Optimal Contracts and Inflation Targeting Revisted

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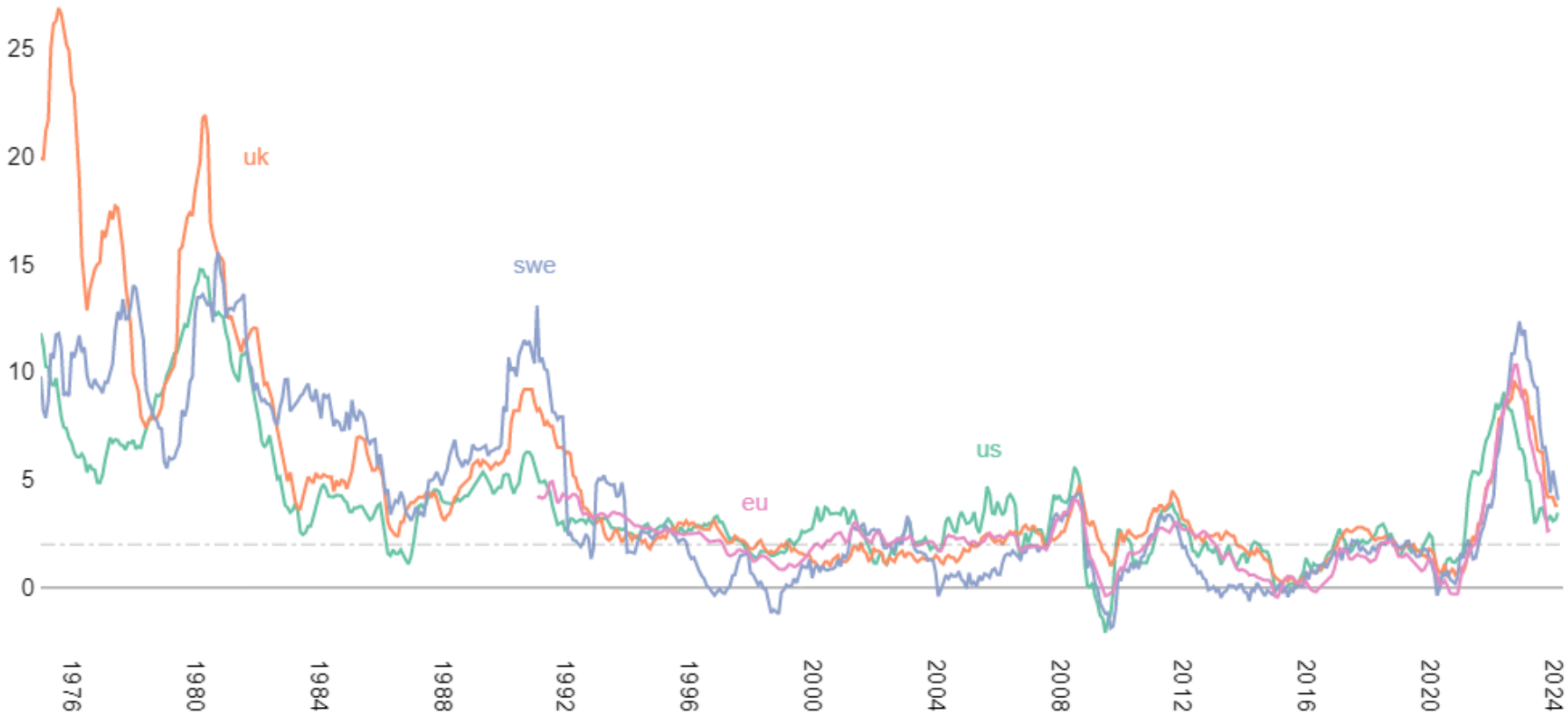
Inflation in the last 50 years

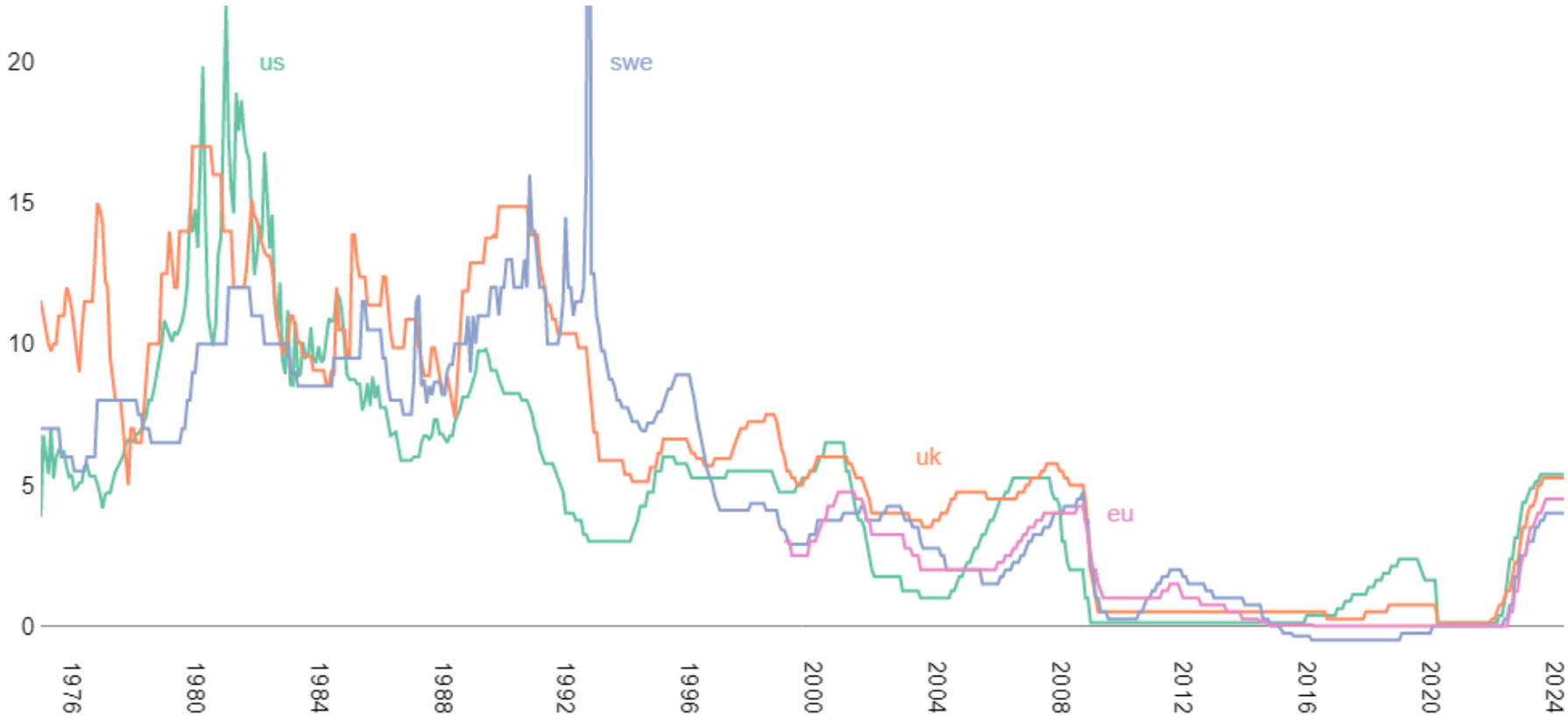
Inflation targeting introduced in early '90s to fight inflation

- Distorted incentives, not policy mistakes (Kydland & Prescott)
- Institutional changes => central banks gained credibility



New challenges: policy rates at the ZLB

A new credibility problem: how to raise expected inflation if $i = 0$



A dual credibility problem

Monetary policy faces two opposite credibility problems:

- How to keep expected inflation low, in the presence of inflationary shocks
- How to raise expected inflation when $i \longrightarrow 0$

Should inflation targeting framework be adjusted, and how?

Focus on incentive problems and institution design

- Institutions $=>$ central bank incentives $=>$ policy credibility $=>$ influence on expected inflation
- Novelty: two credibility problems, not just one

Literature on Monetary Policy

Constraints on interest rates

Credibility and Institutions	*NO*	*ZLB*
NO		
YES		

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A simple model

- *Supply*:

$$x^s = \theta + (\pi - \pi^e) - \varepsilon$$

x = output, π, π^e = actual and expected inflation,
θ = "natural" level of output, ε = supply shocks

  - θ, ε random with mean $\bar{\theta}, 0$ respectively

- *Demand* (IS - like curve):

$$x^d = \theta - \sigma(i - \pi^e - \rho)$$

i = interest rate, ρ = real natural rate of interest, $\sigma > 0$

  - $\rho = R > 0$ with prob $1 - q > 0$, $\rho = r < 0$ with prob $q > 0$

- *Expected inflation*: $\pi^e = E(\pi|\theta) =>$ role of monetary policy in stabilizing demand (ρ) and supply (ε) shocks.

Stationary stochastic environment => static model

Model ctd.

Assume that, irrespective of shocks θ, ε

- ZLB never binds if $\rho = R$, always binds if $\rho = r$
  - $q = \Pr(\rho = r) =$ probability of ZLB
- i is the only policy instrument $=>$ monetary policy can only be used if $\rho = R$
  - Assumption can be relaxed
- Through π^e, policy in state R influences outcomes at ZLB
- *Society's loss function* (reflected in CB mandate):

$$E[L(\pi, x)] = \frac{1}{2} E[(\pi - \overline{\pi})^2 + \lambda(x - \overline{x})^2]$$

$\overline{\pi}$,$\overline{x}$ = desired levels of inflation and output, $\lambda > 0$

Equilibrium under commitment

- CB chooses optimal (state contingent) policy rule, taking into account effect on π^e.
  - π^e relevant on supply side in both states $\rho = R, r$
  - π^e relevant on demand side only if $\rho = r$

If $q > 0$, equilibrium has:

1. $E(\pi^{C,R}) > \bar{\pi}$ and $\pi^{Ce} > \bar{\pi}$
   - As $\pi^{C,R} \uparrow$, so does π^e, which raises demand at the ZLB
     cf. Eggertson- Woodford 2003, Krugman 1997
2. $E(\pi^{C,R})$, $\pi^{Ce} \uparrow$ if ZLB more likely ($q \uparrow$) or more severe ($r \downarrow$)
3. Partial stabilization of supply shocks ε

Equilibrium under discretion

CB minimizes $L(\pi, x)$, given observed realization of shocks, and taking π^e as given

Two offsetting distortions, as CB neglects

- effect of π^e on *supply* in both states $\rho = R, r$ $=>$ *inflation* bias $\lambda(\bar{x} - \theta)$
- benefit of $\uparrow \pi^e$ on *demand* in state r $=>$ *deflation* bias, larger if ZLB more likely ($q \uparrow$) or more severe ($r \downarrow$)
- Which one prevails? Ambiguous: $\pi^{D,R} \gtrless \pi^{C,R}$, $\pi^{De} \gtrless \pi^{Ce}$
  - But $<$ more likely if ZLB more likely ($q \uparrow$) or more severe ($r \downarrow$)
- Output more volatile under discretion
  - Stabilization of supply shock ε undistorted, but demand shock ρ neglected under discretion

Optimal (unrestricted) inflation contract

- CB under discretion is given performance contract $T(\pi)$
  $=>$ CB minimizes $L(\pi, x) + T(\pi)$
  - CB mandate (& public opinion) induce CB to internalize social welfare, $L(\pi, x)$
  - Institution design adds other incentives through $T(\pi)$

- Optimal unrestricted contract:

$$T(\pi^R) = \tau_0 + \tau_1(\theta)\pi^R, \qquad \text{with } \tau_1(\theta) \gtrless 0$$

Implications

- Contract defined only on π^R - nothing can be done at ZLB
- Linear inflation tax $(\tau_1 > 0)$ or subsidy $(\tau_1 < 0)$ contingent on incentive to inflate, θ
  - Subsidy more likely if ZLB more relevant ($q \uparrow$, $r \downarrow$)
  - Implements equilibrium under commitment
  - But needs to be contingent on realized CB incentives, θ

Inflation targeting as optimal inflation contract

What if contingency on θ not feasible? Then optimal contract:

$$T(\pi^R) = \tau_0 + \tau_1(\bar{\theta})\pi^R + \frac{\tau_2}{2}(\pi^R - \bar{\pi}^R)^2$$

Resembles inflation targeting framework, with following features

- CB accountable for inflation performance only in state R
- Inflation target $\bar{\pi}^R = E(\pi^{C,R}) > \bar{\pi}$
- Asymmetric penalties in either direction: $\tau_1(\bar{\theta}) \gtrless 0$
  - More tolerant of π^R ($\tau_1 < 0$) if ZLB more relevant ($q \uparrow, r \downarrow$)
- Penalty $\tau_2 > 0$ increases with $Var(\theta)$, decreases with $Var(\varepsilon)$
  - Does *not* implement equilibrium with commitment

Discussion: What target for inflation?

1. A *higher* target: $\bar{\pi}^R > \bar{\pi}$. How much higher?
   Suppose $\sigma = 1$, $\lambda = 0.25\%$, $\bar{\pi} = 2\%$.
   - If $q = 0.25$ and $r = -3\%$, then $\bar{\pi}^R \simeq 2.5\%$
   - If $q > 0.4$ or $r < -3.3\%$, then $\bar{\pi}^R \simeq 3\%$
     Caveat: if richer stochastic structure, ZLB more likely $=> \bar{\pi}^R \uparrow$

2. A *state-dependent* inflation target: only if out of ZLB
   - At ZLB, CB has no tools (or more costly) to control demand.
   - This should be reflected in how it is held accountable
     cf. Kiley & Roberts (2017).

3. *Symmetric* tolerance for upward vs downward deviations
   - CB incentives could be distorted in either direction

Discussion: Dynamics

- If ρ serially correlated, then dynamics also matter.
  - Optimal policy should raises π^e_{t+1} when at the ZLB
- *Price level* targeting? (Eggertson & Woodford 2003)
  - Risk of additional output volatility after inflationary shocks
  - Price level as optimal shock absorber, in the face of supply, fiscal or financial shocks
- *Average inflation* targeting? (cf. Fed after August 2020)
  - Less transparent
    Was Fed "behind the curve" or was it targeting average inflation?
  - Risk of Procyclicality

Benefit from a simple framework, easy to communicate.

Discussion: How to delegate

Inflation targeting matters if it changes CB incentives (actual and perceived)

- Inflation targeting differs from generic mandate
  - precise measure of performance
  - accountability procedure
  - decision making procedure and communication strategy of CB aligned with targeting framework
- Who should design the targeting framework?
  - *Principal* vs CB vs contractual agreement
- Accountability procedure and periodic evaluations
  - Keep π^R close to target *on average* over some predefined period (eg. 3 years) - not year by year
  - Explain deviations in terms of other objectives in CB mandate

Discussion: QE and financial stability

- QE is an additional policy instrument at the ZLB
  - Optimal inflation contract not significantly different
- QE could impose future social costs, but it could also prevent financial crisis - cf. Allen et al.
  - Financial fragilities due to excessive liquidity vs liquidity crisis
- Are these tradeoffs fully internalized by CB?
- Integrate dual CB mandate (on x and π) with explicit delegation and responsibility for financial stability
- New challenges
  - Wide range of policy instruments
  - How to operationalize macro-prudential policies
  - How to hold CB accountable for them

Summary

Should IT framework be adjusted to cope with challenges of ZLB?
Perspective of optimal institution design

- A higher inflation target (3%?)
- Applicable only if out of ZLB
- Symmetric tolerance around the target

Two aspects deserve more attention, in theory & practice of IT:

- Integrate IT with explicit responsibility for financial stability
- Procedure for accountability
  - Attention to group decisions and intrinsic motives

Decline in the real natural rate of interest