Mean Square Stability Analysis of Semi-Implicit Milstein Scheme for Linear Stochastic Delay Differential Equations

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Abstract. This paper is devoted to investigate the mean square stability of semi-implicit Milstein scheme in approximating the solution of linear stochastic delay differential equations (SDDEs). Semi-implicit Milstein scheme is proposed by extending an explicit Milstein to its semi-implicit counterparts. A method is said to be semi-implicit if it is implicit in drift term and explicit in diffusion term. The condition under which the method is mean square stable is determined. The results show that the semi-implicit Milstein scheme preserves the stability property for linear SDDEs under certain conditions of constant coefficients. Numerical experiments are conducted to verify the results.