Monetary Policy When Policy Makers Cannot Commit to Future Policies

Outline

1. Motivation for Thinking About Absence of Commitment, as a Way of Thinking About Observed Inflation and Interest Rates.

2. Kydland-Prescott/Barro-Gordon Analysis of Lack of Commitment In Monetary Policy
   – Model was an Important Conceptual Breakthrough.
   – But, Has Problems With the Facts.

Motivation

Countries’ Actual Experience Seems Suboptimal, By Comparison with Ramsey Scenario.

• Interest Rates Have Been High and Volatile.
Table 2a: High Inflation Economies

<table>
<thead>
<tr>
<th>Country</th>
<th>mean $R$</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>5.28*10^5</td>
<td>1980 - 2000</td>
</tr>
<tr>
<td>Brazil</td>
<td>946.05</td>
<td>1963 - 2000</td>
</tr>
<tr>
<td>Chile</td>
<td>39.86</td>
<td>1977 - 2000</td>
</tr>
<tr>
<td>Israel</td>
<td>113.47</td>
<td>1979 - 2000</td>
</tr>
<tr>
<td>Peru</td>
<td>519.32</td>
<td>1979 - 1993</td>
</tr>
<tr>
<td>Turkey</td>
<td>68.15</td>
<td>1987 - 2000</td>
</tr>
<tr>
<td>Uruguay</td>
<td>88.10</td>
<td>1976 - 2000</td>
</tr>
<tr>
<td>Mean, High Inflation</td>
<td>75677</td>
<td>NA</td>
</tr>
<tr>
<td>Country</td>
<td>mean $R$</td>
<td>$\sigma_R$</td>
</tr>
<tr>
<td>--------------</td>
<td>----------</td>
<td>------------</td>
</tr>
<tr>
<td>Australia</td>
<td>8.89</td>
<td>1.92</td>
</tr>
<tr>
<td>Austria</td>
<td>6.09</td>
<td>1.55</td>
</tr>
<tr>
<td>Belgium</td>
<td>5.22</td>
<td>1.48</td>
</tr>
<tr>
<td>Canada</td>
<td>8.36</td>
<td>2.45</td>
</tr>
<tr>
<td>Denmark</td>
<td>9.81</td>
<td>2.06</td>
</tr>
<tr>
<td>Finland</td>
<td>9.68</td>
<td>1.94</td>
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<tr>
<td>France</td>
<td>6.96</td>
<td>1.60</td>
</tr>
<tr>
<td>Germany</td>
<td>5.38</td>
<td>1.91</td>
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<td>Netherlands</td>
<td>5.79</td>
<td>1.75</td>
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<tr>
<td>Ireland</td>
<td>10.65</td>
<td>2.27</td>
</tr>
<tr>
<td>Italy</td>
<td>11.28</td>
<td>2.08</td>
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<tr>
<td>Japan</td>
<td>6.21</td>
<td>1.69</td>
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<tr>
<td>New Zealand</td>
<td>11.11</td>
<td>2.10</td>
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<tr>
<td>Norway</td>
<td>9.44</td>
<td>1.48</td>
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<td>Spain</td>
<td>11.60</td>
<td>2.40</td>
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<tr>
<td>Sweden</td>
<td>8.75</td>
<td>2.20</td>
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<tr>
<td>Switzerland</td>
<td>3.40</td>
<td>1.59</td>
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<tr>
<td>United Kingdom</td>
<td>7.78</td>
<td>2.20</td>
</tr>
<tr>
<td>United States</td>
<td>6.15</td>
<td>1.78</td>
</tr>
</tbody>
</table>
Three Possible Explanations of Historical Experience

1. Confused Policymakers Made Bad Mistakes.
   – Athanasios Orphanides: Mistaken About State of the Economy.
   – Clarida-Gali-Gertler: Wrong Coefficient on Taylor Rule (We Will Examine This Later.)

2. Fundamental Flaws In Our Analysis of What is Optimal.
   – I’m Skeptical Fixing Flaws in Analysis Will Rationalize Historical Experience As Optimal.

3. Real-World Governments Do Not Have the Ability to Commit to their Future Policies. Do This Today.
Fundamental Flaws In Our Analysis of What is Optimal: Some Possibilities.

- We Abstracted from Price-Setting Frictions.
  - These Often Imply that the Price Level Should Be Stable.
  - Then, Nominal Interest Rate Should Be Roughly Equal to Real Interest Rate (Positive!).
  - Probably Cannot Rationalize High Rates of Interest Often Observed.
  - See
    - Henry Siu, ‘Optimal Fiscal and Monetary Policy with Sticky Prices,’ forthcoming, JME.
• Keep Interest Rate High, To Keep it Away from Zero Bound.
  – Ability to Cut Rates if Necessary Could Prevent Confidence Crises
    Christiano, 1999, St. Louis Conference Volume.
  – Cutting Interest Rate May Stimulate Aggregate Demand When Needed.
• Limitations on Ability to Tax May Make Use of Inflation Tax Optimal in Some
  Situations.
  – Low-Income People are Expensive to Tax Directly.
  – Inflation as a Tax on Profits. (Recent Work by Schmitt-Grohe and Uribe.)
• These Considerations Seem Unlikely to Rationalize Historical Experience As
  Optimal.
Commitment: What is it, and Why Might it Matter?

• Commitment:

• Lack of Commitment:
  a. Private Economy Makes Decision Based on Guess of What Policy Maker will Do.
  b. Policy Maker Chooses Policy.

• Laffer Curve Example.
  a. Commitment: Get Best Outcome For Sure

• Expectation Trap.
Utility: $c - \frac{1}{2}l^2$
HH Budget constraint: $c = (1 - \tau)zl$
Gov’t Budget constraint: $g = \tau zl$
• Kydland-Prescott, Barro-Gordon Model
• Monetary Policy Situation Looks Like Situation in Laffer Curve, With No Commitment.
  – Private Decisions Involve Some Lead Time.
  – Model:
    * Preferences of Monetary Authority:
      \[ \frac{1}{2} [ (u - ku^N)^2 + \gamma \pi^2 ] \], \( \gamma > 0, \ k < 1 \).
    * Private economy:
      \[ u - u^N = -\alpha (\pi - \pi^e) \], \( \alpha > 0 \).
\[ \alpha \left[ (1 - k)u^N - \alpha (\pi - \pi^e) \right] = \gamma \pi \]

\[ \pi = \pi^e \]

\[ \pi = \psi u, \quad \psi = \frac{\alpha (1 - k)}{\gamma} > 0. \]
Shortcomings of KP-BG Model:
- In Standard Formulations of KP-BG, Inflation Driven By Fluctuations in Fundamentals.
  * ‘Fundamental’ That Drives Inflation In Barro-Gordon is Natural Rate of Unemployment. Observed Comovement in Data Between Inflation and Unemployment Seems Inconsistent with BG.
  * In Early 1980s Inflation Collapsed Just as Unemployment Was Soaring.
  * Late 1950s and early 1960s, Inflation Low and Unemployment High.
  * Are There Other Fundamentals That Can Do The Job?
- Hard to Test Reduced Form Model
- Infinite-Horizon Versions of KP-BG Models Generate Volatility with Trigger Strategies
  These Have Embarrassingly Many Equilibria: Hard to Test These Models.
Objective Today:

• Embed KP/BG Ideas in Standard General Equilibrium Model.
• Are There Equilibria That Are:
  – Generated By Fluctuations in Expectations?
  – And Not Supported by Trigger Strategies?
• Can These Equilibria Display Persistent High and Low Inflation?
• Is there Empirical Evidence to Support Such Equilibria?
Findings

- Multiple Equilibria Possible - Likely, Even

- Type of Equilibria That Occur: ‘Expectation Traps’
- Modest Evidence in Data of Such Equilibria.

A Possibility Ruled Out By Assumption in KP-BG
Expectation Traps

Low Inflation

Private Agents Expect Low Inflation → Private Actions → Monetary Authority Supplies low Inflation

High Inflation

Private Agents Expect High Inflation → Private Actions → Monetary Authority Supplies High Inflation
Embedding KP/BG in General Equilibrium

• Equilibrium Inflation Reflects Interplay Between Incentives and Disincentives to Inflate.

• Incorporate Incentives and Disincentives into a Lucas-Stokey Cash-Credit Good Model.

• Incentives:
  – Monopolistic Competition.
  – Some Preset Prices.

• Disincentives:
  – Svensson Timing ($P_1c_1 \leq M_{-1}$).
  – Distortions to Relative Prices.

• Endogeneity of Payments Technology.

• Finding: Incentives and Disincentives May Balance At Different Inflation Rates.
Model

- Households, Firms, Monetary Authority.
- Continuum of Goods.
- Infinite Horizon.
Exogenous Shocks Realized

- Households Choose Fraction, \( z \), of Goods to Purchase with Cash
- A Fraction, \( \mu \), of Firms Set Their Price, \( P \)

Monetary Authority Takes Its Action, \( x \)

Goods Markets Meet and Clear

Timing in a Period
Description of the Model

- Description Proceeds Backward Through Time, Starting With Decisions Taken at End of Period.
- Decision by Firms and Households At the End of the Period.
- Decision by the Monetary Authority.
- Household Choice of \( z \), and Choice of \( P^e \) by Firms With Preset Prices.
Private Sector Decisions At the End of the Period

- Variables that are Pre-Determined At this Point: $z, P^e, x$
- Description of Agents’ Problem:
  - Firms
  - Households
Firms

- Each good, $y(\omega), \omega \in [0, 1]$, produced by a monopolist.
- Production Technology: $y(\omega) = \theta n(\omega), \omega \in [0, 1]$.
- Firms use Usual Price Markup Rule.
- $1 - \mu$ Firms set Prices, $\hat{P}$, After Monetary Authority:
  $$\hat{P} = \frac{W}{\theta \rho}.$$ 
- $(\mu$ ‘Sticky Price’ Firms set Prices, $P^e$, Before Monetary Authority.)
Households

- Problem:

\[
\max \sum_{t=0}^{\infty} \beta^t u(c_t, \text{labor}_t), \quad c = \left[ \int_0^1 c(x)^\rho dx \right]^\frac{1}{\rho}
\]
• Payments Technology:
\[
labor = n + \frac{(\bar{z} - z)^{1+\nu}}{1 + \nu} \eta, \quad \bar{z} \text{ given.}
\]

• Cash in advance constraint:
\[
M_{-1} \geq P^e \mu z_{cash, preset \ price} + \hat{P}(1 - \mu) z_{cash, flex \ price}
\]

• Usual Wealth Evolution Equation.
Monetary Authority

• Problem:

\[
\max_R U(s, z, P^e, R),
\]
\[s \sim \text{Exogenous Shocks}\]

• Equilibrium:

\[\hat{P}(P^e, R) = P^e\]
\[U_R = 0.\]

• Monetary Authority FONC in Equilibrium:

\[U_R = -\psi_{ID}(R) + \psi_{MD}(R, z) \leq 0\]
with equality if \(R > 1\).

‘Policy Correspondence’

• \(\psi_{ID} \sim \text{‘Inflation Distortion’}:

\[\psi_{ID} = (R - 1) \frac{R^{\rho-1}}{\rho - 1}\]
\[\sim (R - 1) \frac{M}{P}\]
\[\psi_{ID}(1) = \lim_{R \to \infty} \psi_{ID}(R) = 0.\]
• $\psi_{MD} \sim \text{‘Monopoly Distortion’}:

$$
\psi_{MD}(R, z) = -(1 - \rho)R^{\frac{1}{\rho - 1}}
$$

$$
R^{\frac{1}{\rho - 1}} + \psi R^{\frac{\rho}{\rho - 1}} + \frac{\mu}{1 - \mu \rho} \left( R^{\frac{\rho}{\rho - 1}} + \frac{1 - z}{z} \right)
$$

$$
+ \frac{1 + \psi}{1 - \rho} + \frac{\psi}{\rho} \left( \frac{z}{1 - z} R^{\frac{\rho}{\rho - 1}} + 1 \right)
$$

$$
\sim \left[ - \left( \frac{-u_n}{u_{c_2}} \right) + \theta \right] n_R
$$

Efficiency Dictates the Term in Square Should Be Zero. With Monopoly Power, it is Positive.

• Properties of $\psi_{MD}$:

$$
\psi_{MD}(1) \leq 0, \lim_{R \to \infty} \psi_{MD}(R) > 0.
$$

• Proposition: Given $z$, If Monetary Authority FONC Satisfied at All, it Must Be Satisfied At Least Twice.
Household Choice of $z$

- Household Euler Equation for Choosing $z$ Yields Another Relationship Between $R$ and $z$:

$$\frac{(\frac{1}{\rho} - 1)(1 - R^{\frac{1}{\rho-1}})}{z \left[ (R^{\frac{1}{\rho-1}} - 1) + \frac{\psi}{\rho} (R^{\frac{\rho}{\rho-1}} - 1) \right] + (1 + \frac{\psi}{\rho})} = \frac{\rho \eta (\bar{z} - z)^{\nu}}{1 - \frac{(\bar{z} - z)^{1+\nu} \eta}{1+\nu} - \frac{g}{\theta}}$$

Household Payment Technology Function.

- Note that This is a Function of the Shocks.

- Can Show: Downward Sloping - If Households Expect High $R$, Choose Low $z$. 
Markov Equilibria

• Markov Equilibria with Technology Shocks

![Figure 4a: Markov Equilibrium With Production Technology Shocks](image)

- $\rho(R, Y) > 0$ in Low Inflation Equilibrium.
- $\rho(R, Y) < 0$ in High Inflation Equilibrium.
US in the 1970s: An Expectation Trap?

- Arthur Burns, Chairman of the US Federal Reserve in the 1970s, Spoke as Though He Were Caught in an Expectation Trap:

- Burns, May 1970:

  “An effort to offset, through monetary and fiscal restraints, all of the upward push that rising costs are now exerting on prices would be most unwise. Such an effort would restrict aggregate demand so severely as to increase greatly the risks of a very serious business recession. If that happened, the outcries of an enraged citizenry would probably soon force the government to move rapidly and aggressively toward fiscal and monetary ease, and our hopes for getting the inflationary problem under control would then be shattered.”
...  

Conclusion  

• Expectation Traps Equilibria Occur in Simple Monetary Models.  
  – Expecting Inflation, Agents Take Defensive Actions, Which Lead Monetary Authority to Optimally Provide High Inflation.  
  – Similarly, when Agents Expect Low Inflation.  

• Prolonged Periods of High and Low Inflation Consistent With the Model.  

• Some Empirical Support Found.  

• The Expectation Trap Hypothesis About Variation and Persistence in Inflation Deserves Further Consideration.