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 Working Paper 8539.

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):

$$R_t = \rho R_{t-1} + (1-\rho) R_t^*.$$

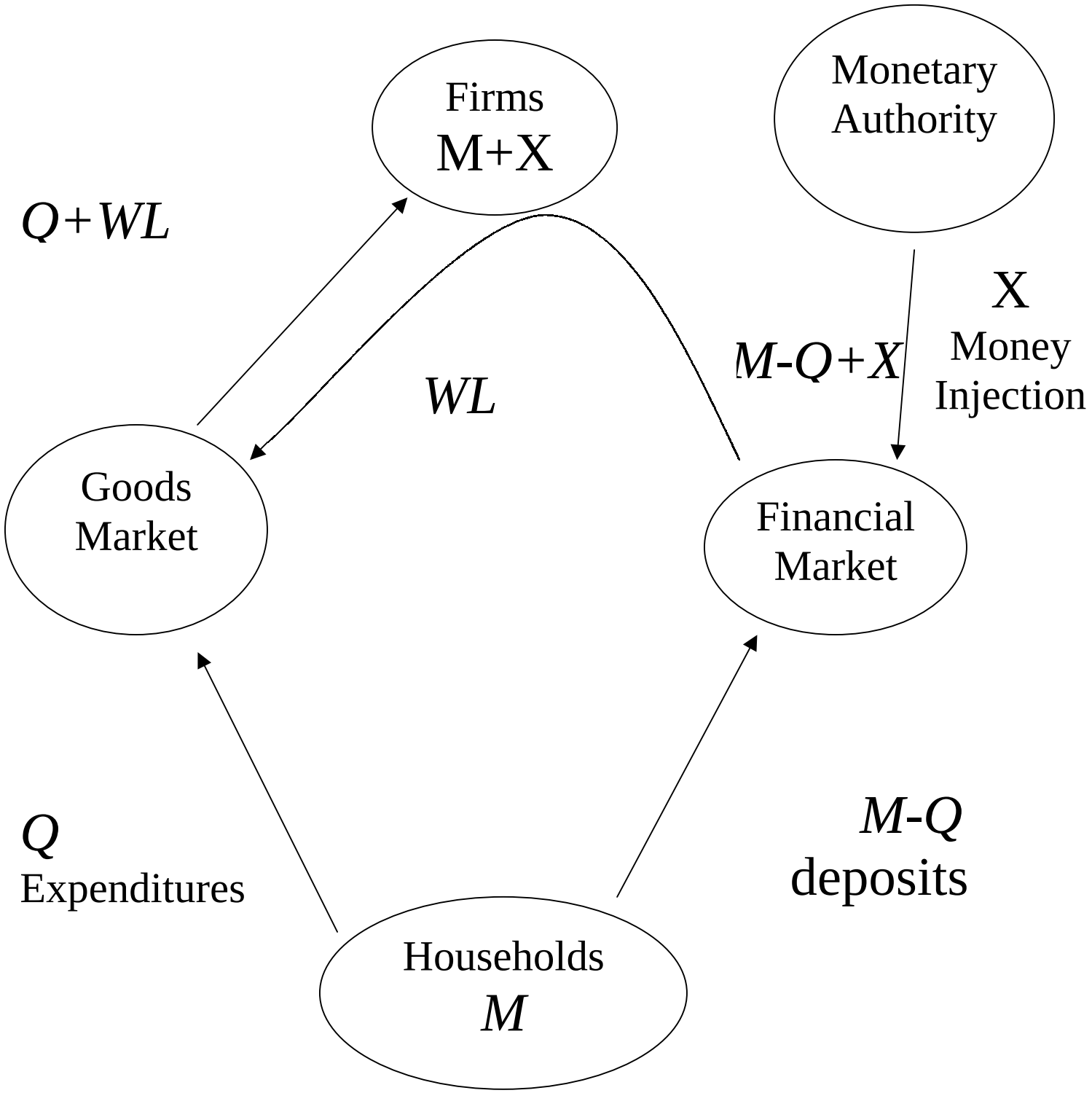
$$R_t^* = \text{constant} + \alpha E_t \log(\pi_{t+1}) + \gamma y_t, \ \pi_{t+1} = \frac{P_{t+1}}{P_t},$$
$$\rho = 0.75, \ \alpha = 0.80, \ \gamma = 0.44.$$

- 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 α Can Make Inflation Vulnerable to Expectations

- Clarida-Gali-Gertler Version of New Keynesian Model
  (a) People Expect High Inflation, π^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



- Limited Participation Model, With Working Capital Channel
  (a) People Expect High Inflation, π^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:

$$E_0 \sum_{t=0}^{\infty} \beta^t U\left(C_t, L_t, H_t\right),$$

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

Cash Constraint in Goods Market:

$$Q_t + W_t L_t \geq P_t \left(C_t + I_t\right),$$

Capital Evolution Equation:

$$K_{t+1} = I_t + (1 - 0.02) K_t.$$

Household Asset Evolution Equation:

$$\begin{aligned} & M_{t+1} \\ = \; & Q_t + W_t L_t - P_t \left(C_t + I_t \right) \\ & + R_t (M_t - Q_t + X_t) + D_t + r_t K_t, \end{aligned}$$

Houshold Adjustment Costs for Changing Q_t :

$$\begin{aligned} H\left(\frac{Q_t}{Q_{t-1}}\right) \; = \; & d\{\exp\left[c\left(\frac{Q_t}{Q_{t-1}} - 1 - x\right)\right] \\ & + \exp\left[-c\left(\frac{Q_t}{Q_{t-1}} - 1 - x\right)\right] - 2\} \end{aligned}$$

Steady State Properties:

$$H = H' = 0, \; H'' = 2c^2 d > 0$$

Firms:

First Order Conditions:

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

Technology:

$$f(K_t, L_t, v_t) = exp(v_t) K_t^{0.36} L_t^{0.64},$$

where

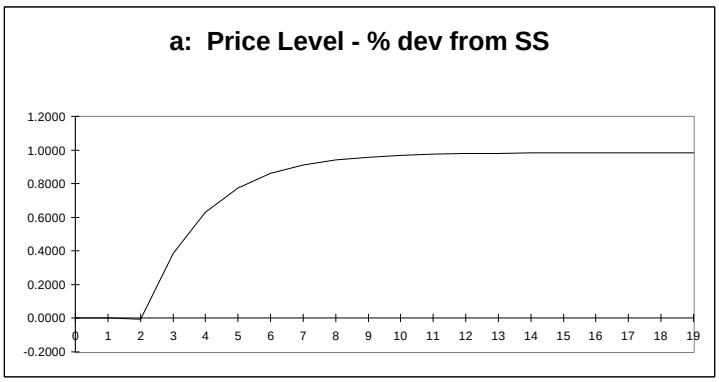
$$v_t = 0.95 v_{t-1} + \varepsilon_{v,t},$$

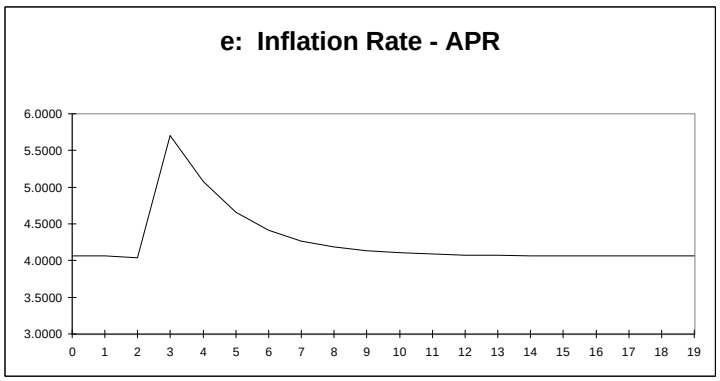
Financial Sector

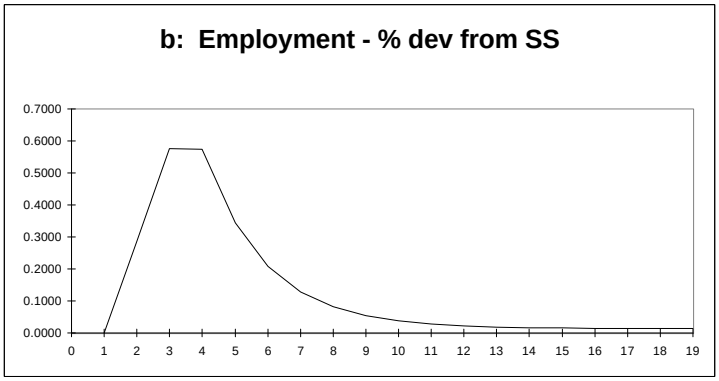
Loan Demand Equals Supply:

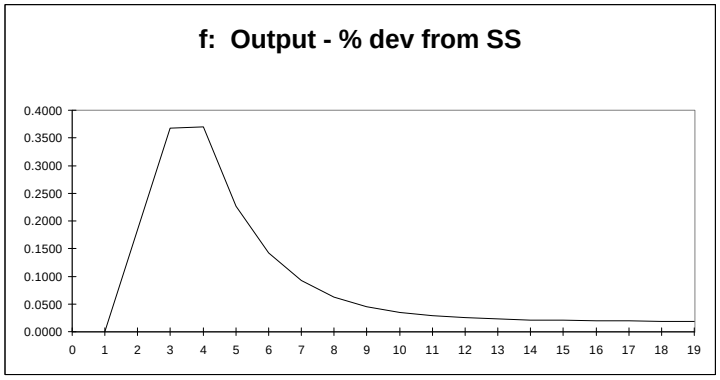
$$W_t L_t = M_t - Q_t + X_t$$

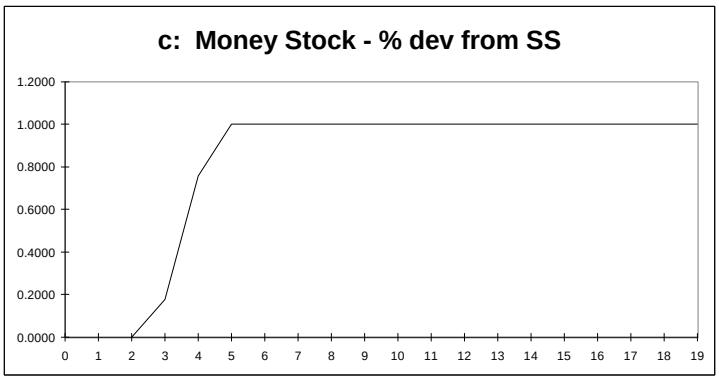
Figure 1
Response of Model to an Exogenous Monetary Policy Shock

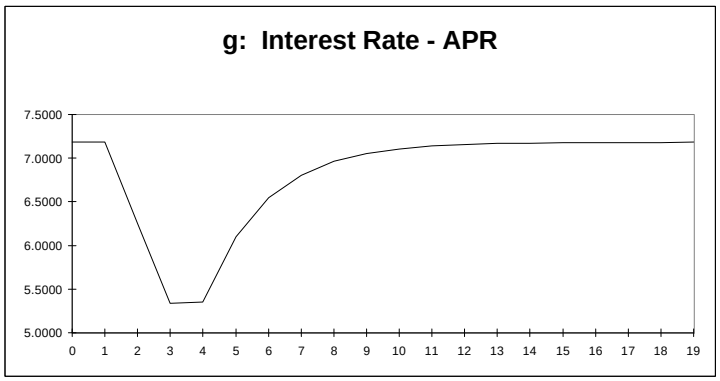


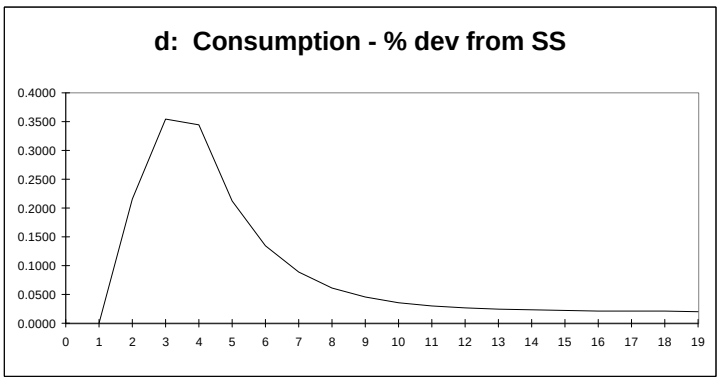


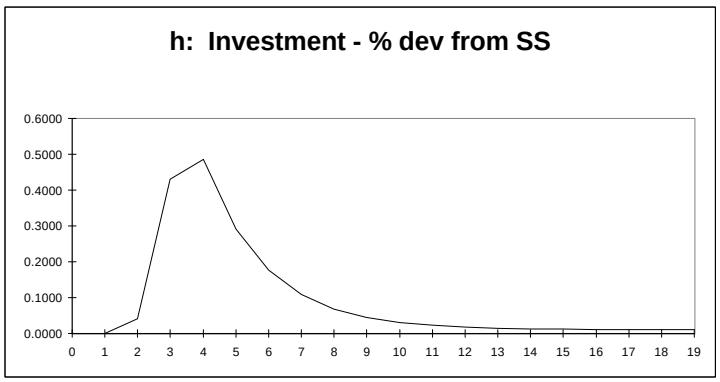






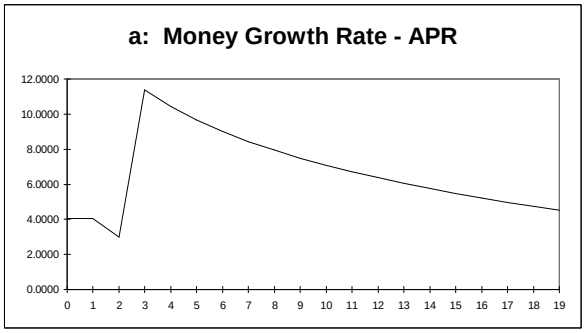


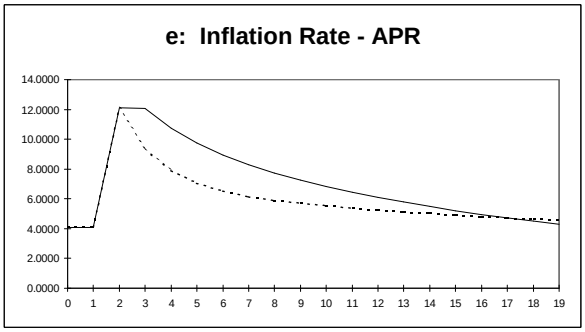


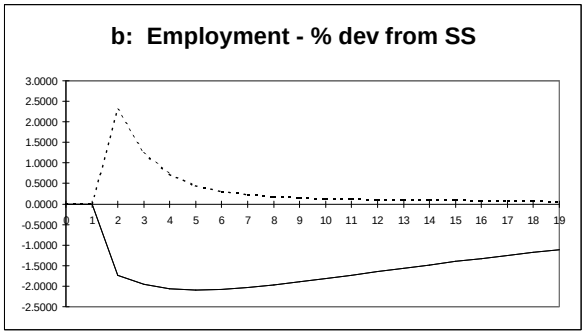


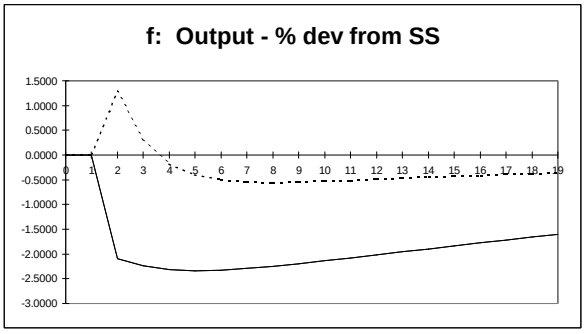
% dev from SS: deviation from unshocked nonstochastic steady state growth path expressed in percent terms
APR: annualized percentage rate

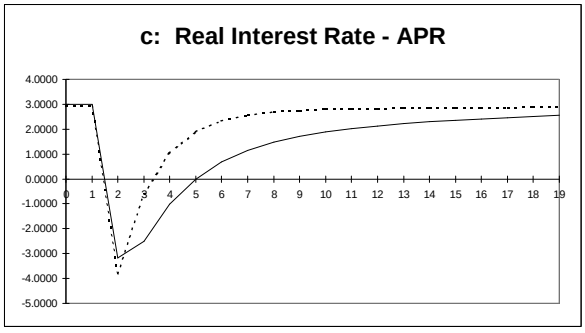
Figure 1
Response to a Technology Shock In Two Different Models

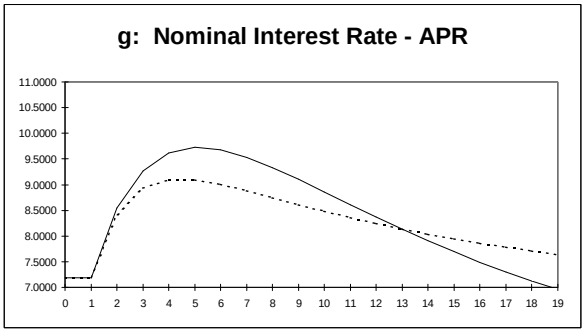


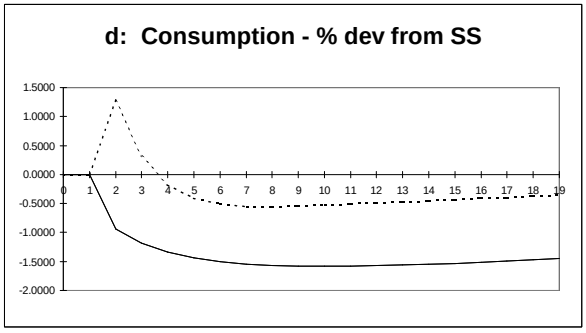


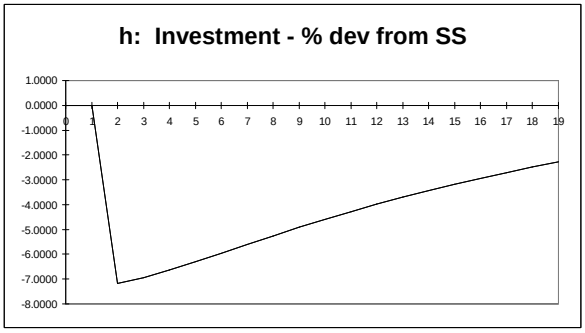


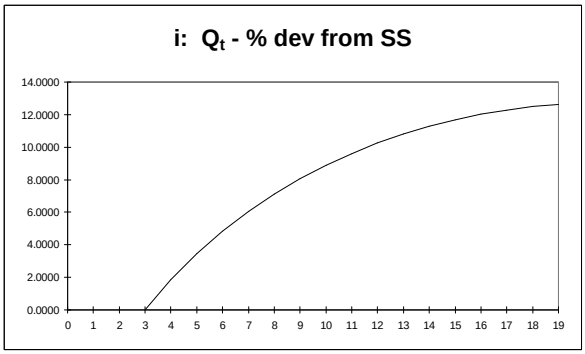












LP Model ————

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 α 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:

$$
\begin{aligned}
u_{c,t} &= \beta u_{c,t+1} \frac{R_t}{\pi^e_{t+1}} \text{ Intertemporal Euler} \\
\frac{-u_{l,t}}{u_{c,t}} &= \frac{W_t}{P_t} \text{ Intratemporal Euler} \\
\frac{R_t W_t}{P_t} &= \text{Marginal Product of Labor = 1} \\
c_t &= l_t \text{ Resource Constraint} \\
c_t &= \frac{M_{t+1}}{P_t} \text{ Binding Cash In Advance Constraint}
\end{aligned}
$$

- With $u = \log(c_t) + \gamma \log(1 - l_t)$:

$$\frac{c_{t+1}}{c_t} = \beta \frac{R_t}{\pi^e_{t+1}}$$
$$\frac{\gamma l_t}{1 - l_t} = \frac{1}{R_t}$$

- Suppose $\alpha > 1$
  - Expected Inflation, π^e, Jumps
  - R_t Jumps By More ($\alpha > 1$), so R_t/π^e_{t+1} Jumps.
  - High $R_t/\pi^e_{t+1} \Rightarrow$ 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 π^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 α 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?