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**On the asymptotic behavior of highly nonlinear hybrid stochastic delay differential equations.** (English) [Zbl 1420.60077](#)  
Discrete Contin. Dyn. Syst., Ser. B 24, No. 10, 5355-5375 (2019).

**Summary:** In this paper, the existence and uniqueness, the stability analysis for the global solution of highly nonlinear stochastic differential equations with time-varying delay and Markovian switching are analyzed under a locally Lipschitz condition and a monotonicity condition. In order to overcome a difficulty stemming from the existence of the time-varying delay, one integral lemma is established. It should be mentioned that the time-varying delay is a bounded measurable function. By utilizing the integral inequality, the Lyapunov function and some stochastic analysis techniques, some sufficient conditions are proposed to guarantee the stability in both moment and almost sure senses for such equations, which can be also used to yield the almost surely asymptotic behavior. As a by-product, the exponential stability in  $p$ th ( $p \geq 1$ )-moment and the almost sure exponential stability are analyzed. Finally, two examples are given to show the usefulness of the results obtained.

**MSC:**

[60H10](#) Stochastic ordinary differential equations (aspects of stochastic analysis) Cited in 1 Document  
[34K20](#) Stability theory of functional-differential equations  
[34K50](#) Stochastic functional-differential equations

**Keywords:**

stochastic differential equations; time-varying delay; asymptotic behavior; stability; Markov switching

**Full Text:** [DOI](#)