

Economic Dynamics

Homework 2: Due October 13, 2017 11:00am Requirements

Submit your homework *by email* to

"Economic Dynamics" <dynamics-hw@turnbull.sk.tsukuba.ac.jp>

The **Subject:** should be FH25051 Homework #2 (in hankaku romaji). Use this class number, even if you are registered according to a different code. Your email must contain your *name* and *student ID number*.

Problems

1. Suppose that members of a population are born at the birth rate β and die from natural causes at the death rate δ (which do not depend on population P , that's what "natural causes" means here). Derive the equation for rate of population increase, and compare it to the "reduced form" model $\dot{P} = \alpha P$.
2. Verify that the logistic growth equation $P(t) = \frac{\beta}{\gamma + [\frac{\beta}{P(0)} - \gamma]e^{-\beta t}}$ is a solution to the logistic differential equation $\frac{dP}{dt} = P(\beta - \gamma P)$ by differentiating the logistic growth equation, and showing that the result is the differential equation. (This equation is equivalent to the one derived in class.)
3. Explain how the interpretation of γ in the constrained growth model (*i.e.*, the logistic growth model) differs from that of δ in the case without resource constraints described in Problem 1. What (possibly variable) expression in this model corresponds to δ in the unconstrained case?