Spherical Harmonics Approach to Mathematical Finance

Maria Christina Mariani and Indranil SenGupta (presenter)

Department of Mathematical Sciences
The University of Texas at El Paso
El Paso, Texas 79968, USA

Abstract

The technique of expanding functions in terms of spherical harmonics turns out to be very useful in solving integral equations. This motivates us to apply the same technique in mathematical finance. The governing equation in mathematical finance is mostly a parabolic partial differential equation. We present a technique of solving Heat equation and Black-Scholes equation using the method of spherical harmonics. We also discuss the method related to the Black-Scholes equation in annular domain and some generalized Black-Scholes equations. We consider the problem for the Lévy market and solve the related integro-differential equation using the method of spherical harmonics.