Consequences of an Incorrect Model Specification on Population Growth

Clara Carlos and Carlos A. Braumann

Abstract

We consider stochastic differential equations to model the growth of a population in a randomly varying environment. These growth models are usually based on classical deterministic models, such as the logistic or the Gompertz models, taken as approximate models of the "true" (usually unknown) growth rate. We study the effect of the gap between the approximate and the "true" model on model predictions, particularly on asymptotic behavior and mean and variance of the time to extinction of the population.

1 Introduction

In [4, 5] we study the extinction of population growth in a random environment for the classical logistic and Gompertz stochastic models. These and other similar models have been frequently proposed in the literature (see [2] for detailed references). Braumann et al. [3] and Carlos et al. [6] study the first passage times for generalized stochastic Gompertz models of individual growth in a random environment.

However, we often do not know the exact form of the average growth rate and so we assume that the "true" unknown rate differs from the one in the classical logistic or Gompertz "incorrect" stochastic models by a small amount. The "true" stochastic model will be called near-logistic or near-Gompertz, respectively, and its

C. Carlos (✉)
Escola Superior de Tecnologia do Barreiro, Instituto Politécnico de Setúbal, Rua Américo da Silva Marinho, 2890-001 Lavradio, Portugal
e-mail: clara.carlos@estbarreiro.ips.pt

C.A. Braumann
Universidade de Évora, Rua Romão Ramalho 59, 7000-671 Évora, Portugal
e-mail: braumann@uevora.pt

A. Pacheco et al. (eds.), *New Advances in Statistical Modeling and Applications*, Studies in Theoretical and Applied Statistics, DOI 10.1007/978-3-319-05323-3_10,

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