

## **Nonlinear Polymodels and the StressVaR: New Risk Concepts for Fund Allocation**

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### **Abstract / Resumo:**

We introduce a novel approach to risk estimation based on nonlinear "poly-models": rather than one multi-factor model, the risk of an investment is represented by a collection of nonlinear dynamic sigma factor models. Using this approach, we build a risk measure, the "StressVaR" (SVaR) which combines the notion of Value-at-Risk and of stress scenarios. Developed to evaluate the risk of hedge funds, the SVaR appears to be applicable to a wide range of investments. The computation of the StressVaR is a 3 step procedure whose main components we describe in relative detail. Its principle is to use the fairly short and sparse history of the hedge fund returns to identify relevant risk factors among a very broad set of possible risk sources. This risk profile is obtained by calibrating a collection of nonlinear single-factor models as opposed to a single multi-factor model. We then use the risk profile and the very long and rich history of the factors to assess the possible impact of known past crises on the funds, unveiling their hidden risks and so called "black swans".

In backtests using data of 1060 hedge funds we demonstrate that the SVaR has better or comparable properties than several common VaR measures - shows less VaR exceptions and, perhaps even more importantly, in case of an exception, by smaller amounts.

The ultimate test of the StressVaR however, is in its usage as a fund allocating tool. By simulating a realistic investment in a portfolio of hedge funds, we show that the portfolio constructed using the StressVaR on average outperforms both the market and the portfolios constructed using common VaR measures.

For the period from Feb. 2003 to June 2009, the StressVaR constructed portfolio outperforms the market by about 6% annually, and on average the competing VaR measures by around 3%.

The performance numbers from Aug. 2007 to June 2009 are even more impressive. The SVaR portfolio outperforms the market by 20%, and the best competing measure by 4%.

Raphaël Douady, joint work with Ilija I. Zovko, Cyril Coste and Alexander Cherny