ECON4325 - Postponed exam - Spring 2023

The exam consists of three parts, A, B, and C, with weights 50%, 25%, and 25%, respectively. Allocate your time accordingly.

Part A (50 %)

This part contains four problems. You need to answer all to get full score.

a) **Monetary policy and financial stability.** Section 3 in "Regulation of Monetary policy" states: "The operational target of monetary policy shall be annual consumer price inflation of close to 2 percent over time. Inflation targeting shall be forward-looking and flexible so that it can contribute to high and stable output and employment and to counteracting the build-up of financial imbalances".

   i) What is the rationale for including the phrase "counteracting the build-up of financial imbalances" in a monetary policy guideline?

   ii) What is macroprudential policy?

b) **Unconventional monetary policy.**

   i) Discuss how liquidity support from the central bank will affect private banks' balance sheet.

   ii) Why did many central banks provide liquidity support to the banking sector in the aftermath of the global financial crisis?

c) **Kappa.** In the standard New-Keynesian model, the slope of the Phillips curve (κ) is

$$\kappa = \left(\sigma + \frac{\phi + \alpha}{1 - \alpha}\right)\left(\frac{1 - \theta}{\theta}\right)(1 - \beta\theta)\left(\frac{1}{1 + \frac{\alpha\varepsilon}{1-\alpha}}\right). \tag{1}$$

   Explain what σ is and why $\frac{\partial\kappa}{\partial\sigma} > 0$.

d) **CES Demand.** The demand for an individual good in a CES-system is

$$C_t(i) = \left(\frac{P_t(i)}{P_t}\right)^{-\epsilon} C_t \tag{2}$$

   where $C_t(i)$ is good i, $P_t(i)$ is the price of good i, P_t is an aggregate price index, and C_t is aggregate demand. Interpret equation (2) and explain the role of ϵ.

Part B (25 %)

In this problem, we are going to solve for optimal monetary policy under various assumptions. The underlying model is from Clarida-Gali-Gertler (1999):

$$L_t = \frac{1}{2}\mathbb{E}_t \sum_{k=0}^{\infty} \beta^k [\lambda y_{t+k}^2 + \pi_{t+k}^2] \tag{3}$$

$$\pi_t = \kappa y_t + \beta \mathbb{E}_t \pi_{t+1} + u_t \tag{4}$$

$$x_t = -\eta[i_t - \mathbb{E}_t \pi_{t+1}] + \mathbb{E}_t y_{t+1} \tag{5}$$

$$u_t = \rho u_{t-1} + \epsilon_t \tag{6}$$

$$\epsilon_t \sim N(0, \sigma_\epsilon) \tag{7}$$

where y_t is the output gap, π_t is the inflation rate, u_t is the cost-push shock, ϵ_t is an i.i.d. innovation to the cost-push shock, and $\lambda > 0$, $\beta \in [0, 1)$, $\kappa > 0$, $\eta > 0$ and $\rho \in [0, 1)$ are parameters. We find optimal monetary policy by minimizing the loss function (3) subject to the model equations.

a) **Optimal monetary policy under commitment.** Solve the problem above for optimal monetary policy under commitment and show that the first order conditions can be combined to the following equation:

$$-\kappa \pi_{t+k} = \begin{cases} \lambda y_{t+k} & \text{if } k = 0 \\ \lambda(y_{t+k} - y_{t+k-1}) & \text{if } k > 0 \end{cases} \tag{8}$$

b) **Interpretation.** Equation (8) can be rewritten to

$$\lambda y_{t+k} = -\kappa \sum_{j=0}^{k} \pi_{t+j} \tag{9}$$

Interpret equation (9).

c) **No persistence in the Phillips curve.** Assume now that equation (4) is given by

$$\pi_t = \kappa y_t + u_t.$$

Explain why the optimal solution under commitment and discretion are the same in this case.

Part C (25 %)

We are going to use the New Keynesian model to see how the economy responds to a discount rate shock under an interest rate rule. The model is

$$\pi_t = \beta E_t\{\pi_{t+1}\} + \kappa y_t \tag{10}$$

$$y_t = E_t\{y_{t+1}\} - (i_t - E_t\{\pi_{t+1}\}) + d_t \tag{11}$$

$$i_t = \phi_\pi \mathbb{E}_t\{\pi_{t+1}\} \tag{12}$$

$$r_t = i_t - \mathbb{E}_t\{\pi_{t+1}\} \tag{13}$$

$$d_t = \rho_d d_{t-1} + \nu_t^d, \qquad \nu_t^d \sim N(0, \sigma_d) \tag{14}$$

$$\kappa = \left(1 + \frac{\phi + \alpha}{1-\alpha}\right)\left(\frac{1-\theta}{\theta}\right)(1-\beta\theta)\left(\frac{1-\alpha}{1-\alpha+\alpha\varepsilon}\right) \tag{15}$$

where π is inflation, y is the output gap, i is the interest rate, r is the real interest rate, and d is a discount rate shock. β, κ, ϕ_π,ρ_d, σ_d, ϕ, α, θ, and ε are parameters of the model.

a) **Guess and verify.**

Find the model solution for the discount rate shock. Guess that

$$y_t = \psi_y d_t, \quad E_t\{y_{t+1}\} = \rho_d \psi_y d_t,$$
$$\pi_t = \psi_\pi d_t, \quad E_t\{\pi_{t+1}\} = \rho_d \psi_\pi d_t,$$

and show that

$$\psi_y = (1-\beta\rho_d)\Lambda,$$
$$\psi_\pi = \kappa\Lambda,$$
$$\Lambda = \frac{1}{(1-\rho_d)(1-\beta\rho_d) + \kappa\rho_d(\phi_\pi - 1)}.$$

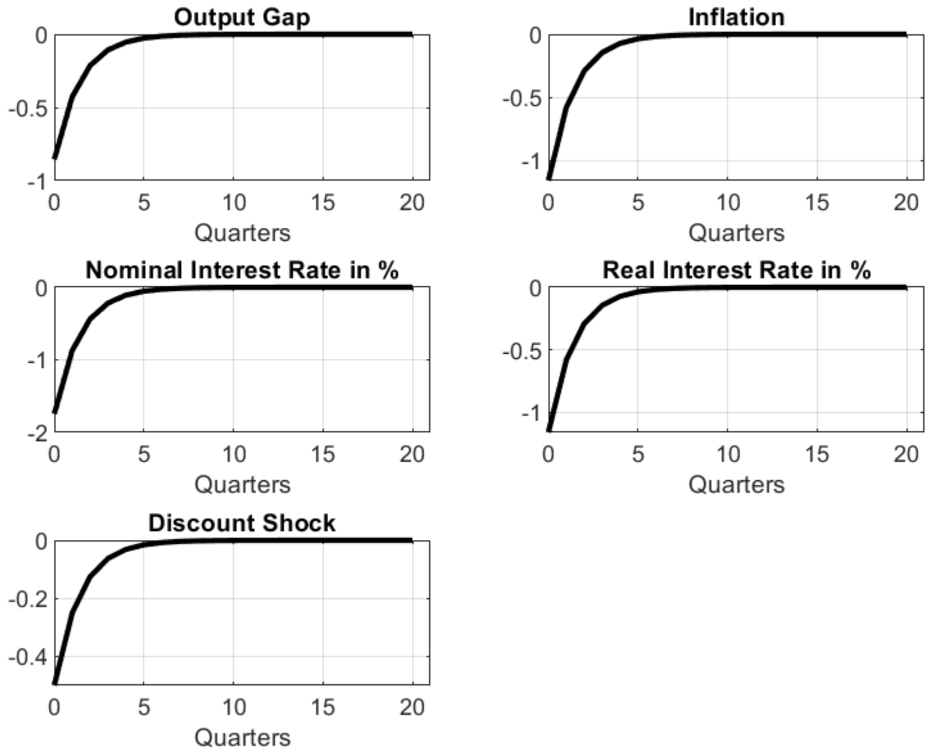

Figure 1: Impulse Responses to a Discount Shock under a Taylor Rule.

b) **Interpretation of impulse responses.**

Figure 1 shows the impulse responses of the output gap, inflation, the nominal interest rate, the real interest rate, and the discount shock to a discount shock of size -0.5. The calibration is as follows: $\beta = 0.99$, $\phi = 5$, $\alpha = 0.25$, $\varepsilon = 9$, $\theta = 0.75$, $\phi_\pi = 1.5$, and $\rho_d = 0.5$. Explain how and why the shock affects the economy in the way displayed in Figure 1.

c) **Optimal monetary policy.**

We are now going to solve for optimal monetary policy under discretion. Assume that the central bank minimizes the following loss function

$$\mathcal{L} = \frac{1}{2}\mathbb{E}_t \sum_{k=0}^{\infty} \beta^k (\lambda y_{t+k}^2 + \pi_{t+k}^2) \tag{16}$$

where $\lambda \geq 0$ is the relative weight on output in the loss function. Minimize the loss function (16) subject to the Phillips curve (10) under discretion. What is the trade-off the central bank faces? What is the optimal interest rate response to a discount shock?