 234,970 200% 209,449 0% 182,095 +200% 273,368 0% 178,686 +200% 284,478	12 51,444,18 13 25,923,27 14,430,97 -1,430,97 12 89,841,96 12 -4,840,04 14 100,952,21	61,818.49 54,773.25 46,742.43 72,616.90 45,863.45 75,775.58	
collateralHeld 220,000 a counterparty initialMargin independentAmount minTransfer 35,000	2 3 4 5 6 7	FX Price -50% Vol + FX Price +10% Vol 0 FX Price +10% Vol - FX Price +20% Vol 0 FX Price +20% Vol - FX Price 0% Vol +20	2200% 234,970 200% 209,449. 0% 182,095. +200% 273,368. +200% 178,686. +200% 284,478. 00% 262,120.	12 51,444,18 51 25,923,27 27 -1,430,97 20 89,841,96 20 -4,840,04 44 100,952,21 35 78,594,61	61,818.49 54,773.25 46,742.43 72,616.90 45,863.45 75,775.58 69,431.95	
collateralHeld 220,000 a counterparty initialMargin 0 independentAmount 0 minTransfer 35,000 threshold 400,000	2 3 4 5 6 7 8	FX Price -50% Vol + FX Price +10% Vol (FX Price +10% Vol (FX Price +20% Vol (FX Price +20% Vol - FX Price 0% Vol +20 FX Price -50% Vol -1	2200% 234,970 200% 209,449. 0% 182,095. +200% 273,368. 9% 178,686. +200% 284,478. 00% 262,120. 75% 179,854.	12 51,944.18 51 25,923.27 27 -1,430.97 20 89,841.96 20 -4,840.04 100,952.21 35 35 78,594.61 34 -3,671.40	61,818.49 54,773.25 46,742.43 72,616.90 45,863.45 75,775.58 69,431.95 46,861.50	
collateralHeld 220,000 a counterparty initialMargin 0 independentAmount 0 minTransfer 35,000 threshold 400,000 rounding 10,000	2 3 4 5 6 7 8 9	FX Price -50% Vol + FX Price +10% Vol (FX Price +10% Vol (FX Price +20% Vol (FX Price +20% Vol - FX Price 0% Vol +20 FX Price -50% Vol -7 FX Price 0% Vol 0%	220/% 234,970 200% 209,449. 0% 182,095. +200% 273,368. 0% 178,686. +200% 284,478. 00% 262,120. 75% 179,854. 183,526. 183,526.	12 51,944.18 51 25,923.27 27 -1,430.97 20 89,841.96 20 -4,840.04 44 100,952.21 35 78,594.61 34 -3,671.40 24 0.00	61,818.49 54,773.25 46,742.43 72,616.90 45,863.45 75,775.58 69,431.95 46,861.50 47,178.47	
collateralHeld 220,000 a counterparty initialMargin 0 independentAmount 0 minTransfer 35,000 threshold 400,000 rounding 10,000	2 3 4 5 6 7 8 9 10	FX Price -50% Vol + FX Price +10% Vol 0 FX Price +10% Vol 0 FX Price +20% Vol 1 FX Price 0% Vol +20% Vol - FX Price 0% Vol +20 FX Price 0% Vol 0% FX Price 9% Vol 0%	200% 234,970 200% 209,449 200% 209,449 9% 182,095 +200% 273,368 9% 178,686 +200% 284,478 00% 262,120 75% 179,854 183,526 75% 75% 163,936	12 51,944,18 18 25,923,27 17 -1,430,97 20 89,841,96 20 -4,840,04 14 100,952,21 35 78,594,61 34 -3,671,40 34 -0,00 44 0,054,140 34 -3,671,40 34 -19,589,83	61,818.49 54,773.25 46,742.43 72,616.90 45,863.45 75,775.58 69,431.95 46,861.50 47,178.47 41,220.21	3
collateralHeld 220,000 a counterparty initialMargin 0 independentAmount 0 minTransfer 35,000 threshold 400,000 rounding 10,000 b user	2 3 4 5 6 7 8 9 10 11	FX Price -50% Vol + FX Price +10% Vol 0 FX Price +10% Vol 0 FX Price +20% Vol 1 FX Price +20% Vol 1 FX Price 0% Vol +20 FX Price 0% Vol 0% FX Price +20% Vol 0 FX Price -50% Vol 0	2240% 224074 200% 209,449. 200% 209,449. 9% 182,095. +200% 273,368. +200% 284,478. 00% 262,120. 75% 179,854. 183,526. 183,936. % 181,897.	12 51,944,18 13 25,923,27 1,430,97 1,430,97 10 88,841,96 10 4,840,04 14 100,952,21 15 78,594,61 34 -3,671,40 24 0,00 11 -19,589,83 52 -1,628,62	61,818.49 54,773.25 46,742.43 72,616.90 45,863.45 75,775.58 69,431.95 46,861.50 47,178.47 41,220.21 47,332.11	2
collateralHeld 220,000 a counterparty initialMargin 0 independentAmount 0 minTransfer 35,000 threshold 400,000 rounding 10,000 b user window 10	2 3 4 5 6 7 7 8 9 10 11 11 12	FX Price -50% Vol + FX Price +10% Vol 0 FX Price +20% Vol 0 FX Price +20% Vol 0 FX Price -20% Vol 0 FX Price -50% Vol 0 FX Price 0% Vol 0% FX Price +20% Vol 0 FX Price -50% Vol 0 FX Price 0% Vol -75	2200% 223(3/70) 200% 209,449) 200% 209,449) 9% 182,095. 1200% 273,368. +200% 284,478. 00% 262,120. 75% 179,854. 183,526. 75% 163,936. 96 96 181,897. 96 170,485.	12 51,944,18 13 25,923,27 1,430,97 1,430,97 10 89,841,96 10 4,840,04 100,952,21 78,594,61 134 -3,671,40 104 -19,589,83 11 -19,589,83 12 -1,628,62 14 -13,040,78	61,818.49 54,773.25 46,742.43 72,616.90 45,863.45 75,775.58 69,431.95 46,861.50 47,178.47 41,220.21 47,332.11 43,503.50	
collateralHeld 220,000 a counterparty initialMargin 0 independentAmount 0 minTransfer 35,000 threshold 400,000 rounding 10,000 b user window 10 CreditLimits	2 3 4 5 6 7 8 9 10 11 12 13	FX Price -50% Vol + FX Price +10% Vol 0 FX Price +20% Vol 0 FX Price +20% Vol 0 FX Price -20% Vol -2 FX Price 0% Vol -2 FX Price 0% Vol -2 FX Price -50% Vol - FX Price +20% Vol 0 FX Price -50% Vol 0 FX Price 0% Vol -75 FX Price +10% Vol -75	2200% 223(3/70) 200% 209,449. 9% 182,095. 1200% 273,368. 9% 178,686. +200% 284,478. 00% 262,120. 75% 179,854.	12 51,944,18 51 25,923,27 27 -1,430,97 20 89,841,96 20 -4,840,04 44 100,952,21 55 78,594,61 24 -0,00 101 -19,589,83 52 -1,628,62 46 -13,040,78 38 -18,014,16	61,818.49 54,773.25 46,742.43 72,616.90 45,863.45 75,775.58 69,431.95 46,861.50 47,178.47 41,220.21 47,332.11 43,503.50 41,714.04	
collateralHeld 220,000 a counterparty initialMargin 0 independentAmount 0 minTransfer 35,000 threshold 400,000 rounding 10,000 b user window 10 CreditLimits b stresses	2 3 4 5 6 7 7 8 9 10 11 12 13 14	FX Price -50% Vol + FX Price +10% Vol 0 FX Price +10% Vol 1 FX Price +20% Vol 0 FX Price +20% Vol - FX Price 0% Vol 20 FX Price -50% Vol 0 FX Price -20% Vol 0 FX Price -20% Vol 0 FX Price 0% Vol -75 FX Price +10% Vol - FX Price -25% Vol 0	2200% 223(3/70) 200% 2009,449. 9% 182,095. 1200% 273,368. 9% 178,686. +200% 284,478. 00% 262,120. 75% 179,854. 183,526. 75% 75% 163,936. % 170,485. 75% 165,512. % 170,485. 75% 163,247.	12 51,944,18 25,923,27 -1,430,97 27 -1,430,97 20 89,841,96 20 -4,840,04 44 100,952,21 55 78,594,61 34 -3,671,40 44 0.00 41 -19,589,83 52 -1,628,62 46 -13,040,78 38 -18,014,16 22 -278,32	61,818.49 54,773.25 46,742.43 72,616.90 45,863.45 75,775.58 69,431.95 46,861.50 47,178.47 41,220.21 47,332.11 43,503.50 41,714.04 47,456.26	

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 pa	ath Monte Carlo):
Counterparties:	2000
Trades:	150,000 (60% swaps, 10%
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.



options, 30% FX)





VectorRisk

ead Office: Vector Risk P/L Suite 3, Level 2, South Tower 1-5 Railway Street, Chatswood NSW 2067 AUSTRALIA

Office Phone: +61 2 9409 4600

www.vectorrisk.com

