Applications of Lévy Processes in Rating Asset-Backed Securities: Modeling Default, Prepayment and Loss-Given-Default

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In this talk we will present an overview of some traditional methods and discuss some applications of Lévy processes that can be used in rating and pricing Asset-Backed Securities (ABSs).

Securitization is the process whereby an institution packs and sells a number of financial assets to a specific entity (created specifically for this purpose), which funds this purchase by issuing notes secured by the revenues from the underlying pool of assets. Though originated within the banking world, as a mechanism to reduce regulatory capital requirements by removing loans from the balance sheet, nowadays, securitization is used by many companies in different industries, with almost any financial asset being eligible for pooling and a seemingly infinite creativity in allocating the revenues to the noteholders, with respect to their seniority. This lack of uniformity implies that each ABS contract requires its own model. However, there are certain features that emerge in virtually any ABS deal, the most important ones of which are default risk, amortization of principal value (and thus prepayment risk) and Loss-Given-Default (LGD). Adequately modeling these phenomena (over time) is thus of significant importance.

In the existing ABS literature, the probability of default is generally modeled by means of the Logistic function or Vasicek's one-factor model, whereas the prepayment rate and the LGD rate are assumed to be constant over time and independent of default. This procedure has some important drawbacks. First of all, the default rate is derived from a light-tailed distribution and thus the probability of extremely high or small default rates is underestimated. Second, actual prepayment rates and loss rates are time dependent and correlated, both with each other and with the default rates (e.g. high default rates, imply low prepayment rates and high loss rates).

We propose a number of alternative models that are based on flexible heavy-tailed distributions and that can be applied to stochastically model default, prepayment and Loss-Given-Default, introducing dependence as well. The main workhorse in our approach will be the Generic Lévy one-factor model by Albrecher, Ladoucette, & Schoutens (2007).

Finally, we will compare our models with some of the classical techniques and discuss the impact on the rating of the ABS notes, by applying them on a simple ABS contract.