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Structural Credit Risk Models with Occupation Times and Spectral Expansions

We propose a class of structural credit risk models with liquidation barriers and hazard rates based on occupation times. The defaults within the models are characterized in accordance with Chapter 7 (a liquidation process) and Chapter 11 (a reorganization process) of the U.S. Bankruptcy Code. The risk-neutral default probabilities involve joint probability distributions of the underlying firm's value with imposed killing at the liquidation barrier and its occupation time with respect to the reorganization barrier. The joint probability distributions are expressed as spectral series expansions, which allow us to write pricing formulas for credit derivatives and credit default swap (CDS) spreads explicitly as infinite series that converge rapidly. The spectral methodology works for solvable diffusion, such as the geometric Brownian motion (GBM), the constant elasticity of variance (CEV) process and other state-dependent volatility diffusion models. We then calibrated our model with a GBM governing the firm's value to market CDS spreads from the Total Energy company. Our calibration results show that the computations are fast, and the fit is nearly perfect.

This is a joint work with Giuseppe Campolieti and Hiromichi Kato.