Written Exam for the M.Sc. in Economics Summer 2011

Monetary Economics: Macro Aspects

Master's Course

June 24

(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.

This set contains three pages (beginning with this page)
All questions must be answered
Questions 1 and 2 each weigh 25 % while question 3 weighs 50 %. These weights, however, are only indicative for the overall evaluation.

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QUESTION 1:

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

(i) In the Calvo pricing model, expectations about future marginal costs are irrelevant for firms that by chance are able to reset their prices.

(ii) In a flex-price, cash-in-advance model, it is never possible to determine the optimal inflation rate.

(iii) In rational-expectations settings where real effects of monetary policy are due to unexpected policy movements, systematic components of monetary policy have no real effects.

QUESTION 2:

Money in the utility function: Finding money demand
Consider an infinite-horizon economy in discrete time, where utility of the representative agent is given by

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

with

$$u\left(c_t,m_t\right)\equiv b\ln c_t+\left(1-b\right)\left(m^F\ln m_t-m_t\right),\qquad 0<b<1,\quad m^F>0.$$

Agents maximize utility subject to the budget constraint

$$\begin{aligned} c_t + k_t + m_t &= f(k_{t-1}) + \tau_t + (1-\delta)k_{t-1} + \frac{1}{1+\pi_t} m_{t-1}, \qquad 0 < \delta < 1 \qquad (2) \\ &\equiv \omega_t, \end{aligned}$$

where c_t is consumption, m_t is real money balances at the end of period t, k_{t-1} is physical capital, τ_t are monetary transfers from the government, and π_t is the inflation rate. Function f satisfies $f' > 0$, $f'' < 0$.

(i) Derive the relevant first-order conditions for optimal behavior [Hint: Set up the value function $V(\omega_t) = \max_{c_t, m_t} \{u(c_t, m_t) + \beta V(\omega_{t+1})\}$ and substitute out ω_{t+1} by (2) and k_t by $k_t = \omega_t - c_t - m_t$]

(ii) Interpret the first-order conditions intuitively, and show that they can be combined into

$$\frac{u_m(c_t, m_t)}{u_c(c_t, m_t)} = \frac{i_t}{1+i_t}, \qquad (3)$$

where $f_k(k_t) + 1 - \delta = (1+i_t)/(1+\pi_{t+1})$ defines i_t as the nominal interest rate. Discuss this and discuss whether steady-state superneutrality holds in the model.

(iii) Apply the particular functional form of u and characterize the monetary policy that maximizes the utility of the representative agent and find the corresponding optimal steady-state real balances. Explain the results intuitively.

QUESTION 3:

Monetary policy trade offs

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

$$\begin{aligned} x_t &= \mathrm{E}_t x_{t+1} - \sigma^{-1}\left(i_t - \mathrm{E}_t \pi_{t+1} - r_t^n\right), \qquad \sigma > 0, \qquad (1) \\ \pi_t &= \beta \mathrm{E}_t \pi_{t+1} + \kappa x_t, \qquad 0 < \beta < 1, \quad \kappa > 0, \qquad (2) \end{aligned}$$

where x_t is the output gap, i_t is the nominal interest rate (the monetary policy instrument), π_t is goods price inflation and r_t^n is the natural rate of interest, which is assumed to be a mean-zero, serially uncorrelated shock. E_t is the rational expectations operator conditional on all information up to and including period t.

(i) Discuss the economic mechanisms behind equations (1) and (2).

(ii) Assume that the monetary authority wants to minimize the loss function

$$L = \frac{1}{2}\mathrm{E}_0 \sum_{t=0}^{\infty} \beta^t \left[\lambda x_t^2 + \pi_t^2\right], \qquad \lambda > 0. \tag{3}$$

Discuss the economic foundations for this loss function.

(iii) Derive the optimal values of x_t and π_t under discretionary policymaking [Hint: Consider x_t the policy instrument, and acknowledge that under discretion the optimization problem becomes a sequence of static problems as expected values can be taken as given]. Discuss the solutions, and describe how the nominal interest rate will move with the natural rate of interest.

(iv) Assume that the monetary policymaker instead follows a rule for nominal interest-rate setting given as

$$i_t = \phi \pi_t, \qquad \phi > 1. \tag{4}$$

Derive the solutions for x_t and π_t for the system (1), (2) and (4). [Hint: Conjecture that the solutions are linear functions of the period's natural rate of interest, r_t^n, and remember that $\mathrm{E}_t r_{t+1}^n = 0$.]. Discuss the differences between these solutions and the ones obtained under discretionary policymaking. Can the monetary policy rule (4) be parameterized such that it will "deliver" the outcomes under discretionary policymaking?

(v) Will an ability to conduct optimal policy under commitment be advantegous in this setting? Why/Why not?