

— PROBLEM SET 3 —  
MA1112: MACROECONOMIC THEORY PART II  
SECTION 2: MONETARY ECONOMICS  
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EXERCISE 1

(The weight is around 40 %) Consider the basic New-Keynesian model that is described in the Chapter 3 of the book. We have the New-Keynesian Phillips Curve

$$\pi_t = \beta \mathbf{E}_t \pi_{t+1} + \kappa \tilde{y}_t \quad (1)$$

and expectation augmented IS curve

$$\tilde{y}_t = \mathbf{E}_t \tilde{y}_{t+1} - \frac{1}{\sigma} (i_t - \mathbf{E}_t \pi_{t+1} - r_t^n). \quad (2)$$

The monetary policy is described by the following version of the Taylor rule:

$$i_t = \rho + \phi_\pi \pi_t + \phi_y \tilde{y}_t + v_t, \quad (3)$$

where the monetary policy shock  $v_t$  is given by the following AR(1) process

$$v_t = \rho_v v_{t-1} + \varepsilon_t^v \quad \varepsilon_t^v \sim \text{iid}(0, \sigma_v^2).$$

Derive the solutions of  $\tilde{y}_t$  and  $\pi_t$  presented in page 51 of the book. The necessary steps are also described in the slides 90-91.

EXERCISE 2

(The weight is around 60 %) Gali's book's exercise 5.4: As show in Steinsson (2003), in the presence of partial price indexation by firms, the second-order approximation to the household's welfare losses takes the form

$$\frac{1}{2} \mathbf{E}_0 \sum_{t=0}^{\infty} \beta^t [\alpha_x x_t^2 + (\pi_t - \gamma \pi_{t-1})^2],$$

where  $\gamma$  denotes the degree of price indexation to past inflation (similar role as  $\omega$  in the problem set 2). The equation describing the evolution of inflation is now given by

$$\pi_t - \gamma\pi_{t-1} = \kappa x_t + \beta \mathbb{E}_t(\pi_{t+1} - \gamma\pi_t) + u_t,$$

where  $u_t$  represents an exogenous i.i.d. cost-push shock.

- a) Determine the optimal policy under discretion.
- b) Determine the optimal policy under commitment.
- c) Discuss how the degree of indexation  $\gamma$  affects the optimal responses to a transitory cost-push shock under the previous two scenarios.

Note, that the problem will be much easier to solve if you make the following change of variable:  $\pi_t^* \equiv \pi_t - \gamma\pi_{t-1}$ .