

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

Exam: **ECON4330 – International Macroeconomics**

Date of exam: Thursday, May 30, 2013

**Grades are given: June 12, 2013**

Time for exam: 9:00 a.m. – 12:00 noon

The problem set covers 5 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.

There are three parts. In the grading, they will count 45% (Part 1), 45% (Part 2) and 10% (Part 3).

## Part 1 (weight: 45%)

### Problem 1.1

Consider an infinitely lived small open economy. It has access to a risk-free world credit market with a constant interest rate  $r$ . Private and government consumption are both fixed shares of GDP, the shares being  $c_p$  and  $c_g$  respectively. There is no investment. The budget constraint facing the country in every period  $t$  is

$$B_{t+1} = (1 - a)Y_t + (1 + r)B_t, \quad t = 0, 1, 2, \dots \quad (1)$$

where  $B_t$  is net foreign assets carried over from period  $t - 1$ ,  $Y_t$  is GDP and  $a = c_p + c_g$ . You may think of  $Y_t$  as a sequence of given endowments. The country starts out with a net foreign debt in period 0 ( $B_0 < 0$ ).

By starting with  $B_0$  and inserting recursively in (1) for  $B_s$  for  $t = 1, 2, \dots, T$ , one can derive:

$$(1 + r)B_0 = \left(\frac{1}{1 + r}\right)^T B_{T+1} - (1 - a) \sum_{s=0}^T \left(\frac{1}{1 + r}\right)^s Y_s. \quad (2)$$

1. Explain what the no Ponzi-game condition is and use it with (2) to yield an intertemporal budget constraint.
2. Explain how the intertemporal budget constraint can be used to evaluate whether the initial debt level is too high for the the consumption share  $a$  to be sustainable given the sequence  $\{Y_s\}_{s=0}^{\infty}$ .
3. Assume that the exogenous process for GDP is  $Y_t = (1 + g)^t Y_0$ , where  $g < r$ . Use this to replace the infinite geometric series in the intertemporal budget constraint. Find the highest level of  $a$  that is sustainable given the initial stock of debt. How does it relate to the growth rate?

## Problem 1.2

A sovereign government can choose to default on its debt instead of cutting consumption. In order to discuss this possibility we now turn to a two-period model. The country at starts period 1 with an initial debt,  $D$ , inherited from period 0. The debt is due to be repaid in period 2.

In period 1 GDP is exogenous. Period 2 GDP is  $A_2F(K_2)$ , where  $A_2$  is a stochastic level of productivity and  $F(K)$  a strictly concave production and  $K_2$  is the period 2 capital stock.  $K_2$  is equal to the investment made in period 1 and we assume complete depreciation after one period. Disregard the possibility that the country may choose  $K_2$  above income in period 1.

If the country defaults when period 2 arrives, the foreign creditors will be able to seize a share  $\eta$  of the country's period 2 GDP. This is the default cost.

1. Find the 'critical' value of  $A_2$  for which the country is indifferent between defaulting and repaying the loan in full. Call this  $A_C$ .
2.  $A_2$  can take values between  $A_L$  and  $A_U$  and has probability density function  $\pi(A_2)$  with expectation equal to 1. Assume that international investors are risk-neutral and can borrow and lend at a safe interest rate equal to zero. In period 1 the market value of the debt  $D$  will then be:

$$V = v(D, K_2) = \eta F(K_2) \int_{A_L}^{A_C} A \pi(A) dA + D \int_{A_C}^{A_U} \pi(A) dA. \quad (3)$$

Interpret this equation. Discuss how  $V$  depends on  $K_2$  and  $D$ . (Intuitive explanations are sufficient).

3. How does the level of debt affect the incentive to invest in  $K_2$ ? Can you think of cases where creditors gain by forgiving debt?

## Part 2 (weight: 45%)

Consider the following model of a small open economy:

$$r = e + p_* - p \quad (1)$$

$$\rho - \bar{\rho} = (\rho_* - \bar{\rho}) + \dot{r}_e \quad (2)$$

$$\dot{r}_e = -\epsilon(r - \bar{r}) \quad (3)$$

$$y - \bar{y} = -\alpha_\rho(\rho - \bar{\rho}) + \alpha_r(r - \bar{r}) + \alpha_g(g - \bar{g}) \quad (4)$$

$$\dot{p} = \dot{p}_e + \gamma(y - \bar{y}) \quad (5)$$

All variables are in logs.  $e$  is the nominal exchange rate,  $p$  the price of home goods,  $p_*$  the price of foreign goods,  $r$  the real exchange rate,  $\rho$  the real interest rate,  $\rho_*$  the foreign real interest rate,  $y$  output and  $g$  government expenditures on home goods. The main equations are written in terms of deviations from long run equilibrium. A bar above a variable distinguishes its value in long-run equilibrium. Dots indicate time rates of change and subscript  $e$  an expectation.

The country's exchange rate is floating. The central bank practices strict inflation targeting. The aim is to keep home goods inflation  $\dot{p}$ , as close to the target,  $\bar{\pi}$ , as possible. The instrument used is the interest rate.

1. Explain briefly the conditions that must prevail for there to be real interest rate parity as in (2).
2. Assume in this question that expected inflation is equal to the inflation target. Suppose there is a temporary cut in government expenditure,  $g$ . Discuss the short-run impact of this on nominal and real exchange rates. How does the effect depend on the different elasticities in the demand function?
3. A permanent cut in government expenditures can be seen as a simultaneous reduction in  $g$  and  $\bar{g}$  by the same amount. How do you expect a permanent cut to affect the long run equilibrium real exchange rate  $\bar{r}$ ? (No formal derivation is expected).
4. Suppose that suddenly it is discovered that the government's finances are in worse shape than expected. Expenditures are cut immediately and the cuts are meant to last. Discuss the short-run effect this will have on the exchange rates. Compare to the results in question 2.
5. If the nominal exchange rate were fixed permanently as for a small country in a large monetary union, how would the necessary change in the real exchange rate come about then?
6. Return to the case with a floating exchange rate. Suppose that it takes some time from the need for cuts is discovered to the cuts are implemented. How do you expect the nominal exchange rate to behave from the moment the problem is discovered and until the cuts have been implemented? Illustrate with a graph with time and exchange rate on the axis. (No formal derivations are expected).
7. Experience from economies with floating exchange rates seems to show that that the short-run effect of tough spending cuts is lower GDP and

more unemployment. Discuss briefly how this may be explained within the model or by extending it.

### **Part 3 (weight: 10%)**

There is an ongoing debate between supporters of ‘austerity’ and ‘stimulus’ in the Eurozone. Some of the key questions discussed are (i) the necessity of austerity and (ii) the effect of austerity on growth in the short and long run. Starting from your answers in Parts 1-2 of the exam, try to comment on this debate.