# 6. Time Inconsistency and Monetary Policy

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# Kydland and Prescott (1977)

- First paper to describe the monetary policy problem
  - They came upon it while doing something else
  - "The original objective of this research was to demonstrate the applicability of optimal control methods in a rational expectations world "
  - Original reception was misunderstanding and confusion (What is Kydland talking about?)
- Implications:
  - Another argument for rules rather than discretion
- Nobel Prize citation:
  - "for their contributions to dynamic macroeconomics: *the time consistency of economic policy* and the driving forces behind business cycles"

# The General Idea

- Policy makers can improve welfare by announcing one thing and then doing something else after people have made their decisions based on the announcement. This is the inconsistent action.
  - Depends on forward looking (rational) expectations so that people take account of the "policy announcements" when making decisions
  - The problem occurs even if people's utility function does not change
- But the inconsistent action will eventually lead to other outcomes.
- Non-monetary examples
  - flood planes
  - patents
  - examinations

# Two-Period Model

$$policies: \pi_t$$

$$outcomes - decisions: x_t$$

Social Welfare Function

$$S(x_1, x_2, \pi_1, \pi_2)$$

Note how future policy affects present

Decision Rules

$$x_1 = X_1(\pi_1, \pi_2)$$

$$x_2 = X_2(x_1, \pi_1, \pi_2)$$

Takes $x_1$ as given

First Order Conditions

$$\frac{\partial X_2}{\partial \pi_2}\frac{\partial S}{\partial x_2} + \frac{\partial S}{\partial \pi_2} = 0 \quad \text{consistent}$$

Uses influence of $\pi_2$ on $X_1$

$$\frac{\partial X_2}{\partial \pi_2}\frac{\partial S}{\partial x_2} + \frac{\partial S}{\partial \pi_2} + \frac{\partial X_1}{\partial \pi_2}\left[\frac{\partial S}{\partial x_1} + \frac{\partial S}{\partial x_2}\frac{\partial X_2}{\partial x_1}\right] = 0 \quad \text{optimal}$$

# The Case of Monetary Policy

$$u_t = u^* - \lambda(x_t - x_t^e)$$

Relationship between inflation and unemployment

$$S_t = (a/2)x_t^2 - b(x_t - x_t^e)$$

Social Welfare Function (Loss)

Alternative solution concepts :

1. Consistent - CB takes $x_t^e$ as given and maximizes wrt $x_t$ but people assume they do this

Here lower values of S are better

$$\frac{\partial S_t}{\partial x_t} = \frac{\partial}{\partial x_t}\left[\frac{a}{2}x_t^2 - b(x_t - x_t^e)\right] = ax_t - b = 0 \Rightarrow x_t^C = (b/a) \Rightarrow$$

$$S_t^C = (a/2)(b/a)^2 - b(0) = b^2/(2a)$$

2. Optimal – CB maximizes wrt to $x_t$ under the assumption that this is not changed in the future

$$x_t^O = 0$$

$$S_t^O = 0$$

3. Inconsistent – CB promises the optimal but then changes

$$x_t^I = (b/a)$$

$$S_t^I = (a/2)(b/a)^2 - b((b/a) - 0) = -b^2/(2a)$$

# Summary

| | $x$ | $S$ | $x^e$ |
|---|---|---|---|
| Consistent (Discretion) | $\frac{b}{a}$ | $\frac{b^2}{2a}$ | $\frac{b}{a}$ |
| Optimal (Rule) | $0$ | $0$ | $0$ |
| Inconsistent (Cheating) | $\frac{b}{a}$ | $-\frac{b^2}{2a}$ | $0$ |

# Graph of Inflation-Unemployment Tradeoff from K-P

$$u_t = \lambda(x_t^e - x_t) + u^*$$

$$x_t^e = Ex_t$$

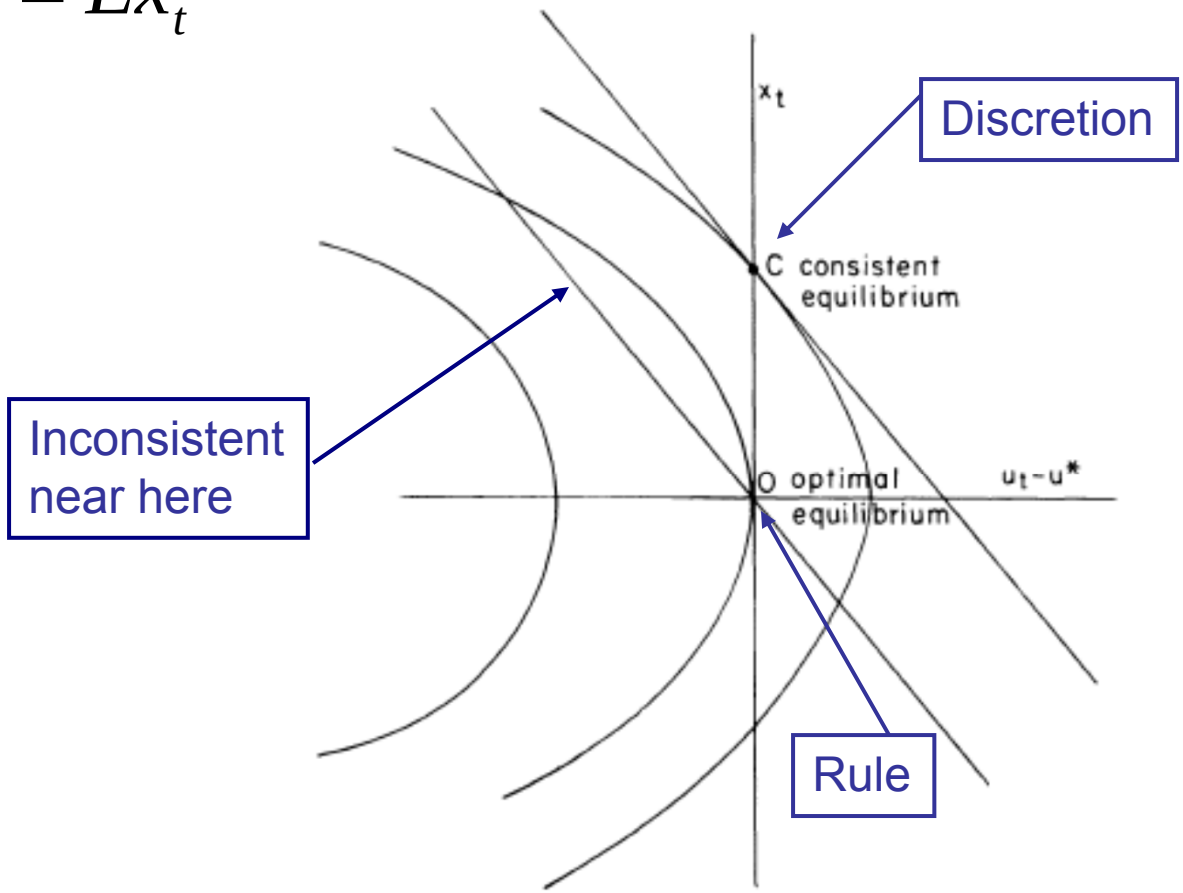


FIG. 1.—Consistent and optimal equilibrium

# Discussion

- Normative versus positive
  - Normative policy implication: use policy rules
  - Positive: aims to explain why we have inflation
    - Explanation of Great Inflation and disinflation?
- Ways to deal with the problem
  - Choose central bankers with a small *b* (Rogoff)
    - If *b=0* then *x=0*
- Another reason to use rules
- Other applications

# Example of sovereign debt bailouts: - emerging market countries 1994-2002 - Some eurozone countries now

- The “bailout process”
  - Purpose: to prevent defaults which are harmful and can cause contagion
  - But adverse side effects: moral hazard, unpredictability
- Common during emerging market crisis period of 1994-2002, but then stopped.
- How? Had to deal with time inconsistency
  - Sandbags in the flood plane example
- Reformed the process for restructuring sovereign debt
  - Collective action clauses as sandbags
- Then IMF could set more credible limits