View Related Documents

Journal Article
Behavior of the trajectories of the solution of a stochastic differential equation R. Funke

Book Chapter
A nonlinear filter with two time scales Jean Picard

Book Chapter
Some examples of the optimal control of diffusions with partial observation and non-gaussian initial condition U. G. Haussmann

Book Chapter
Smoothing of a diffusion process conditionned at final time E. Pardoux

Book Chapter

METHODOLOGY AND COMPUTING IN APPLIED PROBABILITY
DOI: 10.1007/s11009-010-9172-0

Multiphasic Individual Growth Models in Random Environments

Patrícia A. Filipe, Carlos A. Braumann and Carlos J. Roquete

Download PDF (326.9 KB) Permissions & Reprints

REFERENCES (11) EXPORT CITATION ABOUT

Abstract

The evolution of the growth of an individual in a random environment can be described through stochastic differential equations of the form $dY_t = \beta(a - Y_t)dt + \sigma dW_t$, where $Y_t = h(X_t)$, X_t is the size of the individual at age t, h is a strictly increasing continuously differentiable function, $a = h(A)$, where A is the average asymptotic size, and β represents the rate of approach to maturity. The parameter σ measures the intensity of the effect of random fluctuations on growth and W_t is the standard Wiener process. We have previously applied this monophasic model, in which there is only one functional form describing the average dynamics of the complete growth curve, and studied the estimation issues. Here, we present the generalization of the above stochastic model to the multiphasic case, in which we consider that the growth coefficient β assumes different values for different phases of the animal's life. For simplicity, we consider two phases with growth coefficients β_1 and β_2. Results and methods are illustrated using bovine growth data.

Keywords Multiphasic growth models - Stochastic differential equations - Estimation - Cattle weight

AMS 2000 Subject Classification 60H10 - 62G05 - 92D99

Fulltext Preview

Methodol Comput Appl Probab
DOI 10.1007/s11009-010-9172-0

Multiphasic Individual Growth Models in Random Environments

Patrícia A. Filipe · Carlos A. Braumann · Carlos J. Roquete

Received: 14 November 2009 / Revised: 19 February 2010 / Accepted: 9 March 2010

Abstract The evolution of the growth of an individual in a random environment can be described through stochastic differential equations of the form $dY_t = \beta(\alpha - Y_t)dt + \sigma\, dW_t$, where $Y_t = h(X_t)$, X_t is the size of the individual at age t, h is a strictly increasing continuously differentiable function, $\alpha = h(A)$, where A is the average asymptotic size, and β represents the rate of approach to maturity. The parameter σ measures the intensity of the effect of random fluctuations on growth and W_t is the standard Wiener process. We have previously applied this monophasic model, in which there is only one functional form describing the average dynamics of the complete growth curve, and studied the estimation issues. Here, we present the generalization of the above stochastic model to the multiphasic case, in which we consider that the growth coefficient β assumes different values for different phases of the animal's life. For simplicity, we consider two phases with growth coefficients β_1 and β_2. Results and methods are illustrated using bovine growth data.

P. A. Filipe (✉) · C. A. Braumann
Centro de Investigação em Matemática e Aplicações,
Universidade de Évora, Rua Romão Ramalho, 59,
7000-671 Évora, Portugal
e-mail: pasf@uevora.pt

C. A. Braumann
e-mail: braumann@uevora.pt

C. J. Roquete
Instituto de Ciências Agrárias e Ambientais Mediterrânicas,
Universidade de Évora, Núcleo da Mitra, Apartado 94,
7002-774 Évora, Portugal
e-mail: croquete@uevora.pt

Published online: 27 March 2010