Integrating Feynman-Kac Equations Using Hermite Quintic Finite Elements

Abstract

Methods are given for numerically solving a generalized version of the Feynman-Kac partial differential equation. The solution is expressed as a linear combination of piece-wise Hermite quintic polynomials. This twice-differentiable representation has the attributes of being a high-order method that allows easy evaluation of the solution and certain of its partial derivatives. The time-dependent solution coefficients are computed by finite element Galerkin procedures. Boundary values and initial conditions are required.

Many significant problems in financial modeling can be expressed as particular choices of coefficients, initial conditions, and boundary values. That fact allows this Feynman-Kac solver to be used in many financial modeling applications. These include the Black-Scholes models with European type or American type exercise opportunities on Calls or Puts.