

Mean Square Convergence of Stochastic θ -Methods for Non-linear Neutral Stochastic Differential Delay Equations¹

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Siqing Gan², Haomin Zhang², and Henri Schurz³

²*School of Mathematical Sciences and Computing Technology, Central South University, Changsha 410075, Hunan, China*

³*Department of Mathematics, Southern Illinois University, Carbondale, IL 62901-4408, USA*

ABSTRACT: This paper is devoted to the convergence analysis of stochastic θ -methods for non-linear neutral stochastic differential delay equations (NSDDEs) in Itô sense. The basic idea is to reformulate the original problem eliminating the dependence on the differentiation of the solution in the past values, which leads to a stochastic differential algebraic system. Drift-implicit stochastic θ -methods are proposed for the coupled system. It is shown that the stochastic θ -methods are mean-square convergent with order $\frac{1}{2}$ for Lipschitz continuous coefficients of underlying NSDDEs. A nonlinear numerical example illustrates the theoretical results.

Key words and phrases. Neutral stochastic differential delay equations, mean-square continuity, stochastic θ -methods, mean-square convergence, consistency

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