

# Value at Risk (VaR)

Comprehensive intra-day VaR for front and middle office users at financial firms with multi-asset derivatives and fixed income portfolios

## Industry Challenges

Nearly all financial institutions today must calculate VaR in order to satisfy regulatory requirements. But often firms do not have the sophisticated level of systems needed to run such complex calculations. As such, many turn to standard VaR providers, however this approach too can present challenges.

Typically standard vendors apply a basic approach to VaR, and lack coverage for exotic instruments. Some will only run VaR calculations on a predetermined schedule, and clients may be subject to additional cost if they request these numbers to be run more frequently. Additionally, other providers will often supply static VaR reports that give you no ability to slice and dice data. There is also the danger that the front and middle office will be using different data and different VaR calculation methodologies, thereby creating inconsistencies and contention.

## The Solution

F3 VaR is a robust solution that generates the necessary reports to meet your business needs and regulatory requirements, and helps you avoid the limitations of traditional providers. F3 VaR uses industry standard Historical and Monte Carlo simulation methodologies, each configurable to the user's requirements.

In addition to helping with regulatory compliance, F3 VaR also offers several key business benefits. These include:

- **Complete VaR analysis:** Use F3 VaR to determine expected shortfall, and marginal-/incremental-/conditional-VaR at the trade, book or portfolio level.
- **Consistent methodology for both VaR and pricing:** The front and middle office are aligned and working with the same data, assumptions, and calibrations, therefore providing consistent results across teams and eliminating the possibility of inconsistent reporting.
- **Complete choice of models and factors used for VaR, pricing and risk:** FINCAD's extensive coverage allows you to accurately calculate VaR on even the most exotic instruments.
- **Control over the frequency of running VaR:** F3 VaR is powered by our comprehensive portfolio management and risk solution, F3. This technology allows you to generate reports as often as needed.
- **Utmost flexibility:** The solution gives you the option to view additional risk analytics, together with first and second order sensitivities. It also affords you flexibility in running scenarios, determining cash flows and profit and loss (P&L), as well as performing stress testing.
- **Access to powerful technology:** F3 VaR uses in-memory data cube technology for real-time aggregation and break-down of all VaR figures.

## Instrument and Asset Coverage

F3 VaR provides comprehensive multi-asset class coverage for numerous instruments and asset classes, including:

- Interest Rates
- Fixed Income
- FX
- Equities
- Inflation
- Mortgage-Backed Securities (MBS)
- Commodities
- Exotics
- Hybrids
- Structured Credit

## Model Coverage

F3 VaR allows you to choose from a multitude of modelling choices used for the underlying valuation. Models covered include:

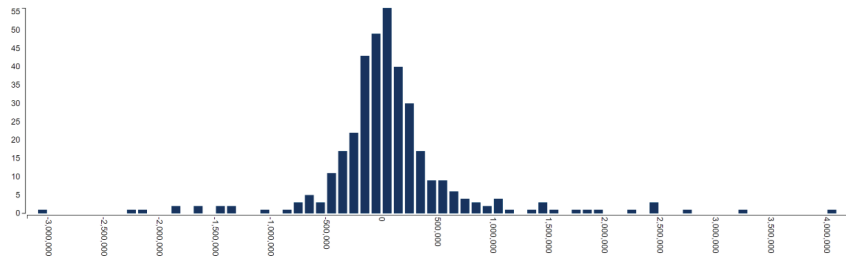
- Black-Scholes (Lognormal + Shift) model
- Local volatility model
- Stochastic volatility model (Heston)
- Local and stochastic volatility model
- Single and multifactor Gaussian short rate models (Hull-White)
- SABR model / volatility parameterization
- Shifted LIBOR market model
- Jarrow-Yildirim inflation model
- Gaussian Copula CDO model
- Andrew-Davidson dynamic MBS prepayment model
- Vanna-Volga FX model
- Generic hybrid model
- Merton Jump Diffusion model
- Variance-Gamma model

## Reports

### Value At Risk Dashboard

VaR Figures					
VaR Figures					
Confidence Level	VaR	Expected Shortfall	Incremental VaR	Mean	73,838.11
99.5%	2,162,300.61	2,748,305.44	-16,581.74	Standard Deviation	655,400.87
97.25%	1,314,938.21	1,884,832.18	50,058.48	Skewness	1.07
95%	640,162.05	1,381,750.93	-67,545.4	Kurtosis	10.02

### Profit And Loss Distribution



FINCAD utilizes F3 WorkStation, a robust web-based GUI for displaying VaR results. This enables you to view the data in either report or graphical format. Analysis can be performed on user-defined hierarchies (typically portfolio, book or trade level), and pre-trade analysis is available through the GUI. Reports can be scheduled to run via a user-configured batch process, giving you complete flexibility over the timing of your firm's intra-day risk numbers.

## F3 VaR helps you determine:

- Historical VaR
- Monte Carlo VaR
- Expected Shortfall
- Marginal VaR
- Component VaR
- Incremental VaR
- Real-time VaR with Notional Changes
- Greek Sensitivities
- Scenario Analysis
- Cash Flows
- P&L Distribution
- Stress Tests

## Workflow

F3 VaR will initially require you to upload your trade, market and reference data. The instruments are then modelled using your preferred models, which helps to align pricing across all departments. At this point, you will be able to obtain valuations, Greeks, cash flows and risk data together with all the standard F3 valuation and pricing analytics.

In addition to standard data, you will also be asked to upload your historical risk factors. Scenarios can then be created to represent the market data VaR distribution. The solution will also specify and generate your derived distribution for Monte-Carlo scenarios. Each trade is then valued under all scenarios, which creates a data cube consisting of: scenarios, products, sensitivities, risk factors and valuation dates. F3 WorkStation can then access the data cube for flexible data extraction.

The screenshot displays the 'Value at Risk' report in the F3 WorkStation. The report configuration shows 500 observations, a 1-day horizon, and 90%, 95%, and 99% percentiles. The main table lists various instruments with their respective VaR, Expected Shortfall (ES), Marginal VaR (mVaR), and Incremental VaR (IVaR) values.

Book > ID	Description	90% 1d				95% 1d			
		VaR	ES	mVaR	IVaR	VaR	ES	mVaR	IVaR
Total		105327.53	736832.22	0.00024	112582.34	356288.33	359493.39	0.00442	194394.8
UK Fixed Income	UK Fixed Income	83481.09	348338.74	0.0014	53903.9	239288.38	214937.18	0.0018	825.4
Derivatives	Derivatives Overlay	93561.23	352726.34	0.00258	95382.43	174735.34	164759.34	0.00225	13968
FX Options	FX Options	99498.72	314151.54	0.00288	99598.21	185111.23	144328.43	0.0032	12456
IR Swaps	IR Swaps	89948.72	131405.65	0.00158	89948.72	119411.08	159024.66	0.0021	11941
IRSwap-280		41788.96	54511.72	(0.0097)	(63903.34)	51888.44	61758.65	(0.00925)	(5980)
IRSwap-261		8677.83	14453.92	(0.00177)	(12319.41)	11646.69	18494.42	(0.00193)	(1411)
IRSwap-66		110437.43	151565.42	0.01179	70206.54	141933.73	176824.25	0.01593	866
IRSwap-178		28253.09	43691.73	0.00932	27055.03	37763.66	51849.2	0.01034	3921
IRSwap-242		34263.82	51978.5	(0.00679)	(41182.69)	44258.49	64642.67	(0.0098)	(5467)
IRSwap-2391		524.66	883.34	0.0028	563.73	888.99	1172.26	0.00303	90
IRSwap-222		5958	8589.5	0.00664	6567.87	7944.97	10037.92	0.00712	726
IRSwap-203		33714.83	52996.38	0.00403	29720.47	43998.97	69010.63	0.00396	3594
IRSwap-159		72644.57	86606.49	0.01257	67561.43	84485	114756.64	0.01644	8880
IRSwap-121		40099.96	65697.95	(0.00557)	(49088.48)	54892.34	82715.26	(0.00796)	(6234)
IRSwap-310		33263.82	52978.5	(0.01659)	(32182.76)	34258.49	65642.67	(0.0098)	(4467)
IRSwap-103		7677.83	13453.92	(0.00237)	(20319.41)	12646.69	20494.42	(0.00203)	(2011)
IRSwap-51									

Run customized VaR calculations intraday and at the end of day, with full control over scenarios, time horizon and confidence levels. View results at an aggregated level, and drill down to view individual trades. Understand tail risk with expected shortfall (or cVaR), mVaR and IVaR.

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