Pricing Defaultable Bonds and Credit Derivatives in the Presence of Shock Risk and Unpredictable Recovery

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Abstract

Consider a defaultable bond whose payoff is contingent on the occurrence of a default event. Suppose that the financial market is vulnerable to shock risk, which has impacts on the default intensity, the risk-free interest rate, the reference rate, and the regime switching of the market state. Further suppose that the recovery rate in the event of default contains an exogenous (hence, unpredictable) component in addition to its contingence on the market performance until default. Thus, our work exhibits two features: the shock risk, which captures profound impacts of exogenous shock events on all aspects of the market; the unpredictable component, which is embedded in the recovery rate to capture additional uncertainty on the market. Assuming that the default intensity, the interest rate, and the reference rate jointly follow a general three-dimensional jump-diffusion process with coefficients governed by the regime of the market, we develop a risk-neutral pricing measure which prices the aforementioned various risk sources in an integrated manner. This pricing framework is directly applicable to other credit derivatives in the presence of shock risk and unpredictable recovery.