- Strategic Portfolio Optimization and Simulation

OPTIFOLIO

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OptiFolio

Solution overview

OPF

Portfolio optimization including Stocks Fixed income and multiple currencies.

Markowitz-Sharpe, Black and Black-Litterman models.

Interactive exploration of efficient investment strategies.

Portfolio performance attribution.

Monte-Carlo forecasting of assets and portfolio value.

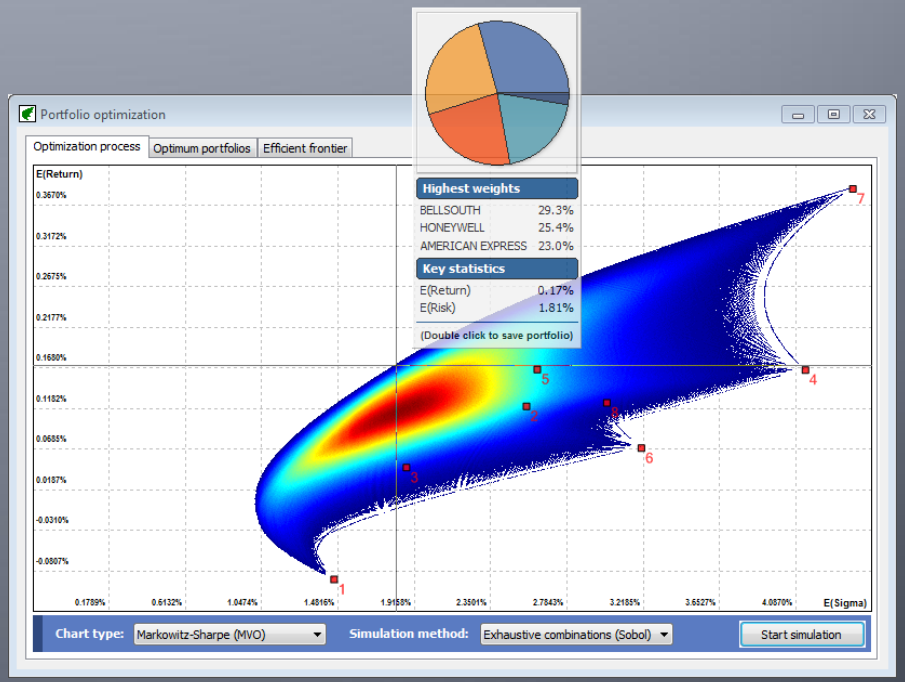
Key indicators for strategic asset allocation decisions.

OptiFolio

Solution overview

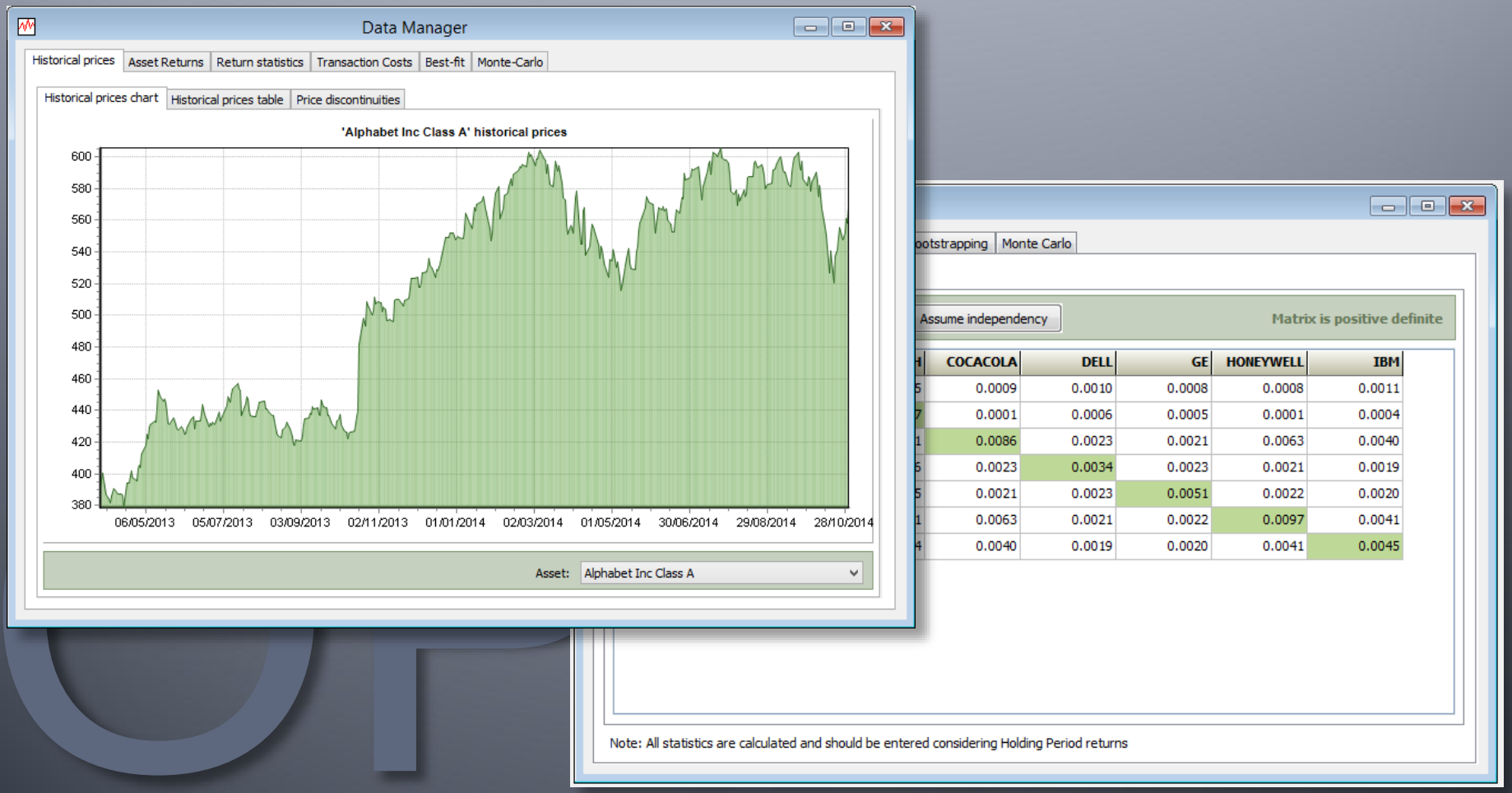
Key features

- Interactively visualize all feasible investment portfolios on the Risk/Return plane given a set of investable assets, considering investment limits and portfolio benchmarks.
- Import prices from MS Excel® worksheets, comma or tab-separated files or directly from the web.
- Find the optimum portfolio composition applying either the classical Nobel-awarded Markowitz model or the Basel III Conditional-Value-at-Risk model.
- Conduct Monte-Carlo simulations to forecast the value of portfolios or individual assets, apply Performance Attribution Models, define Risk Factors mapping and more.



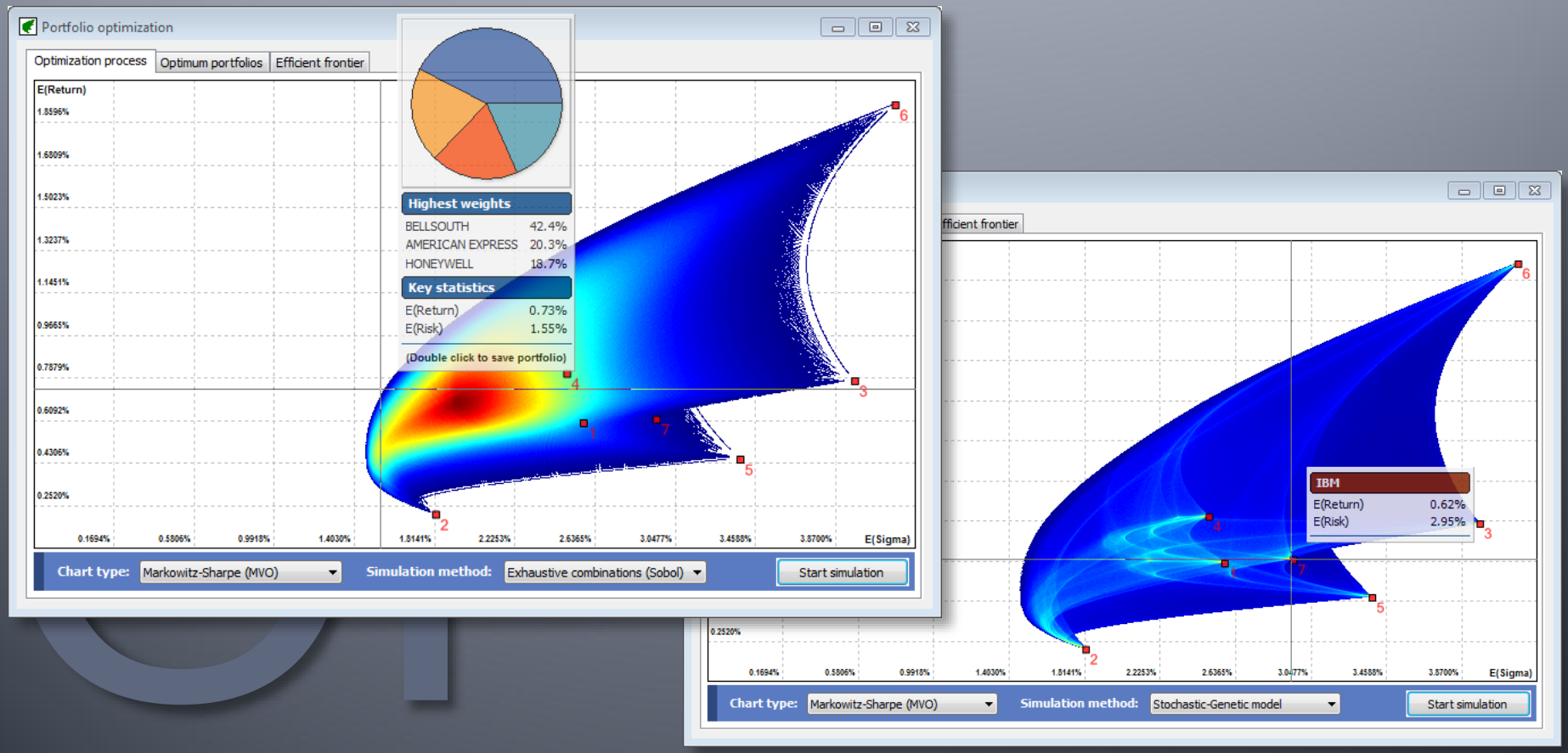
Data manager

- The system allows you to explore the historical prices, returns, correlations and covariances. The user may enter different assumptions to be used as expected values.



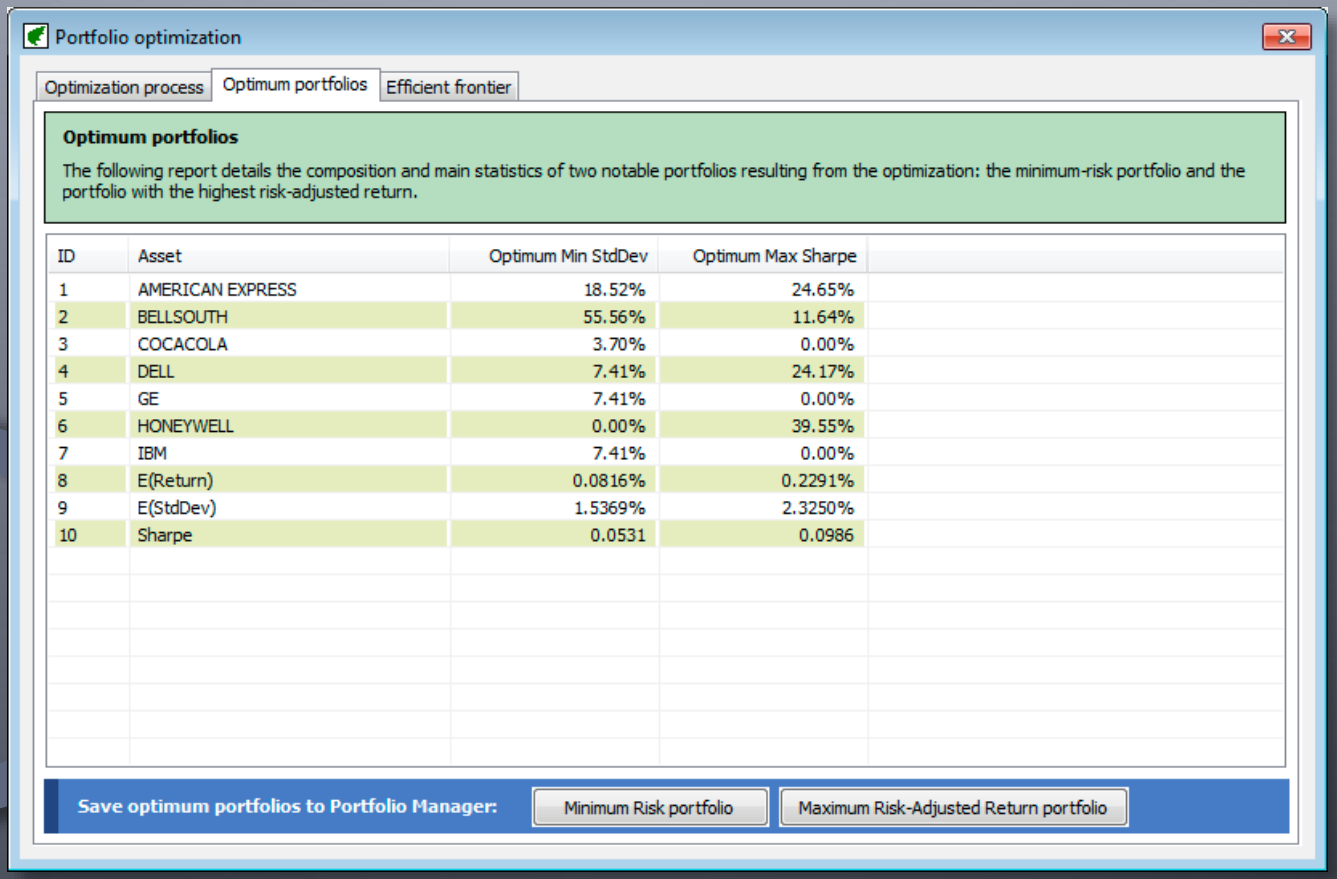
Feasible investment area

- Interactive charts show the feasible investment area and the efficient frontier.
- Color represent the portfolio density in each combination of risk and return.
- The user can select two methods to produce the chart (random or quasi-random).
- The analysis can employ either a Markowitz-Sharpe or Conditional VaR approach.



Optimum portfolios

- The program automatically reports the minimum risk and maximum risk-adjusted return portfolios.
- These optimum portfolios (as well as any portfolio on the efficient frontier) can be saved to the Portfolio Manager module for further analysis.



ID	Asset	Optimum Min StdDev	Optimum Max Sharpe
1	AMERICAN EXPRESS	18.52%	24.65%
2	BELLSOUTH	55.56%	11.64%
3	COCACOLA	3.70%	0.00%
4	DELL	7.41%	24.17%
5	GE	7.41%	0.00%
6	HONEYWELL	0.00%	39.55%
7	IBM	7.41%	0.00%
8	E(Return)	0.0816%	0.2291%
9	E(StdDev)	1.5369%	2.3250%
10	Sharpe	0.0531	0.0986

Alternative portfolio optimization criteria

- **Sharpe ratio**
  (Risk-adjusted return)

$$Sh = \frac{E(r_p) - r_f}{E(\sigma_{r_p})}$$

- **Investor utility**
  (Considering Arrow-Pratt risk-aversion)

$$U = E(r_p) - 0.005 \cdot A \cdot E(\sigma_{r_p}^{\ 2})$$

- ***Conditional VaR***
  (Extreme losses expected value)

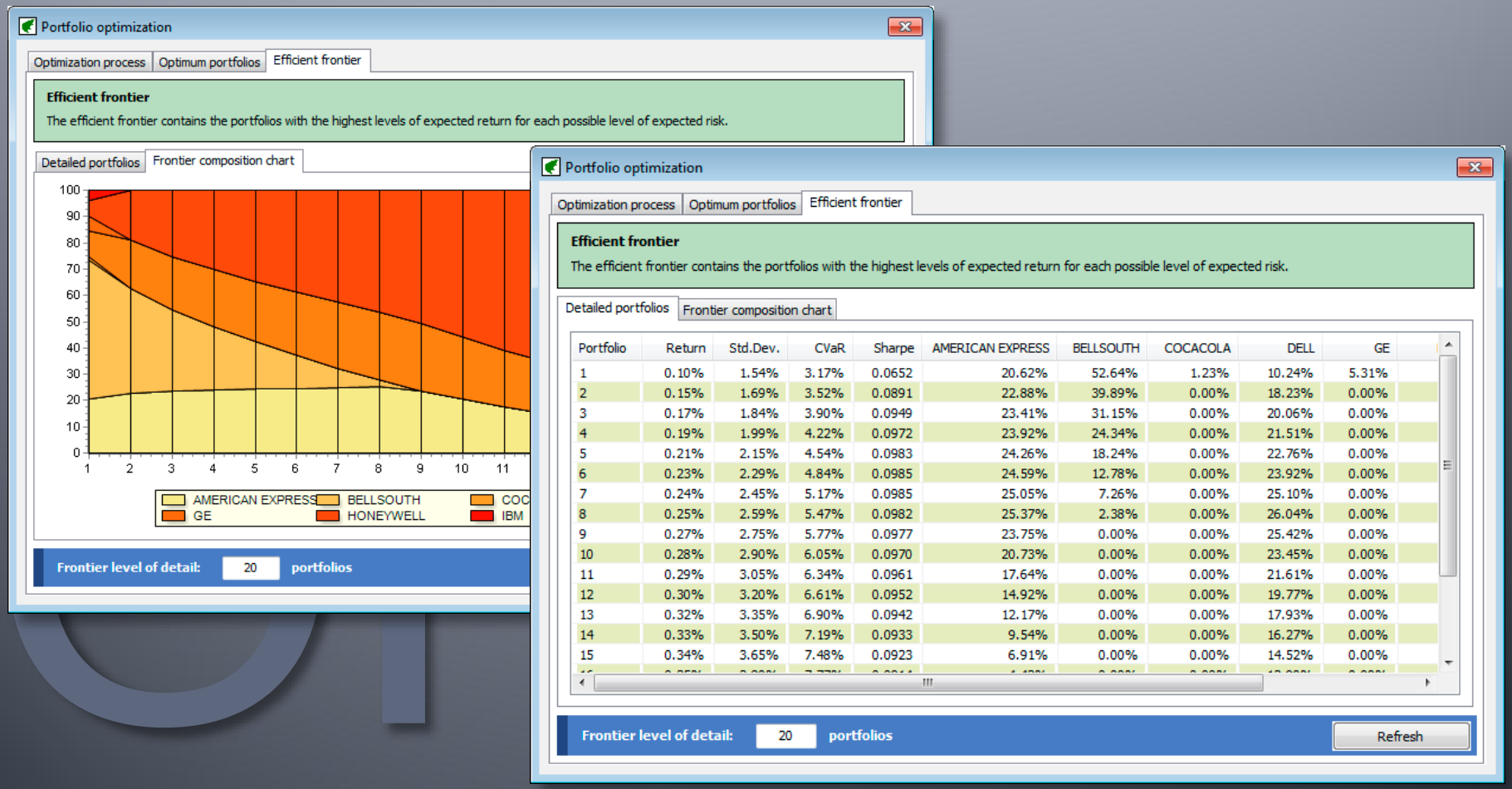
$$CVaR = E(r_p, r_p < VaR)$$

- **Keating's Omega™**
- (Non-parametric risk-adjusted return)

$$\Omega^{TM} = \sum_{r_t > b} (r_t - b) \Big/ \sum_{r_t < b} (b - r_t)$$

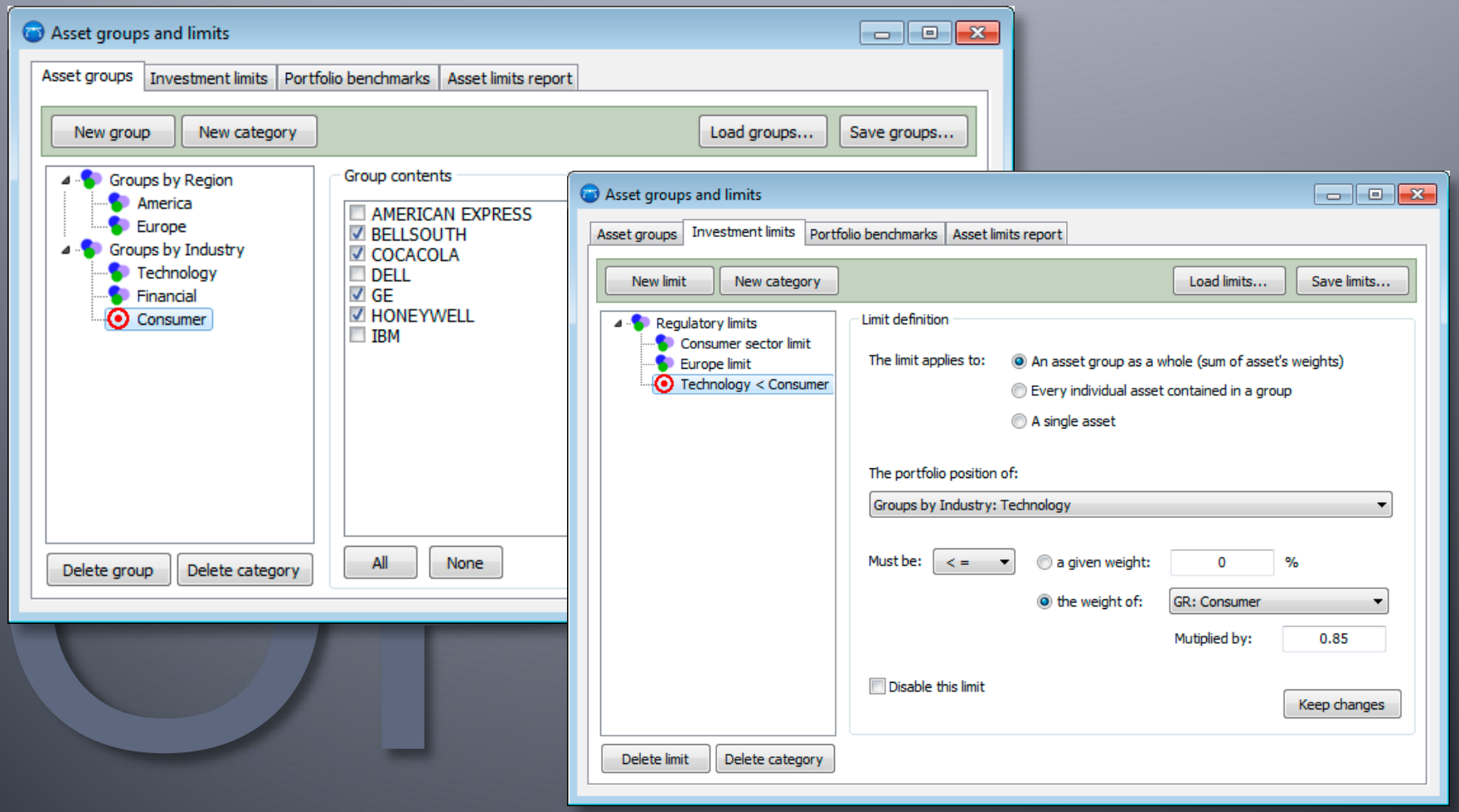
Efficient frontier exploration

- OptiFolio reports all optimal positions along the efficient frontier, including key statistics for each portfolio.
- The user can select the level of detail (number of portfolios) along the frontier.



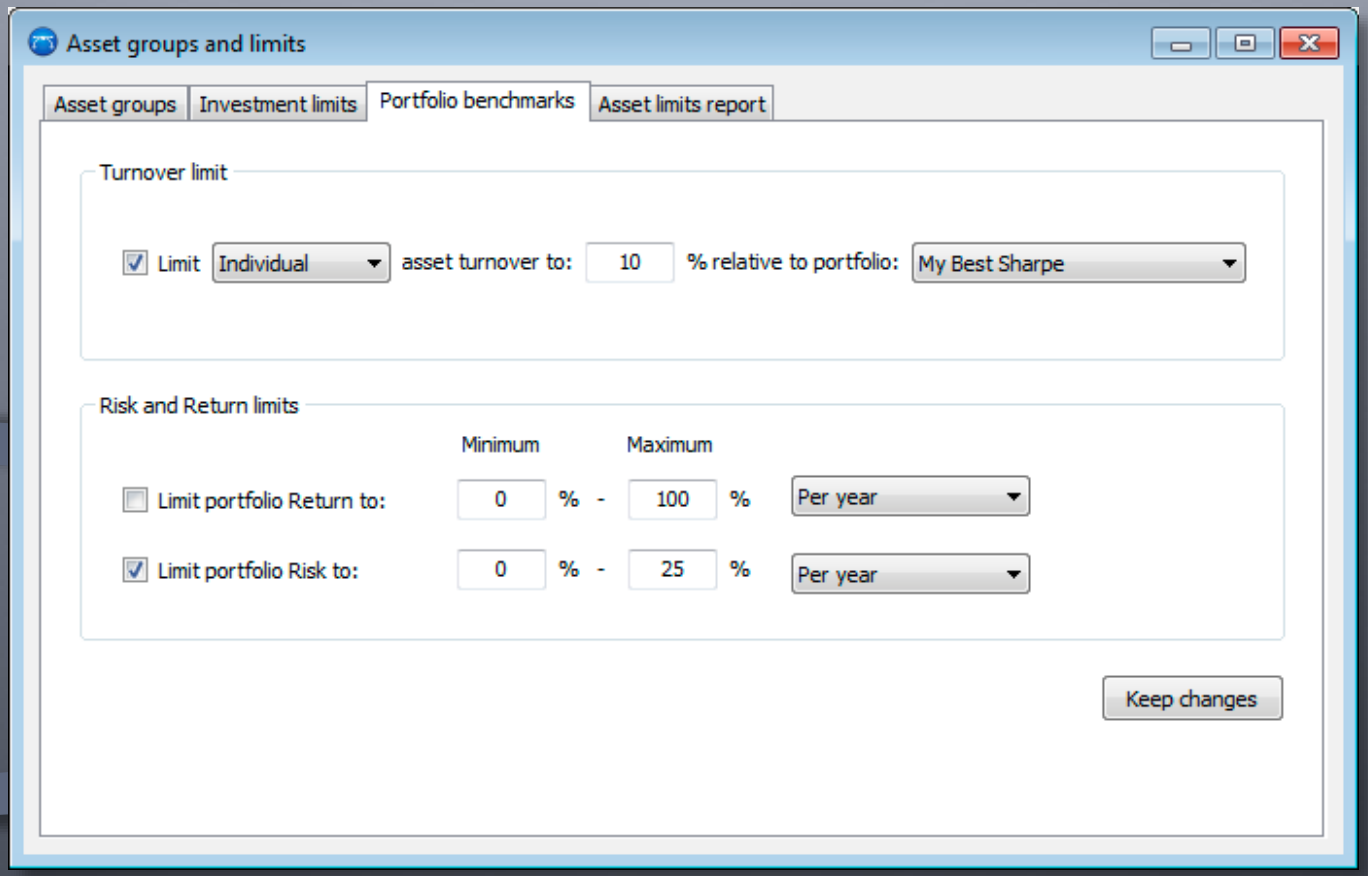
Asset groups and investment limits

- Manage any number of asset group categories and investment limits
- Conveniently manage this information using MS Excel files.



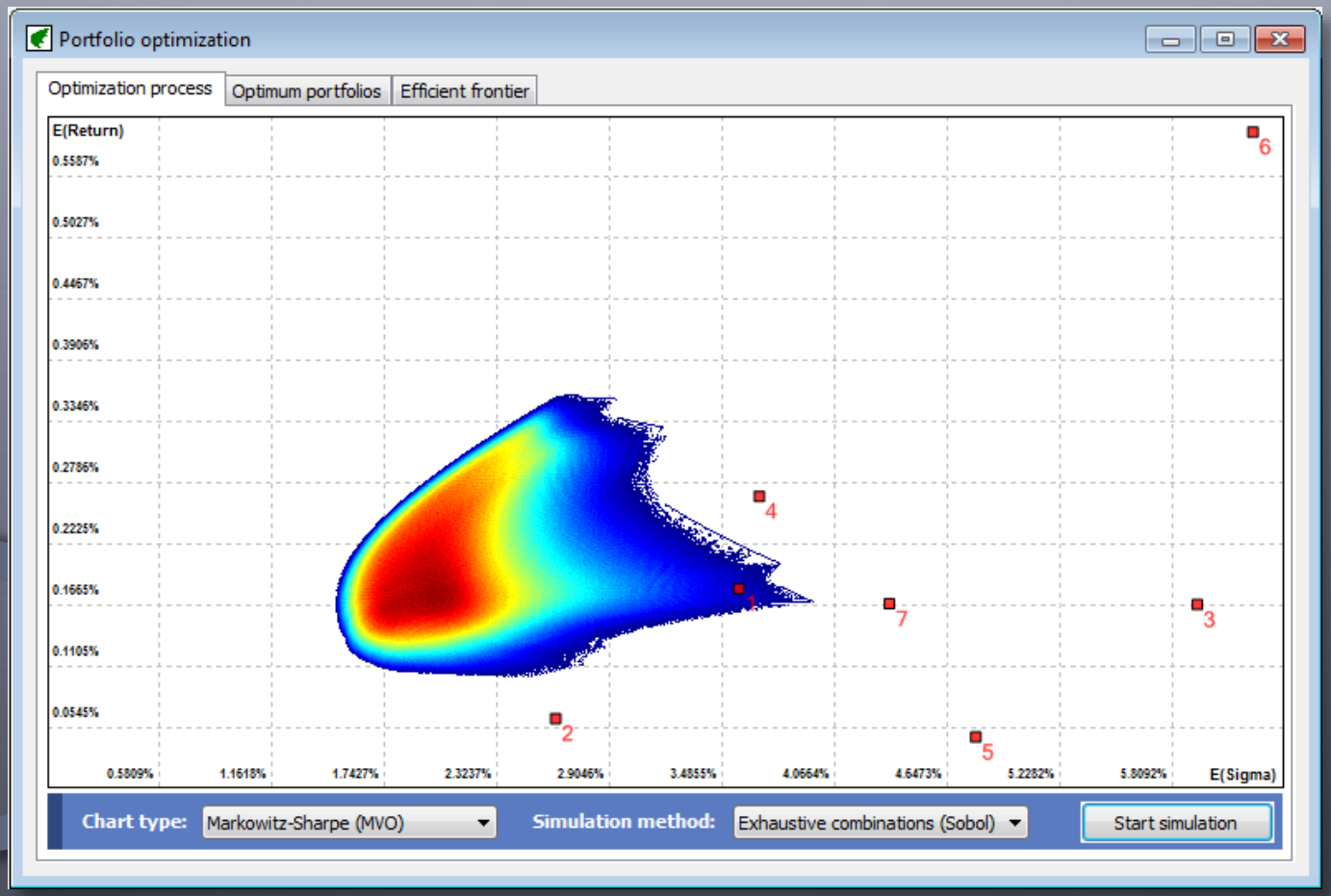
Portfolio benchmarks and turnover limits

- Previously saved portfolios can be used as benchmarks in order to find optimum positions that do not exceed certain turnover threshold (position differences).
- The turnover can be expressed either individually (for each asset) or globally (total turnover).
- Additional constraints on total portfolio risk or return can also be considered.



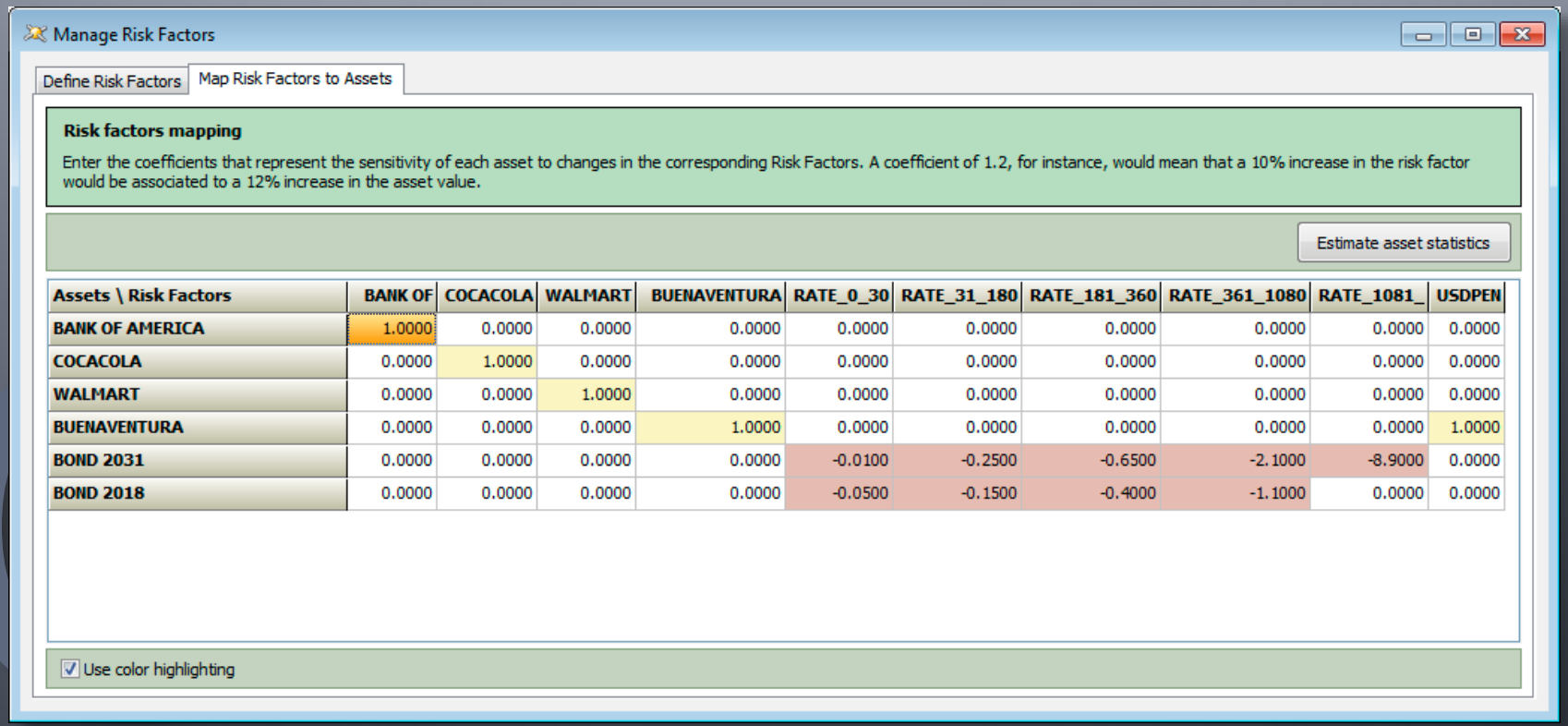
The feasible area affected by constraints

- When constraints are entered, the feasible area automatically shrinks to reflect only portfolios that comply with all the limits.



Risk-Factor Mapping

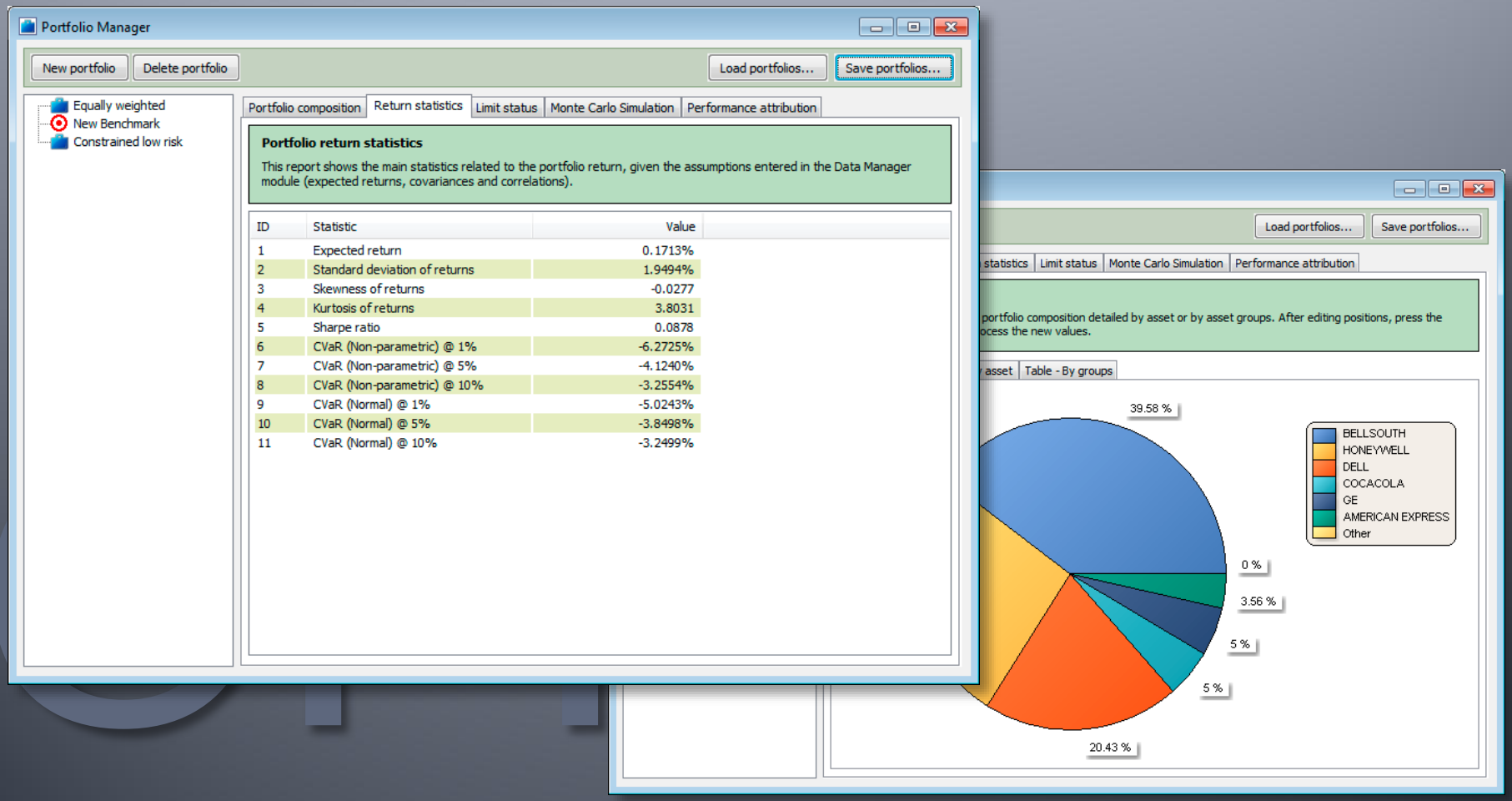
- In addition to investable assets, import data from risk-factors (e.g. interest rates, exchange rates, stock indices, inflation, etc.).
- Define the sensitivity of each asset relative to risk-factors.
- Risk-Factor mapping allows the user to work with multi-currency portfolios and include derivatives, complex and even illiquid assets.



Assets \ Risk Factors	BANK OF	COCACOLA	WALMART	BUENAVENTURA	RATE_0_30	RATE_31_180	RATE_181_360	RATE_361_1080	RATE_1081_	USDPEN
BANK OF AMERICA	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
COCACOLA	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
WALMART	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
BUENAVENTURA	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000
BOND 2031	0.0000	0.0000	0.0000	0.0000	-0.0100	-0.2500	-0.6500	-2.1000	-8.9000	0.0000
BOND 2018	0.0000	0.0000	0.0000	0.0000	-0.0500	-0.1500	-0.4000	-1.1000	0.0000	0.0000

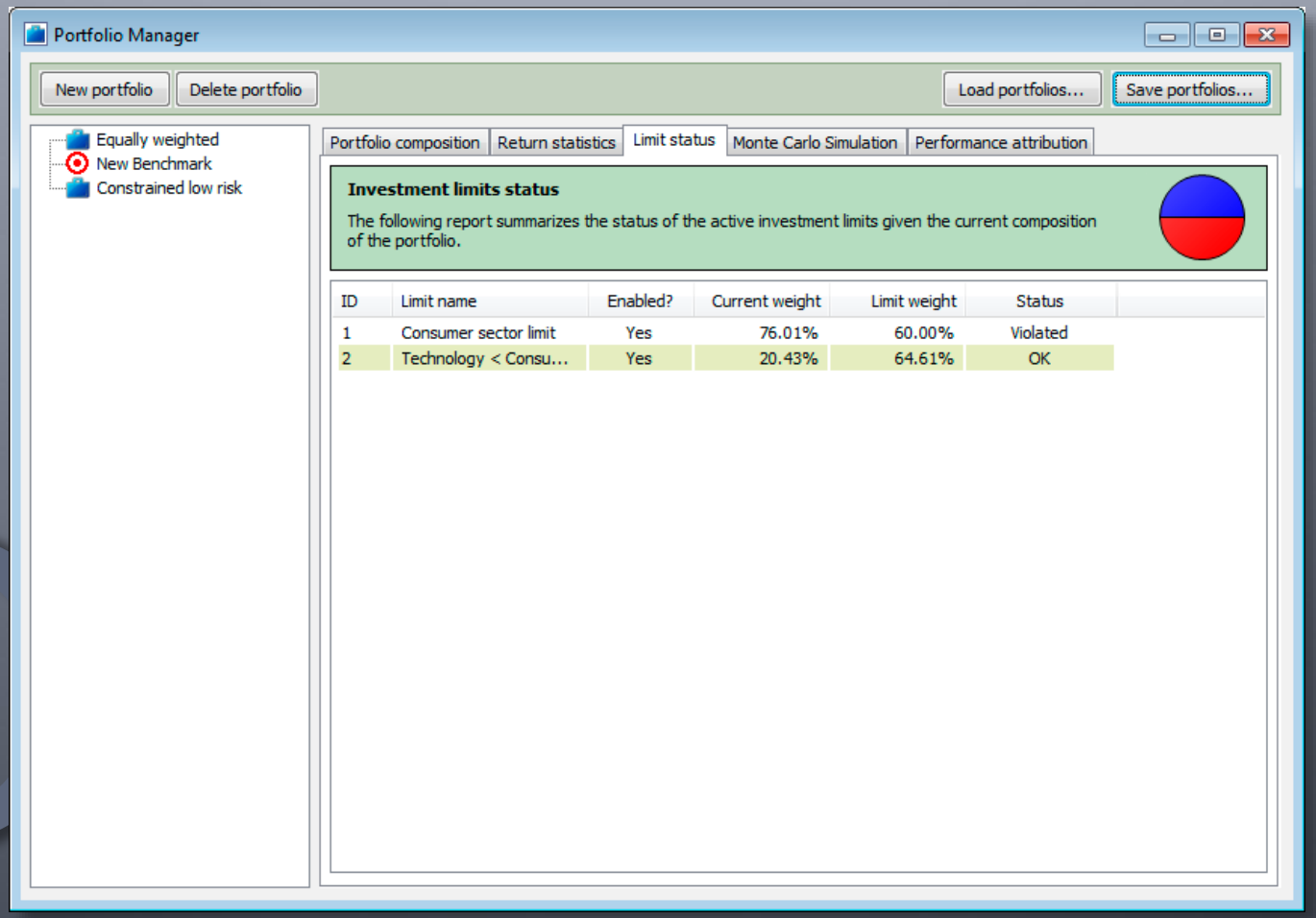
Portfolio Manager

- The user can manage any number of portfolios inside a specialized interface.
- All optimum portfolios can be added interactively from the optimization window.
- Portfolios can be stored in and retrieved from MS Excel® files.



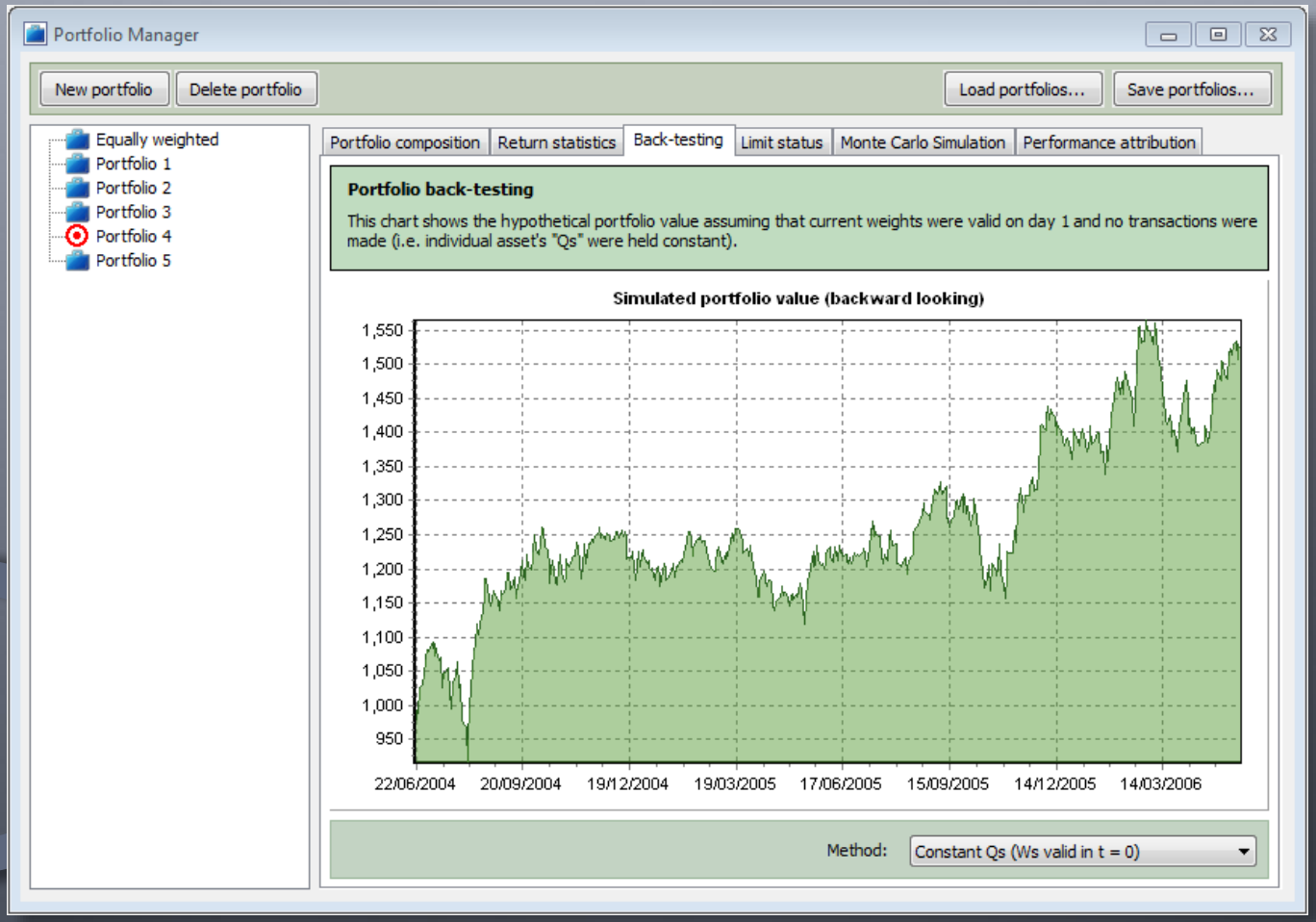
Portfolio limits report

- The system automatically evaluates each investment constraint for all portfolios and report which limits are being met and which are being violated given the portfolio positions.



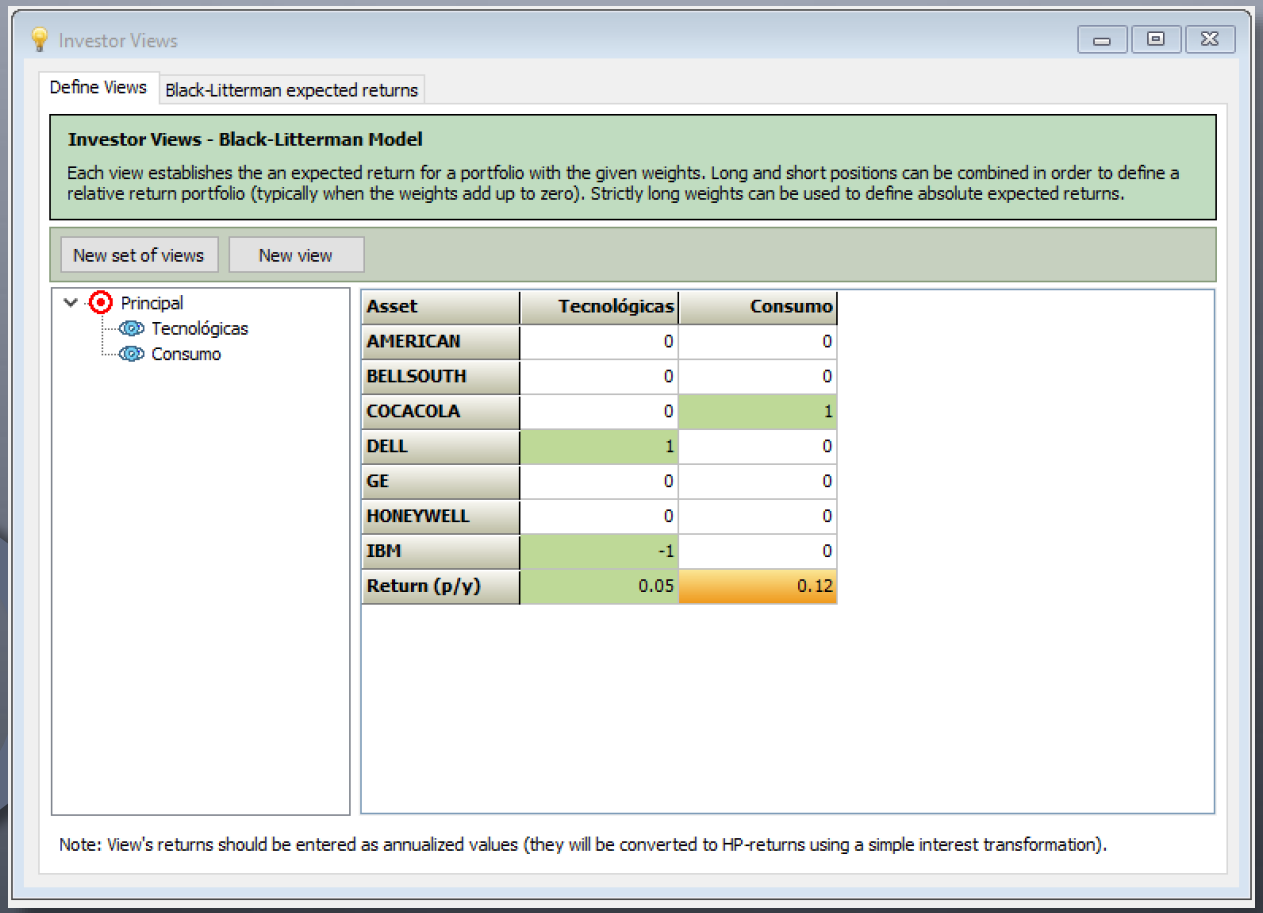
Portfolios Back-testing

- Employing transaction costs entered by the user, OptiFolio estimates the net return of an strategy after costs of rebalancing.



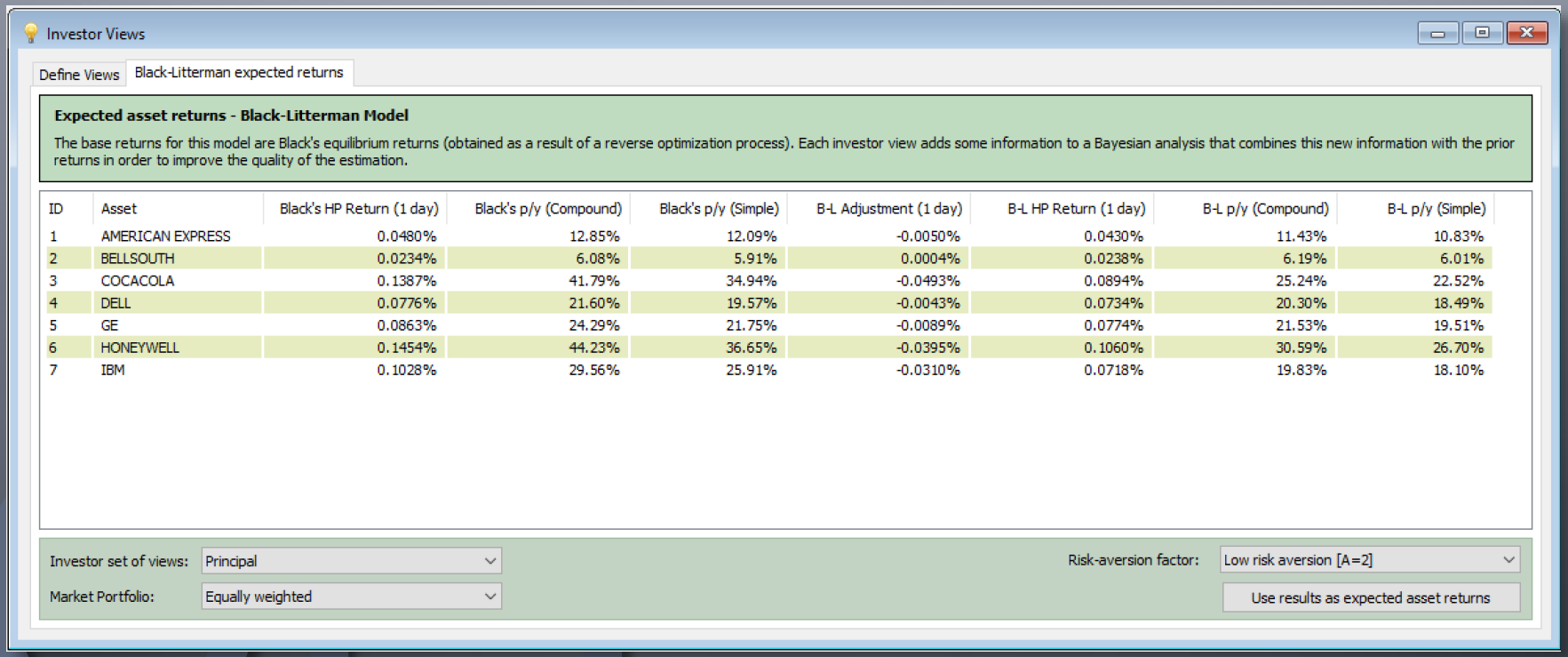
Investor views

- The Views Manager allows the user to manage sets of assumptions about the future behavior of assets and their relative returns.
- This information can then fed into the Black-Litterman model in order to produce improved investment strategies recommendations.



Black-Litterman modeling

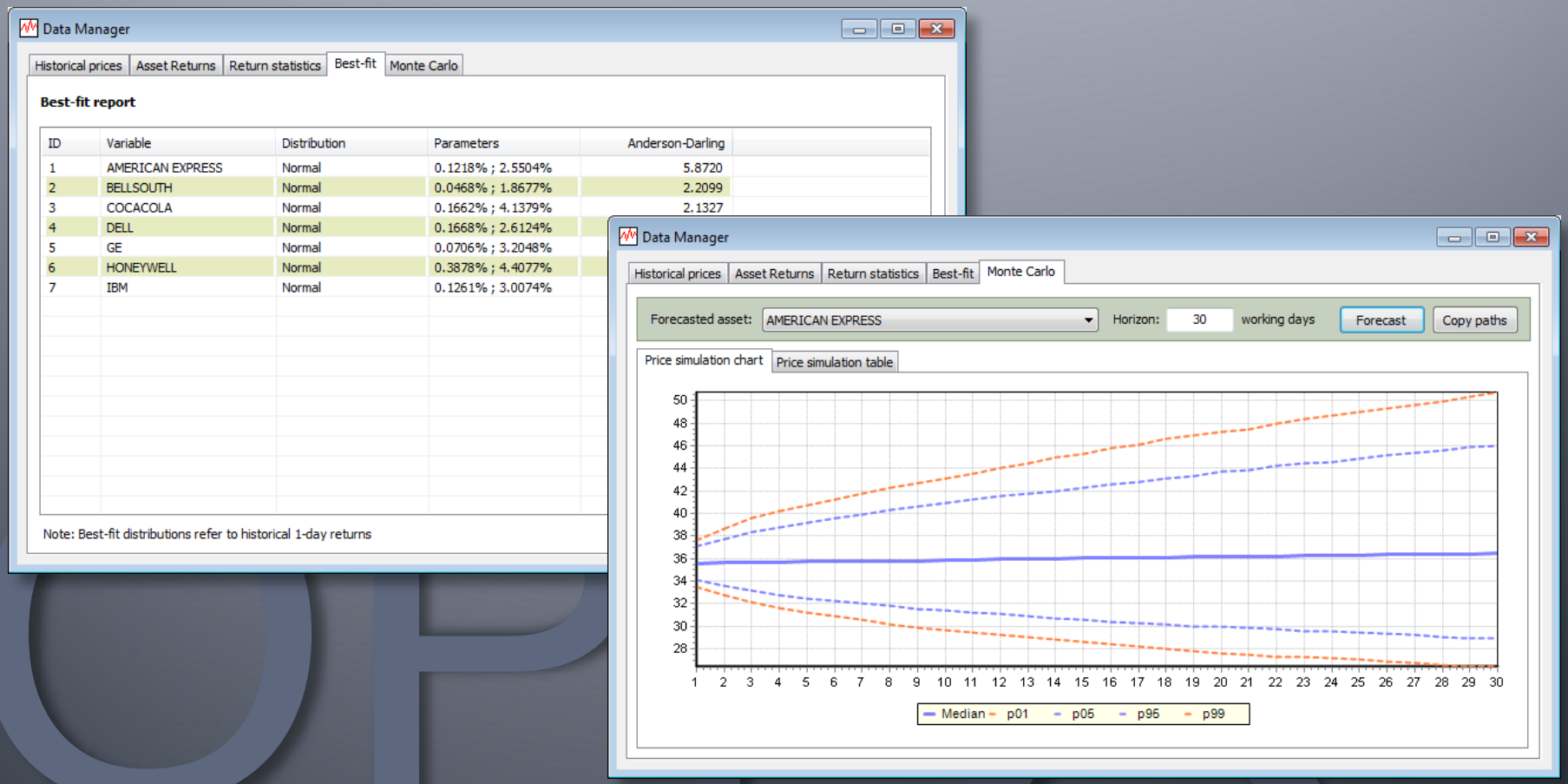
- OptiFolio automates the application of the Black-Litterman Bayesian model and generates the adjusted expected returns for the investment assets. These returns can then be used to generate an improved set of efficient portfolios.



ID	Asset	Black's HP Return (1 day)	Black's p/y (Compound)	Black's p/y (Simple)	B-L Adjustment (1 day)	B-L HP Return (1 day)	B-L p/y (Compound)	B-L p/y (Simple)
1	AMERICAN EXPRESS	0.0480%	12.85%	12.09%	-0.0050%	0.0430%	11.43%	10.83%
2	BELLSOUTH	0.0234%	6.08%	5.91%	0.0004%	0.0238%	6.19%	6.01%
3	COCACOLA	0.1387%	41.79%	34.94%	-0.0493%	0.0894%	25.24%	22.52%
4	DELL	0.0776%	21.60%	19.57%	-0.0043%	0.0734%	20.30%	18.49%
5	GE	0.0863%	24.29%	21.75%	-0.0089%	0.0774%	21.53%	19.51%
6	HONEYWELL	0.1454%	44.23%	36.65%	-0.0395%	0.1060%	30.59%	26.70%
7	IBM	0.1028%	29.56%	25.91%	-0.0310%	0.0718%	19.83%	18.10%

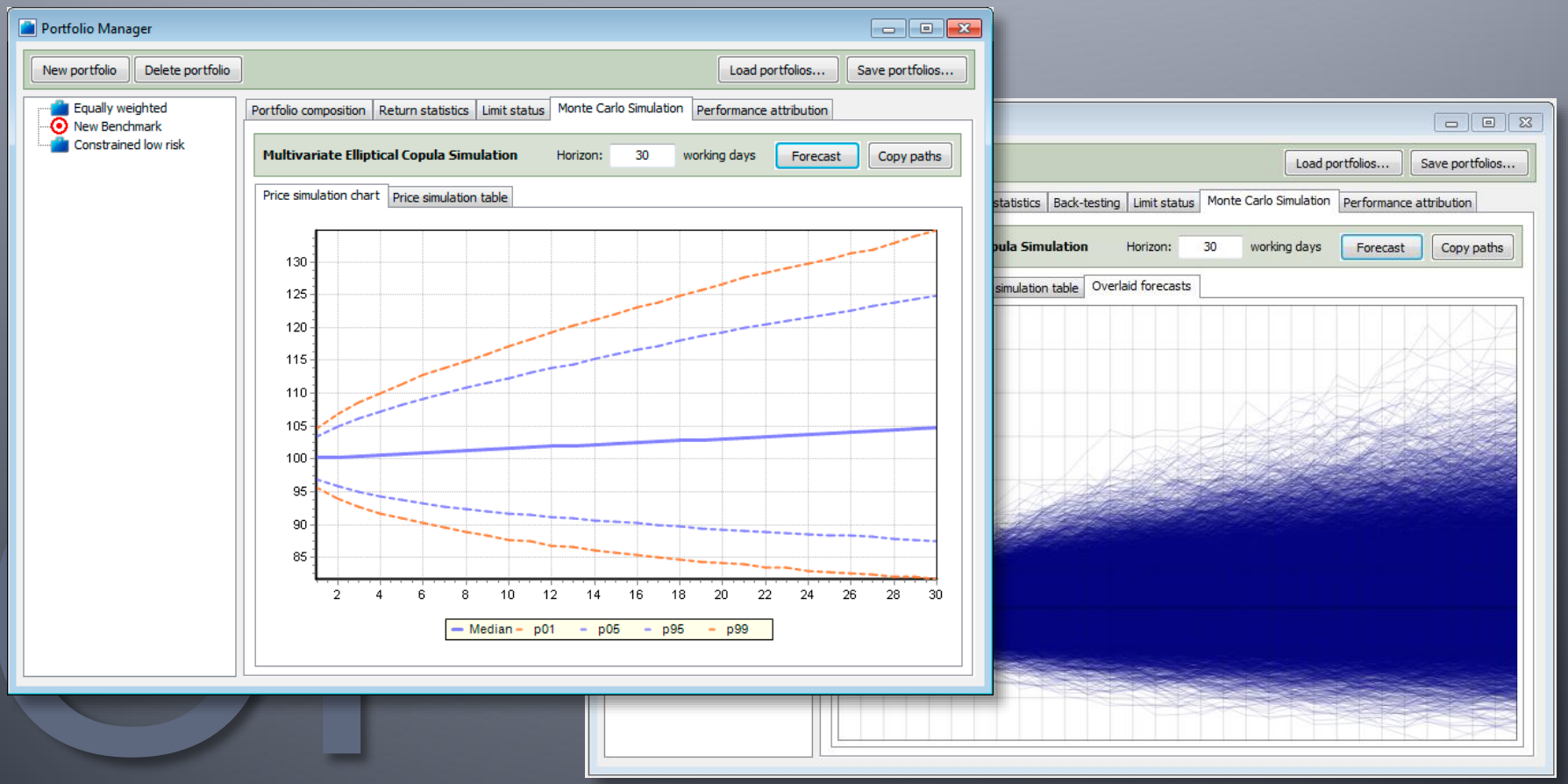
Best-fitting probability distributions

- OptiFolio identifies the best distributions to represent asset returns for Monte-Carlo simulations. Data generation employs multi-variate copulas.



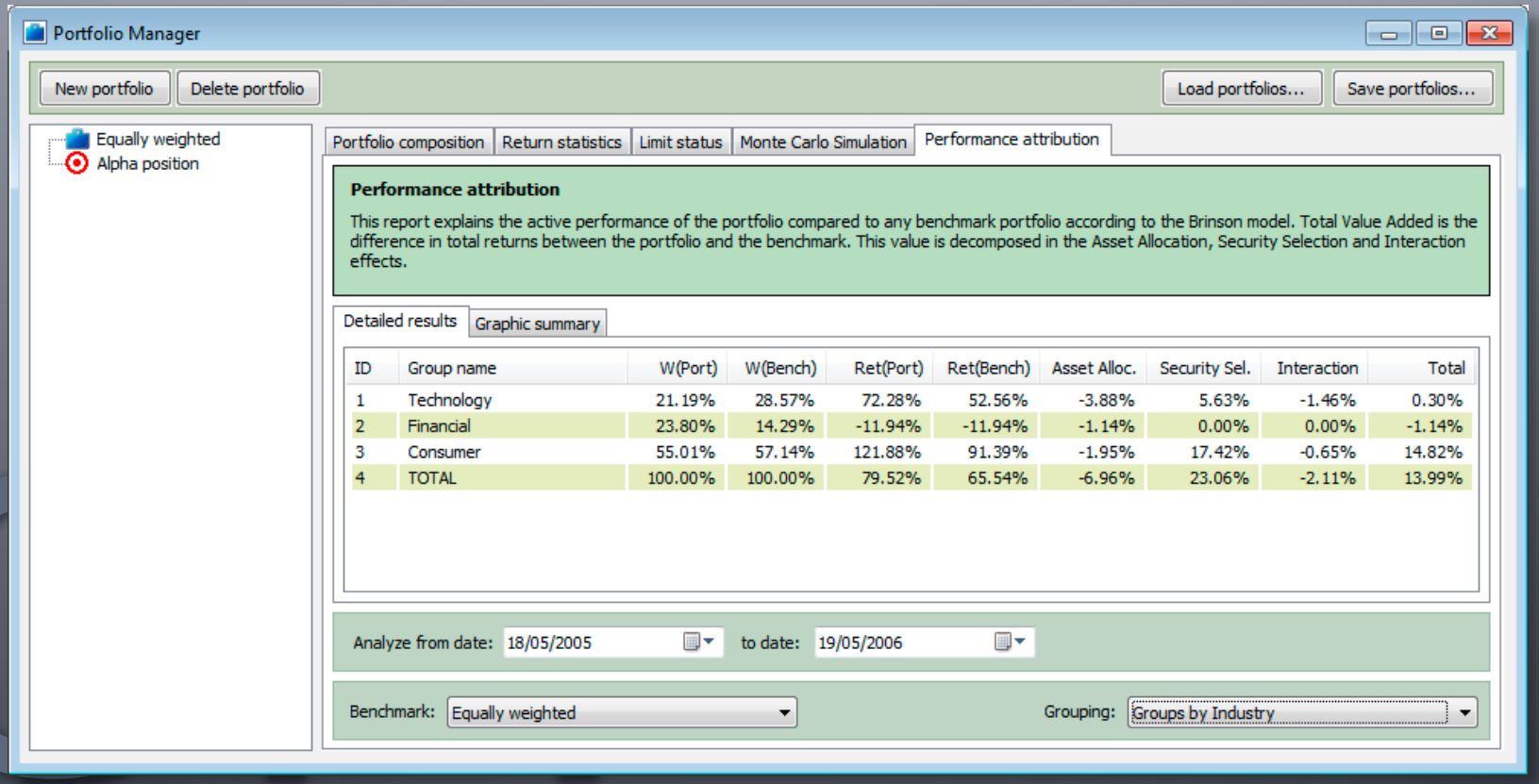
Portfolio Monte-Carlo simulation

- Using mutivariate elliptical copulas, future portfolio values can be forecasted for thousands of possible outcomes. The software reports key confidence intervals for the expected portfolio values.



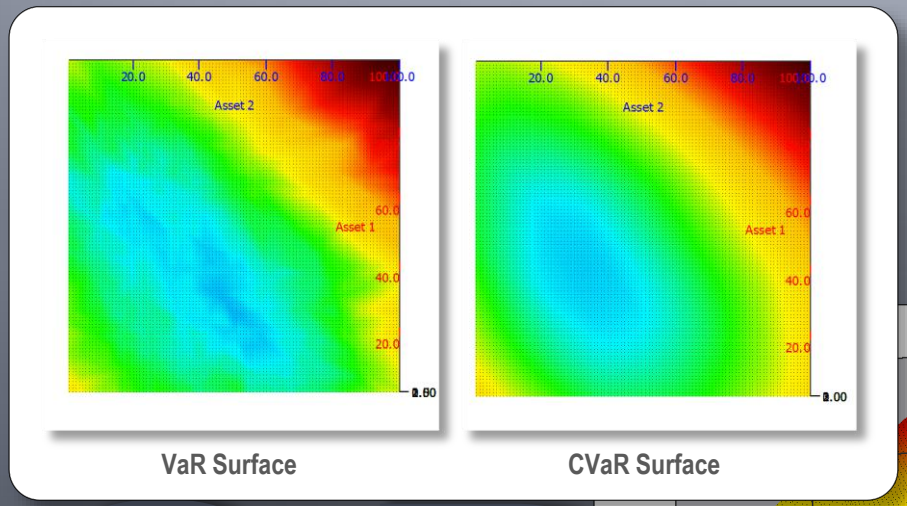
Performance attribution

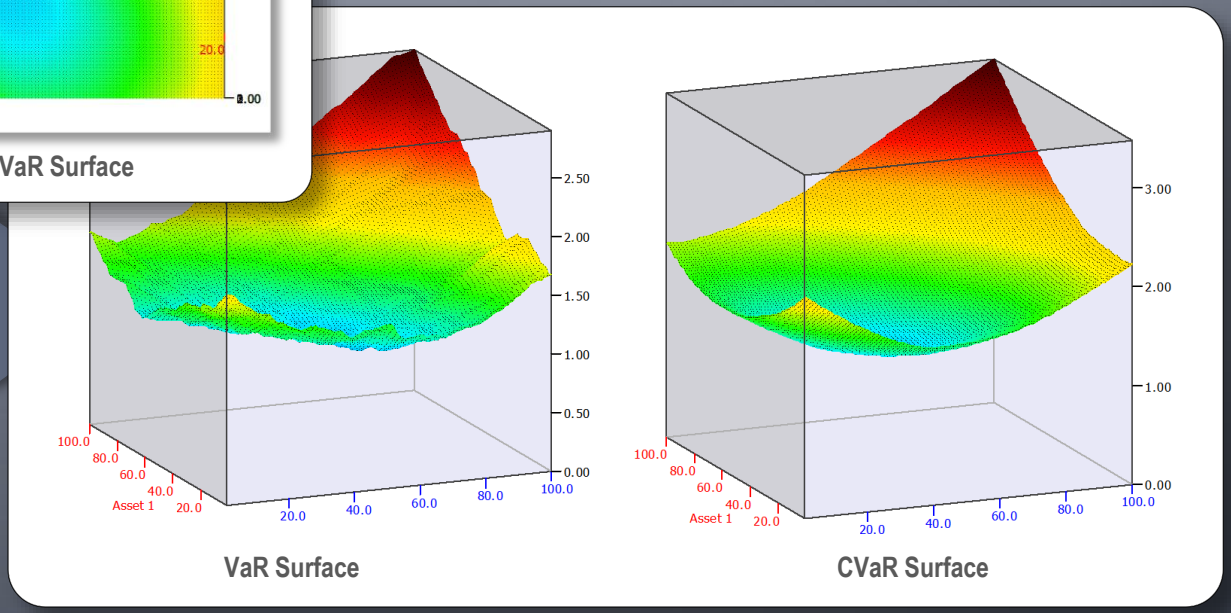
- Applying the Brinson model, OptiFolio decomposes the return difference between the portfolio under analysis and any benchmark portfolio. Results show the return attributable to *Asset Allocation* and *Security Selection,* employing any asset grouping criteria.



Experiment

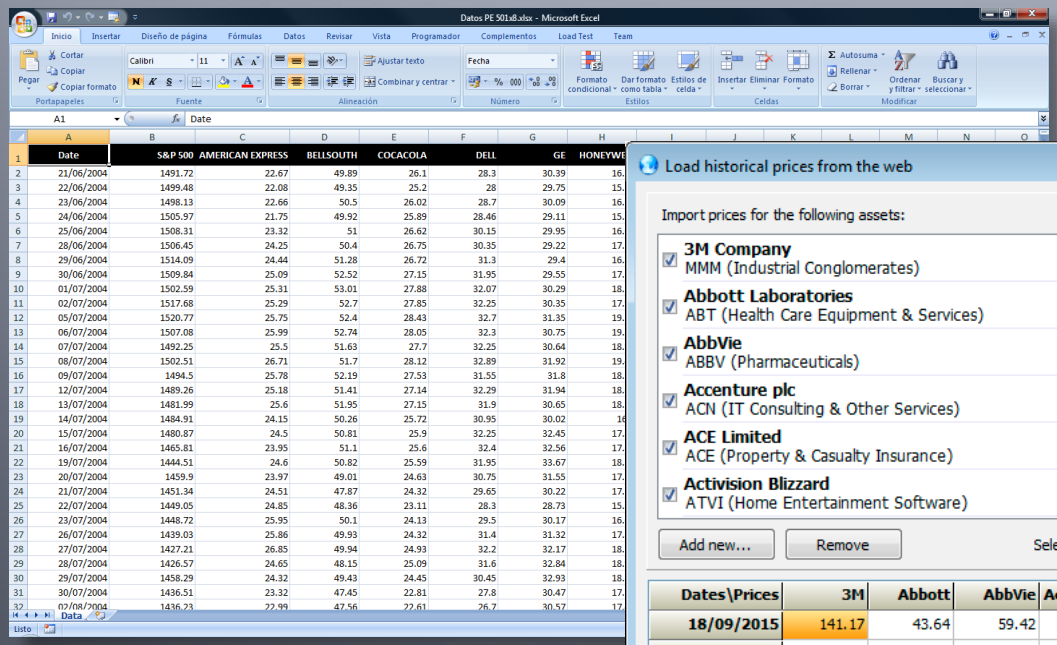
- Instead of analyzing specific market data, OptiFolio allows you to examine generic or random 3-assets portfolios.
- Explore the behavior of VaR and CVaR for unlimited sets of artificial data in order to discover common properties.





Data sources

- Historical prices data can be imported from MS Excel® documents, delimited files or directly from the web.
- There is no predetermined limit to the number or assets or data points you can manage.



OptiFolio

Minimum requirements

Operating system	Microsoft Windows® XP or later.
Processor speed	2 Ghz or more recommended.
System memory	2Gb or more.
Video	1280 x 1024, 16-bit s color.
Connectivity	Internet connection available for license validation.
Other	Microsoft Excel® XP or later.

OptiFolio

Editions

Features \ Editions	Academic	Personal	Professional
Assets per portfolio	25	100	No limit
Investment constraints	7	50	No limit
MVO, CVaR optimization, Backtesting, Risk-Factors, Monte-Carlo simulation	✓	✓	✓
Support	Documentation	By eMail	By eMail & telephone
Audience	For students or professors only	For personal investment management	Investment consultants and fund managers

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