

(A)

### Dynamic Model

Regime 1:

$$d(\text{prey}(t)) = (a \times \text{prey}(t) - b \times \text{prey}(t) \times \text{predator}(t))dt$$

$$d(\text{predator}(t)) = (-c \times \text{predator}(t) + d \times \text{prey}(t) \times \text{predator}(t))dt$$

Regime 2:

$$d(\text{prey}(t)) = (a \times \text{prey}(t) - e \times \text{prey}(t)^2 - b \times \text{prey}(t) \times \text{predator}(t))dt$$

$$d(\text{predator}(t)) = (f \times \text{predator}(t) - c \times \text{predator}(t)^2 + d \times \text{prey}(t) \times \text{predator}(t))dt$$

### Measurement Model

$$x = \text{prey} + \varepsilon_1$$

$$y = \text{predator} + \varepsilon_2$$