Written Exam Economics summer 2016

Monetary Policy

June 8

(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.

This exam question consists of 4 pages in total

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 the Lucas Island model with imperfect information, higher "local" monetary volatility, relative to "aggregate" volatility, makes the real effect of aggregate money shocks smaller.

(ii) By the logic of the Poole (1970) model, the United States' Federal Reserve normally uses the nominal interest rate as the policy instrument because the volatility of money-market shocks are negligible.

(iii) The optimal inflation rate in the simple New-Keynesian model witch sticky goods prices is given by the Friedman rule.

QUESTION 2:

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

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

with

$$u\left(c_t, n_t\right) \equiv \log c_t - \frac{1}{1+\eta} n_t^{1+\eta}, \qquad \eta > 0,$$

where c_t is consumption and n_t is employment. Agents face the budget constraint

$$c_t + m_t + b_t = f\left(n_t\right) + \tau_t + \frac{1+i_{t-1}}{1+\pi_t} b_{t-1} + \frac{1}{1+\pi_t} m_{t-1}, \tag{2}$$

where m_t is real money balances at the end of period t, b_t is real bond holdings, τ_t denotes real monetary transfers from the government, i_t is the nominal interest rate on bonds, and π_t is the inflation rate. Function f is defined as

$$f\left(n_t\right) \equiv A n_t^{1-\alpha}, \qquad A > 0, \quad 1 > \alpha > 0.$$

Agents also face a cash-in-advance constraint

$$c_t \leq \frac{1}{1+\pi_t} m_{t-1} + \tau_t. \tag{3}$$

(i) Derive the relevant conditions for optimal behavior of the representative agent. For this purpose, set up the value function

$$V\left(m_{t-1}, b_{t-1}\right)=\max_{c_t, n_t, m_t}\left\{u\left(c_t, n_t\right)+\beta V\left(m_t, b_t\right)-\mu_t\left(c_t-\frac{1}{1+\pi_t} m_{t-1}-\tau_t\right)\right\},$$

where b_t is eliminated by use of (2), and where μ_t is the Lagrange multiplier on (3). Interpret intuitively the first-order conditions for c_t, n_t, m_t and the expressions for the partial derivatives of V.

(ii) Show that

$$i_t=\frac{\mu_{t+1}}{\beta V_b\left(m_{t+1}, b_{t+1}\right)}, \tag{4}$$

and

$$-\frac{u_c\left(c_t, n_t\right)}{u_n\left(c_t, n_t\right)}=\frac{\left(\mu_t /\left[\beta V_b\left(m_t, b_t\right)\right]\right)+1}{(1-\alpha) A n_t^{-\alpha}}. \tag{5}$$

Discuss (4), and explain how nominal interest rate changes affect the labor supply decision (5).

(iii) Consider the steady state. Apply the particular functional form of u and use (4)–(5) to derive the solution for employment as a function of the nominal interest rate, using that the national account is $c_t = A n_t^{1-\alpha}$. What is the optimal steady-state value of the nominal interest rate? [Hint: Use that optimal steady-state employment, n, solves $\max_n \left\{\log\left(A n^{1-\alpha}\right)-\frac{1}{1+\eta} n^{1+\eta}\right\}$.] Explain.

QUESTION 3:

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

$$y_t = \mathrm{E}_t y_{t+1} - \sigma^{-1}\left(\widehat{i}_t - \mathrm{E}_t \pi_{t+1}\right), \qquad \sigma > 0, \tag{1}$$

$$\pi_t = \beta \mathrm{E}_t \pi_{t+1} + \kappa\left(y_t - y_t^n\right) \qquad 0 < \beta < 1, \quad \kappa > 0, \tag{2}$$

$$\widehat{i}_t = \phi \pi_t, \qquad \phi > 1, \tag{3}$$

where y_t is output, $\widehat{i}_t$ is the nominal interest rate's deviation from steady state, and π_t is goods-price inflation, y_t^n is the natural rate of output, which is assumed to be a mean-zero i.i.d. shock. E_t is the rational-expectations operator conditional upon all information up to and including period t.

(i) Derive the solutions for y_t, π_t and $\widehat{i}_t$. [Hint: Conjecture that the solutions are linear functions of y_t^n, and use the method of undetermined coefficients.] Explain how the shock is transmitted onto the variables.

(ii) Assume that stabilizing the output gap, $y_t - y_t^n$, and π_t is preferable. Discuss the underlying model's welfare rationale for this assumption.

(iii) Evaluate formally whether stabilizing $y_t - y_t^n$ and π_t at the same time is possible in the model by apropriate choice of ϕ. Discuss.