MATHEMATICAL ANALYSIS AND NUMERICAL SOLUTION OF PDE MODELS FOR PRICING FINANCIAL PRODUCTS: THE CASE OF RATCHET CAPLETS

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One of the most popular families of interest rate models are the market models like Libor Market Model (LMM) and Swap Market Model (SMM) that describe the dynamics of forward LIBOR and swap rates, respectively. The agreement between them and market formulas (as Black’s cap formula) provides a chance in order to price products depending on forward and swap rates, respectively. Before they were introduced, there was no interest rate dynamics compatible with such formulas [2]. In this paper we present a PDE formulation for the ratchet cap pricing problem. The underlying LIBOR interest rates are assumed to follow the LIBOR market model. For this PDE problem the mathematical analysis results are obtained in the classical framework of uniformly parabolic PDEs in terms of a sequence of connected Cauchy problems. Moreover, this approach allows to obtain a new numerical method based on the approximation by computable fundamental solutions of constant coefficient operators. This method is compared with classical Monte Carlo simulation and a proposed characteristics Crank-Nicolson time discretization combined with finite elements strategy [1]. Further details concerning the presentation topics can be found in references [3, 4].

Referencias


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