Topics for Today

1.) Rules vs. Discretion

- The Potential "Time Inconsistency" of Optimal Monetary Policy
- Reputation + Credibility
- Repeated Games + Trigger Strategies

Implications of the Expectations-Augmented Phillips Curve for Monetary Policy

Expectations-Augmented Phillips Curve

$$u_t = u^n - \alpha(\pi_t - \pi_t^e)$$

or

$$\pi_t = \pi_t^e - h(u_t - u^n)$$

Note: Assuming the Central Bank always wants to lower the unemployment rate, the Expectations-Augmented Phillips Curve gives the Central Bank an incentive to surprise the public.

Assuming the public is aware of this incentive, what happens?

Assumptions

1.) The Central Bank values low unemployment and low inflation

2.) Firms value low inflation and unemployment to be equal to the Natural Rate

Central Bank Payoffs

CB receives 1 if $\pi = 0$ and 0 if $\pi > 0$

CB receives 1 if $u < u^n$, 0 if $u = u^n$, -1 if $u > u^n$

Firms' Payoffs

Firms receive 1 if $\pi = 0$ and 0 if $\pi > 0$

Firms receive 2 if $u = u^n$ and 0 if $u \neq u^n$

The essence of the strategic interaction between firms and the Central Bank is summarized by the following payoff matrix.

Firms Choice

CB Choice	Raise P	Don't Raise P
Increase M	2 0 Inflation + $u = u^n$	1 2 Surprise inflation, $u < u^n$
Don't Increase M	0 -1 "stagflation"	3 1 No inflation, $u = u^n$

Assuming the CB cannot commit, and firms set prices before (or at the same time as) the CB sets M, what is the Nash Equilibrium?

What if the CB can commit?

A Generalization

Again suppose, $u = u^n - \alpha(\pi - \pi^e)$

Also suppose the CB's "Loss Function" is,

$$\boxed{L(u,\pi) = u + \gamma\pi^2}$$

CB wants low unemployment and has a target inflation of 0.

The CB attempts to minimize this by choosing π subject to the constraint represented by the expectations-augmented Phillips Curve.

If the CB cannot commit, what is its optimal choice of π? [without commitment, the CB takes π^e as <u>given</u>].

$$L = [u^n - \alpha(\pi - \pi^e)] + \gamma\pi^2$$

$$\frac{dL}{d\pi} = -\alpha + 2\gamma\pi = 0$$ First-Order Condition

$$\Longrightarrow \boxed{\pi = \frac{\alpha}{2\gamma}}$$

What is u?

What if the CB <u>can</u> commit to a rule?

Set $\pi = 0$. Now $u = u^n$, $\pi = 0$

Why can't the discretionary CB just promise to set $\pi = 0$?

The promise or announcement is not credible.

Suppose, the private sector believes the promise and sets $\pi^e = 0$. Then the CB will find it optimal to surprise the public by setting $\pi = \alpha/2\gamma$

Reputation and Trigger Strategies

Trigger Strategy: Start out trusting (i.e., believing) the CB, setting $\pi^e = 0$. If the CB ever takes advantage of you and surprises you (by increasing M), don't ever believe them again. Set $\pi^e = \frac{\alpha}{2\gamma}$ forever (starting next period).

Under what circumstances can this support the commitment outcome?

L^C = losses of the CB if it sticks to its promises

L^D = losses of the CB if it reneges (or defects).

L^N = losses in the sub-optimal one-period Nash equil.

$$L^D < L^C < L^N$$

CB's discount rate $\frac{1}{1+r}$

$$\underbrace{L^C - L^D}_{\text{one-shot gain from defecting}} \leq \underbrace{\frac{\beta}{1-\beta}(L^N - L^C)}_{\text{present value of future losses due to loss of reputation.}}$$

$$\beta + \beta^2 + \beta^3 + \dots = \frac{\beta}{1-\beta}$$

Commitment

$$\left.\begin{aligned}\pi = \pi^e &= 0\\ u &= u^n\end{aligned}\right\} \Longrightarrow L^c = u^n$$

Discretion (Nash Equilibrium)

$$\left.\begin{aligned}\pi = \pi^e &= \frac{\alpha}{2\gamma}\\ u &= u^n\end{aligned}\right\} \Longrightarrow L^N = u^n + \frac{\alpha^2}{4\gamma}$$

One-Time Gain From Cheating

$$\left.\begin{aligned}\pi^e &= 0\\ \pi &= \frac{\alpha}{2\gamma}\\ u &= u^n - \frac{\alpha^2}{2\gamma}\end{aligned}\right\} \Longrightarrow L^D = u^n - \frac{\alpha^2}{4\gamma}$$

Sustainability Condition

$$L^c - L^D \leq \frac{\beta}{1-\beta}\left(L^N - L^c\right)$$

$$\Longrightarrow \frac{\alpha^2}{4\gamma} \leq \frac{\beta}{1-\beta}\left(\frac{\alpha^2}{4\gamma}\right)$$

$$\Longrightarrow \boxed{\beta \geq 1/2}$$

If the Central Bank's Discount Rate exceeds $1/2$ then commitment outcome is sustainable.

Ways to Overcome the Time Consistency Problem

1.) Adopt Rules

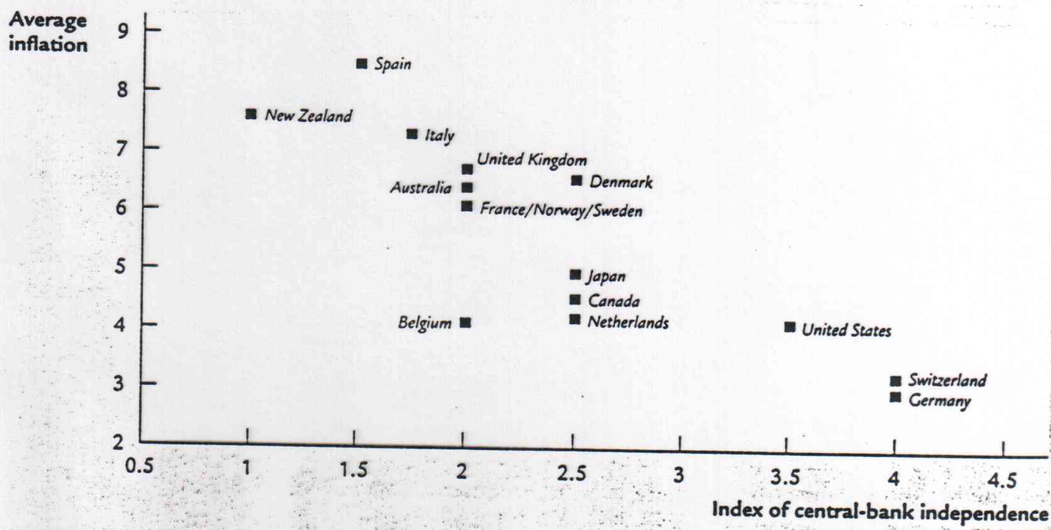
2.) Alter the incentives of the CB

Suppose you change the CB's loss function to $L(u, \pi) = u + \gamma\pi^2 + \alpha\pi$.

Verify that the optimal discretionary rule is to set $\pi = 0$.

3.) Reputation

4.) Make the CB politically independent



Inflation and Central-Bank Independence This scatterplot presents the international experience with central-bank independence. The evidence shows that more independent central banks tend to produce lower rates of inflation.

Source: Figure 1a, page 155, of Alberto Alesina and Lawrence H. Summers, "Central Bank Independence and Macroeconomic Performance: Some Comparative Evidence," *Journal of Money, Credit, and Banking* 25 (May 1993): 151–162. Average inflation is for the period 1955–1988.