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Tamed EM Scheme of Neutral Stochastic Differential Delay Equations

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Abstract

In this paper, we investigate the convergence of the tamed Euler-Maruyama (EM) scheme for a class of neutral stochastic differential delay equations. The strong convergence results of the tamed EM scheme are presented under global and local non-Lipschitz conditions, respectively. Moreover, under the global Lipschitz condition, we provide the convergence rate of tamed EM scheme, which could be the same as the convergence rate of classical EM scheme one half.

MSC 2010: 65C30 (65L20, 60H10)

Key Words and Phrases: neutral stochastic differential delay equations, non-Lipschitz, monotonicity, tamed EM scheme, rate of convergence, pure jumps, Poission processes.

1 Introduction

The Euler-Maruyama (EM) scheme is of vital importance in numerical approximation for stochastic differential equations (SDEs). In [21], Kloeden and Platen illustrated that, if the coefficients of an SDE are globally Lipschitz continuous, then the EM approximation converges to the exact solution of the SDE in both strong and weak sense, the convergence rates for both cases are provided as well. In the same book, they also mentioned that the Milstein scheme converges to exact solution of SDE in both strong and weak sense with different orders under certain conditions including the global Lipschitz condition. It is the first time that Higham, Mao and Stuart [12] established strong convergence results under the super-linear condition and the moment boundedness condition, however, it remained an open question whether the moment of the EM approximation is bounded within finite time if the coefficients of an SDE are not globally Lipschitz continuous. Recently, Hutzenthaler, Jentzen and Kloeden [10] have found that once the global Lipschitz condition was replaced by the super-linear condition, the moment of the EM scheme could be infinity within finite time. To tackle this problem, in the paper [11], Hutzenthaler,

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