Notes on exact and semi-exact Lévy models for the valuation of CDOs

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We investigate the effects of certain simplifying assumptions that are often made when valuating tranches of collateralised debt obligations (CDOs) using a firm's value approach.

As a basic model the following framework, already proposed in [1] and [2] is used:

Let Y be a Lévy process with $\mathbb{E}(Y_1^2) < \infty$ and let $Y^g, Y^1, \ldots, Y^n$ be independent copies of Y. Then we assume, that the random part in the dynamics of firm j is given by

$$X_t^j := Y_{\phi t}^g + Y_{(1-\phi)t}^j$$

for some fixed $\phi \in (0,1)$.

Here we call Y^g the *global risk* and Y^j the *idiosyncratic risk* of firm j. The parameter ϕ equals the correlation of two risks in the portfolio.

In order to simplify valuation and calibration some main assumptions like the homogeneity and largeness of the portfolio and the so-called European approximation are applied.

The error made in this way is measured by comparing the result to a model with less simplification which is evaluated by the use of Monte Carlo simulation.

[1] H. ALBRECHER, S.A.LADOUCETTE, W.SCHOUTENS: A generic one-factor Lévy model for pricing synthetic CDOs. *Advances in mathematical finance,* Birkhäuser Boston, 2007, pp. 259–277.

[2] M. BAXTER: Lévy simple structural models. *International Journal of Theoretical and Applied Finance* **10(4)** (2007), pp. 593–606.