Written Exam at the Department of Economics summer 2017

Monetary Policy

Final Exam

9 June 2017

(3-hour closed book exam)

Please note that the language used in your exam paper must correspond to the language for which you registered during exam registration.

This exam question consists of 4 (four) 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 you 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.

Questions 1, 2 and 3 each weigh 1/3. These weights, however, are only indicative for the overall evaluation.

QUESTION 1:

Evaluate whether the following statements are true or false. Explain your answers.

(i) In any flex-price model, where both consumption and investment in productive capital is subject to a cash-in-advance constraint, superneutrality prevails such that changes in nominal interest rates have no real effects.

(ii) A relatively high coefficient on output in a Taylor-type interest-rate rule is always a sign of an optimizing central bank with a relatively strong preference for output stability.

(iii) If the central bank has little control over the broad money supply, the insights from Poole's 1970 model posit that the central bank should adopt a base money operating procedure rather than an interest-rate operating procedure.

QUESTION 2:

Assume a closed economy in discrete time, where households maximize

$$U = \sum_{t=0}^{\infty} \beta^t u(c_t, m_t, n_t) \tag{1}$$

with

$$u(c_t, m_t, n_t) \equiv \frac{(c_t m_t)^{1-\Phi}}{1-\Phi} + \frac{(1-n_t)^{1-\eta}}{1-\eta}, \quad \Phi > 0, \quad \eta > 0,$$

subject to the budget constraint

$$f(k_{t-1}, n_t) + \tau_t + (1-\delta) k_{t-1} + \frac{1}{1+\pi_t} m_{t-1} = c_t + k_t + m_t, \tag{2}$$

where c_t is consumption, m_t is real money balances at the end of period t, n_t is labor supply, k_{t-1} is physical capital at the end of period $t-1$, τ_t are monetary transfers, $0 < \delta < 1$ is the depreciation rate of capital, and π_t is the inflation rate. The function f is defined as

$$f(k_{t-1}, n_t) = A k_{t-1}^{\alpha} n_t^{1-\alpha}, \quad 0 < \alpha < 1.$$

(i) Discuss why money may enter the utility function, and describe (2) in detail.

(ii) Derive the relevant first-order conditions for optimal choices of c, m, and n subject to (1) and the definition

$$a_t \equiv \tau_t + \frac{1}{1+\pi_t} m_{t-1} \tag{3}$$

[Hint: Set up the value function $V(a_t, k_{t-1}) = \max_{c_t, m_t, n_t} \{u(c_t, m_t, n_t) + \beta V(a_{t+1}, k_t)\}$ and substitute out k_t and a_{t+1} by use of (2) and (3) respectively.]

Interpret the first-order conditions for c_t, m_t, and n_t intuitively, and show that they can be combined into (along with the expressions for the partial derivatives of the value function):

$$\begin{aligned} u_m(c_t, m_t, n_t) + \frac{\beta}{1+\pi_{t+1}} u_c(c_{t+1}, m_{t+1}, n_{t+1}) &= u_c(c_t, m_t, n_t), & (4) \\ u_c(c_t, m_t, n_t) &= \beta R_t u_c(c_{t+1}, m_{t+1}, n_{t+1}), & (5) \\ -u_n(c_t, m_t, n_t) &= u_c(c_t, m_t, n_t) f_n(k_{t-1}, n_t), & (6) \end{aligned}$$

where $R_t \equiv f_k(k_t, n_{t+1}) + 1 - \delta$ is the gross real interest rate, which equals $(1+i_t)/(1+\pi_{t+1})$, with i_t being the nominal interest rate.

(iii) Using the specific functional forms for u and f, examine the properties of the steady state using (4), (5), and (6) together with the national account identity $c^{ss} = A {k^{ss}}^{\alpha} {n^{ss}}^{1-\alpha} - \delta k^{ss}$. Discuss under which circumstances the model exhibits superneutrality, and discuss whether the correlation between output and inflation is unambiguous. [Note: You are not required to explicitly solve for all variables, but to use the equations as input to your arguments.]

QUESTION 3:

Consider the following New-Keynesian log-linear model of a closed economy:

$$x_t = \mathrm{E}_t x_{t+1} - \left(\widehat{i}_t - \mathrm{E}_t \pi_{t+1}\right) + u_t, \qquad (1)$$

$$\pi_t = \beta \mathrm{E}_t \pi_{t+1} + \kappa x_t, \qquad 0 < \beta < 1, \quad \kappa > 0, \qquad (2)$$

$$\widehat{i}_t = \phi_\pi \pi_t + \phi_x x_t^o, \qquad \phi_\pi > 1, \quad \phi_x > 0, \qquad (3)$$

$$x_t^o = x_t + e_t, \qquad (4)$$

where x_t is the output gap, $\widehat{i}_t$ is the nominal interest rate's deviation from steady state, and π_t is goods-price inflation, u_t is mean-zero i.i.d. shock. E_t is the rational-expectations operator conditional upon all information up to and including period t. The variable x_t^o is the observed output gap, which is an imperfect measure of the actual output gap: e_t is a mean-zero i.i.d. shock.

(i) Derive the solutions for x_t and π_t. [Hint: Conjecture that the solutions are linear functions of u_t and e_t, and use the method of undetermined coefficients.] Explain carefully how the shocks are transmitted onto the variables.

(ii) Assume that stabilizing the output gap, x_t and π_t is preferable. Discuss why this is an assumption often used in this type of model.

(iii) Evaluate formally whether stabilizing x_t and π_t perfectly *at the same time,* is possible in the model by appropriate choices of ϕ_π and ϕ_x. Discuss.