ENSAE Paris - IP Paris
Master in Econ. - IP Paris
Academic year : 2022-2023
First exam session (3A-M2, S1)

Exam of the course "Monetary Economics"

Two hours. Course presentation slides allowed, in paper format, possibly with hand-written annotations (on the slides or on separate sheets). No other document allowed, nor any electronic device (calculator, mobile phone...).

1 Exercise (10 points)

The goal of this exercise is to study some positive and normative implications of partial price indexation to past inflation. To that aim, we make the same assumptions as in Chapter 1 of the course, except that :

- for simplicity, we remove cost-push shocks (i.e. we set $\varepsilon_t = \varepsilon$) and we assume constant returns to scale (i.e. we set $\alpha = 0$, so that the production function is $Y_t(i) = A_t N_t(i)$) ;
- when a firm i cannot re-optimize its price at date t, we no longer assume that it keeps the same price as at date $t-1$ ($P_t(i) = P_{t-1}(i)$) ; instead, we assume that it partially indexes its new price on past inflation : $P_t(i) = P_{t-1}(i)\Pi_{t-1}^{\omega}$, where $\Pi_{t-1} \equiv P_{t-1}/P_{t-2}$ and $\omega \in [0,1]$.

We keep exactly the same notations as in the course. **You can answer any question even if you have not answered the previous questions : to do so, just use the results provided in the previous questions.**

Question 1 Justify briefly why the aggregate price index $P_t \equiv [\int_0^1 P_t(i)^{1-\varepsilon} di]^{\frac{1}{1-\varepsilon}}$ can be rewritten as

$$P_t = \left[\theta \left(P_{t-1}\Pi_{t-1}^{\omega}\right)^{1-\varepsilon} + (1-\theta)\left(P_t^*\right)^{1-\varepsilon}\right]^{\frac{1}{1-\varepsilon}}. \quad (1)$$

Log-linearize (1) around the zero-inflation-rate steady state and get

$$\pi_t = \theta\omega\pi_{t-1} + (1-\theta)\left(p_t^* - p_{t-1}\right). \quad (2)$$

Briefly interpret this equation.

Question 2 Justify why the optimization problem of a firm re-optimizing its price at date t is

$$\underset{P_t^*}{Max} \sum_{k=0}^{+\infty} \theta^k \mathbb{E}_t \left\{Q_{t,t+k}\left[\Pi_{t-1,t+k-1}^{\omega} P_t^* Y_{t+k|t} - \Psi_{t+k}(Y_{t+k|t})\right]\right\}$$

$$\text{subject to} \quad Y_{t+k|t} = \left(\frac{\Pi_{t-1,t+k-1}^{\omega} P_t^*}{P_{t+k}}\right)^{-\varepsilon} C_{t+k} \quad \text{for} \quad k \in \mathbb{N},$$

where $\Pi_{t-1,t+k-1} \equiv P_{t+k-1}/P_{t-1}$. Show that the first-order condition of this problem is

$$\sum_{k=0}^{+\infty} \theta^k \mathbb{E}_t \left\{Q_{t,t+k} Y_{t+k|t}\left[\Pi_{t-1,t+k-1}^{\omega} P_t^* - \left(\frac{\varepsilon}{\varepsilon-1}\right)\Psi_{t+k}'(Y_{t+k|t})\right]\right\} = 0. \quad (3)$$

Question 3 Log-linearize (3) around the zero-inflation-rate steady state and get

$$p_t^* = \mu + (1-\beta\theta)\sum_{k=0}^{+\infty}(\beta\theta)^k \mathbb{E}_t\left\{mc_{t+k} + p_{t+k} - \omega(p_{t+k-1} - p_{t-1})\right\}, \tag{4}$$

where $\mu \equiv \log\left[\varepsilon/(\varepsilon-1)\right]$ and $mc_{t+k} \equiv \log[\Psi'_{t+k}(Y_{t+k|t})] - p_{t+k}$. Interpret this equation.

Question 4 Rewrite (4) as

$$p_t^* - \mu - \omega p_{t-1} = \beta\theta\left[\mathbb{E}_t\left\{p_{t+1}^*\right\} - \mu - \omega p_t\right] + (1-\beta\theta)\left(mc_t + p_t - \omega p_{t-1}\right). \tag{5}$$

Combine (2) and (5) to get the Phillips curve

$$\pi_t - \omega\pi_{t-1} = \beta\mathbb{E}_t\left\{\pi_{t+1} - \omega\pi_t\right\} + \chi\left(\mu + mc_t\right), \tag{6}$$

where $\chi \equiv (1-\theta)(1-\beta\theta)/\theta$. Interpret this Phillips curve.

Question 5 In this model, the instantaneous welfare loss function is $(\pi_t - \omega\pi_{t-1})^2 + \lambda(x_t - x^*)^2$. Interpret this welfare loss function.

2 Commentary (10 points)

Comment briefly, in the light of the course, upon the following excerpt from the speech entitled "Forward Guidance as a Monetary Policy Tool : Considerations for the Current Economic Environment" made by M.W. Bowman – Federal Reserve governor – on October 12, 2022, and, in so doing, explain in particular why, in the New Keynesian framework, it may or may not be useful to provide forward guidance, depending on whether the policy rate is at the zero lower bound or above.

"*Forward guidance is official FOMC communication that is intended to signal to the public the likely future path of monetary policy. (...) Over about the past 10 years, the use of explicit forward guidance has become an integral part of the Federal Reserve's monetary policy toolkit. In fact, explicit forward guidance is generally seen by many as especially helpful when use of the Committee's main monetary policy tool (changes to the federal funds rate) is constrained. This is when the rate has been lowered to zero, which we also call the effective lower bound. (...) With the federal funds rate remaining at near-zero levels for several years after that [2008 financial] crisis, (...) explicit forward guidance was seen as providing monetary policy accommodation when the current setting of the federal funds rate could not. (...)*

[T]oday's circumstances are much different from those we faced during most of the decade that followed the 2008 financial crisis. I will focus here on two features of our current environment that I see as especially relevant for assessing the role of explicit forward guidance as a monetary policy tool in the current conduct of monetary policy. The first is that with inflation unacceptably high and the resulting urgent need to remove monetary policy accommodation, the federal funds rate is no longer near zero. (...) The second is that the outlook for inflation and economic activity is especially uncertain, with significant two-sided risks. Gone are the days when the risks to the outlook were skewed to the downside, especially with respect to inflation. (...) In our current environment, I view the benefits of providing explicit forward guidance as lower than they were in the years immediately after the 2008 crisis."