The Scandinavian model of inflation
ECON4330 Spring 2008 Lecture 13 Part II (Part I continues lecture 12)

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The Scandinavian model of inflation: Assumptions

Two industries, traded and non-traded

Small country, price taker for traded goods

Fixed exchange rate

Constant labor shares

Same wages in both sectors

The Scandinavian model of inflation: Equations

$$
\begin{aligned}
p_t &= e + p_{t*} & (1) \\
w &= p_t + a_t & (2) \\
p_n &= w - a_n & (3) \\
p &= \alpha p_n + (1-\alpha)p_t & (4)
\end{aligned}
$$

Endogenous: p_t, p_n, p and w.
Exogenous: p_{t*}, e, a_t and a_n.

Symbols

p_t Traded goods inflation $\dot{P}_t/P_t$

p_n Non-traded goods inflation $\dot{P}_n/P_n$

p_{t*} Traded goods inflation abroad $\dot{P}_{t*}/P_{t*}$

p Average rate of inflation

e Rate of depreciation $\dot{E}/E$

w Rate of wage increases $\dot{W}/W$

a_t Rate of productivity growth in t-industry

a_n Rate of productivity growth in n-industry

α Weight on non-traded goods in the consumer price index

Solution: Fixed exchange rate

Wage growth determined by imported inflation and productivity growth in t-industry (insert (1) in (2)):

$$w = e + p_{t*} + a_t \tag{5}$$

Price growth on n-goods:

$$p_n = w - a_n = e + p_{t*} + a_t - a_n \tag{6}$$

Overall inflation rate determined by imported inflation and gap in productivity growth:

$$p = e + p_{t*} + \alpha(a_t - a_n) \tag{7}$$

Growth in real wage

$$w - p = \alpha a_n + (1 - \alpha)a_t \tag{8}$$

Summary of results

Nominal wage growth determined by the "scope", the sum of

- productivity growth in t-industry
- price increases on t-goods

Overall inflation determined by

- imported inflation (price growth on t-goods)
- the gap in productivity growth between the t- and n-industries.

Real wage growth determined by

- average productivity growth in the economy

Some questions

Why fixed labor share?

- ▶ Cobb-Douglas?
- ▶ Monopolistic pricing in n-industry?
- ▶ Property of bargaining outcome in t-industry?
- ▶ Property of steady state when the required rate of return on capital is constant (perhaps given in international capital markets)

Descriptive or normative?

What if exchange rate is floating?

Solution: Inflation target

Same equations but $p = \bar{p}$ exogenous, e endogenous
Twist equation for growth in real wage (8):

$$w = \bar{p} + \alpha a_n + (1 - \alpha)a_t \tag{9}$$

$$p_n = w - a_n = \bar{p} + (1 - \alpha)(a_t - a_n) \tag{10}$$

$$p_t = w - a_t = \bar{p} + \alpha(a_n - a_t) \tag{11}$$

$$e = p_t - p_{t*} = \bar{p} - p_{t*} + \alpha(a_n - a_t) \tag{12}$$

Results: Inflation target

▷ Nominal wage growth equal to inflation target plus average productivity growth

▷ Real wage growth equal to average productivity growth

▷ Nominal rate of depreciation determined by
  - difference between inflation target and international inflation on traded goods
  - sectoral gap in productivity growth

Bringing in the rest of the world

Assume:

- same equations
- same share of non-traded goods
- always inflation target $\bar{p}_*$

Analogous to (11):

$$p_{t*} = w_* - a_{t*} = \bar{p}_* + \alpha(a_{n*} - a_{t*}) \tag{13}$$

Also

$$w_t - a_t = p_t = e + p_{t*} = e + w_{t*} - a_{t*}$$

Real exchange rates

Irrespective of monetary regime at home:

$$w - a_t = e + w_* - a_{t*} \tag{14}$$

$$p = e + \bar{p}_* + \alpha[(a_t - a_n) - (a_{t*} - a_{n*})] \tag{15}$$

- (14) Implies constant real exchange rate in terms of unit wage costs for traded goods
- (15) Implies relative PPP in consumer prices, but only if sectoral gaps in productivity growth are equal
- (15) Can be used to determine p under fixed rates, e under inflation targeting

A wider context

Scandinavian model describes the relationship between the growth rates of prices and wages in the steady state of a dynamic two-sector model with:

- Competitive markets
- Homogenous production functions in labor and capital in both markets
- Labor mobile between sectors
- Capital for financing investments can be obtained from competitive international markets at a constant real rate

The dynamic model determines *levels*, not just rates of change (CH. 7.4-7.5)

Temporary deviations from the "main course"

Links between profitability, wage growth and investment help produce convergence to steady state

Wage formation as a stabilizing mechanism

Simplify:

No productivity growth

Prices on n-goods always grow with the same rate as wages

Assume wage growth determined by:

$$\dot{W}/W - \dot{P}_t/P_t = G(N(W/P_t), W/P_t) \tag{16}$$

1. Demand pressure in the labor market, $G_1 > 0$
2. Profitability in traded goods industry, $G_2 < 0$

Define real wage $\omega_t = W/P_t$, write (16) as

$$\dot{\omega}_t = G(N(\omega_t), \omega_t) \tag{17}$$

$$\dot{\omega}_t = g(N(\omega_t), \omega_t)$$

Stable differential equation in ω_t (assuming $N' < 0$)

$$\frac{d\dot{\omega}_t}{d\omega_t} = g_1 N' + g_2 < 0$$

Conclusions

  ▷ In steady state $\dot{\omega}_t = 0$, $\dot{w} = \dot{e} + \dot{p}_{t*}$, and the equations of the Scandinavian model holds

  ▷ Concern in wage bargaining for profitability of t-industry contributes to stability irrespective of monetary regime

  ▷ Shifts in labor demand may produce equilibria with different levels of N and ω_t (see Ch. 7.3).

  ▷ Active use of the interest rate still required to produce nominal stability both with an exchange rate target and an inflation target

Caution: An equilibrium with a high W/P_t can be undermined in the long run by lack of investment in traded-goods industry.