

# A.S. Asymptotic Stability of Solutions of Drift-Implicit $\theta$ -Methods for Bilinear (O)SDEs

Preprint m-03-027

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**ABSTRACT:** Global almost sure asymptotic stability of stochastic  $\theta$ -methods with nonrandom variable step sizes when applied to bilinear, nonautonomous, homogeneous test systems of ordinary stochastic difference equations (SDEs) is investigated. Sufficient conditions for their a.s. stability are proved in  $\mathbb{R}^1$ . The investigations indicate that there might be a discrepancy between the asymptotic behavior of the analytic solution and its numerical approximation using drift-implicit  $\theta$ -methods in view of almost sure stability.

**Key words and phrases.** Stochastic differential equations, numerical methods, global asymptotic stability, almost sure stability, drift-implicit  $\theta$ -methods.

**AMS 2000 Mathematics Subject Classification.** Primary 65C30, 60H10; Secondary 37H10, 34K20, 34F05, 39A11, 65C20, 93D20, 93E15