Bayesian Analysis of Structure Credit Risk Models with Microstructure Noise and Jumps

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There is empirical evidence that structural models of credit risk significantly underestimated both the probability of default and credit yield spreads. Three potential sources of the problem in traditional structural models are: 1. The Brownian motion driving the firm asset value process fails to capture extreme events because of the normality assumption of it; 2. The market microstructure noise in trading distorts the information contained in equity prices within estimation process; and 3. The standard option-theoretic approach is inadequate to describe the bankruptcy at any time before debt maturity. These potential problems are separately handled in the literature. In this talk, we propose a Bayesian approach to simultaneously estimate jump-diffusion firm value process and microstructure noise from equity prices based on structural credit risk models. As the firm asset values are not observed but the equity prices are, the proposed Bayesian approach is useful in the estimation with hidden variable and Poisson shocks, and produces posterior distribution for financial analysis. We demonstrate the application with MCMC and Gibbs sampling to calculate the posterior distributions of each parameters and latent stable variable. The proposed approach enables us to check whether the bias of structural credit risk model is mainly caused by the firm value distribution or the microstructure noise of the market, and to examine the interaction between jumps and microstructure noises. By filtering out microstructure noise, the Bayesian approach facilitates the calculation of probability of default, credit spread and credit value adjustment. A simulation study is conducted to ascertain the performance of our model. We then apply our model to selected firms in Hong Kong and emerging markets.

Key words: Bayesian Approach; Credit Risk; Jump Diffusion; Microstructure Noise