Классический МНК

Дискретная система «хищник-жертва»

$$\begin{cases} x_1(i+1) = x_1(i) + hx_1(i)\left(\alpha_1 - \beta_1 x_2(i)\right) \\ x_2(i+1) = x_2(i) + hx_2(i)\left(-\alpha_2 + \beta_2 x_1(i)\right) \end{cases}$$

Частные производные по каждому коэффициенту

$$Q(\bar{\alpha}, \bar{\beta}) = \sum_{i=1}^{n}\left[\left(x_1(i+1) - x_1^*(i+1)\right)^2 + \left(x_2(i+1) - x_2^*(i+1)\right)^2\right] =$$

$$= \sum_{i=1}^{n}\left[\left(x_1(i) + hx_1\left(\alpha_1 - \beta_1 x_2(i)\right) - x_1^*(i+1)\right)^2 + \left(x_2(i) + hx_2(i)\left(-\alpha_2 + \beta_2 x_1(i)\right) - x_2^*(i+1)\right)^2\right]$$

$$\frac{\partial Q}{\partial \alpha_1} = 2\sum_{i=1}^{n}\left[\left(x_1(i) + hx_1(i)\left(\alpha_1 - \beta_1 x_2(t)\right) - x_1^*(i+1)\right) \times \left(hx_1(i)\right)\right] = 0$$

$$\frac{\partial Q}{\partial \alpha_2} = 2\sum_{i=1}^{n}\left[\left(x_2(i) + hx_2(i)\left(-\alpha_2 + \beta_2 x_1(i)\right) - x_2^*(i+1)\right) \times \left(-hx_2(i)\right)\right] = 0$$

$$\frac{\partial Q}{\partial \beta_1} = 2\sum_{i=1}^{n}\left[\left(x_1(i) + hx_1(i)\left(\alpha_1 - \beta_1 x_2(t)\right) - x_1^*(i+1)\right) \times \left(-hx_1(i)\, x_2(i)\right)\right] = 0$$

$$\frac{\partial Q}{\partial \beta_2} = 2\sum_{i=1}^{n}\left[\left(x_2(i) + hx_2(i)\left(-\alpha_2 + \beta_2 x_1(i)\right) - x_2^*(i+1)\right) \times \left(hx_1(i)\, x_2(i)\right)\right] = 0$$