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Exact solutions for bond and option prices with systematic jump risk

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Abstract

A variety of realistic economic considerations make jump-diffusion models of interest rate dynamics an appealing modeling choice to price interest-rate contingent claims. However, exact closed-form solutions for bond prices when interest rates follow a mixed jump-diffusion process have proved very hard to derive. This paper puts forward two new models of interest-rate dynamics that combine infrequent, discrete changes in the interest-rate level, modeled as a jump process, with short-lived, mean reverting shocks, modeled as a diffusion process. The two models differ in the way jumps affect the central tendency of interest rates; in one case shocks are temporary, in the other shocks are permanent. We derive exact closed-form solutions for the price of a discount bond and computationally tractable schemes to price bond options.

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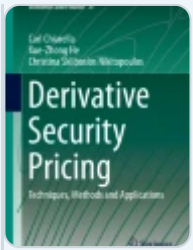

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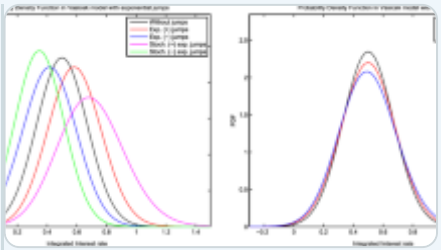

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