GLOBAL MONTE CARLO MULTI-ASSET CLASS (MAC)

❯ Integrate equity, fixed income, commodity, currency, and returns-based factors to gain a full, transparent view of risk at the portfolio, factor, and asset levels using a Monte Carlo approach.
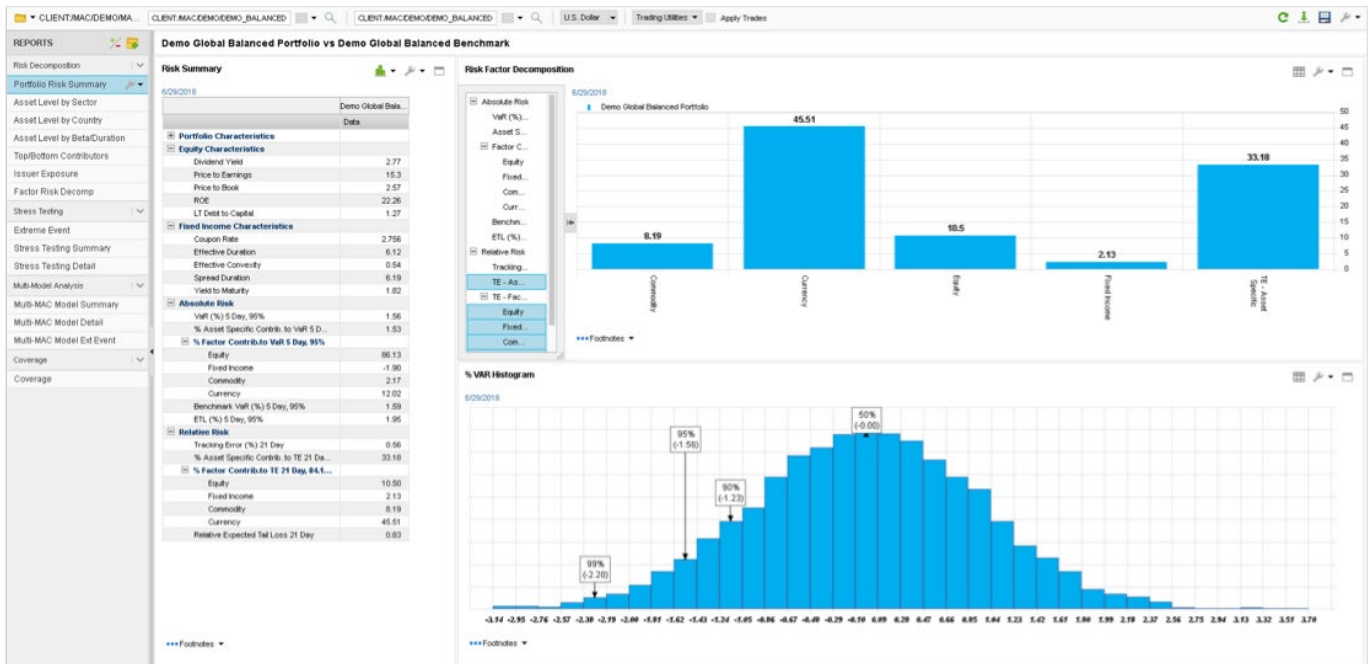

MODEL OVERVIEW

The FactSet multi-asset class (MAC) risk model is based on a Monte Carlo simulation of the joint distribution of future joint distribution of future portfolio returns, which allows for calculation of various risk statistics such as Tracking Error Volatility (TEV), Value-at Risk (VaR), and Expected Tail Loss (ETL), as well as other characteristics of the return distribution (kurtosis, skewness, etc.). The Monte Carlo framework reprices securities for each simulation to account for non-linear effects within a portfolio such as optionality and convexity. The factor framework uses factors specific to equities, fixed income, commodities, and alternative assets and combines them into one multi-asset class model through a full cross-asset class factor covariance matrix.

ASSET COVERAGE

- Over 50,000 global equities

- Over three million global bonds

- Over 250 highly liquid commodity indices, continuous front-month futures contracts, commodity ETFs, and mutual funds

- Over 150 currencies

- Exchange-traded and OTC derivatives of equity, fixed income, index, currency, and commodity products

- Hedge funds, private equity, real estate, and other private assets with flexible coverage based on available asset transparency

COVARIANCE CONSTRUCTION

The framework employs a classical, exponentially weighted moving average (EWMA) method of covariance matrix estimation. The default calibration uses a two-year lookback with a six-month half-life, though full customization of the lookback and half-life parameters is available. Robust estimation of the covariance matrix is obtained through matrix regularization based on random matrix theory. The covariance matrix of the MAC model is calculated daily, resulting in a rich database of covariance matrices that can be used for historical simulations and scenario analysis.

FORECAST HORIZON

The forecast horizon can be customized for one-day to two-month horizons. Risk measures can be displayed in annualized and unannualized terms.

RISK MEASURES

Risk measures are estimated through a Monte Carlo process that simulates the future distribution of the risk model factor returns. The default risk model assumes all risk factors are jointly normally distributed, though additional assumptions for the joint distribution of the factors are available in subsequent model versions. Within each Monte Carlo scenario for the factors of the model, the appropriate pricing function is applied and each security can be repriced based on samples from joint distribution of contributions from each factor to the return of a security. The valuation of all securities allows the entire portfolio to be revalued, resulting in a simulated portfolio return distribution used to estimate total portfolio risk measures such as TEV, volatility, VaR, ETL, and their components.

Full factor-, group-, and asset-level decomposition is available for portfolio risk measures and extreme event and factor stress testing is available—again with full decomposition. Stress testing includes pre-defined or fully customizable tests that leverage FactSet's robust, accurate market data. Extreme events can be run on any historical period within the risk model history or can be customized based on user-defined market shocks.
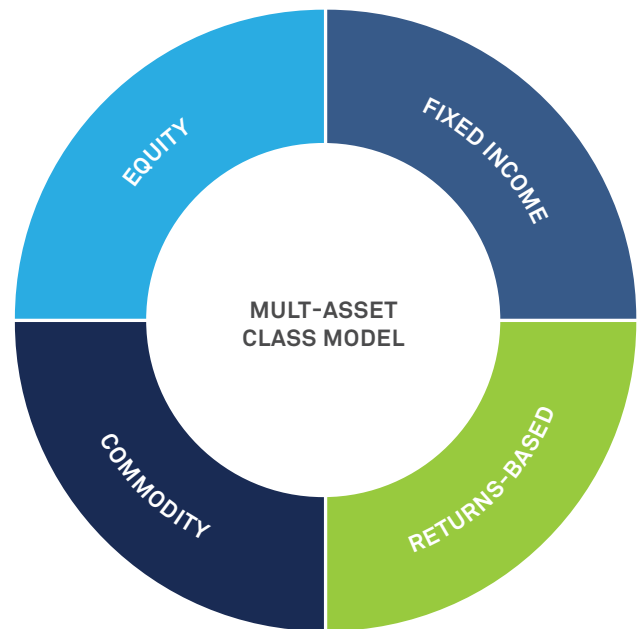
MODEL DELIVERY

The global MAC risk model is fully integrated with FactSet's powerful Portfolio Analytics suite and offers interactive and batched reporting as well as standard or customized PDF reporting featuring your firm's branding and logo. Raw or derived risk model analytics are available off-platform via flat file while covariance matrix and factor return data are available via Microsoft Excel integration.

EQUITY RISK

- Combines both cross-sectional and time series regression to maximize explanatory power

- Leverages a multiple stepwise regression with priors, on a stock-by-stock basis, to calculate stock sensitivities

- Permits application of Bayesian priors and statistical significance tests to determine relevant factors for each stock

- Factor structure is comprised of five major factor blocks:

  - Currency factors

  - Region-specific fundamental style factors

  - Region/Country factors

  - Industry factors based on GICS classification
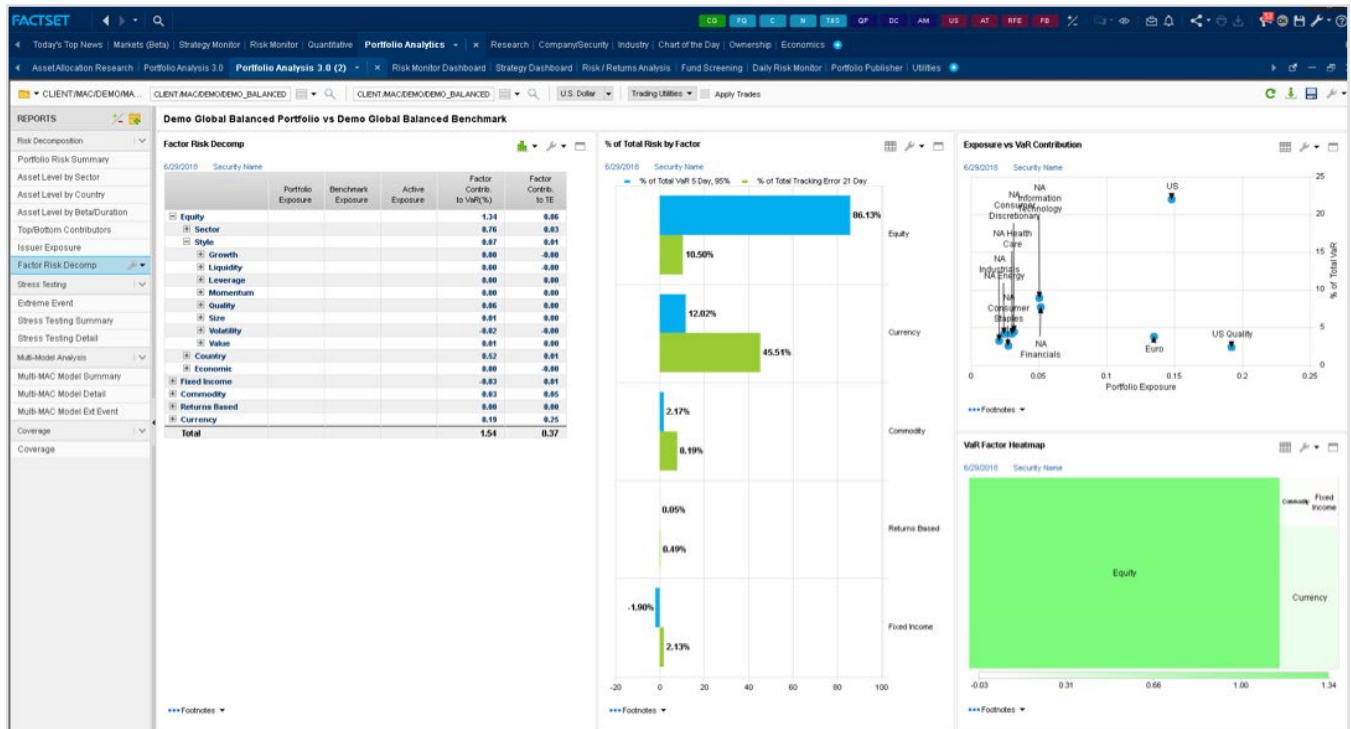
  - Macroeconomic factors

FIXED INCOME RISK

- Incorporates full precomputed set of FactSet analytics to ensure consistency between performance analysis, attribution, and risk reporting

- Combines relative valuation, fundamental, and statistical models with factors specific to each fixed income asset type

  - Utilizes a Contingent Claim Analysis (CCA) approach to valuing credit risk of corporate bonds, bank loans, and CD

  - Utilizes a duration times spread approach for Euro Sovereign and municipal bonds

  - Utilizes duration-based spread factors for MBS/ABS/CMBS, agency, supranational, and inflation-protected bonds

- Leverages efficient revaluation based on a multivariate Taylor series of fixed income returns
  - Reduces the computational burden of full re-pricing by using a robust set of risk factor sensitivities for each fixed income security

- Employs a principal component analysis (PCA) algorithm to capture yield curve behavior

  - PCs are translated back to 17 key rate tenors for meaningful interest rate risk decomposition

Donut chart: **MULT-ASSET CLASS MODEL** with segments labeled EQUITY, FIXED INCOME, RETURNS-BASED, COMMODITY

COMMODITY RISK

- Hybrid factor-based model designed to capture systematic risk from exposures to factors common across all commodities as well as idiosyncratic risk specific to individual commodities

- Factors include five cross-sectional momentum factors and ten time-series factors based on market drivers

CURRENCY RISK

• Currency risk is calculated as sensitivities across almost 70 global currencies

RETURNS-BASED RISK

• Dynamic model that employs observed market returns as time series of risk factors, alongside a proprietary algorithm to model variance of almost any asset type

• Factors include more than 100 time series factors which represent hedge fund, real estate, equity, fixed income, interest rate, commodity, timberland, and currency instruments

• Returns-based modeling is leveraged when only a return stream of an asset is provided; no underlying holdings are required—allowing for a multi-tiered approach to incorporate varying levels of holdings transparency

DERIVATIVES RISK

• Portfolio return distributions that include equity derivatives will not be normal, therefore each future scenario will be fully repriced

• Dynamics of the volatility surface will be modeled to determine the implied volatility of each future scenario

The approach described throughout this overview is covered in further detail in our white paper, FactSet Multi-Asset Class (MAC) Risk Model. To request a copy, contact sales@factset.com.

APPENDIX

Equity Fundamental Style Factors

- Value: composite of annual dividend yield, annual earnings yield, book to price ratio, and cash flow to price ratio

- Growth: composite of trailing annual earnings growth and forecast one-year earnings growth

- Size: natural log of market capitalization

- Quality: composite of annual return on assets, annual return on equity, and annual cash flow to sales ratio

- Long Momentum: OLS slope of 14 prices at four-week intervals from T-20 back to T-280, normalized by starting price (one-year momentum)

- Liquidity: time-weighted daily trading volume divided by 30-day average daily volume

- Leverage: composite of annual net debt to equity ratio and annual net debt to asset ratio

- Volatility: natural log of annualized standard deviation of daily returns over the last 65 trading days

Interest Rate Factors

- Government Curve: Australia, Brazil, Canada, Chile, China, Colombia, Czech, Denmark, Euro, Hong Kong, Hungary, India, Indonesia, Israel, Japan, Malaysia, Mexico, New Zealand, Nigeria, Norway, Peru, Philippine, Poland, Romania, Russia, Singapore, South Africa, South Korea, Sweden, Switzerland, Taiwan, Thailand, Turkey, UK, U.S.

- Libor Curve: Australia, Canada, Denmark, Euro, Hong Kong, Japan, New Zealand, Norway, Singapore, Sweden, Switzerland, UK

- Muni Curve: U.S.

Spread Factors

- Corporate Credit: uses Merton valuation model, which calculates the probability of default and translates that into a new simulated spread based on the relationship of debt to simulated value of underlying issuer

- Euro-Sovereign: Austria, Luxembourg, Belgium, Finland, France, Greece, Cyprus, Ireland, Italy, Central and Eastern Europe, Netherlands, Portugal, Spain

- MBS/ABS/CMBS: U.S. ABS/CMBS/RMBS, Japanese MBS, Non-U.S. ABS/CMBS

- Inflation Protected: Canada, France, Germany, Italy, Japan, UK, U.S.

- Quasi-Governmental

  - Agency: Australia, Canada, Canada in USD, Japan, Northern Europe, Southern Europe, U.S.

  - Supranational: AUD, EUR, GBP, USD

- Municipal: Sector, State, Duration, Vega