

Title: An Extension of Gompertzian Growth Dynamics Weibull and Frechet Models

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Source: Mathematical Biosciences and Engineering **Volume:** 10 **Issue:** 2

Pages: 379-398 **DOI:** 10.3934/mbe.2013.10.379 **Published:** Apr 2013

Document Type: Article

Language: English

Abstract: In this work a new probabilistic and dynamical approach to an extension of the Gompertz law is proposed. A generalized family of probability density functions, designated by Beta* (p, q), which is proportional to the right hand side of the Tsoularis-Wallace model, is studied. In particular, for p = 2, the investigation is extended to the extreme value models of Weibull and Frechet type. These models, described by differential equations, are proportional to the hyper-Gompertz growth model. It is proved that the Beta* (2, q) densities are a power of betas mixture, and that its dynamics are determined by a non-linear coupling of probabilities. The dynamical analysis is performed using techniques of symbolic dynamics and the system complexity is measured using topological entropy. Generally, the natural history of a malignant tumour is reflected through bifurcation diagrams, in which are identified regions of regression, stability, bifurcation, chaos and terminus.

Author Keywords: Growth models; Extreme value laws; Beta* (p, q) densities; Bifurcations and chaos; Symbolic dynamics; Topological entropy; Tumour dynamics

Keywords Plus: Logistic Model; Tumor-Growth; Immunotherapy

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Funding:

Funding Agency	Grant Number
National Funds through FCT - Fundacao para a Ciencia e a Tecnologia	PEst-OE/MAT/UI0006/2011
PTDC/FEDER	

Publisher: Amer Inst Mathematical Sciences

Publisher Address: Po Box 2604, Springfield, MO 65801-2604 USA

ISSN: 1547-1063

Citation: ROCHA, J. Leonel; AILEIXO, Sandra M. - An Extension of Gompertzian Growth Dynamics Weibull and Frechet Models. Mathematical Biosciences and Engineering. ISSN 1547-1063. Vol. 10, nr 2 (2013), p. 379-398.