

Comparison of the Logistic and the Gompertz Growth Functions Considering a Periodic Perturbation in the Model Parameters

Authors : Avan Al-Saffar, Eun-Jin Kim

Abstract : Both the logistic growth model and the Gompertz growth model are used to describe growth processes. Both models driven by perturbations in different cases are investigated using information theory as a useful measure of sustainability and the variability. Specifically, we study the effect of different oscillatory modulations in the system's parameters on the evolution of the system and Probability Density Function (PDF). We show the maintenance of the initial conditions for a long time. We offer Fisher information analysis in positive and/or negative feedback and explain its implications for the sustainability of population dynamics. We also display a finite amplitude solution due to the purely fluctuating growth rate whereas the periodic fluctuations in negative feedback can lead to break down the system's self-regulation with an exponentially growing solution. In the cases tested, the Gompertz and logistic systems show similar behaviour in terms of information and sustainability although they develop differently in time.

Keywords : dynamical systems, Fisher information, probability density function (pdf), sustainability

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