Operational matrices for finding numerical solution of stochastic differential equations arisen in financial mathematics

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Abstract: In this paper, one of the new convenient techniques is used to solve problems formulated by stochastic Volterra integral equations. Cox-Ingersoll-Ross (CIR) model, Vasicek model and Heston model in financial mathematics can be transformed to a stochastic Volterra integral equation. Triangular functions, block pulse functions and their operational matrix and stochastic operational matrix of integration are considered. Properties of the operational matrices are utilized to reduce the computation of this equations to some algebraic equations. This method has several benefits; in addition to validity and good degree of accuracy, arithmetic operations are carried out without the need to derivative or integration, also, computation of presented method is very simple and attractive. The method is applied to a few test examples to illustrate the accuracy and implementation of the method.

Keywords: Orthogonal functions; Operational matrix; Stochastic operational matrix; Ito Integral; Brownian motion.

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