

Model Documentation of the Lotka-Volterra (Predator-Prey) Model

1 Nomenclature

1.1 Nomenclature for Model Equations

x_1 population of prey
 x_2 population of predators

2 Model Equations

State Vector:

$$\underline{x} = (x_1 \ x_2)^T$$

System Equations:

$$\dot{x}_1 = \alpha x_1 - \beta x_1 x_2 \quad (1a)$$

$$\dot{x}_2 = \gamma x_1 x_2 - \delta x_2 \quad (1b)$$

Parameters: $\alpha, \beta, \gamma, \delta$

2.1 Exemplary parameter values

Parameter Name	Symbol	Value
reproduction rate of prey alone and with plenty of food	α	1.3
mortality rate of prey per predator	β	0.9
mortality rate of predators, if no prey is present	γ	0.8
reproduction rate of predators per prey	δ	1.8

References

- [1] Peter J. Wangersky: *Lotka-Volterra Population Models*, 1978,
<https://www.jstor.org/stable/2096748>