New Models for Rating Asset Backed Securities

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Summary

Our paper discusses several enhanced models for default risk and prepayment risk, two important features that appear in virtually any securitization deal. The models we propose allow for stochastic defaults and prepayments driven by jump dynamics, in contrast to today’s standard models which are either deterministic or are driven by diffusion processes. Overall we work with 4 default models and 3 prepayment models, both deterministic and stochastic, and analyse how different combinations of default and prepayment models influence the pricing and rating of a simple securitization deal.

Securitization is the process whereby an institution packs and sells a number of financial assets to a special entity, created specifically for this purpose and therefore termed the Special Purpose Entity (SPE) or Special Purpose Vehicle (SPV), which funds this purchase by issuing notes secured by the revenues from the underlying pool of assets. In general, we can say that securitization is the transformation of illiquid assets (for instance, mortgages, auto loans, credit card receivables and home equity loans) into liquid assets (marketable securities that can be sold in securities markets). These liquid assets are commonly referred to as Asset Backed Securities (ABS).

Unlike the nowadays very popular Credit Default Swap, ABS contracts are not yet standardized. This lack of uniformity implies that each deal requires a new model. However, there are certain features that emerge in virtually any ABS deal, the most important ones of which are default risk, prepayment risk (unscheduled early amortization of principal) and Loss-Given-Default (LGD). Since defaults, losses and accelerated principal repayments can substantially alter the projected cashflows and therefore the planned investment horizon, it is of key importance to adequately describe and model these phenomena when pricing securitization deals.

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In the current ABS practice, 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 (or at least deterministic) over time and independent of default. However, it is intuitively clear that default and prepayment events are coming unexpectedly and are generally driven by the overall economy, hence infecting many borrowers at the same time, causing jumps in the default and prepayment term structures. Therefore it is essential to model these events by stochastic processes that include jumps. Furthermore, it is unrealistic to assume that prepayment rates and loss rates are time independent and uncorrelated, nor with each other, nor with default rates. For instance, a huge economic downturn will most likely result in a large number of defaults and a significant increase of the interest rates at which firms and private persons can refinance their loans, causing huge losses and a decrease in (voluntary) prepayments. Reality indeed shows a negative correlation between default and prepayment.

In this paper, we propose a number of alternative techniques that can be applied to stochastically model defaults and prepayments. The models we propose are based on Lévy processes, a well know family of jump-diffusion processes that have already proven their modeling abilities in other settings like equity, fixed income and lately also in credit risk. We discuss 4 models for the default term structure and 3 models for the prepayment term structure. These models are then build into a Monte Carlo scenario generator, used to analyse and rate two subordinated notes from a very simple ABS deal. The ratings are based on Moody’s idealized cumulative expected loss rates table. A comparison of the results obtained with different combinations of default and prepayment models shows that the pure jump models produce lower (i.e. more conservative) ratings than the traditional methods (e.g. Vasicek). Hence the latter are clearly incapable of capturing the shock-driven nature of defaults and prepayments. Finally, a large scale sensitivity analysis provides insights in the impact of several important parameters on the expected loss, the weighted-average life and the rating of the notes.