Abstract

We present an application of Independent Component Analysis to financial portfolio allocation based on daily data. The independent components are, like the financial asset returns, time series that exhibit volatility clustering and heavy tails. Unlike the initial set of returns the components are stochastically independent. The scale terms of the independent components are modeled by a GARCH-type process and the innovation sequence is taken to be either (non-Gaussian) stable Paretian or normal inverse Gaussian, depending on the result of a test for the former. The convolutions of stable Paretian and normal inverse Gaussian random variables remain in the domain of attraction of a stable law, thus ensuring a heavy tailed portfolio returns distribution. In particular, even as the number of assets tends towards infinity, the classic central limit theorem is not applicable to the independent components and instead the generalized central limit theorem applies. The portfolio distribution based on risk minimization for a specified target return results from characteristic function inversions and is validated using simulation studies. An empirical example demonstrates the validity of the procedure and presents its advantage over its competitor models.