The Central Bank Strikes Back! Credibility Of Monetary Policy Under Fiscal Influence

Antoine Camous and Dmitry Matveev
Slides by Marco Bassetto

April 12, 2024

Time for Endogenous Policy!

- Almost all the papers that we discussed feature government *strategies*...
- ... but no objective function
- Look at one paper that has an objective function

Big Picture

- CB and Treasury have same preferences
- Difference in timing of moves

Linear-Quadratic Setup: Players

Two players + continuum:

- Private sector (continuum)
- Monetary authority (CB)
- Fiscal authority (Treasury)

Actions (but will expand on this)

- Private sector: sets expectations x^e, π^e
- CB sets π
- Treasury sets x

Preferences

- Private sector: $(\pi - \pi^e)^2 + (x - x^e)^2$
- CB and Treasury:

$$L = \frac{1}{2}\left[(x - x^*)^2 + \lambda(\pi - \pi^*)^2 + \gamma(y - y^*)^2\right]$$

with

$$y = x - x^e + \alpha(\pi - \pi^e)$$

and $y^* > 0$

α-λ equivalence

- Free choice: scale units for π.
- Define $\hat{\pi} := \pi/K$
- Get

$$y(x, x^e, \pi, \pi^e) = x - x^e + \alpha K(\hat{\pi} - \hat{\pi}^e)$$

$$L(x, x^e, \pi, \pi^e) = \frac{1}{2}\left[(x - x^*)^2 + \lambda K^2(\hat{\pi} - \hat{\pi}^*)^2 + \gamma(y - y^*)^2\right]$$

- $\implies$ two economies with same α^2/λ share same properties

Policy under No Commitment

Timing

- Private sector chooses π_t^e, x_t^e
- CB, treasury choose π_t, x_t
- Homework: check that solution is the same if CB and Treasury move sequentially

Equilibrium Computation

Work backwards:

- CB problem

$$\min_{\pi} \frac{1}{2}\left[(x - x^*)^2 + \lambda(\hat{\pi} - \hat{\pi}^*)^2 + \gamma(y - y^*)^2\right]$$

given x, x^e, π^e s.t.

$$\frac{1}{2}\left[(x - x^*)^2 + \lambda K^2(\hat{\pi} - \hat{\pi}^*)^2 + \gamma(y - y^*)^2\right]$$

- Treasury: same (taking as given π, π^e, x^e), max wrt x
- Get $\pi(x, x^e, \pi^e)$, $x(\pi, x^e, \pi^e)$
- Set $\pi^e = \pi$, $x^e = x$, compute fixed point

Equilibrium

- $$\pi = \pi^* + \frac{\alpha\gamma y^*}{\lambda}$$
- $$x = x^* + \gamma y^*$$

Policy under Full Commitment

Timing:

- CB and Treasury choose π, x
- Private sector chooses expectations π^e, x^e

Full Commitment Solution

- Work backwards: $\pi^e = \pi$, $x^e = x$
- Under commitment y independent of π, x
- $\implies$ choose $\pi = \pi^*$ and $x = x^*$
- Note: no need for coordination

Does Anything Change if only One Authority Has (Full) Commitment?

- Consider first unconditional commitment to a value π
- y still independent of π
- Still optimal to choose $\pi = \pi^*$

Can We Do Something Different?

The threat differs from the ordinary commitment, however, in that it makes one's course of action conditional on what the other player does. While the commitment fixes one's course of action, the threat fixes a course of reaction, of response to the other player. The commitment is a means of gaining first move in a game in which first move carries an advantage; the threat is a commitment to a strategy for second move. (Schelling, 1960, emphasis added)

Commitment to a Strategy

Timing

- CB sets $\pi(x)$
- Private sector sets π^e, x^e
- Treasury sets x
- Note: no need to make π contingent on π^e, x^e (Chari-Kehoe, 1990)
- Reason:
  - π^e, x^e not set strategically (take as given what treasury will do)
  - Consider eq (x, π) under commitment to some function $\hat{\pi}(x, x^e, \pi^e)$
  - Same equilibrium applies under commitment to $\hat{\pi}(x, x, \pi)$
- True because set of feasible π does not depend on expectations (Bassetto, 2005)

Can We Do Better than Uncontingent Commitment?

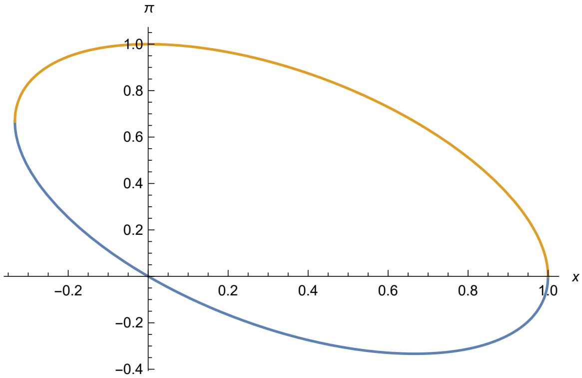
YES!!

- Show strategy that implements (x^*, π^*)
- Choose $\pi(x)$ such that

$$L(x, x^*, \pi(x), \pi^*) - L(x^*, x^*, \pi^*, \pi^*) \leq 0$$

and $\pi(x^*) = \pi^*$

Graphical representation



$$\alpha = \gamma = \lambda = y^* = 1,\ x^* = \pi^* = 0$$

Baseline Timing in the Paper

- CB sets strategy $\pi(x, \pi^e, x^e)$
- Private sector locks in expectations π^e, x^e
- Treasury sets x
- CB implements $\pi(x, \pi^e, x^e)$ or reneges, picks different π and pays cost κ.

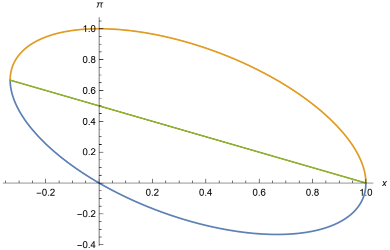
Preliminary Observations

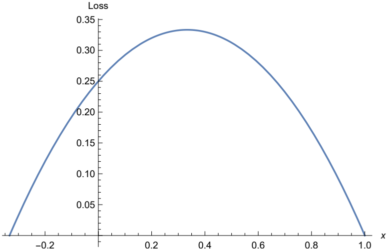
- Need to keep track of π^e, x^e in the CB rule, because cost of reneging depends on them.
- In equilibrium, CB never defects

Extreme Cases

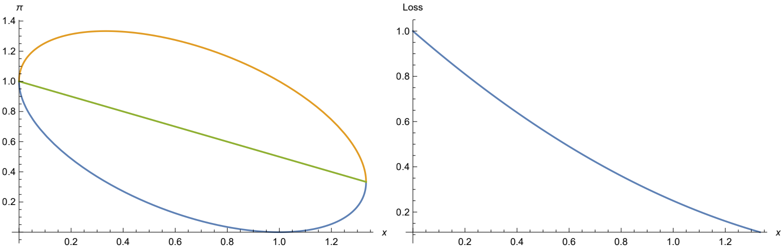
- For κ large enough, get full commitment
- For $\kappa = 0$, gets discretionary solution ((1,1) in the numerical example)

Credibility Bound for Contingent Commitment





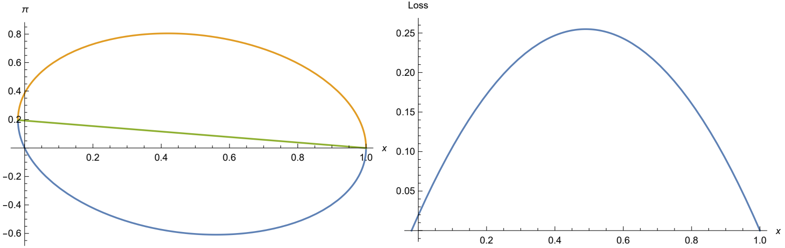
Credibility Bound for Uncontingent Commitment



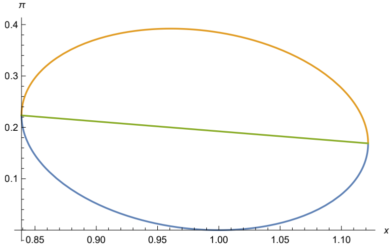
Not Always True that Contingent Commitment Is Cheaper

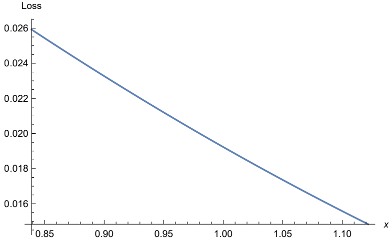
- When α^2/λ small, monetary policy not effective
- Small time inconsistency problem for monetary policy
- But need big change in inflation to threaten fiscal authority
- Change $\alpha = .2$

Credibility Bound for Contingent Commitment



Credibility Bound for Uncontingent Commitment





What Can We Do if We Do not Have Enough Commitment Power?

- Uncontingent commitment: raise equilibrium π
- Contingent commitment: raise equilibrium π, x

Monetary Economy, Infinite Horizon

- Technology:

$$c_t + d_t + g = 1 - \ell_t$$

- Preferences:

$$\sum_{t=0}^{\infty} \beta^t \left[\alpha \log c_t + (1-\alpha) \log d_t + \gamma \ell_t\right]$$

- CIA: $M^h_{t-1} \geq P_t d_t$ (Svensson timing)

Flow Budget Constraint of the Household

$$P_t c_t + P_t d_t + q_t B_t^h + M_t^h = P_t(1 - \tau_t)(1 - \ell_t) + B_{t-1}^h + M_{t-1}^h$$

Policy

$$q_t B_t + M_t = P_t \tau_t \ell_t + B^h_{t-1} + M^h_{t-1}$$

- CB sets $M_t = (1 + \sigma_t) M_{t-1}$
- Treasury sets τ_t
- B_t adjusts as a residual

Money Demand

In a CE

$$\frac{M_t}{P_t} = \frac{\beta(1-\alpha)(1-\tau_t)}{\gamma}$$

- Independent of future expected inflation: log magic!

Household first-order conditions

$$c_t = \frac{\alpha}{\gamma}(1 - \tau_t)$$

$$d_{t+1} = \frac{\beta(1-\alpha)}{\alpha}\frac{P_t}{P_{t+1}}c_t$$

$$q_t = \beta\frac{P_t}{P_{t+1}}\frac{1-\tau_t}{1-\tau_{t+1}}$$

d_0 determined by CIA (unless P_0 really low)

Implementability Constraint and Welfare

- Flow version (useful for getting evolution of B_t/M_t):

$$\beta\left[\frac{(1-\alpha)\beta}{1+\sigma_{t+1}}\right]z_t-\alpha(1-\tau_t)-(1-\alpha)\beta\frac{1-\tau_t}{1+\sigma_t}$$
$$=-\beta(1-\alpha)+\gamma g-\alpha+\left[\frac{(1-\alpha)\beta}{1+\sigma_t}\right]z_{t-1}$$

- PV version (useful to compute Ramsey):

$$\sum_{t=0}^{\infty}\beta^t\left[\beta(1-\alpha)-\gamma g+\alpha-\frac{(1-\alpha)\beta(1-\tau_t)}{1+\sigma_t}\right]$$
$$=\left[\frac{(1-\alpha)\beta}{1+\sigma_0}\right]z_{t-1}$$

Welfare

$$\sum_{t=0}^{\infty} \beta^t \Bigg\{ \alpha[\log(1-\tau_t) - \tau_t]$$

$$+(1-\alpha)\left[\log\left(\frac{\beta(1-\tau_t)}{1+\sigma_t}\right) - \frac{\beta(1-\tau_t)}{1+\sigma_t}\right]\Bigg\}$$