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Valuation of Caps and Floors in a LIBOR Market Model with Markov Jump Risks

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Abstract : The characterization of the arbitrage-free dynamics of interest rates is developed in this study under the presence of Markov jump risks, when the term structure of the interest rates is modeled through simple forward rates. We consider Markov jump risks by allowing randomness in jump sizes, independence between jump sizes and jump times. The Markov jump diffusion model is used to capture empirical phenomena and to accurately describe interest jump risks in a financial market. We derive the arbitrage-free model of simple forward rates under the spot measure. Moreover, the analytical pricing formulas for a cap and a floor are derived under the forward measure when the jump size follows a lognormal distribution. In our empirical analysis, we find that the LIBOR market model with Markov jump risk better accounts for changes from/to different states and different rates.

Keywords : arbitrage-free, cap and floor, Markov jump diffusion model, simple forward rate model, volatility smile, EM algorithm
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