RISK EX ANTE

MONITOR PORTFOLIO EXPOSURE TO RISK ON AN EX-ANTE BASIS

HIGHLIGHTS

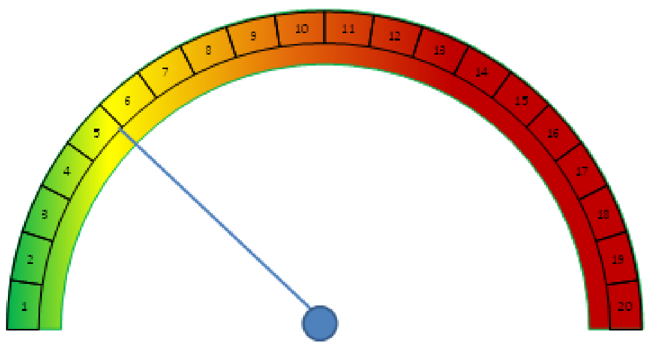
- Large number of risk measures to analyze the distribution of future values
- User friendly interface to select risk factors and models
- Calculation based on Monte Carlo simulation or historical extrapolation
- Implementation by experts in risk management and modeling
- Integrated solution which allows to integrate risk analysis to performance and ESG analysis

KEY FEATURES

Large number of **risk measures** to analyse the future values distribution:

- Median, Mode, Average
- Standard deviation, Min, Max, Percentile value
- VaR, CVaR (or Expected Shortfall)
- ...

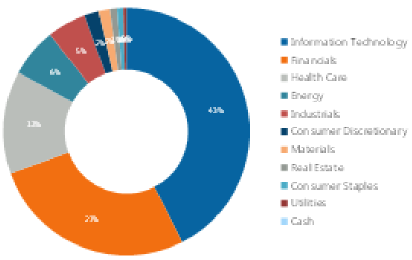
VAR 99% - Ex-ante



Drills down into risk analysis from portfolio to security

Risk measures aggregated at any level to follow the **investment decisions process**

VAR Weighted by Sector

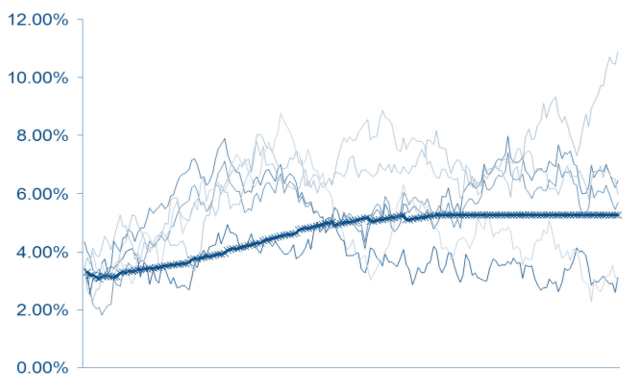


Selection of **risk factors**:

- Interest rates
- Exchange rates
- Market prices
- Credit Spread
- Other systematic risk factors

Optimized Monte Carlo simulator for a complete **distribution of future values**

Monte Carlo simulation for interest rates



Calibration of model parameters

Measuring the impact of changes in parameters on risk measure with **Sensitivity analysis**

PROCESS AND CAPABILITIES

- Unlimited possibilities to model risk factors dynamics
- Modelling financial instruments sensivities to each risk factor
- Transparency and consistency of all models
- Calibration on market data
- Monte Carlo simulation
- Stress test & what if analysis to generate different scenarios

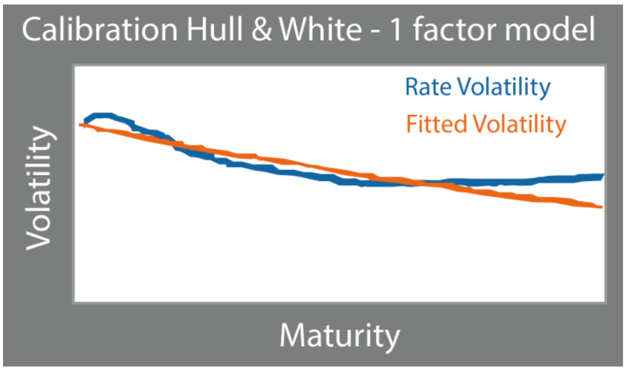
KEY FEATURES

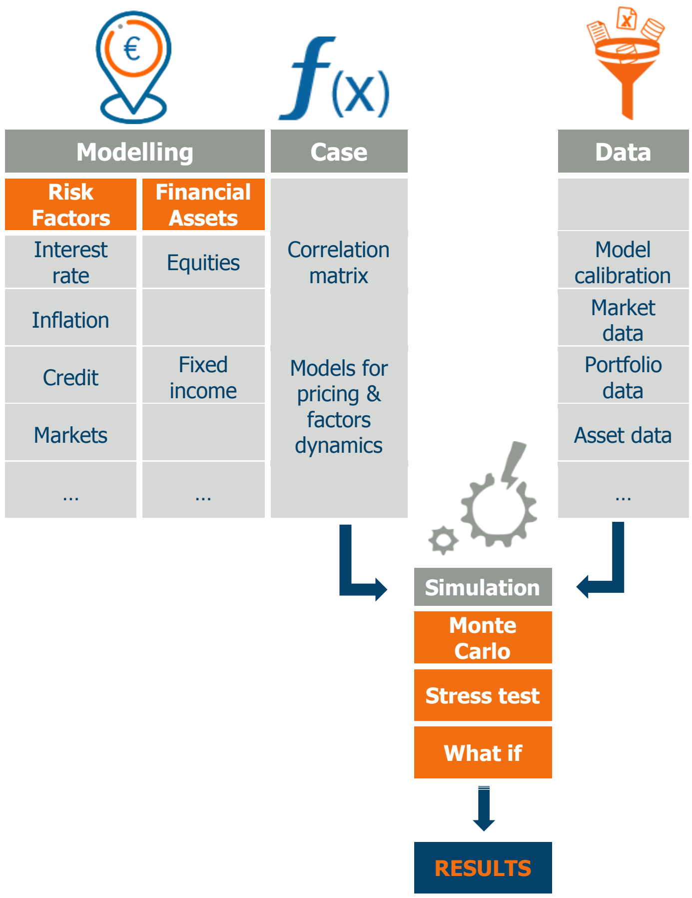
Extensive models of **risk factor dynamics**

- Hull & White model
- Vasiceck model
- Heath-Jarrow-Morton model
- Black-Scholes model
- …

Powerful equation writer to **customize** models and links between asset values and risk factors

Definition of **matrix correlation** between the different risk factors





Monte Carlo simulator

- Customized time horizon, number of paths and simulation steps
- Possible to include the portfolio liabilities in the simulation
- Optimized random numbers generator
- Break points at any step

What if analysis

- what if the volatility increases
- what if the correlations move towards
- …

Stress tests

- Regulatory tests
- Internal stress tests

Risk reports

- Wide variety of key indicators to quantify a portfolio's risk
- Measure of the contribution to key risk indicators
- Drills down into risk analysis from portfolio to security
- Risk measures aggregated at any level to follow the investment decisions process

Key Features

Key risk measures:

- Volatility, tracking error, downside risk
- Contribution to volatility and tracking error
- Maximum drawdown
- Value at Risk and CVaR (or Expected Shortfall) for any confidence interval
- Beta, bull and bear beta

Specific risk measures for **interest rate instruments**:

- duration, modified duration,
- sensitivity, convexity
- basis point value, key rates

Specific risk measures for **derivative instruments**:

- delta
- gamma
- vega

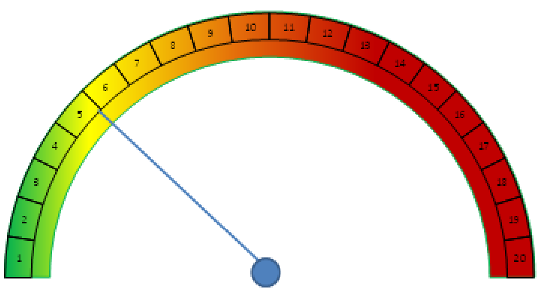
Risk ex-ante measures:

- What if analysis
- Simulation of extreme events
- Worse case scenario
- Monte Carlo simulation
- VaR and CVaR. VaR for each risk factors (market, interest rates, inflation, credit,...)

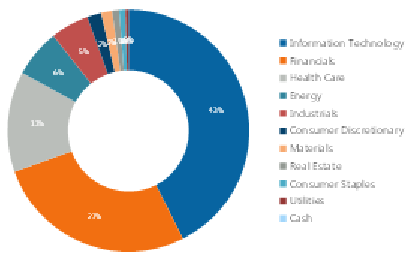
Statistics

Portfolio Return	23.36%
VAR	12,360,664.22
VAR %	3.15%
Expected Shortfall	14,161,091.47
Expected Shortfall (%)	3.61%
VAR Ex-ante	19,282,170.45
VAR Ex-ante%	4.92%
Expected Shortfall Ex-ante	22,993,699.02
Expected Shortfall Ex-ante (%)	5.86%
Volatility	8.18
Volatility Ex-Ante	8.85
Tracking Error	3.34
Tracking Error Ex-ante	4.12
Worst Month	0.16
Worst Month Date	31/03/17
Max Drawdown	-3.23
Drawdown Start Date	03/03/19
Drawdown End Date	14/04/19
Number of Negative Return Month	0.00

VAR 99% - Ex-ante



VAR Weighted by Sector



Top 5 Absolute VAR Ex-ante

Asset	Sector	% Market Value	VAR Ex-ante 99 %	Abs VAR Weighted
APPLE INC	Information Technology	19.66	10.62	2.09
MICROSOFT CORP	Information Technology	16.15	7.16	1.16
J.P. MORGAN CHASE	Financials	8.20	9.41	0.77
WELLS FARGO & CO	Financials	8.23	8.75	0.72
MERCK	Health Care	5.65	8.05	0.45

Integrated solution which allows to integrate risk analysis to performance and ESG analysis in the same report

All results can be publish for your client in an interactive reporting in the client portal