

***UNIVERSITY OF OSLO***  
***DEPARTMENT OF ECONOMICS***

Exam: **ECON4310 – Macroeconomic Theory**

Date of exam: Monday 28. November, 2011

**Grades are given: December 16, 2011**

Time for exam: 09:00 a.m. – 12:00 noon

The problem set covers 3 pages (incl. cover sheet)

Resources allowed:

- No resources allowed

The grades given: A-F, with A as the best and E as the weakest passing grade. F is fail.

Question A has weight 60 per cent, question B 40 per cent.

## A Population growth in the Ramsey-model

Different suggestions have been made for how population growth should be treated in the social planner's welfare function. Some suggest that she should maximize

$$U = \sum_{t=0}^{\infty} (1 + \rho)^{-t} u(c_t) N_t \quad (1)$$

where  $c_t$  is consumption per capita in period  $t$ ,  $u$  is the period utility function,  $\rho > 0$  is a subjective discount rate and  $N_t$  is the size of the population.  $N_t$  is exogenous and grows with a rate  $n$  per period ( $N_{t+1} = (1+n)N_t$ ). It is assumed that  $\rho > n$ .

Others suggest to maximize

$$U = \sum_{t=0}^{\infty} (1 + \rho)^{-t} u(c_t) \quad (2)$$

If we ignore the discounting for a second, each individual has the same weight in (1), while (2) may be interpreted as each generation having the same weight.

The aggregate production function is

$$Y_t = F(K_t, N_t) \quad (3)$$

where  $Y_t$  is output and  $K_t$  is the capital stock. Each individual is assumed to supply the same amount of labor. Hence, labor input can be measured by  $N_t$ .  $F$  is homogeneous of degree one. There is no productivity growth.

The aggregate capital stock evolves over time according to

$$K_{t+1} = K_t - \delta K_t + Y_t - N_t c_t, \quad t = 0, 1, 2, \dots \quad (4)$$

where  $\delta \geq 0$  is the rate of depreciation. The initial capital stock,  $K_0$ , is given.  $K_t$  and  $c_t$  have to be  $\geq 0$  for all  $t$ .

1. Rewrite the constraints (3) and (4) in per capita terms.
2. Derive the first-order conditions for the two versions of the social planners problem. (No particular maximization method is preferred). Explain in words what the first order conditions mean and compare them. What is the condition for consumption per capita to be growing from period  $t$  to period  $t + 1$ ?

3. Explain what is meant by a steady state (a balanced growth path) in the present model. How are the steady state values of the capital stock and consumption per capita determined here? Compare the steady state levels of capital and consumption per capita for the two alternative social welfare functions.
4. Show in a graph (phase diagram) how the economy will move from an initial point towards the steady state.
5. Suppose the economy is initially on a balanced growth path. Discuss with the help of graphs like the one in the previous question the effect of an increase in  $n$  on the time paths of per capita consumption for the two alternative utility functions.

## **B The housing market**

1. Explain how house prices and investments in new housing are determined in standard market theories. A graphical analysis will be appreciated.
2. Compare briefly the theory of housing investment and Tobin's  $q$ -theory of business investment.
3. Suppose that banks are suddenly required to reduce the maximum loan for house purchases from 100 per cent to 85 per cent of the market value of the house. Discuss briefly what effects this will have on house prices and investment in new housing.