FHS - An Overview
the web site of the authentic Filtered Historical Simulation (FHS)

An overview of Filtered Historical Simulation (FHS)

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FHS is a scenario generating technique for speculative assets prices (risk factors). In contrast to some other techniques where the scenarios are generated ad hoc, FHS uses a combination of nonlinear econometric models and past returns to build the probability distribution of possible values that the asset (risk factor) could take in the days ahead. Risk estimates are directly derived from the tails of the distribution.

The FHS is a kind of historical simulation since uses past returns as innovations in modeling the randomness of the asset prices. It has however one major improvement; the row returns are first scaled by the volatility that prevailed that day and then are multiplied by the current forecast of volatility. The first pass, the scaling, is necessary in order to make the past returns stationary and to render them suitable innovations for a simulation process. The second step, the re-scaling, endows the historical returns to reflect the current volatility conditions prevailing in the markets.

From the statistical perspective the FHS is seen as a semi-parametric model. The price series is not forced to conform to any kind of probability distribution, but rather the data are allowed to talk themselves. Risk estimation is highly dependent on good prediction of uncommon events, or catastrophic risk. Simulation models that draw innovations from theoretical distributions, such as the parametric Monte Carlo, indeed smooth the empirical distribution of the data and consequently they may underestimate "catastrophic risk"

The cross dependencies among the series are handled through parallel bootstrapping. This reduces dramatically the dimensions of the problem because the number of parameters and the time needed to carry out the computation increases linearly with the number of securities or risk factors in the portfolio. In contrast, in models that are relying on the variance-covariance matrix to capture the cross dependencies, the dimension is a quadratic function of the number of securities that are handled.

In summary, the FHS combines the best features from other risk management models.

- The data do not have to follow a unique or a pre-specified distribution (it uses the historical or empirical distribution). Thus it allows for fat tails, volatility clusters and changing means.
- It goes around the bias problem of using just historical data.
- It handles easily dependencies across very large numbers of assets.

- Generates thousands of scenarios for the mean and variance of each risk factor in a multi-period horizon. This provides a more accurate formation of the structure in the tails of possible price realizations.
- Non linear instruments such options are re-priced each day ahead in the risk horizon. The re-pricing handles the risk with unbalanced portfolios found in the expiring contracts before the end of the investment horizon.
- Stress testing, sensitivity analysis and coherent risk measures are easily implemented.

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