

0.1 Variables

Phase variables: $N_H(t)$, $S_H(t)$

Control parameters: $C_H(t)$

Exogenous parameters: $r_l(t)$, $p_y(t)$, $p_{i_o}(t)$, $a_S(t)$

0.2 Optimality conditions

0.2.1 Euler equations

- $-\alpha_1(t) + \frac{d}{dt}\alpha_0(t) = 0$
- $\alpha_0(t)r_l(t) + \frac{d}{dt}\alpha_0(t) = 0$

0.2.2 Control optimality conditions

- $\frac{\lambda_0 C_H^{1-\beta}(t)e^{-\delta t}}{C_H(t)} + \alpha_0(t)p_y(t) = 0$

0.2.3 Transversality conditions

- $\alpha_0(0) = -\gamma\lambda_1$
- $\alpha_0(T) = -\lambda_1$
- $\alpha_0(0) = -\gamma\lambda_1 a_S(0)$
- $\alpha_0(T) = -\lambda_1 a_S(T)$

0.2.4 Dual feasibility and Complementary slackness conditions

- $\alpha_1(t) \geq 0$
- $N_H(t)\alpha_1(t) = 0$
- $\lambda_1 \geq 0$
- $\lambda_1 (-\gamma (N_H(0) + S_H(0)a_S(0)) + N_H(T) + S_H(T)a_S(T)) = 0$