Written Exam for the B.Sc. in Economics 2011-I

Macro C

Final Exam

13 January 2011

(3-hour 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.

If you are in doubt about which title you registered for, please see the print of your exam registration from the students' self-service system.

All questions of all three problems should be answered

Problem A

For each of the following statements, provide an *economic explanation* of whether the statement is true or false.

1. In the Ramsey Model, an increase in the population growth rate will result in a lower growth rate of aggregate variables but will not affect the steady state values of variables measured per unit of effective labour.

2. In the model where a monopoly sets the price before knowing the true state of demand, if the monopoly resets its price following a contraction in demand, doing so is also socially optimal.

3. Since individuals in the OLG Model maximize utility subject to their intertemporal budget constraint, the equilibrium exhibits Ricardian equivalence.

Problem B

Consider the following version of the Blanchard Model in usual notation. All variables are functions of time but for ease of exposition, reference to time is not made explicit. Expectations are assumed to be rational and there is no uncertainty.

$$\dot{p} = \gamma (y - \bar{y}), \quad \gamma > 0 \tag{B.1}$$

$$y = \eta Q - \beta p + z, \quad \eta, \beta > 0 \tag{B.2}$$

$$r = r^f \tag{B.3}$$

$$\frac{(1 - \tau) D + \dot{Q}}{Q} = r \Leftrightarrow \dot{Q} = rQ - (1 - \tau) D, \quad 0 < \tau < 1 \tag{B.4}$$

$$D = \alpha y, \quad \alpha > 0 \tag{B.5}$$

Note that in comparison with the standard model, a change has been made by assuming (see equation (B.4)) that share dividends are taxed at the rate τ.

The economy may be described by the following two differential equations

$$\dot{p} = \gamma \eta Q - \gamma \beta p + \gamma (z - \bar{y}) \tag{B.6}$$

$$\dot{Q} = \left(r^f - (1 - \tau) \alpha \eta \right) Q + (1 - \tau) \alpha \beta p - (1 - \tau) \alpha z \tag{B.7}$$

and it is assumed that values of parameters and exogenous variables are such that the $\dot{p} = 0$ and $\dot{Q} = 0$ loci intersect in the positive orthant. You may use the fact that the solution to equation (B.4) is

$$Q(t) = \int_t^T (1 - \tau) D(s) e^{-r(s-t)} ds + e^{-r(T-t)} Q(T) \tag{B.8}$$

The following analysis should be made under the assumption that $r^f < (1 - \tau) \alpha \eta$.

1. Construct the phase diagram of the economy. Comment.

   Hint: You will need to show that the $\dot{Q} = 0$ locus is positively sloped and steeper than the $\dot{p} = 0$ locus.

Assume that the economy is in a long-run equilibrium when, at time t_0, there is an *unexpected and permanent decrease* in the dividend tax rate τ.

2. Use the phase diagram to analyze the effects on the economy from time t_0 and onwards. Provide explanations of the relevant economic effects.

Assume instead that the economy is in long-run equilibrium when, at time t_0, it is *announced* that at time $t_1 > t_0$ there will be a *permanent decrease* in τ.

3. Use the phase diagram to analyze the effects on the economy from time t_0 and onwards. Assume that at some point in time between t_0 and t_1, the economy has to cross the original $\dot{Q} = 0$ locus. Provide explanations of the relevant economic effects.

Problem C

Consider an economy where the SRAS curve is given by

$$\pi_t = \pi^e_{t,t-1} + y_t - \bar{y} \tag{C.1}$$

Government has a social loss function,

$$SL = (y_t - y^*)^2 + \eta \left(\pi_t - \pi^*\right)^2, \ \eta > 0 \tag{C.2}$$

where

$$y^* = \bar{y} + \theta, \ \theta > 0 \tag{C.3}$$

reflecting the fact that due to imperfections in the goods and/or labour markets, the target value of real output in the social loss function is greater than the natural level of real output. It is assumed that expectations are rational, i.e. for any variable X:

$$X^e_{t,t-1} = E\left[X_t \,|I_{t-1}\right] \tag{C.4}$$

Assume that government is able to directly choose the level of inflation, π_t, and that government wants to follow a policy rule where inflation is kept constant, $\pi_t = \bar{\pi}$.

1. Argue that if government follows the rule - and is expected to do so - the specific choice of $\bar{\pi}$ that minimizes the social loss is $\bar{\pi} = \pi^*$. What is the equilbrium value of real output and the social loss of government when this policy is chosen?

Assume that it is expected that government will follow the policy rule $\pi_t = \pi^*$, when actually government decides to act in a discretionary way, i.e. to choose π_t freely with the aim of minimizing the social loss function.

2. Derive the equilibrium values of real output and inflation in this case and show that the resulting value of the social loss function is

$$SL_{\text{Cheat}} = \frac{\eta}{1+\eta}\theta^2 \qquad (C.5)$$

Explain the result in economic terms.

3. Explain why the equilibrium of question 2 is not a true rational expectations equilibrium. Derive the true rational expectations equili-brium when policy is discretionary, and show thereby that the equilibrium values of real output and inflation are

$$
\begin{aligned}
y_t &= \bar{y} \qquad &(C.6)\\
\pi_t &= \pi^* + \frac{\theta}{\eta} \qquad &(C.7)
\end{aligned}
$$

Also calculate the associated social loss. Comment.

4. Explain how government can actually improve on the outcome in the dynamically consistent equilibrium by completely delegating policy to an independent central bank having a social loss function that differs from that of government. Also explain why this is not necessarily a good idea if the economy is hit by supply shocks.