

BEHAVIOR OF SOME POPULATION MODELS WITH
SPECIAL REFERENCE TO GENERALIZED
STOCHASTIC RICKER MODEL

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ABSTRACT

Behavior of Some Population Models with Special Reference to Generalized Stochastic Ricker Model

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Some famous population models such as Logistic model, Ricker model etc. are investigated in the presence of random noise. Their computer simulations are also presented using Matlab's built in ability to generate pseudo-random sequences of Gaussian numbers. This dissertation also examines various concepts such as binary string models, speciation, computational evolution etc.

Among the above mentioned population models, the Ricker model provides a classic description of an isolated single-species population in the inhibiting environment, which only produces offspring at specific time each year. The following stochastic generalization of the discrete Ricker population model with delays is studied, when noise impacts the population

reproduction rate:

$$x_{n+1} = x_n e^{-\sum_{i=0}^n \beta_{n-i} x_{n-i}} \left(f(x_0, x_1, \dots, x_n) + g(x_0, x_1, \dots, x_n) \xi_{n+1} \right),$$
$$n = 0, 1, 2, \dots$$

To obtain the result, the convergence theorem for discrete semimartingale inequalities is applied, and the result demonstrates that the demographic-type stochastic noise increases the risk of the population extinction.

Key words: single-species models, Ricker population model, convergence theorem, semimartingale inequalities.