Written Exam for the M.Sc. in Economics August 2012

Monetary Economics: Macro Aspects

Master's Course

August 17

(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
Question 1 weighs 25 %, while questions 2 and 3 each weigh 37,5 %. 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 simple New-Keynesian model with monopolistic competition and sticky prices, a monetary policy implementing the Friedman rule is optimal as it eliminates any relative demand distortions.

(ii) Consider the model of Barro and Gordon, where output, y, is given by $y = \pi - \pi^e + \varepsilon$, where π is inflation, π^e is inflation expectations and ε is a supply shock. Social welfare is given by $V = -(y-k)^2 - \pi^2$, $k > 0$. Delegating monetary policy conduct to a "conservative" central banker with utility function $V^c = -(y-k)^2 - (1+\delta)\pi^2$, $\delta > 0$, is disadvantageous if the variance of ε is sufficiently high.

(iii) In the Lucas "islands" model, anticipated aggregate money shocks have real effects as agents — due to imperfect information — cannot distinguish between local money disturbances and aggregate money disturbances.

QUESTION 2:

Consider an infinite-horizon economy in discrete time, where the utility of the representative agent is given by

$$U = \sum_{i=0}^{\infty} \beta^i \left[\ln c_{t+i} + \ln\left(1 - n_{t+i}\right)\right], \qquad 0 < \beta < 1, \tag{1}$$

where c_t is consumption in period t, and n_t is employment. The economy is characterized by flexible prices and perfect competition in the goods and labor markets. Agents have perfect foresight and face the budget constraint

$$c_t + b_t + m_t \leq y_t + \frac{1 + i_{t-1}}{1 + \pi_t} b_{t-1} + \frac{m_{t-1}}{1 + \pi_t} + \tau_t, \tag{2}$$

where y_t is real income, b_{t-1} denotes real government bond holdings at the end of period $t-1$, i_{t-1} is the nominal interest rate, π_t is the inflation rate, m_{t-1} is real money holdings, and τ_t denotes real government transfers. Income (output) is produced with labor as only input:

$$y_t = n_t^{1-\alpha}, \qquad 0 < \alpha < 1. \tag{3}$$

Purchases of consumption goods are subject to a cash-in-advance constraint:

$$c_t \leq \frac{m_{t-1}}{1 + \pi_t} + \tau_t. \tag{4}$$

(i) Agents maximize utility. Find the relevant first-order conditions characterizing the optimal choices of c_t, n_t, and m_t, and interpret them intuitively. [Hint: Use dynamic programming and express the value as a function of the state variables b_{t-1} and m_{t-1}; substitute out b_t by constraint (2), and let μ_t be the multiplier on (4).]

(ii) Use the envelope theorem to eliminate the partial derivatives of the value function, let $\lambda_t \equiv \beta V_b\left(b_t, m_t\right)$ where V is the value function and V_b denotes $\partial V\left(b_t, m_t\right)/\partial b_t$, and show that the steady state can be characterized by

$$\begin{aligned} 1/c^{ss} &= \lambda^{ss}\left(1 + i^{ss}\right), \\ 1/\left(1 - n^{ss}\right) &= \lambda^{ss}\left(1 - \alpha\right)\left(n^{ss}\right)^{-\alpha}, \\ \beta^{-1} &= \frac{1 + i^{ss}}{1 + \pi^{ss}}, \end{aligned}$$

where superscript "ss" denotes steady-state values. Explain.

(iii) Derive steady-state employment as a function of the nominal interest rate. [Hint: Use the economy's resource constraint $y_t = c_t$.] Explain.

(iv) Derive the monetary policy that generates the utility-maximizing solution for employment. Explain.

QUESTION 3:

Consider the following model for output and inflation determination in a closed economy:

$$y_t = \theta y_{t-1} - \sigma\left(i_{t-1} - \mathrm{E}_{t-1}\pi_t\right) + u_t, \qquad 0 < \theta < 1, \quad \sigma > 0, \tag{1}$$

$$\pi_t = \pi_{t-1} + \kappa y_t + \eta_t, \qquad \kappa > 0, \tag{2}$$

where y_t is log of output in period t, i_t is the nominal interest rate (the monetary policy instrument), π_t is the inflation rate, u_t and η_t are independent, mean-zero, serially uncorrelated shocks. E_j is the rational expectations operator conditional on information up to and including period j. It is assumed that $\sigma\kappa < 1$.

(i) Discuss equations (1) and (2), with emphasis on the monetary transmission mechanism and the stability properties in absence of policy intervention (only a verbal discussion is required).

The objective of the central bank is to conduct monetary policy so as to maximize

$$U = -\frac{1}{2}\mathrm{E}_t \sum_{j=1}^{\infty} \beta^j \pi_{t+j}^2, \qquad 0 < \beta < 1.$$

(ii) Find the optimal interest-rate rule for i_t as a function of π_t and y_t. (Hint: Treat $\mathrm{E}_t y_{t+1} \equiv y_{t+1} - u_{t+1}$ as the policy instrument, and solve the maximization problem by dynamic programming treating π_t as the state variable. That is, find the optimal policy as $\mathrm{E}_t y_{t+1} = B\pi_t$, where B is a parameter to be found, and use (1) and (2) to derive the associated nominal interest rate.)

(iii) Comment on the coefficient on π_t in the optimal interest rate rule, with special emphasis on how its value affects the stability properties of the model.

(iv) Discuss how the coefficients on π_t and y_t in the optimal interest rate rule depend on the underlying parameters of the model. and discuss whether the parameters reveal anything about the "strict" inflation-targeting preferences of the central bank.