

Global Portfolio Simulation

A Gavekal Software Tool

A Manager's Approach to Portfolio Simulation

In 2002, the founders of Gavekal Intelligence Software launched TrackRisk, a global portfolio simulation tool, combining their expertise in money management, academic research on risk, and artificial intelligence.

The aim was (i) to reduce the uncertainty for money managers and (ii) to help them frame their investment decision rules with the support of innovative computerized techniques.

TrackRisk addresses three areas of portfolio management:

- Asset selection
- Strategic asset allocation
- Tactical asset allocation and risk management

In 2014, the company joined the Gavekal group and teamed up with Gavekal's economists, to enrich the macroeconomic approach of the software to assess risks and simulate portfolio reallocations.

“ The financial market is a global arbitrager of risks. ”

Yann Ageon, CEO, Gavekal Intelligence Software

Asset Selection

TrackRisk analyses and compares financial data series. The data series can refer to a fund or a hedge fund, a single asset such as a stock, an index tracker, a bond etc., or a multi-asset portfolio.

The system provides answers to the following questions:

Idiosyncratic Risks

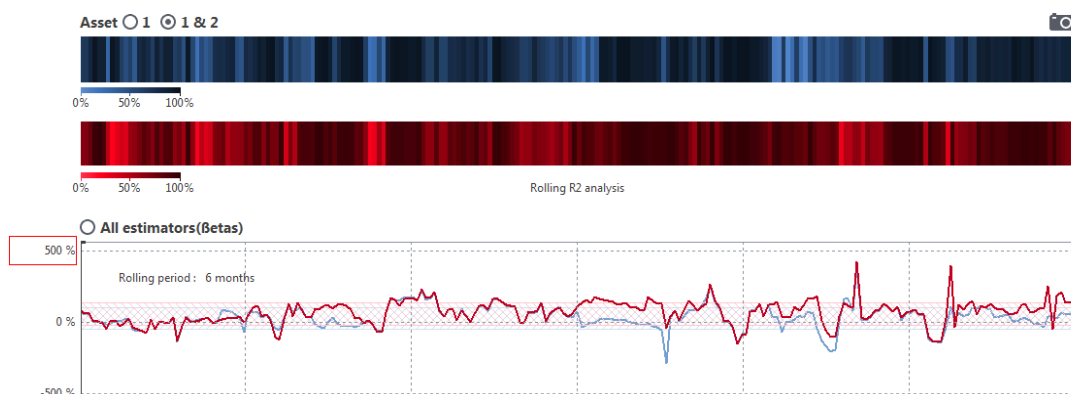
- What is the historical return and volatility of the asset?
- Is the asset distribution skewed towards negative or positive returns in volatile markets?
- What is the risk of loss at any probability level? Minimum loss (VaR), average loss (expected shortfall), catastrophic loss (extreme event)?
- What is the probability of a series of losses leading to significant drawdowns?
- What is the confidence level on all calculations (Monte Carlo simulation)?

Dependency Risks

- What are the risk factors or the assets classes correlated with the asset?
- When a risk factor declines or rises by say 1% or 2%, what is the asset's behavior?
- When a risk factor drops or rises by a much greater percentage, does the asset leverage or attenuate the shocks?

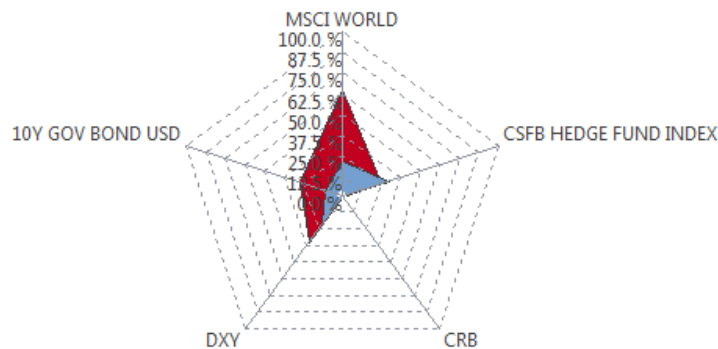
Stress Tests

- What was the asset's behavior during the major market stress periods in the last 10, 20 or 30 years?



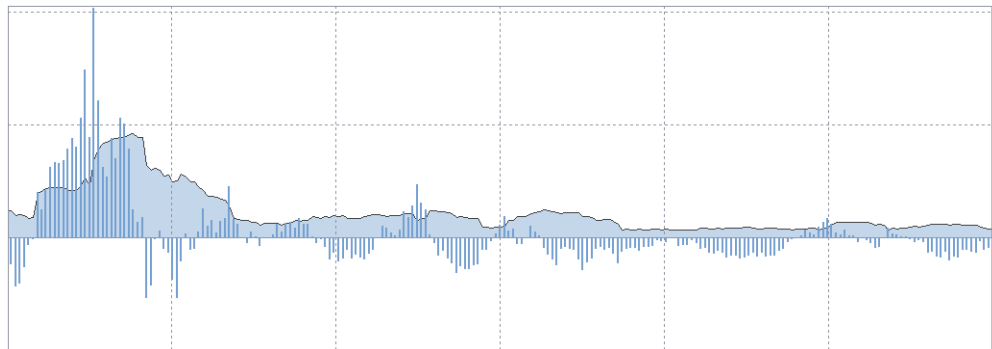
Replication

- Can we replicate the investment with standard and liquid assets or derivatives?
- Is the replication stable over time?



Alpha Generation

- Does the asset provide excess return?
- If so, where does the excess return come from, and is it stable?



Follow Up

- Is the selected asset still the best among its peers?

| Assets | A. C. Perf. | A. Vol. | VaR n°1 | Max. DD | Sharpe | Skewness | E. Kurtosis |
|-----------------------------|-------------|---------|---------|---------|--------|----------|-------------|
| FRESENIUS SE 1 CO KGAA | 18,8 % | 33,2 % | 21,8 % | -81,3 % | 0,6 | 1,4 | 11,2 |
| ALSTOM | -11,3 % | 51,1 % | 41,4 % | -97,2 % | -0,2 | 0,7 | 6,6 |
| ILIAD SA | 19,4 % | 30,0 % | 19,2 % | -30,2 % | 0,6 | 0,3 | 1,0 |
| ORANGE | -3,5 % | 44,9 % | 35,4 % | -95,5 % | -0,1 | 0,3 | 8,7 |
| EONIA | 2,0 % | 0,5 % | 0,2 % | -0,5 % | 4,1 | 0,2 | -1,3 |
| RENAULT SA | 5,2 % | 41,4 % | 32,0 % | -89,8 % | 0,1 | 0,1 | 2,7 |
| CAPGEMINI | 2,2 % | 40,1 % | 31,2 % | -94,2 % | 0,1 | 0,1 | 2,4 |
| GAMESA CORP TECNOLOGICA SA | 7,4 % | 40,3 % | 32,5 % | -96,2 % | 0,2 | 0,0 | 2,3 |
| DISTRIBUIDORA INTERNACIONAL | 11,3 % | 23,4 % | 16,4 % | -40,5 % | 0,5 | -0,1 | -0,3 |

Strategic Asset Allocation

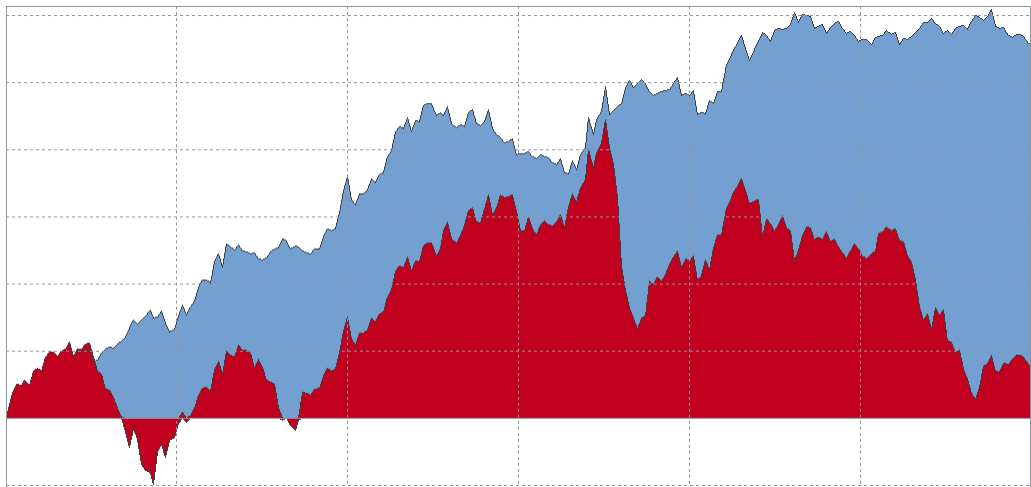
TrackRisk understands strategic asset allocation, from a quantitative standpoint, as a long-term portfolio optimization under the following constraints:

- Minimum and maximum exposure by asset class
- Expected risk in terms of volatility, VaR, or drawdown
- Diversification target
- Expected returns

-----Portfolio Optimization

TrackRisk defines a "Portfolio Scoring Function", based on the selected constraints and optimizes allocations.

The optimization model is a genetic algorithm imitating the natural selection process of living organisms and converging towards the "best of breed" portfolio.



-----What If

The "What If" function is designed to try and test manually potential reallocations. It provides information on all the underlying assets of the portfolio:

- Asset profile
- Return/ risk/ ratios
- Contribution to global risk
- Dependency to risk factors
- Stress test

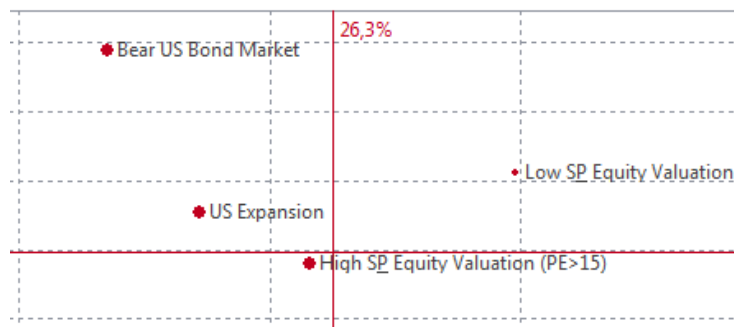
Tactical Asset Allocation & Risk Management

TrackRisk helps portfolio managers react to changes in macroeconomic or financial situations and dynamically adjust risk levels, with the support of quantitative information.

TrackRisk answers the following questions:

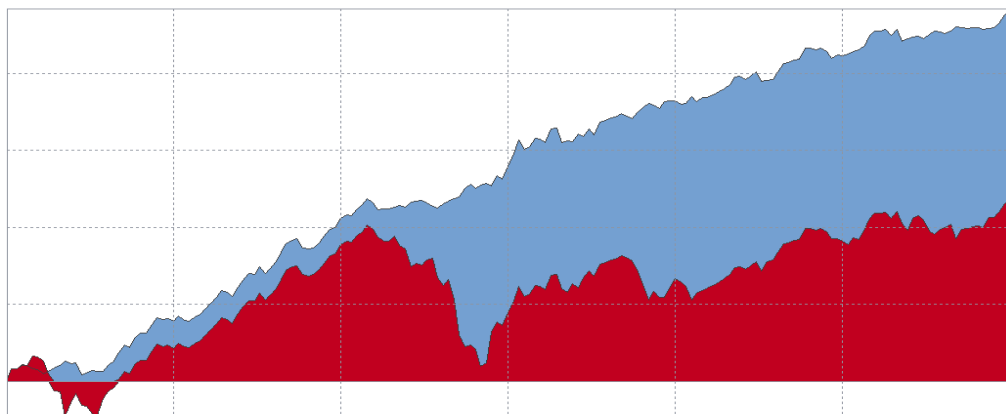
-----Adjust for Macro Conditions

What are the favorable and unfavorable economic scenarios for the portfolio?
How can we better optimize the portfolio given the current macro views?



-----Test Dynamic Allocation Strategies

What happens if exposures are switched from aggressive allocations to defensive allocations on a given scenario-when inflation is rising? when leading indicators are rolling over etc.?



----- Prepare for Situations of Market Stress

What should the optimized portfolio look like in the case of a bond market sell-off? In case of an inflationary shock on oil etc.?

Data Management and Reporting

-----Data Update

The TrackRisk database is automatically updated from Bloomberg™ or Macrobond™, Excel™, Yahoo™, or any internal or external data provider upon request, or at any predefined time and periodicity.

-----Reporting

The quantitative analysis of TrackRisk can be exported to predefined and customizable report templates.



Le Consul – 37/41 Bd Dubouchage 06000, Nice, France

www.gavekal-intelligence-software.com

contact@gavekal-intelligence-software.com

Gavekal is one of the world's leading independent providers of global investment research.

Gavekal Intelligence Software is a research and development company from the Gavekal group, based in Nice, France. The company was founded in 1999 and combines academic knowledge, computing skills and financial expertise to provide risk software to the asset management industry. The company is headed by Yann Ageon, a former engineer of the French National Center for Scientific Research (CNRS) and focuses on artificial intelligence and quantitative modeling of complex systems, applied to finance.

