Economics 8823
Advanced Macroeconomics
Project 0 – (Partial/Sketch of) Suggested Solutions
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Objective

To get you started using Matlab and because it will be a building block needed for constructing approximations to (locally-accurate) decision rules of models we will study, you will computationally solve the deterministic (aka non-stochastic) steady state of the basic RBC economy.

The Economy

The representative household maximizes lifetime utility

$$\max_{c_t, n_t, k_{t+1}, x_t} E_0 \sum_{t=0}^{\infty} \beta^t \ln\left[c_t - x_t \cdot \frac{\kappa}{1+1/\psi} n_t^{1+1/\psi} \right]$$

subject to its budget constraint

$$c_t + k_{t+1} - (1-\delta)k_t = w_t n_t + r_t k_t$$

and

$$x_t = c_t^{\omega} \cdot x_{t-1}^{1-\omega}.$$

The representative firm maximizes profits

$$\max_{n_t, k_t} \left[z_t f(k_t, n_t) - w_t n_t - r_t k_t \right]$$

by choosing factor inputs n_t and k_t.

The aggregate goods resource constraint is

$$c_t + k_{t+1} - (1-\delta)k_t + g_t = z_t f(k_t, n_t),$$

in which g_t denotes the government's period-t flow of expenditures. The stationary-state (aka, balanced-growth) production technology is

$$f(k_t, n_t) = z_t k_t^{a} n_t^{1-a}$$

and the steady-state level of TFP is $\bar{z} = 1$.

Numerically compute the deterministic steady-state values of *c*, *n*, *k*, *r*, *w*, and *x* (i.e., consumption, labor, the capital stock, the real interest rate, the real wage, and the term that arises from the Jaimovich-Rebelo preference specification) for this economy using the two parameter sets in Table 1**.** (Note: you are **not** solving for any dynamics, just long-run values for each parameter set.)

	Parameter Set A	**Parameter Set B**
β	0.99	0.99
δ	0.02	0.02
ψ	1	1
α	0.36	0.36
ω	1	0.3
κ	**To be determined**	**To be determined**
$\bar{g}$	**To be determined**	**To be determined**

Table 1. Parameter values.

For each parameter set, compute (i.e., calibrate) the value of κ so that n^{SS} = 0.30 and the value of $\bar{g}$ so that the long-run share of government expenditures in GDP is 20 percent. (That is, you will compute two different deterministic steady states.)

Also compute the steady-state level of household lifetime utility for each of the two parameter sets, and provide (brief) economic discussion/interpretation of how/why they do or do not differ.

Solution:

The steady-state equilibrium is defined as a list of variables $\{c^{ss}, n^{ss}, k^{ss}, r^{ss}, w^{ss}, x^{ss}\}$ that solve: 1) the steady-state household consumption-labor optimality condition; 2) the steady-state household consumption-savings optimality condition (aka, the physical capital Euler expression); 3) the steady-state firm profit-maximizing labor demand function; 4) the steady-state firm profit-maximizing capital demand function; 5) the steady-state evolution of x_t; and 6) the aggregate goods resource constraint.

The endogenous variables (including the values for κ and $\bar{g}$ for the pair of parameter sets) are provided in Table 2 and Table 3.

	Parameter Set A	Parameter Set B
β	0.99	0.99
δ	0.02	0.02
ψ	1	1
α	0.36	0.36
ω	1	0.3
κ	**12.6800**	**8.1408**
$\bar{g}$	**0.2423**	**0.2423**

Table 2. Steady-state values for kappa and gbar for each parameter set.

	Parameter Set A	Parameter Set B
c	0.6794	0.6794
n	**0.3000**	**0.3000**
k	14.4897	14.4897
r	0.0301	0.0301
w	2.5846	2.5846
x	0.6794	0.6794
utils	**-1.2318**	**-0.8427**

Table 3. Endogenous steady-state equilibrium variables for each parameter set.

All long-run quantity values are identical across the two structural parameter sets. Because utility is just an ordinal, not a cardinal, value, "comparison" of the steady-state welfare across the two structural sets of parameters is meaningless.