

# NONLINEAR FACTOR ANALYSIS BY POLYMODELS

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## Abstract

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 of 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 polymodel-based "Dominant Factors" methodology provides superior portfolio returns, simply thanks to a better control of the downside, without the pitfalls of traditional Markowitz and Black-Litterman methods.