ECON 815

Optimal Monetary Policy

Winter 2014

Long-run Wedge

Efficient allocation:

$$\frac{C_t^\sigma}{(1-N_t)^\eta} = \alpha A N_t^{\alpha-1}$$

Monopolistic competition:

$$\frac{C_t^\sigma}{(1-N_t)^\eta} = \frac{W_t}{P_t} = \frac{\epsilon-1}{\epsilon}\alpha A N_t^{\alpha-1}$$

so that labour is *paid less* than its marginal product.

Wedge in the labour supply condition similar to a tax on labour income (unemployment?).

A subsidy for labour (financed by a lump-sum tax) can remove this inefficiency and is given by

$$\frac{\epsilon-1}{\epsilon}(1+\tau) = 1.$$

Short-run Wedge

Sticky prices lead to *variation* in the average mark-up.

$$\mu_t = \frac{P_t}{W_t} \alpha A N_t^{\alpha-1} \neq \mu$$

Differences in prices lead to differences in demand/consumption.

$$C_t(i) \neq C_t(j)$$

Hence, we need a time-varying subsidy that stabilizes the mark-up.

Alternatively, monetary policy can counteract price rigidities.

Full Stabilization of Prices

Assume $\tau_t > 0$ so that $y_t^n = y_t^*$ and we are in SS (i.e. P is constant).

Goal: Monetary policy wants to maximize welfare.

Idea: stabilize the average mark-up perfectly.

Then firms have no reason to change prices and $P_t^* = P_{t-1} = P$.

In other words:

1. Choose nominal interest rate so that $i = r_t^n$.
2. This implies that output gap is *zero in equilibrium forever*.
3. Phillips curve gives zero inflation given optimal price setting by firms.

Problem I – Multiple Solutions

For $i_t = r_t^n$, we have

$$\begin{bmatrix} x_t \\ \pi_t \end{bmatrix} = \begin{pmatrix} 1 & \frac{1}{\sigma} \\ \kappa & \beta + \frac{\kappa}{\sigma} \end{pmatrix} \begin{bmatrix} E_t[x_{t+1}] \\ E_t[\pi_{t+1}] \end{bmatrix}$$

Unique (stationary) solution requires that number of EV of the matrix are both less than 1.

But only one is, so that there are multiple (stable) solutions.

Again sunspots are possible, implying the monetary policy does not have control over prices and, hence, welfare.

Digression – Blanchard & Kahn (1980)

Setting – stable rational expectations equilibiria

$$E_t[y_{t+1}] = Ay_t + B\epsilon_{t+1}$$

- y is a vector of state (backward looking) and control (forward looking) variables
- ϵ is shocks
- Key: eigenvalues of A that are greater than 1
- Why? otherwise lots of freedom through ϵ's, so that we need to pin down controls in an exact way

Case 1 – Uniqueness and Saddle-Path Stability: number of EV greater than 1 equal to number of control variables implies

Case 2 – Multiplicity: not enough EV larger than 1

Case 3 – No stable solution: too many EV larger than 1

Problem II – r^n is not observable

Consider welfare losses given by

$$W = \frac{1}{2} E_0 \left[\sum_{t=0}^{\infty} \beta^t \left(\frac{\kappa}{\lambda} x_t^2 + \frac{\epsilon}{\lambda} \pi_t^2 \right) \right]$$

or in form of an *average* per-period loss function

$$L = \frac{1}{2} \left[\frac{\kappa}{\lambda} Var[x_t] + \frac{\epsilon}{\lambda} Var[\pi_t] \right]$$

where $\kappa/\lambda = \sigma + \frac{\eta + (1-\alpha)}{\alpha}$ and losses are to be understood as % losses from steady state.

Key: all the frictions influence only the inflation variability term.

Consider now the rule

$$\begin{aligned} i_t &= \rho + \phi_\pi \pi_t + \phi_y (\log Y_t - \log Y^*_{SS}) \\ &= \rho + \phi_\pi \pi_t + \phi_y (\log Y_t - \log Y^n_t + \log Y^n_t - \log Y^*_{SS}) \\ &= \rho + \phi_\pi \pi_t + \phi_y x_t + v_t \end{aligned}$$

where only actual output measures matter and Y^*_{SS} is the efficient steady state.

This is the same specification as with monetary policy shocks. Hence, should set $\phi_y \simeq 0$ to minimize variability.

This looks like an inflation targeting regime.

General Problem

We have some loss function for the central bank.

$$\min_{x_t,\pi_t} E_0 \left[\sum_{t=0}^{\infty} \beta^t f(\pi_t, x_t) \right]$$

We have a Phillips curve as a constraint.

$$\pi_t = \beta E_t[\pi_{t+1}] + \kappa x_t + u_t$$

Key variables are *model dependent*:

- f is some function related to welfare (approximation)
- x_t is some measure of the output gap
- κ is a parameter
- u_t captures shocks relative to the relevant output gap

The IS equation is only relevant for implementing the optimal policy through nominal interest rates.

Example I

Assumption: steady state is efficient, but there are short-run deviations

Output gap: $x_t = y_t - y_t^*$

Loss function: $f = \pi_t^2 + \omega x_t^2$, with ω possibly set to $\frac{\kappa}{\epsilon}$

Shocks: $u_t = \kappa(y_t^* - y_t^n)$

We can also interpret $\omega = \frac{\kappa}{\epsilon}$ as a structural parameter.

Example II

Assumption: long-run deviations from efficient steady state

Short-run output gap: $x_t = y_t - y_t^*$

Long-run output gap: $x = y_{SS}^n - y_{SS}^* < 0$

Loss function: $f = \frac{1}{2}\left(\pi_t^2 + \omega(x_t - x)^2\right) - \frac{\lambda}{\epsilon^2}(x_t - x)$

The last term captures the welfare costs of long-run distortions.

Shocks: $u_t = \kappa\left((y_t^* - y_{SS}^*) - (y_t^n - y_{SS}^n)\right)$