# Solution of the Black-Scholes Equation for Pricing of Barrier Option

Mehdi Dehghan and Somayeh Pourghanbar

Department of Applied Mathematics, Faculty of Mathematics and Computer Science,
Amirkabir University of Technology, No. 424, Hafez Ave., 15914,Tehran, Iran

Reprint requests to M. D.; E-mail: mdehghan@aut.ac.ir or mdehghan.aut@gmail.com

Z. Naturforsch. **66a,** 289 – 296 (2011); received May 4, 2010 / revised September 13, 2010

In this paper two different methods are presented to approximate the solution of the Black-Scholes equation for valuation of barrier option. These techniques can be applied directly for all types of differential equations, homogeneous or inhomogeneous. The use of these methods provides the solution of the problem in a closed form while the mesh point techniques provide the approximation at mesh points only. Also, the two schemes need less computational work in comparison with the traditional methods. These techniques can be employed for problems with initial condition. In this paper we use the variational iteration and homotopy perturbation methods for solving the Black-Scholes equation with terminal condition. Numerical results are compared with theoretical solutions in order to confirm the validity of the presented procedures.

*Key words:* Black-Scholes Equation; Barrier Option; Variational Iteration Method (VIM); Homotopy Perturbation Method (HPM); Semi-Analytic Approach; Stochastic Differential Equation (SDE); Mathematical Finance.

*AMS Subject Classifications:* 65M99