

ECON 405
ECONOMIC GROWTH AND DEVELOPMENT
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Final

1. (60 points) Suppose the economy is characterized by a production function in the form $Y_t = K_t^\alpha L_t^{1-\alpha}$, where $L_t = L_0 e^{nt}$, $L_0 = 1$, and $n > 0$ and an overall utility function

$U(c) = \int_0^\infty u(c_t) e^{-(\rho-n)t} dt$, where the instantaneous utility function $u(\cdot)$ belongs to the constant

elasticity of intertemporal substitution (CIES) class: $u(c_t) = \frac{c_t^{1-\theta} - 1}{1-\theta}$, $\theta > 0$.

- Solve the household's intertemporal utility maximization problem.
- Solve the firm's profit maximization problem.
- Solve the model at the steady state and find the equilibrium values of capital, output, and consumption.
- Formulate the same problem by using the social planner's approach.
- Suppose now that you are given the following parameter values: $\alpha = 0.5$, $\theta = 2$, $\rho = 0.1$, $n = 0.02$, $L_0 = 1$, $\delta = 0.05$. Calculate the steady state values of capital, output, and consumption.

2. (40 Points) Suppose that a social planner has the following optimization problem:

$$\begin{aligned} U &= \int_0^\infty e^{-\rho t} [LnC_t + LnH_t] dt \\ Y_t &= K_t^\alpha L_t^{1-\alpha} \\ \dot{K} &= Y_t - C_t - I_{H,t} - \delta \cdot K_t \\ \dot{H} &= I_{H,t} - \delta \cdot H_t \end{aligned} \tag{M}$$

C, Y, K, and H represent consumption, output, the capital stock, and the housing stock, respectively. I_H is the investment in housing, ρ is the subjective rate of discount and δ is the depreciation rate of K and H. We assume that $\rho, \delta > 0$ and $0 < \alpha < 1$, where α is the partial output elasticity of labor. The macroeconomic budget shows the tradeoff between consumption, physical capital investment and housing investment. The last equation is the housing accumulation function. Solve the model.
Hint: C and I_H are control variables.

3. BONUS QUESTION (20 Points) Would results qualitatively change, were $\delta = 0$? Show.