ECON4325 - Monetary Policy - Spring 2023

The exam consists of two parts, A and B, with equal weight (50%). Remember to allocate your time accordingly.

Part A (50 %)

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

a) **Unconventional monetary policy.**

  i) Discuss why unconventional monetary policy was used after the global financial crisis.

  ii) How could quantitative easing (QE) and credit easing (CE) affect the price of credit and the supply of credit. Explain how QE and CE affect the balance sheet of central banks and private banks.

b) **Monetary policy and financial stability.**

Section 3 in the "Regulation of Monetary policy" in Norway 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 are the arguments for mandating monetary policy to counteract "the build-up of financial imbalances"?

  ii) What could be the implication for inflation and output gap by introducing a financial gap in a central bank's loss function? Relate the discussion to the current economic situation in Norway.

  iii) What is macroprudential policy and why was it introduced after the global financial crisis?

c) **Intratemporal Labor Choice.**

The intratemporal choice between consumption and labor is the solution to the following maximization problem

$$\max_{C_t,N_t} \frac{C_t^{1-\sigma}}{1-\sigma} - \frac{N_t^{1+\phi}}{1+\phi} \text{ subject to } P_t C_t = W_t N_t$$

i) Show that the first order conditions can be written as

$$N_t^{\phi} = \frac{W_t}{P_t} C_t^{-\sigma}. \tag{1}$$

ii) Interpret equation (1).

iii) Log-linearize equation (1).

iv) Show that $1/\phi$ is the Frisch elasticity in this model.

Part B (50 %)

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

We are going to use the New Keynesian model to see how the economy responds to a cost-push shock under an interest rate rule. We assume that the model is

$$\pi_t = \beta E_t\{\pi_{t+1}\} + \kappa y_t + u_t \tag{2}$$

$$y_t = E_t\{y_{t+1}\} - (i_t - E_t\{\pi_{t+1}\}) \tag{3}$$

$$i_t = \phi_\pi \mathbb{E}_t\{\pi_{t+1}\} \tag{4}$$

$$r_t = i_t - \mathbb{E}_t\{\pi_{t+1}\} \tag{5}$$

$$u_t = \rho_u u_{t-1} + v_t^u, \qquad v_t^u \sim N(0, \sigma_u) \tag{6}$$

$$\kappa = \left(1 + \frac{\phi + \alpha}{1 - \alpha}\right)\left(\frac{1 - \theta}{\theta}\right)(1 - \beta\theta)\left(\frac{1 - \alpha}{1 - \alpha + \alpha\varepsilon}\right) \tag{7}$$

where π is inflation, y is the output gap, i is the interest rate, r is the real interest rate, and u is a cost-push shock. β, κ, ϕ_π,ρ_u, σ_u, 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

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

and show that

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

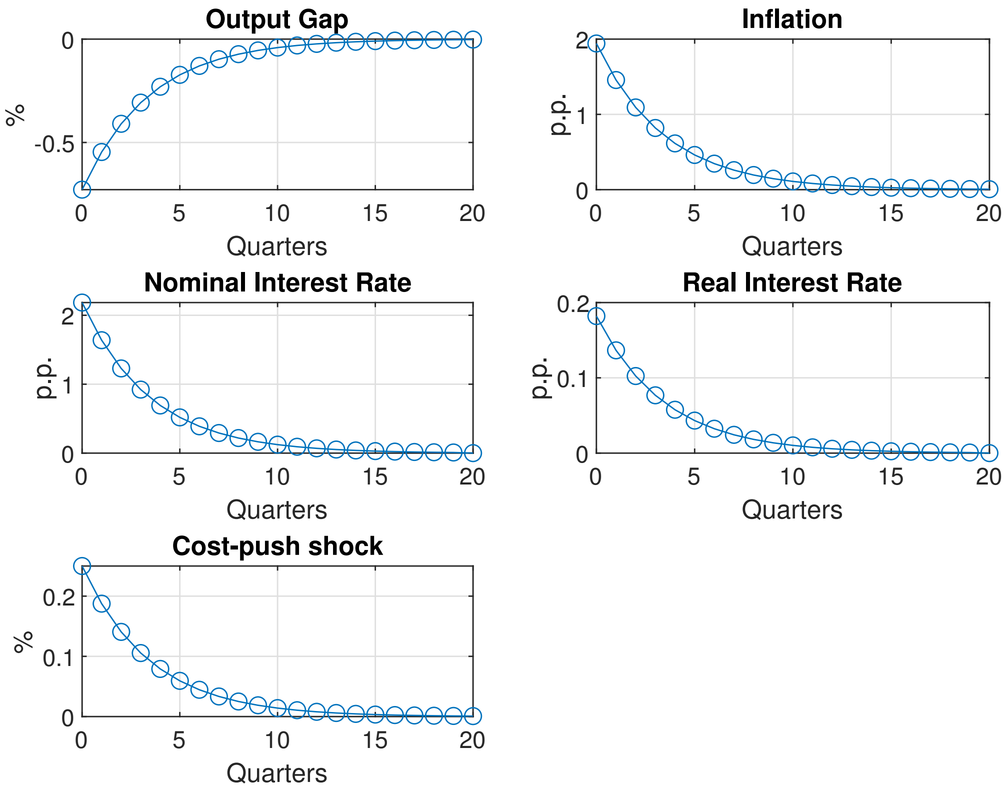

Figure 1: Impulse Responses to a Cost-Push Shock under a Taylor Rule.

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 cost-push shock to a cost-push shock. The calibration is as follows: $\beta = 0.99$, $\phi = 5$, $\alpha = 0.25$, $\varepsilon = 9$, $\theta = 0.75$, $\phi_\pi = 1.5$, and $\rho_u = 0.75$. Explain how and why the shock affects the economy in the way displayed in Figure 1.

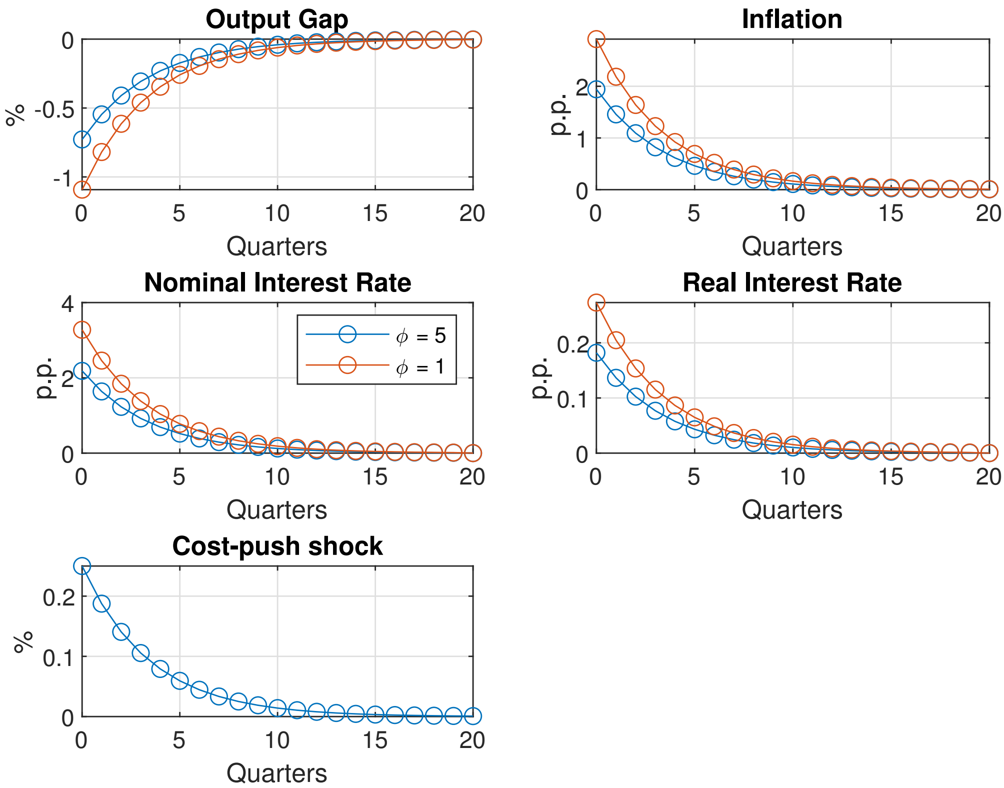

Figure 2: Impulse Responses to a Cost-Push Shock under a Taylor Rule.

c) **Parameter changes.**

We now reduce ϕ from 5 to 1. All other parameters are the same as in problem b. Figure 2 presents the impulse responses in the benchmark scenario and in the new calibration. Explain what ϕ is, how it changes the economic environment, and explain how agents alter their behavior. Next, explain why the impulse responses change in the way they do in Figure 2.

d) **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

$$\mathcal{L} = \frac{1}{2}\mathbb{E}_t \sum_{k=0}^{\infty} \beta^k (\lambda y_{t+k}^2 + \pi_{t+k}^2) \tag{8}$$

where $\lambda \geq 0$ is the relative weight on output in the loss function. Minimize the loss function (8) subject to the Phillips curve (2) under discretion. What is the trade-off the central bank faces?

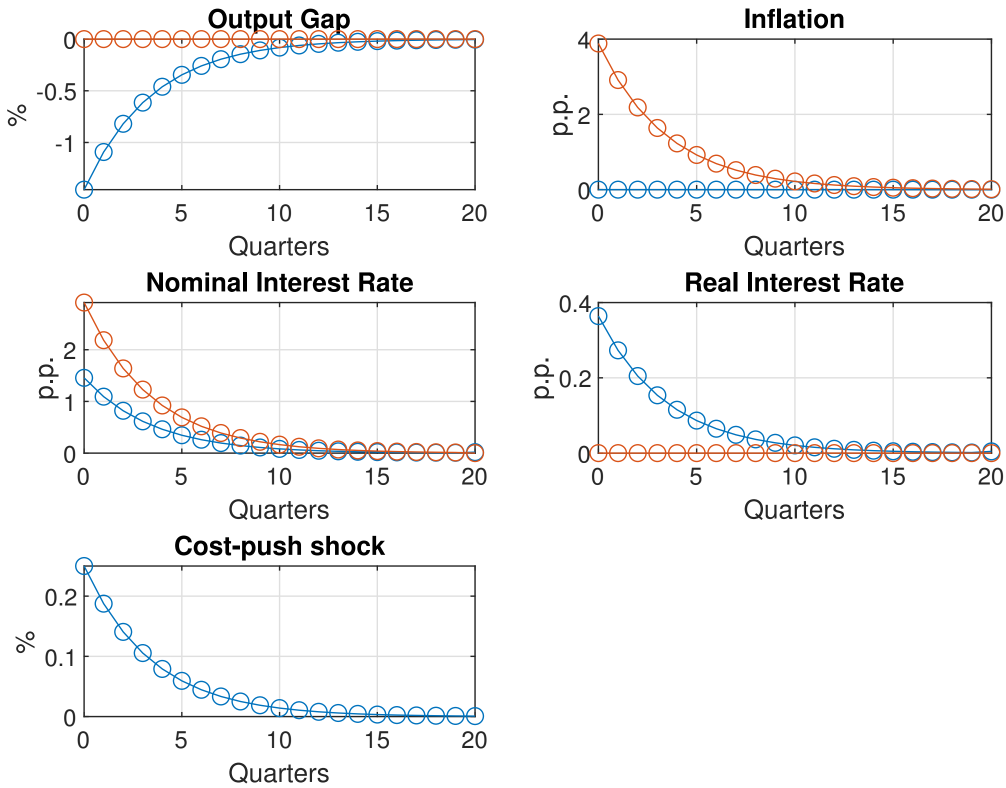

Figure 3: Impulse Responses to a Cost-Push Shock under Optimal Monetary Policy.

e) **Impulse responses under optimal monetary policy.**

Figure 3 displays the impulse responses in an economy with $\lambda = 0$ and $\lambda \to \infty$.[1] Explain in words which one (red or blue) is an economy with $\lambda = 0$ and which one is an economy with $\lambda = \infty$. Both policies ($\lambda = 0$ and $\lambda = \infty$) can be implemented in the setting with a Taylor rule above by adjusting ϕ_π in equation (4). What values of ϕ_π in a model with a Taylor rule correspond to the same policies as $\lambda = 0$ and $\lambda = \infty$, respectively, under optimal monetary policy?

Note: in this problem, the task is to fill in the table below and explain why that is the solution.

	color in Fig. 3	ϕ_π in Eqn. (4)
$\lambda = 0$		
$\lambda \to \infty$		

[1]Strictly speaking, I use λ equal to a very high finite number, not ∞.