

國立中央大學數學系

專題演講

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演講題目：THE PHASE TRANSITION IN A FAMILY OF
STOCHASTIC DIFFERENTIAL EQUATIONS
WITH NON-LIPSCHITZ DRIFT TERM

演講時間：2023年05月16日(星期二) 11:00 a.m. 開始

演講地點：中央大學鴻經館M107

Abstract：

We consider the one-dimensional stochastic differential equation (SDE) of the form:

$$dX_t = (X_t - X_t^3)dt + \lambda X_t dB_t, \quad \lambda > 0,$$

subject to a positive initial value.

It should be emphasized that because the Lipschitz conditions are not satisfied, the existence of a solution to the SDE is not assured. However, we can establish the existence and uniqueness of a strong solution by truncating the drift term and taking the limit as the truncation is removed. As an application of martingale problems, the solution is a strong Markov process. Our primary goal is to investigate the large-time behavior of this process. The conclusions will depend on the value of λ . By utilizing comparison theorems, we demonstrate that the process has a unique trivial invariant measure when λ is large enough. In addition, we prove that a unique invariant probability measure exists when λ is small, which is why we are more interested in this case. We discover, in particular, that the critical point exists and is equal to $\sqrt{2}$. Furthermore, using the coupling method, we establish ergodicity, which ensures convergence in the total variation distance, is established. We also obtain an exponential rate of convergence in the strong norm based on results from the application of "drift criteria" for general state space Markov processes.

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