

Dominant Factor Analysis

Raphael Douady¹

¹ SUNY Stony Brook

Nonlinear polymodels is a factor-based statistical analysis technique which can be applied in a broad range of fields. Inspired by pattern recognition methods used in DNA analysis or in hand writing recognition, it is particularly adapted to situations where space-dependent changes of regime modify the relation between dependent variables and their independent drivers, making it difficult for a single multi-factor model to fit all the possible situations that may potentially occur. We shall present in the particular context of financial modeling. Traditional multi-factor analysis is essentially used in finance in a linear setting. Asset returns are replicated by a linear combination of factor returns. Not only it provides answers to questions related to the statistical behaviour of assets with respect to the market, but it is intellectually comfortable, as a portfolio is naturally represented as a reduced "portfolio" of risk factors. However, this representation sadly lacks of any predictive value, especially when we need it the most, that is, when a crisis is coming. We shall show how nonlinear polymodels provide a reliable solution to the main questions factor analysis aims at addressing: 1) finding the probability distribution of individual asset returns (risk measurement) 2) assessing the impact of a given shift of risk factors (stress testing) 3) estimating the joint probability distribution of family of assets (portfolio risk and optimization) We shall show how the nonlinear polymodel-based "Dominant FactorsTM" methodology provides superior portfolio returns, simply thanks to a better control of the downside dynamics, without the procyclicality pitfalls of traditional Markowitz and Black-Litterman methods.