

Written Exam at the Department of Economics summer 2017

Macroeconomics III
Final Exam

August 14, 2017

(3-hour closed book exam)

Please note that the language for this exam is English.

This exam question consists of 3 pages in total

NB: If you fall ill during the actual examination at Peter Bangsvej, you must contact an invigilator in order to be registered as having fallen ill. Then submit a blank exam paper and leave the examination. When you arrive home, you must contact your GP and submit a medical report to the Faculty of Social Sciences no later than seven (7) days from the date of the exam.

1 (20 points) Answer true, false, or uncertain. Justify your answer.

According to the basic real business cycle model, the observed fluctuations of consumption and investment are the optimal responses to exogenous supply shocks. Thus, government intervention to smooth consumption volatility is not desired.

2 (20 points) Answer true, false, or uncertain. Justify your answer.

An open Diamond economy that increases the size of its pay-as-you-go social security system will not affect its current account as the system is balanced (resources raised from workers' contributions are transferred to retirees).

3 (20 points) Answer true, false, or uncertain. Justify your answer.

In a Ramsey model a permanent increase in government spending will not crowd out investment if lump sum taxes are used.

4 (60 points) Consider an economy where individuals live for two periods, and population is initially constant. Identical competitive firms maximize the following profit function:

$$\pi^F(K_t^i, L_t^i) = AK_t^{i\alpha} L_t^{i1-\alpha} - w_t L_t^i - r_t K_t^i,$$

where r_t is the interest rate at which firms can borrow capital, w_t is the wage rate, K_t^i and L_t^i denote the quantities of capital and labor employed by firm i , and $A > 0$ is total productivity. Assume $0 < \alpha < 1$. Capital fully depreciates. Utility for young individuals born in period t is

$$U_t = \ln(c_{1t}) + \beta \ln(c_{2t+1}), \quad \beta > 0$$

where c_{1t} is consumption when young, and c_{2t+1} consumption when old. Young agents work one unit of time (i.e. their labor income is equal to the wage). Old agents do not work and provide consumption through saving and social security benefits. The old receive return r_{t+1} for their savings.

Suppose that the government runs a balanced fully-funded social security system in which each young household contributes a fraction $0 < \tau < 1$ of their wages in period t that is invested to provide them with benefits when old ($\tau w_t r_{t+1}$ are then the benefits received by the old in period $t + 1$). Assume $\tau < \frac{\beta}{1+\beta}$.

a) Characterize individual saving behavior by solving the individual's problem of optimal intertemporal allocation of resources. Find the capital accumulation equation that gives k_{t+1} as a function of k_t (where k is capital per worker). Find the level of capital per worker in steady state. Why do we impose the restriction $\tau < \frac{\beta}{1+\beta}$?

Assume that the economy is initially in the steady state. Now unexpectedly there is a permanent flow of temporary immigrants. Immigrants arrive when young, have same preferences as residents, and are assumed to get employment. They have no children and leave the country just before they die. The ratio of temporary immigrant workers to native resident workers is n (i.e. the economy moves to a regime of constant population at a higher level driven by immigration). Both immigrants and residents receive the same wage, but only residents make contributions to, and receive benefits from, social security. Immigrants only use their capital income to fund their old age consumption.

Assume that the government decides to keep the social security tax at initial level τ , and that parameters are such that the economy is always dynamically efficient. Note that to solve what follows you have to consider the general equilibrium effects that the flow of immigrants has on wages and the interest rate.

b) What is the effect of the shock on capital accumulation in the first period (compared to capital accumulation in the previous steady state)? And on the new steady state? Explain.

c) Are the initial old better off with immigration? Show that the disposable income of the first young generation of residents is lower. Explain.

5 (60 points) Assume that the monetary policy in the Eurozone is determined according to credible rules, such that equilibrium inflation for the euro is given by

$$\pi^{eu} = \frac{\lambda^{eu}}{1 + \lambda^{eu}} \epsilon^{eu}$$

where ϵ^{eu} is a supply shock in Europe, characterized as white noise with variance σ_{eu}^2 . Consider now the following equations that characterize the behavior of the Danish economy

$$\begin{aligned}\pi &= m \\ x &= \theta + (\pi - \pi^e) - \epsilon\end{aligned}$$

where π is the inflation rate, π^e the expected inflation rate, m the rate of growth of money, x is output (or rate of growth of output), θ the stochastic level for potential output (or the potential growth rate of output), and ϵ is a supply shock. Assume that all shocks are independent from each other, and across time, with zero mean and known variances ($\sigma_\theta^2, \sigma_\epsilon^2, \sigma_{eu}^2 > \sigma_\epsilon^2$). Sequential decision making implies that the private sector forms expectations on inflation after only observing θ , while the monetary authority determines m after observing $\theta, \pi^e, \epsilon^{eu}$, and ϵ . Finally assume that society evaluates policy according to the following loss function

$$E[L(\pi, x)] = \frac{1}{2}(E(\pi)^2 + \lambda E(x - \bar{x})^2)$$

where $\lambda > 0$ measures the relative importance of policy objectives with respect to output deviations from target level \bar{x} , and inflation deviations from target level of 0. For all realizations of θ , distortions in the economy imply that $\bar{x} - \theta > 0$.

a) Characterize the equilibrium inflation and output under discretion. Does the equilibrium respond to supply shocks in Europe, ϵ^{eu} ? Explain.

b) Find equilibrium inflation and output under a credible peg of the krone to the euro. Under what conditions would the outcome of a) be preferable to a peg? Explain.

c) Find the equilibrium inflation and output when monetary policy is delegated to an independent central bank whose loss function is given by

$$E[L^B(\pi, x)] = \frac{1}{2}(E(\pi)^2 + \lambda^B E(x - \bar{x})^2)$$

Show that society's optimal choice of λ^B implies $0 < \lambda^B < \lambda$. Could it be the case that the outcome of b) be preferable to having an optimally chosen independent central bank? Explain.