## Exercises and Notes on Bayesian Estimation of DSGE Models, by E.P. Herbst and F. Schorfheide

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## 1 Small NK Model

The most basic example of a DSGE model can be the standard version of the Neo-Keynesian model.

## 1.1 The Environment

## 1.1.1 Firms

Final good producers:

$$\max_{(Y_t(j))_{j \in [0,1]}} P_t Y_t - \int_0^1 P_t(j) Y_t(j) \ dj$$
s.t. 
$$Y_t = \left[ \int_0^1 Y_t(j)^{1-\nu} \ dj \right]^{\frac{1}{1-\nu}}.$$

First order conditions imply the demand for each intermediate good:

$$Y_t(j) = \left\lceil \frac{P_t(j)}{P_t} \right\rceil^{-\frac{1}{\nu}} Y_t \qquad \forall j \in [0, 1].$$

Intermediate goods producers produce with:

$$Y_t(j) = A_t N_t(j) \qquad \forall j \in [0, 1].$$

They set prices subject to quadratic adjustment costs:

$$AC_t(j) = \frac{\phi}{2} \left[ \frac{P_t(j)}{P_{t-1}(j)} - \pi \right]^2 Y_t(j)$$
  $\forall j \in [0, 1],$ 

and each firm j solves the following at each period t:

$$\max_{N_{t}(j), P_{t}(j)} \mathbb{E}_{t} \left( \sum_{s=0}^{\infty} \beta^{s} Q_{t+s|t} \left[ \frac{P_{t+s}(j)}{P_{t+s}} Y_{t+s}(j) - W_{t+s} N_{t+s}(j) - A C_{t+s}(j) \right] \right).$$

- 1.1.2 Households
- 1.1.3 Exogenous Processes
- 1.2 Optimality and Equilibrium Conditions
- 1.3 Log-Linearization