Materials 1

Laura Gáti

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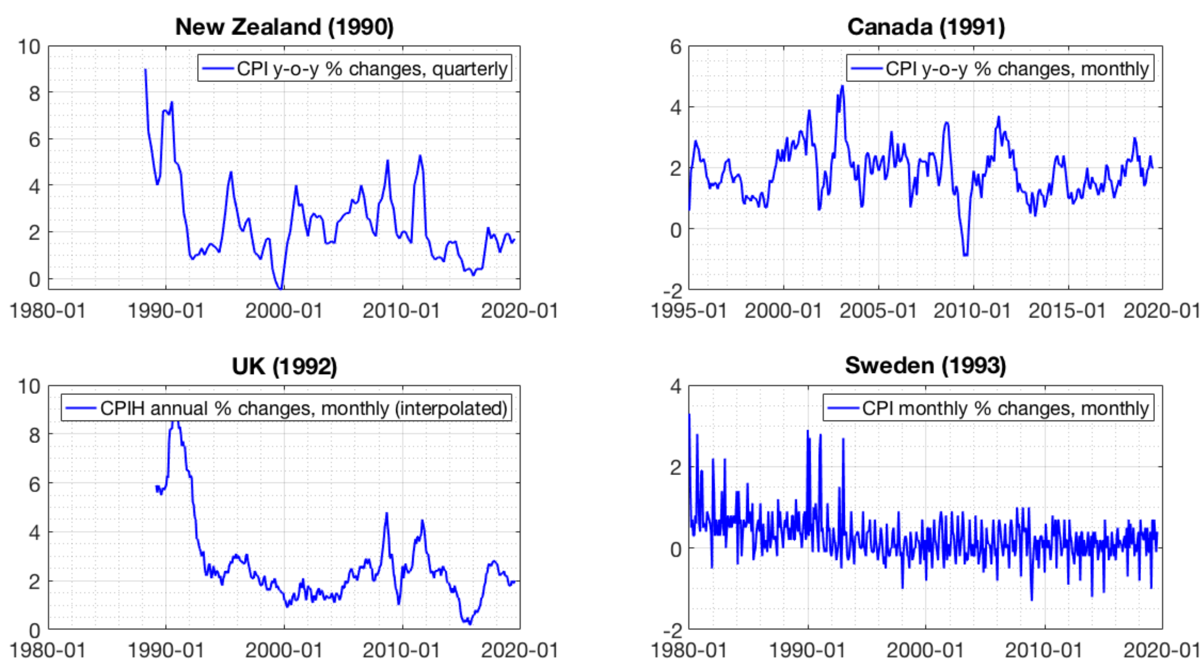
Overview

1 Some inflation targeting countries

Figure 1: 4 inflation targeting countries (switch to IT year in brackets)



2 Cost-push shock in NK model w/o and w/ learning - Intuition

Same clarification (based on Justiniano & Primiceri's Bank of Belgium presentation 2010):

- efficient output: output under flexible prices and no distortions
- potential output: output under flexible prices but imperfect competition, yet constant markups
- natural output: output under flexible prices but imperfect competition AND nominal frictions (time-varying markups)

→ Eric Sims: "2 distortions in the NK model: LR distortion (imperfect competition) and SR distortion (price rigidity)." I think:

1. In st.st, potential output = natural output.
2. In an NK model, mon. policy stabilizes actual output to potential output (= st.st. natural output). In other words, mon. pol can't undo a LR distortion because money is neutral in the LR.

A cost-push shock:

- is a shock to the steady-state markup μ: $\mu = \frac{\theta}{\theta - 1}$, where θ = el. of substitution between varieties → it's a shock to the level of LR distortions (to the distance to perfect competition).
- Note that a cost-push shock isn't the only thing that can move markups in the NK model: out of st.st., marginal costs are an increasing function of demand (and thus of output gaps), and so demand shocks increase marginal costs, decreasing markups.
- I think it is for this reason that Clarida, Gali & Gertler (1999) call cost-push shocks "all shocks that are not demand that move markups."

Why think about cost-push shocks? → because they are the only shock that introduces an inflation-output gap tradeoff for the mon. authority. Key point: I think that this tradeoff is amplified is expectations are allowed to move around. That is, I think one can make a case for anchoring expectations here. I'm going to lay out the argument in three steps:

- Clarida, Gali & Gertler (1999)'s Result 1: for mon. policy w/o commitment, cost-push shocks introduce an inflation-output gap tradeoff in a NK model. If expectations are allowed to adjust, the tradeoff is amplified.

- Let's see the same intuition on the plain-vanilla 3-equation NK model w/ commitment (a Taylor rule). f expectations are allowed to adjust, the tradeoff is amplified.
- Let's look at the CEMP economy: we can see the same intuition at work as in the 3-equation NK model.

2.1 Clarida, Gali & Gertler (1999)'s Result 1

The CB's problem is the standard mon. policy problem under discretion:

$$\max -\frac{1}{2}(\alpha x_t^2 + \pi_t^2) + F_t \quad \text{s.t} \quad \pi_t = \lambda x_t + f_t \tag{1}$$

where expectations F_t and $f_t = \beta \mathbb{E}\, \pi_{t+1} + u_t$ are taken as given by the CB, and u_t is a cost-push shock (appended to the NKPC). Optimality conditions to this problem, subbing f_t in, are:

$$x_t = -\frac{\lambda}{\alpha + \lambda^2}(\beta \mathbb{E}\, \pi_{t+1} + u_t) \tag{2}$$

$$\pi_t = \frac{\alpha}{\alpha + \lambda^2}(\beta \mathbb{E}\, \pi_{t+1} + u_t) \tag{3}$$

- A favorable cost-push shock ($\theta \uparrow, u_t \downarrow$, that is we move towards perfect competition) $\rightarrow x_t \uparrow, \pi_t \downarrow$.
- If $\mathbb{E}\, \pi_{t+1}$ is allowed to move (unanchored), it will decrease over time, amplifying the shock. (I'm implicitly assuming RLS learning for the expectation formation.)

2.2 The 3-equation NK model

$$\pi_t = \beta \mathbb{E}_t\, \pi_{t+1} + \kappa x_t + u_t \tag{4}$$

$$x_t = \mathbb{E}_t\, x_{t+1} - \frac{1}{\sigma}(i_t - \mathbb{E}_t\, \pi_{t+1}) + \frac{1}{\sigma} r_t^n \tag{5}$$

$$i_t = \delta_\pi \pi_t + \delta_x x_t \tag{6}$$

- $u_t \downarrow \rightarrow \pi_t \downarrow$ (my intuition tells me that x_t should go up because less market power means higher quantities, lower prices, but I fail to see it here).
- If mon policy reacts, as the TR tells it to, it lowers interest rates, leading to a rise in output gaps. Voila.
- Again, if expectations are allowed to move, assuming RLS learning, $\mathbb{E}\, \pi_{t+1} \downarrow$, pushing inflation down further, amplifying the shock.

- Although expectations moving also helps you a bit, because it balances some of the increase in x_t. (?)

2.3 CEMP (w/o specified mon. policy)

$$k_t = \mathbf{f_k} \tag{7}$$

$$\bar{\pi}_t = \mathbf{f}_{\bar{\pi}} + \mathbf{f_k}^{-1}\eta_{t-1} \tag{8}$$

$$\xi_t = \mathbf{f}_\xi + \mathbf{A}_\xi \xi_{t-1} + S_\xi \begin{pmatrix} \epsilon_t \\ \mu_t \end{pmatrix} \tag{9}$$

where $\xi = (\eta, \varphi, \pi)'$, and π is described by a hybrid Phillips-curve with marginal cost shocks (shock ϵ on φ) and markup shocks μ_t, and $\eta_t = \mu_t + \epsilon_t$, i.e. it's a catch-all shock which mixes marginal cost and markup shocks $\rightarrow$ marginal cost shocks stand in for demand shocks (which is absent in the model), and μ_t is the cost-push shock. (Here a demand shock will have the same effect as a cost-push shock... mmm, I don't know if I like that...)

- $\mu_t \downarrow \rightarrow \eta_t \downarrow$
- $\pi_t \downarrow$
- If beliefs anchored, $\mathbf{f_k}^{-1} \rightarrow 0$, i.e. beliefs aren't allowed to fluctuate, so we stop here.
- If unanchored, $\bar{\pi}_t \downarrow \rightarrow \pi_t \downarrow \dots$ Again, shock is amplified.

3 Questions

- Why is the discretion and 3-equation intuition not quite the same? Does ignoring beliefs make their amplification role more acute?
- Demand shocks? $\rightarrow$ it seems to me to be a general thing that expectations (if based on RLS learning) amplify shocks, making stabilization more costly. But cost-push shocks seem special because of the tradeoff they introduce.
- Cost-push shocks as supply shocks? The issue of stabilization when shocks permanent (new steady state).