Operating Characteristics of the Taylor Rule

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

‘Money Growth Monitoring and the Taylor Rule’, with Massimo Rostagno, NBER
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.
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.
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

Goods Market $Q+WL$

Financial Market $M-Q+X$

Households $M$

Expenditures $Q$

Deposits $M-Q$

Money Injection $X$
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:

\[ M_{t+1} = Q_t + W_t L_t - P_t (C_t + I_t) + R_t (M_t - Q_t + X_t) + D_t + r_t K_t, \]

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:

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

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

% 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:

\[
    u_{c,t} = \beta u_{c,t+1} \frac{R_t}{\pi_{t+1}} \quad \text{Intertemporal Euler}
\]

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

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

\[
    c_t = l_t \quad \text{Resource Constraint}
\]

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

\[
\frac{c_{t+1}}{c_t} = \beta \frac{R_t}{\pi_{t+1}^e} \\
\frac{\gamma l_t}{1 - l_t} = \frac{1}{R_t}
\]

– Suppose \( \alpha > 1 \)

* Expected Inflation, \( \pi^e \), Jumps
* \( R_t \) Jumps By More (\( \alpha > 1 \)), so \( R_t - \pi_{t+1}^e \) Jumps.
* High \( R_t - \pi_{t+1}^e \) \( \Rightarrow \) jump in \( c_{t+1}/c_t \) 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).
Conclusion

• Performance of CGG Hypothesis Depends on the Assumptions You Make About the Macro-Economy
  – 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.
• 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.

  – For Added Protection, Include an ‘Escape Clause’: Switch to a Money Growth Rule in Case Money Growth Gets Out of Control.

  – Note: This is a Version of the ECB’s ‘Two Pillar Strategy’.
• But, Was It Really Ignorance of Right Value of $\alpha$ That Prevented Burns from Stopping Inflation?

• Or, Was it the Institutional Environment, Which Forced Him To Focus on the Heavy Social Costs that Would Have to Be Paid if he Had Tried to Stop Inflation?