Institutions and Rules in Monetary Policy

‘The Expectations Trap Hypothesis’, with Chris Gust, Federal Reserve Bank of Chicago Economic Perspectives, 2000


Objective:

- That a Taylor Rule Might Work Well in Practice Does Not Seem Surprising.
- Illustrate What Can Go Wrong with the Taylor Rule.
- Explore Hypothesis of Clarida-Gali-Gertler (QJE), That Take-Off In Inflation in 1970s Reflected Bad Taylor Rule.
- Consider the ‘Institutional’ Perspective on Inflation.
Two Representations of CGG Hypothesis

- Both Cases: Estimated Policy Rule For the 1970s (Clarida-Gali-Gertler):

\[ R_t = \rho R_{t-1} + (1 - \rho) R^*_t. \]

\[ R^*_t = \text{constant} + \alpha E_t \log(\pi_{t+1}) + \gamma y_t, \quad \pi_{t+1} = \frac{P_{t+1}}{P_t}, \]

\[ \rho = 0.75, \quad \alpha = 0.80, \quad \gamma = 0.44. \]

- With \( \alpha < 1 \), Multiple Equilibria in New Keynesian and Limited Participation Model.

- New Keynesian (CGG) Model.

- Limited Participation Model.
Case where interest rate is aggressive in CGG model prevents inflation expectations from losing their anchor.
Phillips curve
Any initial rise in $\pi_e$ would quickly disappear.
Mechanism By Which Taylor Rule with Small $\alpha$ Can Make Inflation Vulnerable to Expectations

- Clarida-Gali-Gertler Version of New Keynesian Model

  a. People Expect High Inflation, $\pi^e$ rises.
  
  b. If $\alpha < 1$, $R - \pi^e$ Falls, Stimulating Aggregate Demand
     
     c. Output Rises.
     
     d. The Rise in Output is Associated With Increased Marginal Costs, Leading to a Rise In Prices
     
     e. This Justifies Original Rise in Expected Inflation.
CASH FLOW PATTERN IN LIMITED PARTICIPATION MODEL

Firms $M + X$

Monetary Authority

Financial Market

Goods Market

Households $M$

$Q + WL$

$W L$

$X$

Money Injection

$Q$

Expenditures

$M - Q$

deposits

$M - Q + X$
• Limited Participation Model, With Working Capital Channel
  a. People Expect High Inflation, $\pi^e$ rises.
  b. If $\alpha < 1$, $R - \pi^e$ Falls, Leading People to Put Less Money Into Interest-Bearing Deposits.
  
  c. Firms Who Need Money to Finance Production, Still Need it.
  
  d. With Supply of Deposits Reduced, and Demand From Firms Unchanged, there is Pressure for $R$ to Rise a Lot.
  
  e. To Prevent Huge Rise in $R$ (since $\alpha < 1$), Central Bank Must Inject Reserves into Banks.
  
  f. The Injection of Reserves Leads to a Rise in Inflation, Justifying Original Rise in Inflation Expectations.
  
  g. The Higher $R$ Forces a Slowdown in the Economy.
Households in Limited Participation Model:

Preferences:

\[ E_0 \sum_{t=0}^{\infty} \beta^t U (C_t, L_t, H_t), \]

\[ U(C, L, H) = \log \left[ C - \psi_0 (L + H)^{(1+\psi)} / (1 + \psi) \right], \]

Cash Constraint in Goods Market:

\[ Q_t + W_t L_t \geq P_t (C_t + I_t), \]

Capital Evolution Equation:

\[ K_{t+1} = I_t + (1 - 0.02) K_t. \]

Household Asset Evolution Equation:
\[ M_{t+1} = Q_t + W_tL_t - P_t(C_t + I_t) \]
\[ + R_t(M_t - Q_t + X_t) + D_t + r_tK_t \]

Household Adjustment Costs for Changing \( Q_t \):

\[ H \left( \frac{Q_t}{Q_{t-1}} \right) = d \{ \exp \left[ c \left( \frac{Q_t}{Q_{t-1}} - 1 - x \right) \right] \]
\[ + \exp \left[ -c \left( \frac{Q_t}{Q_{t-1}} - 1 - x \right) \right] - 2 \} \]

Steady State Properties:

\[ H = H' = 0, \quad H'' = 2c^2d > 0 \]
Firms:

First Order Conditions:

\[
\frac{W_t R_t}{P_t} = \frac{f_{L,t}}{\mu}, \quad \frac{r_t}{P_t} = \frac{f_{K,t}}{\mu}, \quad \mu = 1.4.
\]

Technology:

\[
f(K_t, L_t, v_t) = \exp(v_t)K_t^{0.36}L_t^{0.64},
\]

where

\[
v_t = 0.95v_{t-1} + \varepsilon_{v,t},
\]
Financial Sector

Loan Demand Equals Supply:

\[ W_t L_t = M_t - Q_t + X_t \]
Figure 1
Response of Model to an Exogenous Monetary Policy Shock

a: Price Level - % dev from SS

b: Employment - % dev from SS

c: Money Stock - % dev from SS

d: Consumption - % dev from SS

e: Inflation Rate - APR

f: Output - % dev from SS

g: Interest Rate - APR

h: Investment - % dev from SS

% dev from SS: deviation from unshocked nonstochastic steady state growth path expressed in percent terms
APR: annualized percentage rate
Figure 1
Response to a Technology Shock In Two Different Models

LP Model ———
IS/LM Model ————

% dev from SS: deviation from unshocked nonstochastic steady state growth path expressed in percent terms.
APR: annualized percentage rate.
Does a High Value for $\alpha$ Guarantee Stability?

- In the Models Analyzed Above, ‘Yes’.

- Easy to Find Models in Which Answer is ‘No’.

- Need Extra Protection, In Case the World is Better Captured by A Model in Which the Answer is No.

- One Piece of Protection: Monitor the Money Growth Rate.
• Example:

– Euler Equations and Resource Constraint:

\[ u_{c,t} = \beta u_{c,t+1} \frac{R_t}{\pi_t^{e}} \] Intertemporal Euler

\[ -\frac{u_{l,t}}{u_{c,t}} = \frac{W_t}{P_t} \] Intratemporal Euler

\[ \frac{R_t W_t}{P_t} = \text{Marginal Product of Labor} = 1 \]

\[ c_t = l_t \] Resource Constraint

\[ c_t = \frac{M_{t+1}}{P_t} \] Binding Cash In Advance Constraint
\[ u = \log(c_t) + \gamma \log(1 - l_t): \]

\[ \frac{c_{t+1}}{c_t} = \beta \frac{R_t}{\pi^e_{t+1}} \]

\[ \frac{\gamma l_t}{1 - l_t} = \frac{1}{R_t} \]

- Suppose \( \alpha > 1 \)

* Expected Inflation, \( \pi^e \), Jumps

* \( R_t \) Jumps By More (\( \alpha > 1 \)), so \( R_t/\pi^e_{t+1} \) Jumps.

* High \( R_t/\pi^e_{t+1} \Rightarrow \) jump in \( c_{t+1}/c_t \)

\[ \text{Intertemporal Euler Equation Satisfied} \]
Higher $R \Rightarrow$ Lower $l_t$ (Consistent with $c_{t+1}/c_t$ High).

Intratemporal Euler Equation Satisfied

Higher $\pi^e$ Accommodated with Higher Money Growth, Consistent with Cash in Advance Constraint

(Money Demand in Model).
A more formal analysis of the example:

- Core equations:

\[
\frac{l_{t+1}}{l_t} = \beta \frac{R_t}{\pi^e_{t+1}} \\
\frac{\gamma l_t}{1 - l_t} = 1 \\
\pi^e_{t+1} = \frac{R_t}{\alpha} \quad \text{(Taylor rule)} \\
\Rightarrow l_{t+1} = \beta l_t \left[ \frac{1 - l_t}{\gamma l_t} \right]^{1 - \frac{1}{\alpha}}
\]

- Other equations:

\[
R_t = \frac{(1 - l_t)}{\gamma l_t} \\
\pi^e_{t+1} = \frac{R_t}{\alpha} \\
\frac{l_{t+1}}{l_t} = \frac{M_{t+2}}{P_{t+1}} \\ = \frac{M_{t+2}}{M_{t+1}} \frac{1}{\pi_{t+1}} = g_{t+1} \\
\Rightarrow g_{t+1} = \pi_{t+1} \frac{l_{t+1}}{l_t}
\]
Adding a 'supply-side' channel to CCG model has effect that aggressive Taylor rule is destabilizing.
The diagram illustrates the Phillips curve and the IS-LM model. The Phillips curve (orange line) shows the relationship between inflation ($\pi$) and real GDP ($y$), with $\pi_1$ indicating a point of inflation. The IS-LM model includes two IS curves, IS($\pi e'$) and IS($\pi e$), and a LM curve, intersecting at $y_1$ and $\pi$. The IS($\pi e'$) curve is above the IS($\pi e$) curve, indicating different equilibrium points for the economy.
\[ R \]

\[ y \]

LM

LM'

IS(\pi e')

IS(\pi e)

Phillips curve

\[ y_1 \]

\[ \pi \]

\[ \pi_1 \]
Phillips curve
Higher $\pi^e$ confirmed and likely to persist
• Clarida-Gali-Gertler Model with Supply-Side Channel

\[ y_t = -(R_t - \pi_{t+1}) + y_{t+1} \]

\text{IS curve}

\text{supply-side channel}

\[ \pi_t = 0.085 y_t + \gamma R_t + 0.99 \pi_{t+1} \]

\text{Phillips curve}

\text{aggressive Taylor rule}

\[ R_t = 1.5 \pi^e_{t+1} \]

\text{Taylor rule}

• Could reflect:
  – working capital requirements
  – other financial frictions

• Results:
  – \( \gamma = 0 \) and \( \tau = 1.5 \) steady state is determinate (like in CGG!)
  – for \( \gamma \geq 0.01 \), steady state is indeterminate.
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  – If You Assume the New Keynesian Model that CGG Adopt, Hypothesis is Rejected Because the Model Implies there was a Boom in the 1970s.
  – If You Assume a Limited Participation Model, the Hypothesis Passes Because the Model Implies that there Was Economic Weakness in the 1970s.
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  - For Added Protection, Include ‘Escape Clause’: Switch to a Money Growth Rule in Case Money Growth (or Some Other Variable, Like Inflation) Behaves Erratically.
  - Note: this is a Version of the ECB’s ‘Two Pillar Strategy’
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- But, Was it Really Ignorance of the right Value of $\alpha$ That Prevented Arthur Burns From Stopping Inflation?
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• In The Context of the Models Analyzed Here, the Right Fix is to Adopt a Taylor Rule with a Big Coefficient on Inflation. But, there are Other Models in Which this Does Not Work.

• But, Was it Really Ignorance of the right Value of $\alpha$ That Prevented Arthur Burns From Stopping Inflation?

• Or, Was it the Institutional Environment, Which Forced Him to Focus on the Heavy Cost of Fighting Inflation, Which Snared Him in a Bad Expectations Trap?
Barro-Gordon, Kydland-Prescott Model

- Private Economy:
  \[ y - y^N = \alpha (\pi - \pi^e), \alpha > 0. \]

- Preferences of Monetary Authority:
  \[ \frac{1}{2} [(y - ky^N)^2 + \gamma \pi^2], \gamma > 0, k < 1. \]
  - \( k < 1 \): economy is inefficient, creating incentive for monetary authority to ‘step on the gas’

- Explicit, Micro-founded version based on Lucas-Stokey cash-credit good model:
  - ‘\( k < 0 \)’ due to the presence of monopoly power in the economy (or, could be distortionary taxes).
Problems with expectation trap hypothesis:

- When articulated using Barro-Gordon model:
  * implies that to move to low inflation, must have institutional reform
  * US did not have institutional reform in 1980s.

- When articulated using Albanesi-Chari-Christiano-Eichenbaum:
  * Model allows transition from high to low inflation without institutional reform, but...
  * Transition from high inflation to low inflation associated with unambiguous welfare gain, no losses along the way like in the 1980s.
– Proponents of Expectation Traps hypothesis argue that the key to keeping inflation low is:

* Institutional reform that would make sustained difficult actions by monetary authority to keep inflation down credible

* In US - convert the ‘dual mandate’ (inflation and unemployment) into a single, inflation mandate.

* ECB is an example of institutional reform.