LECTURE 11

1 Continued: solutions to the inflation bias.

1.1 Reputation

Lesson from repeated games. With an infinite horizon it is possible for the efficient equilibrium to be achieved even if the one-shot-game has a unique, inefficient, equilibrium (e.g. prisoner dilemma).

- Infinite horizon. Discount rate β. The policy maker maximizes

$$\sum_{s=t}^{\infty} \beta^s U_s \tag{1}$$

  where U_s is the one-period utility function.

- LQ preferences for policymaker. The one-period utility function is

$$U_t = \lambda(y_t - y_n) - \frac{1}{2}\pi_t^2. \tag{2}$$

- No shocks. AS is

$$y_t = y_n + \alpha(\pi_t - \pi_t^e) \tag{3}$$

Let us show that the following is an equilibrium under certain conditions.

1. At period zero, agents expect inflation to be $\bar{\pi}$ and the policymaker chooses $\pi = \bar{\pi}$.

In all future periods s:

2. If $\pi_{s-1} = \pi_{s-1}^e = \bar{\pi}$ then $\pi_s^e = \bar{\pi}$. If $\pi_{s-1} \neq \pi_{s-1}^e$ then $\pi_i^e = \lambda\alpha$ for $i = s, ..., s+k-1$ and $\pi_{s+k}^e = \bar{\pi}$.
   In words, if the policymaker has not created unexpected inflation yesterday agents expect her to behave in the same way today.
   If instead the policymaker has created unexpected inflation yesterday, agents "punish" her by expecting the time-consistent (under discretion) rate of inflation for k period.

3. The policymaker chooses $\pi_s = \pi_s^e$ always. In other words, she sets $\pi_s = \bar{\pi}$ when agents expect $\bar{\pi}$ and $\pi_s = \lambda\alpha$ when people expect $\lambda\alpha$ (i.e. in "punishment" periods).

Consider the policymaker incentives to create unexpected inflation.

- If the policymaker sticks to its *commitment* and does not create unexpected inflation in period t it is $\pi_t = \pi_t^e = \bar{\pi}$ and $y = y_n$.

$$U_t^c = -\frac{1}{2}\bar{\pi}^2. \tag{4}$$

- If the policymaker *fools* people and creates unexpected inflation it maximizes the gain from doing so. The gain lasts only one period hence π_t solve

$$\max_{\pi_t} U_t^f = \lambda(\alpha(\pi_t - \pi_t^e) + e_t) - \frac{1}{2}\pi_t^2. \tag{5}$$

  The corresponding FOC is

$$\lambda\alpha - \pi_t = 0. \tag{6}$$

  The associated level of output is $y_s = y_n + \alpha(\lambda\alpha - \bar{\pi})$. The policymaker instantaneous utility is

$$U_t^f = \lambda\alpha(\lambda\alpha - \bar{\pi}) - \frac{1}{2}(\lambda\alpha)^2 \tag{7}$$

- The gain from fooling agents in the current period t is

$$G(\bar{\pi}) = U_t^f - U_t^c = \lambda\alpha(\lambda\alpha - \bar{\pi}) - \frac{1}{2}(\lambda\alpha)^2 + \frac{1}{2}\bar{\pi}^2 = \frac{1}{2}(\lambda\alpha - \pi)^2. \tag{8}$$

- If the policymaker has cheated last period, then $\pi = \pi^e = \lambda\alpha$ and $y = y_n$ in the next k periods. In such periods the policymaker's welfare is its utility under *discretion*

$$U_s^d = -\frac{1}{2}(\lambda\alpha)^2. \tag{9}$$

- The long run cost of cheating in the current period t is

$$C(\bar{\pi}) = \beta \sum_{s=t}^{t+k-1} \beta^s (U_s^d - U_s^c) = \beta \sum_{s=t}^{t+k-1} \beta^s \frac{1}{2}[(\lambda\alpha)^2 - \bar{\pi}^2]. \tag{10}$$

  Note: the punishment starts the following period and is therefore discounted. We call this the cost of losing *reputation.*

- Hence, the above is an equilibrium if the cost from losing one's reputation exceeds

the benefit from cheating or $G(\bar{\pi}) < C(\bar{\pi})$ or

$$\frac{1}{2}(\lambda\alpha - \pi)^2 < \beta \sum_{s=t}^{t+k-1} \beta^s \frac{1}{2}[(\lambda\alpha)^2 - \bar{\pi}^2]. \tag{11}$$

A one-period punishment ($k = 1$) is not enough to enforce an equilibrium with $\bar{\pi} = 0$ given $\beta < 1$. Yet,

1. There exists $\bar{\pi} < \lambda\alpha$ which can be enforced through reputation by a one-period punishment.
2. There exists a long enough punishment which can enforce through reputation even the $\bar{\pi} = 0$ equilibrium.

2 Empirical evidence

As a positive theory of inflation, the time-inconsistency theory of the inflation bias is difficult to test. It predicts that inflation is related to: 1) costs of inflation; 2) ratio at which unexpected inflation boosts output; 3) policymakers' ability to commit; 4)

their ability to establish a reputation; 5) whether monetary policy is entrusted to individuals who dislike inflation more.

Evidence:

- Across countries average inflation is negatively correlated with measures of central bank independence.

Does this support Rogoff's independent central banker story?
Two problems:

1. Central bank independence is endogenous. Countries who dislike inflation more (e.g. Germany) are more likely to shield central banks from political pressure. So part of the inflation performance is due to the preferences of citizens (reflected in those of the policymaker) and not of the central banker.
2. Delegating monetary policy to an independent central banker reduces the inflation bias only if the central banker is more inflation averse (more "conservative") than the government. The latter does not automatically follow from independence.

Only if independence is associated with greater "conservativeness" of the central banker reduces the inflation bias. If this mechanism were important we should observe a positive correlation between independence and output variability, as the more conservative central banker dislikes inflation fluctuations relatively more than output fluctuations. No empirical evidence that such correlation is positive.

- Negative relationship between inflation and trade openness. The slope of the short run aggregate supply is likely to be steeper (α smaller) in more open country as higher domestic inflation is more likely to induces agents to switch from tradables to non-tradables.

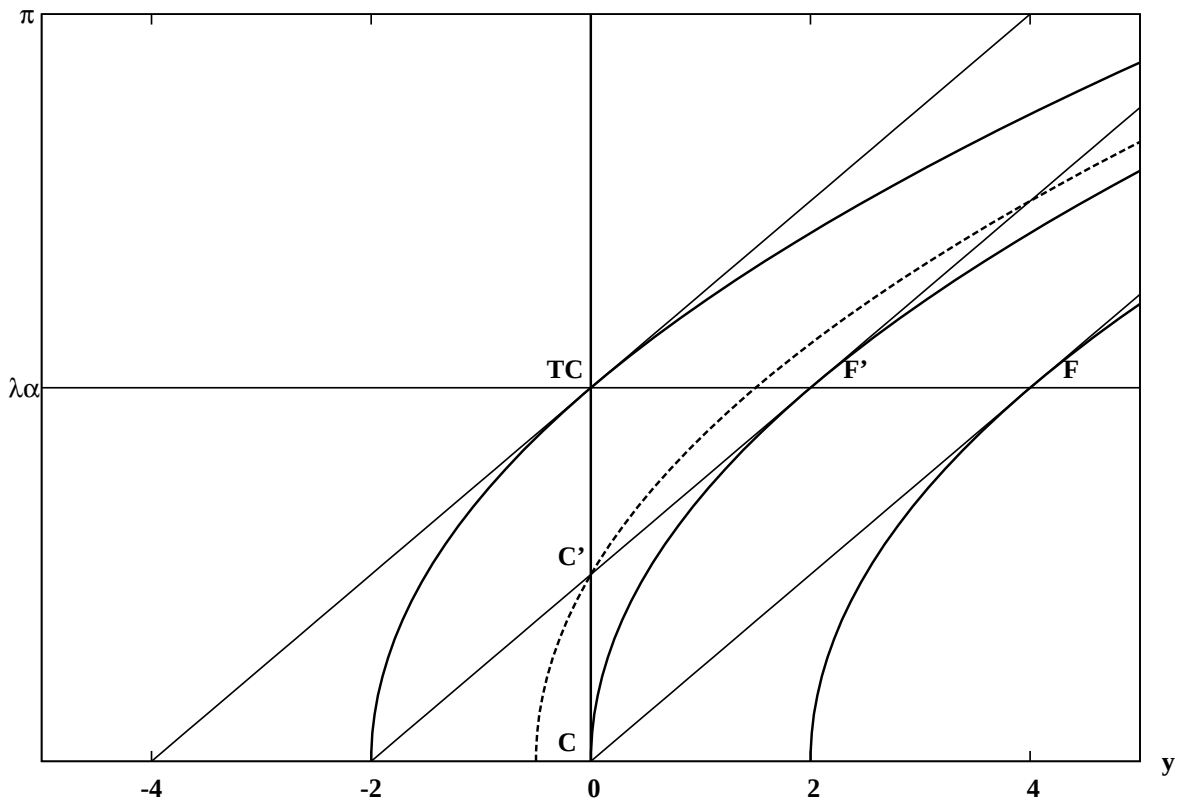
- Time series evidence. Inflation changes over long time spells without changes in monetary institutions. Low in the 50s and early 60s, higher in the 70s and lower again from the mid 80s onward.

Overall mixed evidence, that the inflation bias is a good candidate for a *positive* theory of inflation. Yet, the theory has importantly focused attention of issues of optimal design of monetary institutions.

Possible alternative *positive* theories of inflation:

1. Sargent and Cho (2004): the learning hypothesis. In the 70s central banks had the wrong model of the economy (they thought the AS did not shift with changes in expectations) and had to learn the hard way.

2. Inflation as a source of revenue for the government. Money creation (seignorage) generates revenue for the government and results in inflation. ("High inflation is eventually a fiscal phenomenon").
   Explanation for hyperinflation. Especially relevant for less developed countries (countries with less developed tax systems or in which expenditure represents a very large share of GDP).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