Written Exam for the B.Sc. in Economics summer 2014

Macro B

Final Exam

June 16 2014
(3 hours closed-book exam)

Please note that the language used in your exam paper must correspond to the language of the title for which you registered during exam registration. *I.e.* if you registered for the English title of the course, you must write your exam paper in English. Likewise, if you registered for the Danish title of the course or if you registered for the English title which was followed by "eksamen på dansk" in brackets, you must write your exam paper in Danish.

This exam question consists of 6 pages in total

All questions of both problems should be answered

Problem A

In this exercise you are invited to analyse factors in private consumption that affect the market determination of interest rates.

Consider a representative household that lives for two time periods; period 1 which is the current period and period 2 which is the future. Utility is obtained from consumption in the two periods, *i.e.* C_1 and C_2 and the household's preferences may be written as

$$U = u(C_1) + \beta u(C_2), \qquad \text{where } 0 < \beta = \frac{1}{1+\phi} < 1, u' > 0, u' < 0 \tag{A.1}$$

1. Describe the household's preferences. In particularly, describe the importance of ϕ. Why do these preferences foster consumption smoothing?

The price system is normalised so that price on consumption goods is equal to 1 in both periods, hence we abstract from inflation. Assume the household receives a lump sum income Y_t and pay net taxes T_t which are also lump in the two periods, $t = 1, 2$. Furthermore, household initial wealth is V_1 and the household can transfer income between the two periods at the going (real) interest rate, r.
The household's budget constraint for period 1 is

$$V_2 = (1+r)(Y_1 - T_1 + V_1 - C_1) \tag{A.2}$$

In period 2 it will not be optimal for the household to leave any savings for future consumption given that the household will not be around to enjoy consumption in period 3. Hence, the budget constraint for period 2 is

$$C_2 = V_2 + Y_2 - T_2 \tag{A.3}$$

2. Interpret equation (A.2). Show that (A.2) and (A.3) can be combined into the household's intertemporal budget constraint

$$\begin{aligned} C_1 + \frac{C_2}{1+r} &= Y_1 - T_1 + \frac{Y_2 - T_2}{1+r} + V_1 = H_1 + V_1, \qquad \text{(A.4)} \\ \text{where } H_1 &= Y_1 - T_1 + \frac{Y_2 - T_2}{1+r} \end{aligned}$$

and interpret (A.4). In particular describe H_1.

The household maximizes total lifetime utility by choosing the consumption level in the two periods, *i.e.* C_1 and C_2 taking the intertemporal budget constraint into consideration. In short, the household solves the problem

$$\begin{aligned} &\max_{C_1,C_2} U = u(C_1) + \frac{u(C_2)}{1+\phi} \\ &st. \\ &C_1 + \frac{C_2}{1+r} = Y_1 - T_1 + \frac{Y_2 - T_2}{1+r} + V_1 \end{aligned} \tag{M.1}$$

3. Show that the first-order condition for solving the households' maximization problem is

$$\frac{u'(C_1)}{\beta u'(C_2)} = 1 + r. \tag{A.5}$$

Interpret (A.5). Illustrate the solution of the consumers problem in a diagram where you have C_1 at the first axis and C_2 at the second axis. Explain and illustrate why the existence of capital markets is welfare improving. How is the ratio C_1/C_2 affected by a) an increase in ϕ and b) an increase in r. Explain.

Throughout the following analysis it is assumed that $u(C_t) = \ln C_t$, $t = 1, 2$. Then $u' = 1/C_t$, and equation (A.5) can rewritten as

$$\frac{u'(C_1)}{u'(C_2)} = \frac{C_2}{C_1} = \beta(1+r) = \frac{1+r}{1+\phi} \tag{A.6}$$

4. Show that the solution to the households problem is

$$C_1^* = \frac{H_1 + V_1}{1+\beta} \tag{S.1}$$

$$C_2^* = \beta(1+r)C_1^* = (1+r)\frac{\beta}{1+\beta}(H_1 + V_1) \tag{S.2}$$

$$V_2^* = (1+r)\frac{\beta}{1+\beta}(Y_1 - T_1 + V_1) - \frac{1}{1+\beta}(Y_2 - T_2) \tag{S.3}$$

where a "*" denotes the optimal consumption and savings. (Hint: Combine (A.4) and (A.6) to back out (S.1). Then use (A.2) and (S.1) to find (S.3)). How does the ratio C_2^*/C_1^* depend on ϕ and r. Illustrate and explain.

5. Consider the following three scenarios:

   a. Stock markets and house prices are driven down so that consumers' initial wealth V_1 is reduced,

   b. Current income Y_1 is reduced,

   c. Both current income Y_1 and future income Y_2 is reduced by an amount equal to the reduction in Y_1 in scenario b).

   How is optimal current consumption C_1^* affected in each of the three scenarios. In relation to scenario b, explain why the change in current income, Y_1, leads to only a less than proportional reduction in C_1^* so that $0 < \partial C_1^*/\partial Y_1 < 1$. Also compare the effect on current consumption in scenario b and scenario c. Explain.

So far we have analysed the optimal consumption and savings behavior for a household which takes the interest rate as given. Now we turn attention to the endogenous determination of the interest rate in the macroeconomy. To simplify the analysis we assume that the economy consist of N identical household. Each household can be described by equation (A.1) and (A.4). Hence optimal consumption and savings for each household is given by the equations (S.1)-(S.3). Also, you may interpret the vehicle, V, whereby consumption can be transferred between the two periods as bonds. We are interested in finding the interest rate, r^*, that clears the bond market. For our purpose it is sufficient to focus on the bonds market (though formally, both the goods and the bonds market must clear). The market clearing interest rate is the one where the bond market clears. Since all households are alike this requires that

$$N \cdot V_2^* = 0.$$

which in turn implies that each household neither borrows nor lends, *i.e.* $V_2^* = 0$.

6. Show that the market clearing interest rate is

$$r^* = \frac{Y_2 - T_2}{\beta\left(Y_1 - T_1 + V_1\right)} - 1. \tag{A.7}$$

   How is the equilibrium interest rate affected in the 3 scenarios mentioned in question 5? What is the economic intuition. Explain. When describing the

effect on r^* in scenario c you may assume $V_1 = 0$. How is r^* affected if ϕ is increased? Explain.

7. Assume $V_1 = 0$. Find r^* if disposal income is evenly distributed across the two periods so that $Y_1 - T_1 = Y_2 - T_2$. How is the equilibrium interest rate affected by a tax relief in period 1 so that $\widetilde{T}_1 < T_1$ implying that $Y_1 - \widetilde{T}_1 > Y_1 - T_1 = Y_2 - T_2$. Is the equilibrium interest rate higher, lower or unchanged relative to the situation where $Y_1 - T_1 = Y_2 - T_2$? (Note that in the above the households do not take the governments intertemporal budget constraint into account. Hence, in your answer you are expected to abstract from Ricardian equivalence considerations).

Problem B

1. In the textbook two different models for wage formation are used when deriving the AS curve; the right to manage model and the efficiency wage model. Explain the main features of the two models, including why both models imply structural unemployment.

2. Explain why it is socially desirable to stabilize the rate of inflation around some constant target value. Explain why even a constant rate of inflation generates welfare costs and explain why an inflation target of zero is not desirable.

3. Explain the so-called "Impossible Trinity" which states that a macroeconomic policy regime simultaneously can include at most two of the following three policy goals:

    a. Free cross-border capital flows

    b. A fixed exchange rate

    c. Independent monetary policy.