

A Deterministic Approach for Solving the Hull and White Interest Rate Model with Jump Process

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Abstract : This work considers the resolution of the Hull and White interest rate model with the jump process. A deterministic process is adopted to model the random behavior of interest rate variation as deterministic perturbations, which is depending on the time t . The Brownian motion and jumps uncertainty are denoted as the integral functions piecewise constant function $w(t)$ and point function $\theta(t)$. It shows that the interest rate function and the yield function of the Hull and White interest rate model with jump process can be obtained by solving a nonlinear semi-infinite programming problem. A relaxed cutting plane algorithm is then proposed for solving the resulting optimization problem. The method is calibrated for the U.S. treasury securities at 3-month data and is used to analyze several effects on interest rate prices, including interest rate variability, and the negative correlation between stock returns and interest rates. The numerical results illustrate that our approach essentially generates the yield functions with minimal fitting errors and small oscillation.

Keywords : optimization, interest rate model, jump process, deterministic

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