Example State-Dependent Pricing 2

1 Intoduction

- Some comment

2 Model

- Production function
$$y_t(h) = Z_t a_t(h) \ell_t(h) \tag{2.1}$$
- Profits
- Each firm chooses prices {} in order to maximize its market value
$$\mathbb{E}_t \sum_{\tau=0}^{\infty} D_{t,t+\tau} \Pi_{t+\tau}(h) \tag{2.2}$$
where nominal profits in period t are given by
$$\Pi_t(h) = p_t(h) y_t(h) - W_t \ell_t(h) - \kappa_t(h) \mathbb{1}\{p_t(h) \neq p_{t-1}(h)\} \tag{2.3}$$
- Value function for the firm
$$\begin{aligned} V_t\left(a_t(h), \frac{p_{t-1}(h)}{P_t}, \xi_t;\ \cdot\ \right) = \max_p \Bigg\{ \Pi^R \left(a_t(h), \frac{p_{t-1}(h)}{P_t}, \cdot\right) - \mathbb{1}\{p \neq p_{t-1}(h)\}\xi + \\ + \mathbb{E}_t\left[D^R_{t,t+1} V_{t+1}\left(a_{t+1}(h), \frac{p}{P_{t+1}}, \xi_{t+1}, \cdot\right)\right]\Bigg\} \end{aligned} \tag{2.4}$$
- Rewriting the problem
$$v(a, \tilde{p};\ \cdot\ ) = \int_{\xi} \max\Big\{V^A(a,\tilde{p}) - \xi w(\cdot),\ V^N(a,\tilde{p})\Big\} dH(\xi)$$
where
$$\begin{aligned} V^A(a, \tilde{p}_{-1},\ \cdot\ ) &= \max_{\tilde{p}} \left\{ \Pi^R\left(a,\tilde{p},\cdot\right) + \mathbb{E}\Big[D^R(\cdot,\cdot) v\Big(a, \tilde{p}\pi^{-1}_{t+1}\Big)\Big]\right\} \\ V^N(a, \tilde{p}_{-1},\ \cdot\ ) &= \Pi^R\left(a,\tilde{p}_{-1},\cdot\right) + \mathbb{E}\Big[D^R(\cdot,\cdot) v\Big(a', \tilde{p}_{-1}\pi^{-1}_{t+1}\Big)\Big] \end{aligned} \tag{2.5}$$
The firm will choose to pay the fixed cost iff $V^A - \xi \geq V^N$. Hence, there is a unique threshold which makes the firm indifferent between these two options
$$\tilde{\xi}(a, \tilde{p};) = \frac{V^A(a,\tilde{p}) - V^N(a,\tilde{p})}{w}$$
- The firm value function V , adjusted by the marginal utility of the representative households, is therefore given by

2.1 Household

2.2 Equilibrium

Equilibrium. *A recursive competitive equilibrium is a set of value functions* $\left\{v, V^A, V^N\right\}$*, policies* $\{\tilde{p}, \xi\}$ *for the firm and household* $\left\{C(), N()\right\}$*, and wage* w *such that*

1. *Firm optimization*
   Taking w, Y *as given the value function solves the Bellman equation and the* $\{\tilde{p}, \xi\}$ *are the associated policies*

2. *Household optimization*

$$R_t \mathbb{E}\left\{\beta \frac{u_c(C_{t+1})}{u_c(C_t)} \frac{P_t}{P_{t+1}}\right\} = 1 \qquad N^{1/\varphi} = \frac{1}{\chi} C^{-\sigma} w$$

3. *Market clearing*
   - *Labor market*

$$\left(\frac{1}{\chi} C^{-\sigma} w\right)^{\varphi} = \int \left[\frac{\tilde{p}(a, \tilde{p}_{-1})^{-\epsilon} Y}{a} + \left(\int^{\xi()} \zeta dH(\zeta)\right) w\right] d\mu \tag{2.6}$$

   - *Goods market*

$$C_t = Y_t = \left(\int y(h)^{\frac{\epsilon-1}{\epsilon}} d\mu\right)^{\frac{\epsilon}{\epsilon-1}} \tag{2.7}$$

   where $y(a, \tilde{p}_{-1}) = \left(\tilde{p}(a, \tilde{p}_{-1})\right)^{-\epsilon} Y$

4. *Law of motion Distribution*

2.3 Computation

Compute Steady State

1. Guess a value for the wage w^*

2. Given w^* compute the firm's value function by iterating on Bellman equation. Note that Y can be suppressed from the stationary Bellman because it is a multiplicative constant.

3. Using firm's decision rules, compute the invariant distribution

4. Compute aggregate supply using the invariant distribution

$$\frac{C}{Y} = \left(\int \tilde{p}(a, \tilde{p}_{-1})^{1-\epsilon} d\mu\right)^{\frac{\epsilon}{\epsilon-1}}$$

   If < 1 increase w otherwise decrease w (*Check on code*)