Final Exam

05/01/2024

Answer the following questions. Show and explain your work instead of only writing the final answers. Read the entire exam before starting to answer it.

This exam is open book: you can consult all materials, but do not communicate with anyone else

1. (20 points) **Short Answer/Essay questions**

   (a) In deriving the modern Aggregate Supply curve: the New Keynesian Phillips Curve, we emphasized two key ingredients: 1) monopolistic competition with CES utility, and 2) the Calvo-style probabilistic price changing probability, in addition to the general focus on rational expectations and micro-foundation. Explain why these two assumptions are needed.

   (b) At a job interview, your potential employer asks you to discuss the likely outcomes of a government stimulus program that provides a one-time transfer of $1.5K to all households.

   Hint: As with most interviews, the aim is to show off your knowledge and how you can approach the question from various perspectives and provide a synthesized analysis, not to give one short answer. You may want to discuss different variables, what their responses may depend on, in both the short versus long-run, and other aspects you can think of.

   (c) (True/False/Uncertain) Explain: "According to the Calvo model of price adjustment, the higher the parameter θ, the more the COVID relief stimulus package should help boost output."

   (d) (True/False/Uncertain) Explain: Consider an economy where firms set prices that are fixed over one-year intervals, and the ideal price for each firm at time t is equal to the money supply at time t. If price-setting is staggered such that a quarter of the firms set prices in the beginning of each quarter, the effect of monetary policy can last beyond one year.

2. (15 points) A consumer maximizes a life-time utility as follows (starting in period t):

$$\max_{\{C_s\}_{s=t}^{\infty}} \mathbb{E}_t \sum_{t=s}^{\infty} \beta^{s-t} \log C_s$$

   subject to:

$$A_{t+1} = \tilde{R}_{t,t+1}(\tilde{Y}_t + A_t - C_t), \quad \forall\, t$$

   where C_t is consumption, A_t is the value of assets (wealth) at t, $\tilde{Y}$ is the income at t, and $\tilde{R}$ is the gross return on wealth at t. Variables with a tilde ($\tilde{x}$) are stochastic.

   Derive the consumer's Euler equation.

   [Hint: the consumer should pick their assets and consumption optimally in every period. Also notice that the assets chosen at t, i.e., A_{t+1} will show up in more than one period, making this an inter-temporal problem]

3. (10 points) Consider the following impulse responses of an economy to an exogenous shock "u". Variables x, pi, and p are as defined in the three equation New Keynesian model (output gap, inflation, prices level).

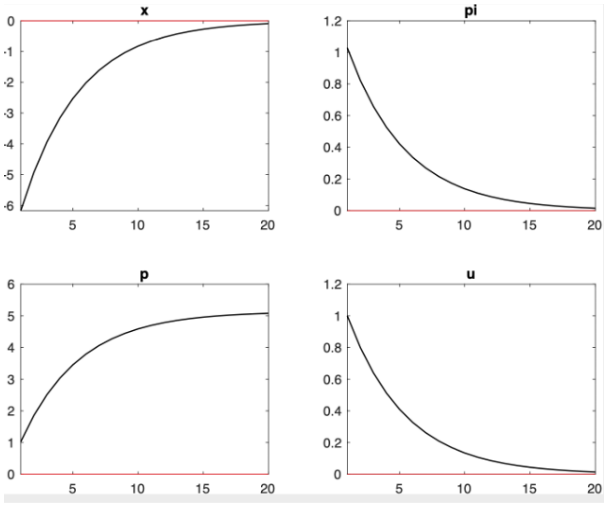

Figure 1: Impulse response of variables of the model to a 1 std. dev. "u" shock

The plots above depict the impulse responses of the standard 3 equation NK-DSGE model. What do these figures say? Is the shock permanent (random-walk) or transitory (white-noise)? What kind of shock in the model would you guess u refers to?

4. (20 points) Suppose a final consumption producer uses intermediate inputs produced by monopolistically competitive firms according to the production function:

$$Y_t = \left[\int_0^1 y_{i,t}^{\frac{\theta-1}{\theta}} d_i\right]^{\frac{\theta}{\theta-1}}$$

where $\theta > 1$. The final consumption producer operates in a perfectly competitive market and takes the price of consumption, P_t, as given. The producer chooses how much to demand of each individual input $y_{i,t}$ to maximize profits given by:

$$P_t Y_t - \int_0^1 p_{i,t} y_{i,t} d_i$$

subject to the production function above, where $p_{i,t}$ is the price the final producer pays for intermediate input i.

(a) Show that optimal input demand by the final good producer is determined by

$$y_{i,t} = \left(\frac{p_{i,t}}{P_t}\right)^{-\theta} Y_t$$

(b) Explain this demand function

Intermediate good producers produce goods with the production function

$$y_{i,t} = Z_t N_{i,t}$$

where Z_t is exogenous productivity and $N_{i,t}$ is labor employed by producer i. This production function implies that the marginal cost of production for the intermediate producer is w_t/Z_t, where w_t is the real wage (in units of the final consumption good). The producer sets the price $p_{i,t}$ to maximize

$$p_{i,t}y_{i,t} - P_t\frac{w_t}{Z_t}y_{i,t}$$

subject to the demand function obtained above.

(c) Show that optimal price setting implies:

$$\frac{p_{i,t}}{P_t} = \frac{\theta}{\theta - 1}\frac{w_t}{Z_t}$$

(Bonus) Optional question: Answer 1 out of the 3 choices below.

(a) Describe how the presence of financial frictions can alter the quantitative responses of an economy to, e.g. a negative productivity or recessionary shock.

(b) Describe in your own words what the dynamic inconsistency problem is. In the context of monetary policy making, how can dynamic inconsistency lead to inflation bias?

(c) What is the equity premium puzzle and what are some of the proposed solutions?