UNIVERSITY OF OSLO
DEPARTMENT OF ECONOMICS

Postponed exam: **ECON4310 – Macroeconomic Theory**

Date of exam: Thursday, January 9, 2014

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.

1 A Social Planner's Problem, Weight 2/3

Consider an economy populated by a large number of identical consumers. The population is constant, equal to L. Each consumer has a period utility function

$$u(c) = \begin{cases} \frac{1}{1-\theta} C_t^{1-\theta} & \text{if } \theta > 1 \\ \\ \ln C_t & \text{if } \theta = 1 \end{cases}$$

where C_t is consumption per capita.

Each consumer supplies one unit of labor per time period. The production function is

$$Y_t = F(K_t, A_t L) \tag{1}$$

where Y_t is output, K_t, the capital stock, and A_t a productivity factor. F is homogenous of degree 1. Productivity grows over time according to

$$A_t = A_0(1+g)^t \tag{2}$$

Corresponding to Y_t, K_t and C_t we define variables per efficiency unit of labor, $y_t = Y_t/A_t L$, $k_t = K_t/A_t L$ and $c_t = C_t/A_t$.

A social planner wants to maximize

$$U_0 = \sum_{t=0}^{\infty} \beta^t u(c_t A_t), \qquad 0 < \beta < 1 \tag{3}$$

given

$$\begin{gathered} c_t = f(k_t) + k_t - (1+g)k_{t+1}, \\ k_0 = \bar{k_0}, \;\; k_t \geq 0, \;\; c_t \geq 0 \end{gathered} \tag{4}$$

1. Explain what is behind the constraint (4)including the relation between the two production functions F and f.

2. Find the first-order conditions for the social planner's problem and interpret them.

3. Draw a phase-diagram for the model and explain how the time path of k_t is determined.

4. Explain under what conditions the social planner's optimum will also be a competitive equilibrium.

5. Explain how the real interest rate and real wage rate are determined.

6. Define a steady state for the model. Discuss how the interest rate in steady state depends on the rate of productivity growth.

7. Suppose the economy is in a steady state. Suddenly it gets a gift of new capital Δk. What will the time paths of the capital intensity k and of consumption per capita C look like from the time the gift is received?

2 Tobins'Q, Weight 1/3

Congratulations! You have been hired as an economist in the Ministry of Finance. Your first task is to evaluate the effect of a higher interest rate for the rate of investment, and explain this clearly for the Minister. You are asked to use Tobin's q-model as a theoretical framework. The Minister of Finance is only interested in an explanation of, and the intuition for, the results, no math.

1. Assume that initially the economy is in a steady state. Explain what happens to the value of firms and to the capital stock if there is a permanent reduction in the interest rate from i_0 to i_1. Explain both what happens (i) at impact and (ii) as the economy converges to a steady state.

2. Next assume that - contrary to expectations - the lower interest rate turns out to be temporary instead of permanent. Before the economy has converged to the new steady state, the interest rate is increased to i_2, where $i_1 < i_2 < i_0$. Explain what happens to the value of firms and the capital stock. Explain both what happens (i) at impact and (ii) as the economy converges to a steady state.

3. Do your results indicate that the Minister can expect a stable relationship between the level of investment and the level of the interest rate?