UNIVERSITY OF OSLO
DEPARTMENT OF ECONOMICS

Postponed exam: **ECON4310 – Macroeconomic Theory**

Date of exam: Monday, December 12, 2011

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

The problem set covers 4 pages

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.

A

In this question we want to look at the effects of temporary and permanent productivity shocks in a two-period model with endogenous labor supply. To make things simple we shall focus mainly on an open economy where the real interest rate is exogenously given from the world capital markets. The economy is inhabited by a large number of identical consumers with utility functions:

$$U = \ln c_1 + \beta \ln c_2 + v(\ell_1) + \beta v(\ell_2) \qquad 0 < \beta < 1 \tag{1}$$

where

$$v(\ell) = \begin{cases} \frac{\mu}{1-\theta} \ell^{1-\theta} & \text{for } \theta > 0, \theta \neq 1 \\ \mu \ln \ell & \text{for } \theta = 1 \end{cases}$$

Here c_t is consumption in period t ($t = 1, 2$) and ℓ_t is leisure. Each period the consumers have one unit of time that they can use either for leisure or work. Hence, working time is $1 - \ell$.

The period-by-period budget equations of the consumers are

$$a_{t+1} = (1 + r_t)a_t + w_t(1 - \ell_t) \qquad t = 1, 2 \tag{2}$$

Here a_t is net assets carried over from $t - 1$ to t, r_t is the real interest rate and w_t is the real wage in period t. The initial asset stock $a_1 \geq 0$ is given while $a_3 = 0$.

Wages are proportional to labor productivity. Hence, looking at the effects of changes in labor productivity is the same as looking at changes in wages.

Try to answer all questions from 1 to 4 below and four of the remaining questions from 5 to 9.

1. Show that the budget constraints for the consumers can be summarized as
$$c_1 + \frac{c_2}{1 + r_2} = w_1(1 - \ell_1) + \frac{w_2(1 - \ell_2)}{1 + r_2} + (1 + r_1)a_1$$

2. Derive the first-order conditions for maximum utility. Interpret them. (Use the method you find simplest).

3. Focus on the case where $\theta = 1$. What does a proportional increase in w_1 and w_2 mean for the ratios a) between leisure time in the two periods, b) between consumption in the two periods? c) Between leisure time and consumption within each period. What are the implications for the effect on labor supply in the two periods? Base your answers directly on the first-order conditions and the budget restriction.

4. Maintain that $\theta = 1$. Suppose wages go up only in period 1. What does this mean for the ratios a) between leisure time in the two periods, b) between consumption in the two periods? c) between leisure time and consumption within each period? Discuss the effects on labor supply in the two periods.

5. Maintain still that $\theta = 1$. Show how you can solve for labor supply in the two periods. (Warning: Do not try to find explicit solutions for $\theta \neq 1$).

6. Explain why in general the sign of the effect of a proportional increase w_1 and w_2 on labor supply is ambiguous. Discuss what the value of θ means for the effect of a proportional wage increase on labor supply.

7. Discuss in the same way what the value of θ means for the effect on labor supply of an increase in w_1.

8. Comment briefly on the realism of assuming $\theta = 1$.

9. Would you expect the general equilibrium effects of a temporary productivity shock to be much different if we were looking at a closed economy? An intuitive answer is sufficient.

B

We are looking at a small open economy. The government of the economy has a net debt that equals 100 per cent of one year's GDP. It also has a budget deficit equal to 6 per cent of gross domestic product. Inflation is zero. The government is able to borrow in international capital markets at an interest rate equal to 3 per cent per year.

1. Explain what is meant by the primary deficit of the government. Do the figures above contain sufficient information to calculate the level of the primary deficit relative to GDP?

2. Let B_t be the real value of the government debt that is carried over from period $t - 1$ to period t, D_t the real value of the primary deficit and r_t the real interest rate. The latter is determined in international capital markets and for simplicity we assume that r_t is constant and equal to r. Write down an equation that shows how the evolution of B_t over time depends on D_t and r.

3. Use the answer to the previous question to derive an equation that shows how the ratio of debt to GDP, ($b_t = B_t/Y_t$ where Y_t is GDP), evolves over time when the growth rate of GDP is γ. Suppose the primary deficit is kept constant in per cent of GDP. Derive an expression for the stationary level of the debt ratio b_t. What is the condition for the stationary state to be stable? Is the condition satisfied for the numerical example given above?

4. By how much does the government in the numerical example have to cut the primary deficit if it wants to reduce the debt ratio by one per cent of GDP from one year to the next?

5. Explain what is meant by a no-Ponzi-game condition. If the government in the numerical example continues its policy, does it satisfy the no-Ponzi-game condition?

6. Should governments never run Ponzi-games? Explain!