Ecuaciones de Lotka-Volterra
para tres especies con salto y retardo

Versión 1

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$$dx_1(t) = \big(x_1(t) - \beta x_1(t)x_2(t) - \delta x_1(t)x_3(t-\tau) - Ax_1(t)u_1(t)\big)dt + \alpha_1 dW_1(t)$$
$$dx_2(t) = \big(x_2(t) - \beta x_2(t)x_1(t) - \epsilon x_2(t)x_3(t-\tau) - Bx_2(t)u_2(t)\big)dt + \alpha_2 dW_2(t)$$
$$dx_3(t) = \big(-x_3(t) + \delta x_3(t-\tau)x_1(t) + \epsilon x_3(t-\tau)x_2(t) - Cx_3(t)u_3(t)\big)dt + \alpha_3 dW_3(t)$$

con las condiciones:

$$x_1(t) = 0.7$$
$$x_2(t) = 0.7$$
$$x_3(t) = 0.5, \quad -\tau \le t \le 0$$

$$dp_1(t) = \Big(x_1(t) - p_1(t) + \beta p_1(t)x_2(t) + Ap_1(t)u_1(t) + \beta p_2(t)x_2(t) + \delta p_1(t)x_3(t-\tau) - \delta p_3(t)x_3(t)\Big)dt$$
$$+ \ p_1(t)dW_1(t)$$
$$dp_2(t) = \Big(x_2(t) - p_2(t) + \beta p_1(t)x_1(t) + \beta p_2(t)x_1(t) + Bp_2(t)u_2(t) + \epsilon p_2(t)x_3(t-\tau) - \epsilon p_3(t)x_3(t)\Big)dt$$
$$+ \ p_2(t)dW_2(t)$$
$$dp_3(t) = \Big(x_3(t) + p_3(t) + \delta p_1(t)x_1(t) + \epsilon p_2(t)x_2(t) + Cp_3(t)u_3(t) - \epsilon p_3(t)x_2(t) - \delta p_3(t)x_1(t)\Big)dt$$
$$+ \ p_3(t)dW_3(t)$$
$$p_1(t) = 0.5$$
$$p_2(t) = 0.5$$
$$p_3(t) = 0.7, \quad T-\tau \le t \le T$$

$$u_1(t) = -p_1(t)x_1(t)$$
$$u_2(t) = -p_2(t)x_2(t)$$
$$u_3(t) = -p_3(t)x_3(t)$$