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A multivariate jump-driven financial asset model

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Abstract

We discuss a Lévy multivariate model for financial assets which incorporates jumps, skewness, kurtosis and stochastic volatility. We use it to describe the behaviour of a series of stocks or indexes and to study a multi-firm, value-based default model. Starting from an independent Brownian world, we introduce jumps and other deviations from normality, including non-Gaussian dependence. We use a stochastic time-change technique and provide the details for a Gamma change. The main feature of the model is the fact that—opposite to other, non-jointly Gaussian settings—its risk-neutral dependence can be calibrated from univariate derivative prices, providing a surprisingly good fit.

Keywords:

Lévy processes

Multivariate asset modelling

Copulas

Risk neutral dependence

Notes

- †For an extensive discussion of the economic interpretation of time change and its relationship with the market activity, see Geman and Ané ([2000](#)).
- †Note that in theory we can make the Brownian motions depedent on each other (as in Madan and Seneta ([1987](#))). However, this would lead to a quadratic incerase in the parameters and would generate an estimation problem of the correlation structure, as discussed before.
- ‡Extensions to common stochastic voltaility time changes can be part of future research.
-

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