3 Coherencia temporal y credibilidad. Políticas cambiarias y monetarias

3.1 Preliminares: credibilidad

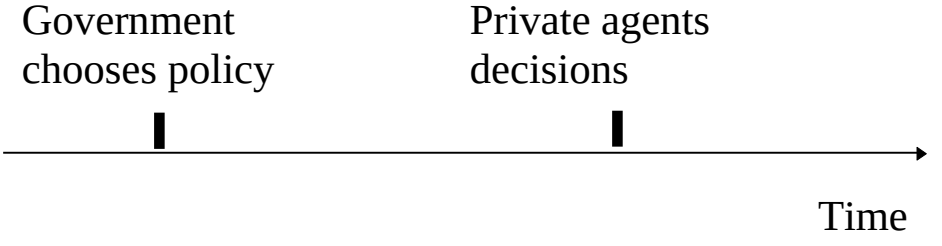
Credibility

Starting point: ruling out systematic cheating...
Example: abuse of surprise inflation.

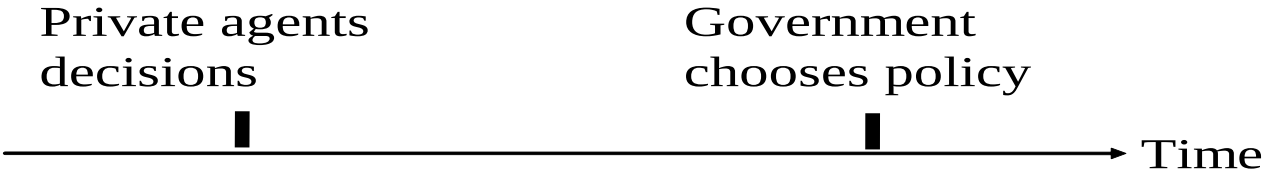
Cheating (like crime) requires two things: *opportunity* and *motive*

i) *Opportunity*: timing

Commitment



Discretion



ii) *Motive* (incentives to surprise):

Lack of enough instruments $\rightarrow$ second best $\rightarrow$ cheating in order to move towards the first best

No systematic cheating requires:

- no opportunity: *commitment technology*, or ...
- no incentives: *time consistent policies*

Definition: A policy is time *in*consistent if - given that it is expected by the private sector - the optimal plan made for period t + j at time t is different from the optimal plan made for that period at time t + j.

The basic model

The setting:

* Law of one price: Price (domestic currency) = E

* Players: government and central trade union

* Timing: discretion or commitment

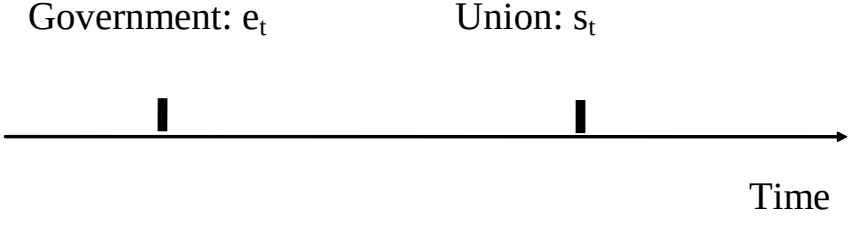
* Union solves: $$S^{*} = \underset{S}{\text{Argmax}} \ \frac{S.L(S/E)}{E}$$

$\Rightarrow$ Union's real wage target: $s_U = \ln\left(\frac{S^*}{E}\right)$

* Government loss function:

$$G(s_t, e_t) = (s_t - e_t - s_G)^2 + a(e_t - e_{t-1})^2$$

Commitment:



Solving by backward induction:

1) Union chooses s_t knowing e_t, hence: $s_t = s_U + e_t$

2) Government solves:

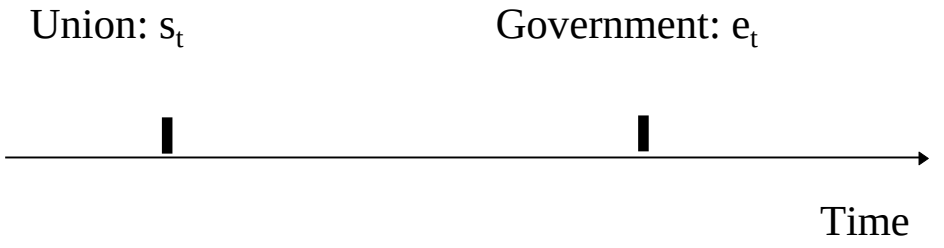
$$\begin{array}{l} \underset{e_t}{\text{Minimize}} \ \left(s_t - e_t - s_G\right)^2 + a\left(e_t - e_{t-1}\right)^2 \\ \text{s.t.} \qquad\qquad s_t = s_U + e_t \end{array}$$

With solution: $\boxed{e_t = e_{t-1}}$

Results under commitment:

- Real wage (competitiveness) = s_U
- Inflation = $e_t - e_{t-1} = 0$

Discretion



Backward induction:

1) Government chooses e_t ... *given nominal wages*

$$\begin{array}{l} \underset{e_t}{\text{Minimize}} \ \left(s_t - e_t - s_G\right)^2 + a\left(e_t - e_{t-1}\right)^2 \\ \text{s.t.} \qquad\qquad s_t = \text{constant} \end{array}$$

$\Rightarrow$ government reaction function (or best response):

$$e_t = \frac{s_t + a e_{t-1} - s_G}{1 + a}$$

2) Union picks s_t *anticipating government's response:*

$$s_t = s_U + E[e_t] = s_U + \frac{s_t + ae_{t-1} - s_G}{1 + a}$$

Notice, we have used two important hypotheses here:

- Union knows government incentives
- Union forms expectations rationally, using the information it has about government incentives

Economic performance under discretion?

1) Union still manages to get its real wage target: $s_t - e_t = s_U$

2) Variation of nominal wages:

$$\boxed{s_t - s_{t-1} = \frac{s_U - s_G}{a}}$$

Crucial assumption: there is a motive to cheat, for $s_U > s_G$

Hence, under discretion, there is an *inflationary bias*:

$$e_t - e_{t-1} = s_t - s_{t-1} > 0$$

Puzzle: government devalues to reduce real wages, but it fails, and causes inflation. Yet, it is perfectly rational!

Should government decide not to devalue? Not credible, it is time inconsistent.

Rules rather than discretion...

... the advantage of tying one's own hands...

Payoffs matrix:

	Commitment		Discretion
Union's utility	$U(s_U)$	=	$U(s_U)$
Government's losses	$(s_U - s_G)^2$	<	$\frac{1+a}{a}(s_U - s_G)^2$

$\Rightarrow$ commitment Pareto dominates discretion

Policy implication: make commitments, if possible...

Costs of inflation and rate of inflation (Fischer and Summers, 1989)

Notice: inflationary bias is *decreasing* in coefficient "a".

$\Rightarrow$ Countries adapted to inflation (low a) have higher inflation.

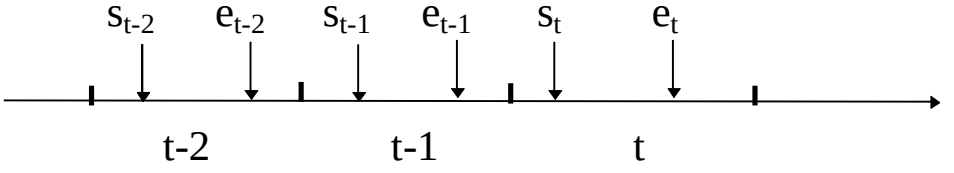
$\Rightarrow$ Inflationary bias causes larger losses in countries that are better adapted to inflation!

Reputation

Motivation: reputation as a substitute for commitment...

Environment:

- discretion + repeated game



- complete and perfect information

- infinite horizon

- Government *per-period* losses:

$$G(s_t, e_t) = (s_t - e_t - s_G) + \frac{a}{2}(e_t - e_{t-1})^2$$

It can be shown that, with this loss function, government discretionary policy will be: $e_t - e_{t-1} = 1/a$

- Government *total* losses:

$$Total\ \ losses = \sum_{i=0}^{\infty} \delta^i G_{t+i} \quad , \ 0 \leq \delta \leq 1$$

Proposition (existence of a reputational equilibrium):

The infinitely repeated game has a zero-inflation subgame perfect equilibrium, provided δ is large enough.

Proof

Se elige un perfil de estrategias del sindicato y el gobierno y se muestra que cada una de esas estrategias es una mejor respuesta a las estrategias del otro en el juego completo y en todos los subjuegos.

i) Union's strategy:

For t = 0:

$$s_0 = s_U + e_{-1}$$

For t > 0:

$$s_t = s_{t-1} \quad \text{,if} \quad i)\, s_{t-1} = s_U + e_{t-2} = s_{t-2} \ \text{,and} \ \ ii)\, e_{t-1} = e_{t-2}$$

$$s_t = s_{t-1} + 1/a \quad \text{,otherwise}$$

Government's strategy:

For t = 0:

$e_0 = e_{-1}$, if $s_0 = s_U + e_{-1}$

$e_0 = e_{-1} + 1/a$, otherwise

For t > 0:

$e_t = e_{t-1}$,if i) $s_t = s_U + e_{t-1} = s_{t-1}$,and ii) $e_{t-1} = e_{t-2}$

$e_t = e_{t-1} + 1/a$,otherwise

Government's per-period losses:

$$\tilde{G} < G^{*} < \hat{G}$$

One-shot game

"Cooperation":
i) zero inflation, ii) $s_t - e_t = s_U$

Cheating: $\tilde{G} = \underset{e}{Min}\, G\left(e, s^{*}\right)$

i) Government total losses, if it does not devalue (and union does not deviate):

$$G^* + \delta G^* + \delta^2 G^* + ... = \frac{1}{1-\delta} G^*$$

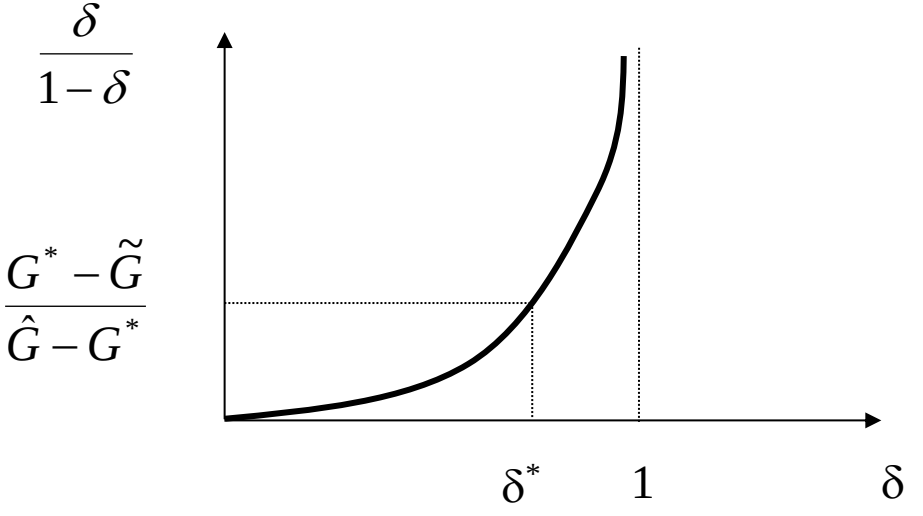
ii) Government total losses, if it devalues one period surprising private sector (it deviates, it "cheats"):

$$\tilde{G} + \delta \hat{G} + \delta^2 \hat{G} + ... = \tilde{G} + \frac{\delta}{1-\delta} \hat{G}$$

Hence, government does **not** deviate if and only if:

$$\underbrace{G^* - \tilde{G}}_{\text{temptation to cheat}} \leq \underbrace{\frac{\delta}{1-\delta}\left(\hat{G} - G^*\right)}_{\text{cost of cheating}} \qquad (1)$$

This inequality holds true for δ close enough to 1:



iii) Union does not deviate, for adopting the specified strategy it gets its first best: s_U

Inequality (1) and (iii) imply that the "candidate" is a Nash equilibrium.

What about subgame perfection?

iv) Show that deviating is not optimal *in any subgame*, including those out of equilibrium: no empty threats.

QED

Problems: multiple equilibria, coordinating expectations.

Complete information and finite horizon: no zero-inflation sub-game perfect equilibrium. Proof: backward induction.

Uncertainty and contingent rules

Productivity shocks taking place after wage setting $\Rightarrow$
Room for active output stabilization policies?

Assumptions

Productivity shock: ε_t , $E[\varepsilon_t]=0$, $E[\varepsilon_t^2]=\sigma^2$

Government real wage target: $s_G+\varepsilon_t$

Government expected losses:

$$G(s_t, e_t) = E\left[(s_t - e_t - s_G - \varepsilon_t)^2 + a(e_t - e_{t-1})^2 \right]$$

Functional form of the optimal policy rule:

$$e_t - e_{t-1} = \overline{\kappa} + \kappa \varepsilon_t$$

Notice: this policy rule is contingent on the shock.

Union real wage target: s_U
"Simple" wage contracts: *no* contingent nominal wages.

Commitment

Government: e_t Union: s_t Shock: ε_t

Solving by backward induction:

1) Union: $s_t = s_U + E[e_t] = s_U + e_{t-1} + \bar{\kappa}$

2) Government:

$$\underset{\bar{\kappa},\kappa}{\text{Minimize}}\ E\left[\left(s_t - e_t - s_G - \varepsilon_t\right)^2 + a\left(e_t - e_{t-1}\right)^2\right]$$

$$\text{s.t.} \qquad s_t = s_U + e_{t-1} + \bar{\kappa}$$

$$e_t = e_{t-1} + \bar{\kappa} + \kappa\varepsilon_t$$

$$\underset{\bar{\kappa},\kappa}{\text{Minimize}}\ E\left[\left(s_U - s_G - \kappa\varepsilon_t - \varepsilon_t\right)^2 + a\left(\bar{\kappa} + \kappa\varepsilon_t\right)^2\right]$$

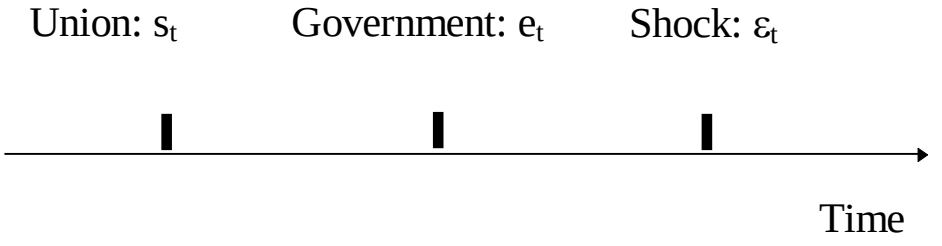
$$\Rightarrow \qquad \bar{\kappa} = 0 \quad ; \quad \kappa = -1/(1+a)$$

So, government policy under commitment will be:

$$e_t = e_{t-1} - \frac{1}{1+a}\varepsilon_t$$

Notice: *on average* inflation will still be zero, but government will cause inflation when negative realization of the productivity shock and deflation when positive shocks.

Discretion



Solving by backward induction:

1) Government:

$$\underset{\bar{\kappa},\kappa}{\text{Minimize}}\ E\left[\left(s_t - e_t - s_G - \varepsilon_t\right)^2 + a\left(e_t - e_{t-1}\right)^2\right]$$

$$\text{s.t.} \qquad s_t = \text{constant}$$

$$e_t = e_{t-1} + \bar{\kappa} + \kappa\varepsilon_t$$

2) Union: set s_t , knowing government incentives.

Solving:

$$\bar{\kappa} = \frac{s_U - s_G}{a} \quad ; \quad \kappa = -1/(1+a)$$

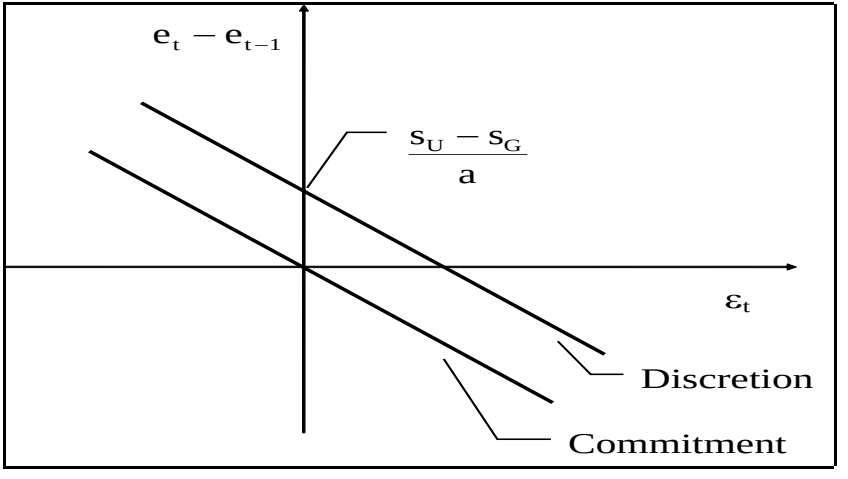
So, government policy under discretion will be:

$$e_t = e_{t-1} + \frac{s_U - s_G}{a} - \frac{1}{1+a}\varepsilon_t$$

Notice: *on average* inflation will be positive, hence there is an inflationary bias.

Union is not surprised: $s_t = s_U + e_{t-1} + \frac{s_U - s_G}{a}$

Comparing commitment and discretion



Government will be better off with commitment to this contingent rule: i) no inflationary bias, ii) same output stabilization than under discretion.

Normative implication: if possible, commit to a contingent rule.

Simple rules

Contingent rule is something very sophisticated. What if the government is not able to implement such policy rule, but can instead commit to a simpler rule, like a constant devaluation rate? Should it do it? If so, which rate?

Notice: we are moving now towards the normative issue...

The best simple (constant devaluation) rule: zero!

Welfare:

- Contingent rule dominates both simple rule and discretion. But it might not be available...
- Simple rule vs discretion: ambiguous! Simple rule avoids inflationary bias at a cost: not stabilizing output.

Normative implication: if contingent rule not available, choose simple rule of zero devaluation..., if credibility is a big issue while real shocks are relatively minor...

Institutions for credibility (normative analysis)

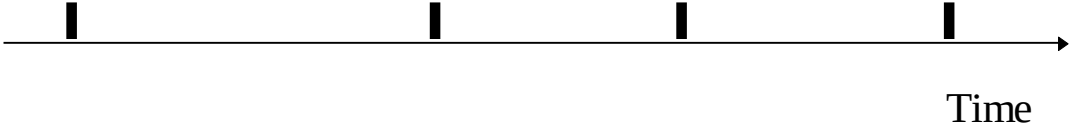
Independent Central Bank (Rogoff 1985)

Inflationary bias stemming from government inability to commit the exchange rate policy, i.e. from government playing after union. What if government can make a previous move, setting an independent Central Bank?

Delegation:

- Daily exchange rate policy delegated to the Central Bank. Central Bank has no commitment ability.
- Government appoints authorities of the Central Bank, according to rules that make them independent and stable.
- Government preferences over inflation (a_{gov}) not necessarily equal to Central Banker's preferences (a_{cb}).

Government: a_{cb} Union: s_t Central Bank: e_t Shock: ε_t



Should the government delegate the exchange rate policy? If so, who should be the Central Banker?

Answer: yes, government should delegate exchange rate policy to someone more "conservative" (although not infinitely conservative) than government itself ($a_{cb} > a_{gov}$).

Proof (sketch, see problem set): (Backward induction)

1) Once in office, Central Bankers will implement the discretionary policy, with preferences a_{cb}:

$$e_t = e_{t-1} + \frac{s_U - s_G}{a_{cb}} - \frac{1}{1 + a_{cb}} \varepsilon_t$$

2) Government decides who the Central Banker will be:

$$a_{cb} = \underset{a}{\text{Argmin}}\ E\left[(s_t - e_t - s_G - \varepsilon_t)^2 + a_{gov}(e_t - e_{t-1})^2\right]$$

s.t. i) Central Bank's discretionary policy

$$e_t - e_{t-1} = \frac{s_U - s_G}{a} - \frac{1}{1+a}\varepsilon_t$$

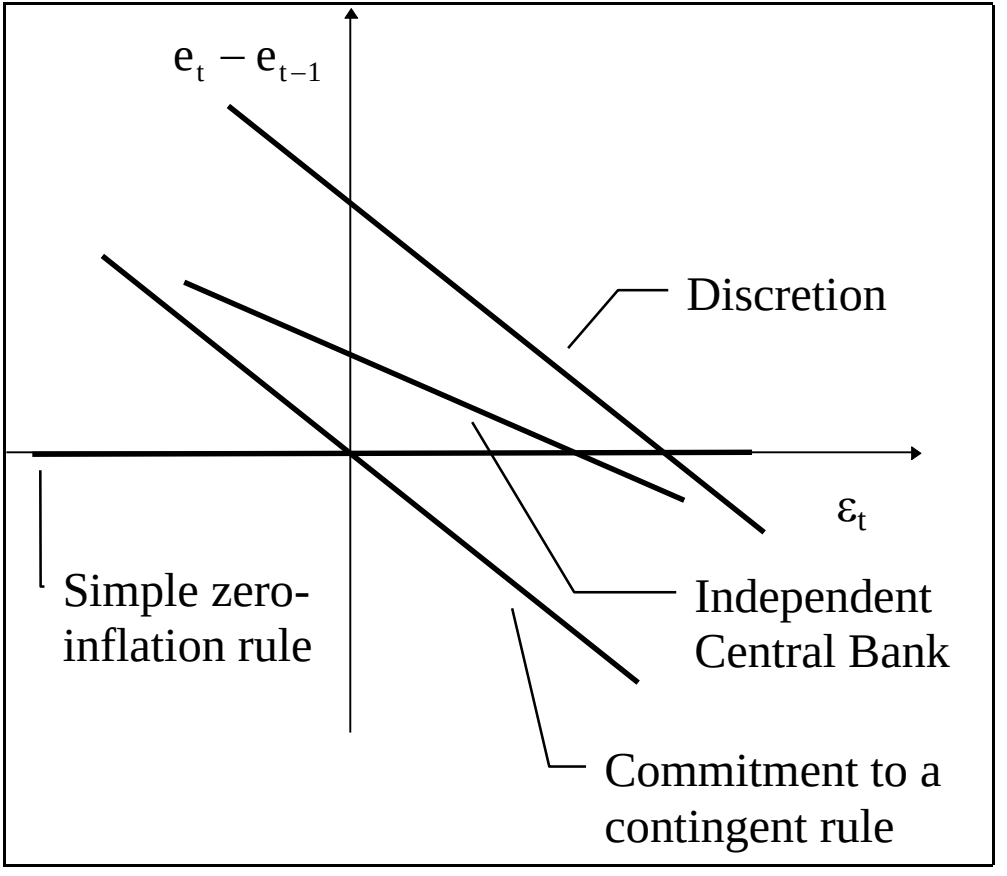
ii) Union's wage policy

$$s_t = s_U + E[e_t] = s_U + e_{t-1} + \frac{s_U - s_G}{a}$$

It can be shown that:

a) $a_{cb} > a_{gov}$, "conservative" Central Banker

b) $a_{cb} < \infty$, not "ultraconservative" Central Banker...

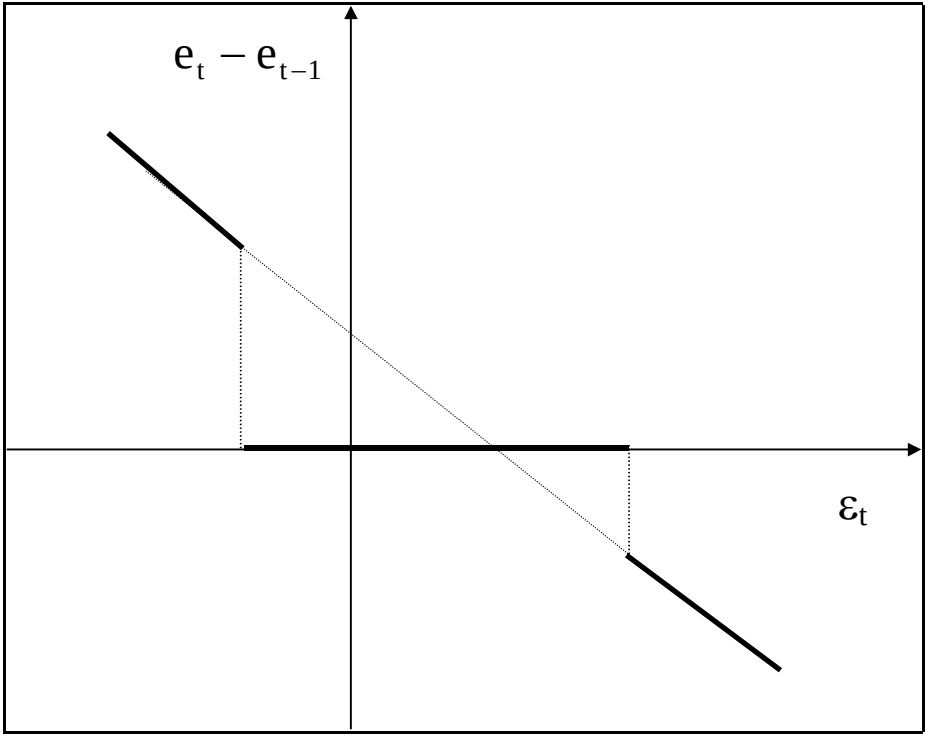

$e_t - e_{t-1}$
Discretion
ε_t
Simple zero-inflation rule
Independent Central Bank
Commitment to a contingent rule

Delegation vs discretion:

- lower inflationary bias
- less active in output stabilization
- higher welfare

Simple rule with escape clause (Flood and Isard, 1988)

Combine good properties of simple rules and discretion:
simple rule in normal times + discretion in exceptional times (when the shock is really large).


$e_t - e_{t-1}$
ε_t

Partially independent Central Bank (Lohman 1992)

Government delegates exchange rate policy to the Central Bank, but it can override the Central Bank in exceptional times.

Government losses:

$$E\left[\left(s_t - e_t - s_G - \varepsilon_t\right)^2 + a_{gov}\left(e_t - e_{t-1}\right)^2 + \delta c \right]$$

where: $\delta = 0$, if government does not intervene

$= 1$, if government overrides the Central Bank

and, $c > 0$

Institutional design means choosing a_{bc} and c.

Results:

- Independence region: Central Bank picks its discretional policy, if ε small.
- Accommodation region: Central Bank picks inflation between its own preferences and those of the government, if ε large. Otherwise, government would pay the cost c and override Central Bank, with the result of even larger inflation.

Some empirical evidence on Central Bank independence

Difficulty: measure of Central Bank independence.
Several dimensions:

- Who appoints the president of the Central Bank,
- How many years in office,
- Is it explicitly established that the Central Banker should pursue price stability?,
- How easy is for government to get credit from Central Bank?
- Bank supervision...

Results for OECD countries:

More independence associated to:

1. Lower average inflation
2. Lower variability of inflation
3. No real effects (neither level nor variance)
4. Fiscal discipline: ambiguous.