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Confidence interval for number of population in stochastic exponential population growth models with mixture noise

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Abstract

we consider the stochastic exponential population growth model. We suppose the noise in the population growth model be the mixture noise. The expectations and variances of solutions are obtained. However, the confidence interval for the solution of stochastic exponential population growth model where the so-called parameter, population growth rate is not completely definite and it depends on some random environmental effects is obtained.

Keywords: Stochastic differential equation, Ito integral, Mixture noise, Population growth model, Confidence interval
Mathematics Subject Classification [2010]: 60H10, 60H05

1 Introduction

Population growth is the change in population over time. Environmental scientists use two models to describe how populations grow over time, the exponential growth model and the logistic growth model. In exponential growth, the population size increases at an exponential rate over time. As such as, the growth rate at time t is not completely definite and it depends on some random environment effects. Braumann[1] proposed the applications of stochastic differential equations to population growth. Matisa and Kiffe[2], Andreis and Ricci[3] used of the stochastic exponential population growth model in their studies. We know, the growth rate is depended to many different random environment effect. So, in this here, we let that the this random effects were to the linear combination of some white noise[5]. Then, we consider the perturbation effects the mixture noise on the growth rate of population model. The organization of this paper is as follows: In this next section, we will define the calculus stochastic and mixture noise. In section 3, we will consider the stochastic exponential population growth model with mixture noise. In section 4, We construct a confidence interval for number of population obtained.

2 Preliminaries

There are two main stochastic calculus, Ito and Stratonovich calculus. They yield different solutions and even qualitatively different predictions. In this here, we consider the Ito

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