

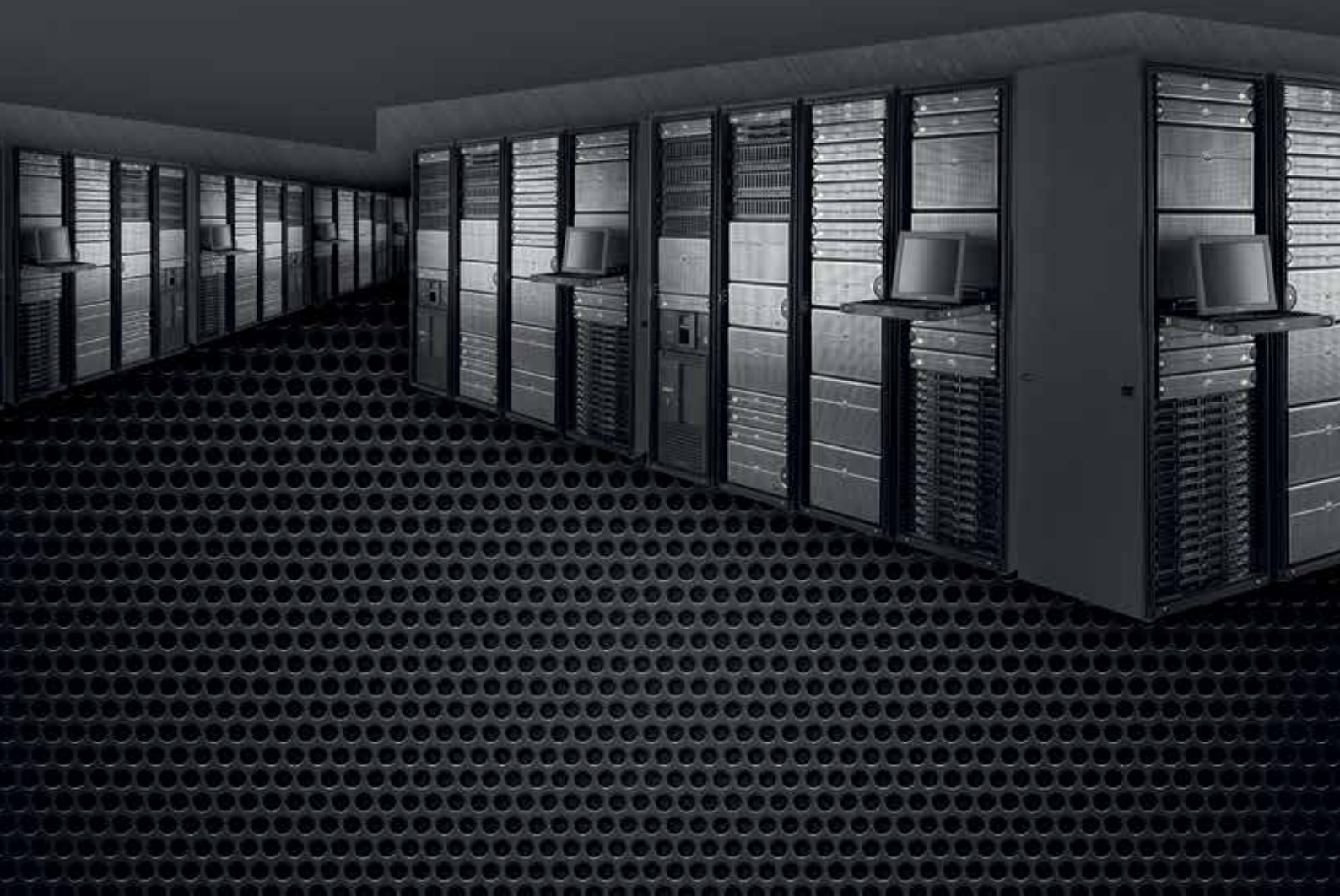
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VectorRisk



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.



The Facts

[EXPERIENCED]

- The founders of Vector Risk came out of banks.
- Vector Risk has been active in the Australian market since 1998 in both a software and risk consulting capacity
- A proven enterprise risk solution has been in use since 2001 at Tier 1 banks
- Developed a new Software as a Service (SaaS) version for market and credit risk in 2014/15
- Multi-tenancy cloud solution (Microsoft Azure) vastly reduces IT costs, implementation timeframes and project risk. Private cloud is an option.
- Became a global partner of KPMG and foundation service provider for their Risk as a Service offering. Vector Risk is providing trading book risk management as part of this service.
- Became a strategic partner of Microsoft, in particular Microsoft Consulting Services, to provide trading book risk solutions across Europe.

[AN EVOLUTIONARY FRAMEWORK]

- The multi-tenancy cloud solution (Microsoft Azure) vastly reduces IT costs, implementation timeframes and project risk. Put simply, the solution is inexpensive and scalable.
- Upgrades, bug fixes and product enhancements become available immediately
- The pricing and risk analytics are proven inside large banks.
- The workflow is defined around a daily process. It is simple to use “out of the box”.
- Modular functionality allows organisations to evolve from a simple initial solution to a more sophisticated solution without the need for costly system upgrades or re-installations.
- High Performance Computing including vectorisation guarantees maximum performance.
- FRTB solution independently validated by KPMG Australia
- Customers can progress to the internal model if warranted by capital savings or other benefits.



[YOUR EVOLUTIONARY PATH TO THE FUTURE]



Performance Benchmarks

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

FRTB benchmark (internal model – historic simulation 500 path):	
Books:	14 (plus 20 parent aggregations up to global IMCC)
Trades:	331,000 (42% swaps, 21% options, 37% FX)
Historic Simulations:	350
Trade Valuations:	2,215,230,420
Cashflow valuations:	30,050,754,264
CPU cores:	80
Run time:	12 MINUTES

FRTB benchmark (standard model):	
Books:	14
Trades:	331,000 (42% swaps, 21% options, 37% FX)
Sensitivities:	76,878 (6,372 portfolio + 70,506 trade level vega)
Trade Valuations:	54,872,271
Cashflow Valuations:	767,525,862
CPU Cores:	80
Run Time:	8 MINUTES

Vector Risk analytics always perform full revaluations on every scenario. There is no trade compression.

Analytics with larger scenario sets are better able to utilize vectorization in the pricing library and therefore have comparatively higher valuation throughput.

Trade Load and database caching for the above 331,000 trade portfolio: 30 minutes.

Benchmarks performed in February 2016.

FIGURE 1: GUI WORKFLOW AND REPORTS

The screenshot shows the VectorRisk application interface. At the top, it displays 'Organisation: Demo', 'User: tim', and 'System Status: [green checkmark]'. The main window is titled 'Task List' and contains a table of tasks. The table has columns for TaskID, Task Name, Status, Description, Type, Started (UTC), Ended (UTC), Elapsed (min), Dependencies, Run Alone, User, and Records. The tasks listed include 'LoadRates', 'LoadTrades', 'ReconcileTrades', 'Decomposition', 'LoadParameters', 'ReadyForCredit', 'ReadyForMarket', 'VaR', 'TradeStressUSD', 'StressUSD', 'xVA', 'PFE', 'xVA - Drilldown', 'Margining', 'CVA VaR', 'xVA Sensitivities', 'xVA Stress Testing', and 'Publish'. Each task has a 'Success' status and a 'True' 'Run Alone' flag.

TaskID	Task Name	Status	Description	Type	Started (UTC)	Ended (UTC)	Elapsed (min)	Dependencies	Run Alone	User	Records
30	LoadRates	Success	Load all private rates	LoadRate	25-04-2016 12:59 PM	25-04-2016 12:59 PM	0:02	10	True	rob	2
40	LoadTrades	Success	Load all trades	LoadTrade	11-05-2016 2:35 PM	11-05-2016 2:36 PM	0:13	10	False	tim	1014
50	ReconcileTrades	Success	Reconcile all trades	MarketTrade	11-05-2016 2:36 PM	11-05-2016 2:36 PM	0:41	30:40	False	System	9
55	Decomposition	Success	Decompose P&L	Decomposition	11-05-2016 2:36 PM	11-05-2016 2:37 PM	1:10	50	False	System	26
62	LoadParameters	Success	Load Funding Curve Parameters	LoadCurveEvo	25-04-2016 1:03 PM	25-04-2016 1:03 PM	0:02		True	rob	4
75	ReadyForCredit	Success	Prerequisites for credit completed	Milestone	11-05-2016 2:36 PM	11-05-2016 2:36 PM	0:00	20:50	False	System	0
80	ReadyForMarket	Success	Prerequisites for market risk complete	Milestone	11-05-2016 2:37 PM	11-05-2016 2:37 PM	0:00	50	True	System	0
90	VaR	Success	Run VaR and Expected Shortfall	MarketVar	11-05-2016 2:37 PM	11-05-2016 2:39 PM	2:09	80	True	System	26
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	True	System	8
110	StressUSD	Success	Run stress tests with USD base	MarketStress	11-05-2016 2:40 PM	11-05-2016 2:41 PM	1:23	80	True	System	78
120	xVA	Success	Run xVA - Risk Neutral Sim - All CPTYS	CreditExposure	11-05-2016 2:41 PM	11-05-2016 2:44 PM	2:56	75	True	System	16
125	PFE	Success	PFE - Real World Sim - All CPTYS	CreditExposure	11-05-2016 2:44 PM	11-05-2016 2:46 PM	2:18	75	True	System	16
127	xVA - Drilldown	Success	xVA Drilldown Example	CreditExposure	11-05-2016 2:47 PM	11-05-2016 2:47 PM	0:53	75	True	System	0
129	Margining	Success	Run Margin on IR Swaps	Margining	11-05-2016 2:47 PM	11-05-2016 2:48 PM	0:21	75	True	System	3
140	CVA VaR	Success	Run CVA VaR calculations	CvaVar	11-05-2016 2:48 PM	11-05-2016 3:06 PM	17:44	75	True	System	19
150	xVA Sensitivities	Success	xVA Sensitivities	CreditExposureStress	11-05-2016 3:06 PM	11-05-2016 3:07 PM	1:21	75	True	System	0
160	xVA Stress Testing	Success	xVA Stress Testing	CreditExposureStress	11-05-2016 3:07 PM	11-05-2016 3:08 PM	1:00	75	True	System	0
900	Publish	Success	Publish all reports	Publish	23-05-2016 9:29 AM	23-05-2016 9:29 AM	0:08	50,55,90,95,105,110,120,125,129,140	False	tim	0

The screenshot shows the VectorRisk application interface displaying a report. The report title is 'Var Global HS VaR 1 Day 99% Report'. It shows the following details: Organisation: Demo, Currency: USD, Environment: Standard, Date: 22 Jan 2016. The report is categorized by 'Attribution: Total'. The main table shows VaR values for various products/regions, comparing 'New York' and 'Global'.

Products / Regions	New York	Global
FXForward	2,899,886	2,899,886
FXOption	521,002	521,002
CCS	1,999,002	1,999,002
FX Total	3,490,248	3,490,248
IRSwap	3,054,266	3,054,266
IROption	61,167	61,167
IR Total	3,054,927	3,054,927
CorpBond	1,815,170	1,815,170
Bond	906,994	906,994
Fix Int Total	1,531,588	1,531,588
Deposit	5,515	5,515
Deposit Total	5,515	5,515
Total	5,393,927	5,393,927

Run Date: 2016-05-23 05:29 AM (UTC)

Cloud Architecture

[CLOUD ARCHITECTURE]

- Hosted on Microsoft Azure which is ISO 27001 compliant.
- Utilising Microsoft HPC (high performance computing), C++ and C#.
- Single instance of the software – shared databases and CPU. Easily scalable.
- Security database containing organisations, users and permissions.
- Web services. XML or CSV interface format. Reports viewable in GUI and published to secure URL.
- Separation of risk engine and workflow. Choose stateless risk engine calls, or configure a daily workflow with rate and trade loads, valuations, risk calculations and reporting.

[BENEFITS]

- “Nothing to install” full cloud solution as the Vector Risk Service runs 24x7 on Microsoft Azure. Subscribers simply log-in and use the system.
- Trades and market data loaded in XML or CSV format
- Microsoft Azure provides high level of security, geographical redundancy and full DR.
- No in-house hardware requirement beyond access to a browser.
- The SaaS model is significantly less expensive than the bespoke enterprise model alternative.
- Opportunity to pilot the service before subscribing so you can be absolutely certain the service provides what you want before you commit.



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