6. Time Inconsistency and Monetary Policy

John B. Taylor, May 6, 2013
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

\( \text{policies} : \pi_t \)
\( \text{outcomes} – \text{decisions} : x_t \)

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

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

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

Uses influence of \( \pi_2 \) on \( X_1 \)
The Case of Monetary Policy

\[ u_t = u^* - \lambda(x_t - x_t^e) \]
\[ S_t = (a/2)x_t^2 - b(x_t - x_t^e) \]

Alternative solution concepts:

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

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

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

\[ x_t^I = (b/a) \]
\[ S_t^I = (a/2)(b/a)^2 - b((b/a) - 0) = -b^2/(2a) \]

Here lower values of \( S \) are better
## Summary

<table>
<thead>
<tr>
<th></th>
<th>$x$</th>
<th>$S$</th>
<th>$x^e$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Consistent</strong></td>
<td>$b$</td>
<td>$b^2$</td>
<td>$b$</td>
</tr>
<tr>
<td>(Discretion)</td>
<td>$a$</td>
<td>$2a$</td>
<td>$a$</td>
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<tr>
<td><strong>Optimal</strong></td>
<td>$0$</td>
<td>$0$</td>
<td>$0$</td>
</tr>
<tr>
<td>(Rule)</td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>Inconsistent</strong></td>
<td>$b$</td>
<td>$-b^2$</td>
<td>$0$</td>
</tr>
<tr>
<td>(Cheating)</td>
<td>$a$</td>
<td>$2a$</td>
<td></td>
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</tbody>
</table>
Graph of Inflation-Unemployment Tradeoff from K-P

\[ u_t = \lambda (x_t^e - x_t) + u^* \]
\[ x_t^e = Ex_t \]
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