MULTIVARIATE ASSET PRICING MODELS: SOME EXTENSIONS OF THE αVG MODEL

ABSTRACT

We propose a class of multivariate Lévy and Sato models for option pricing built upon a Lévy or Sato time change Brownian motion where the time change consists of a weighted sum of an idiosyncratic and a common component. We consider the particular case of Gamma subordinators and we distinguish in between a reduced model where the asset log-return margins are of Variance Gamma (VG) type and a generalized model where the margins remain Lévy or Sato-distributed but not necessarily VG distributed anymore. These models can be seen as an extension of the αVG model proposed by Semeraro [1] where the VG margins are replaced by more flexible distributions. We calibrate the different models for a period ranging from June 2008 until October 2009 including therefore the recent credit crisis period. In particular, we show that the reduced models usually fail to reproduce the market correlations when calibrated by using the decoupling calibration procedure whereas the generalized models can adequately reproduce the market implied correlations when a penalty term which assesses the correlation goodness of fit is included into the calibration surface optimizer. Moreover, the proposed Sato models are able to fit univariate option surfaces quotes both for low and high volatility regime periods and consequently outperform both the multivariate Black-Scholes model and the proposed multivariate Lévy models.

[1] Semeraro, P. (2008). A multivariate Variance Gamma model for financial applications. *International Journal of Theoretical and Applied Finance*, **11**, 1-18.