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Institutions and Rules in Monetary Policy

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

'Inflation and Monetary Policy in the 20^{th} Century,' with Terry Fitzgerald, Federal Reserve Bank of Chicago Economic Perspectives, 2003.

'Money Growth Monitoring and the Taylor Rule', with Massimo Rostagno, NBER Working Paper 8539.

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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.

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Two Representations of CGG Hypothesis

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

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

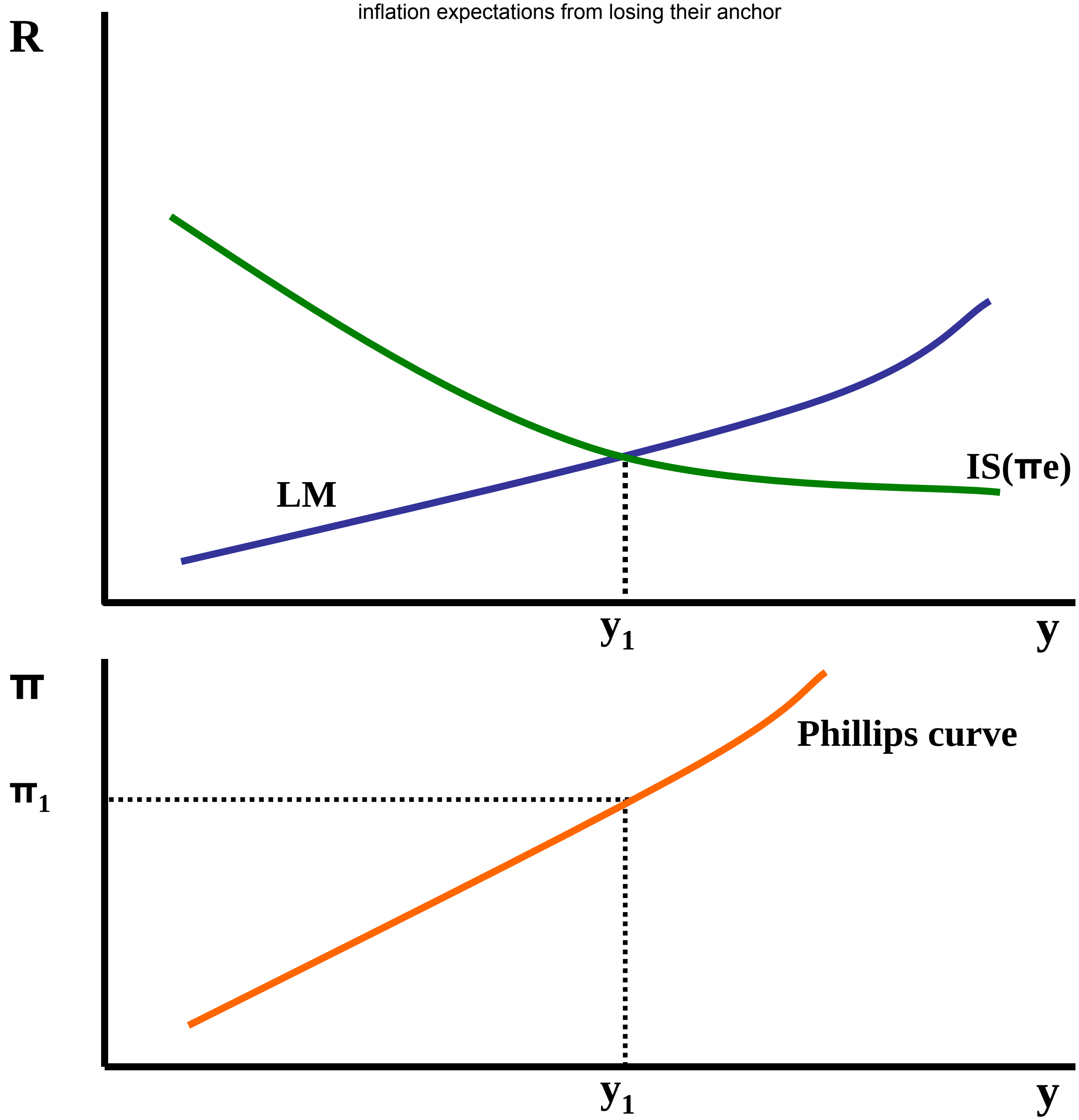
$$\begin{aligned} R_t^* &= \text{constant} + \alpha E_t \log(\pi_{t+1}) + \gamma y_t, \; \pi_{t+1} = \frac{P_{t+1}}{P_t}, \\ \rho &= 0.75, \; \alpha = 0.80, \; \gamma = 0.44. \end{aligned}$$

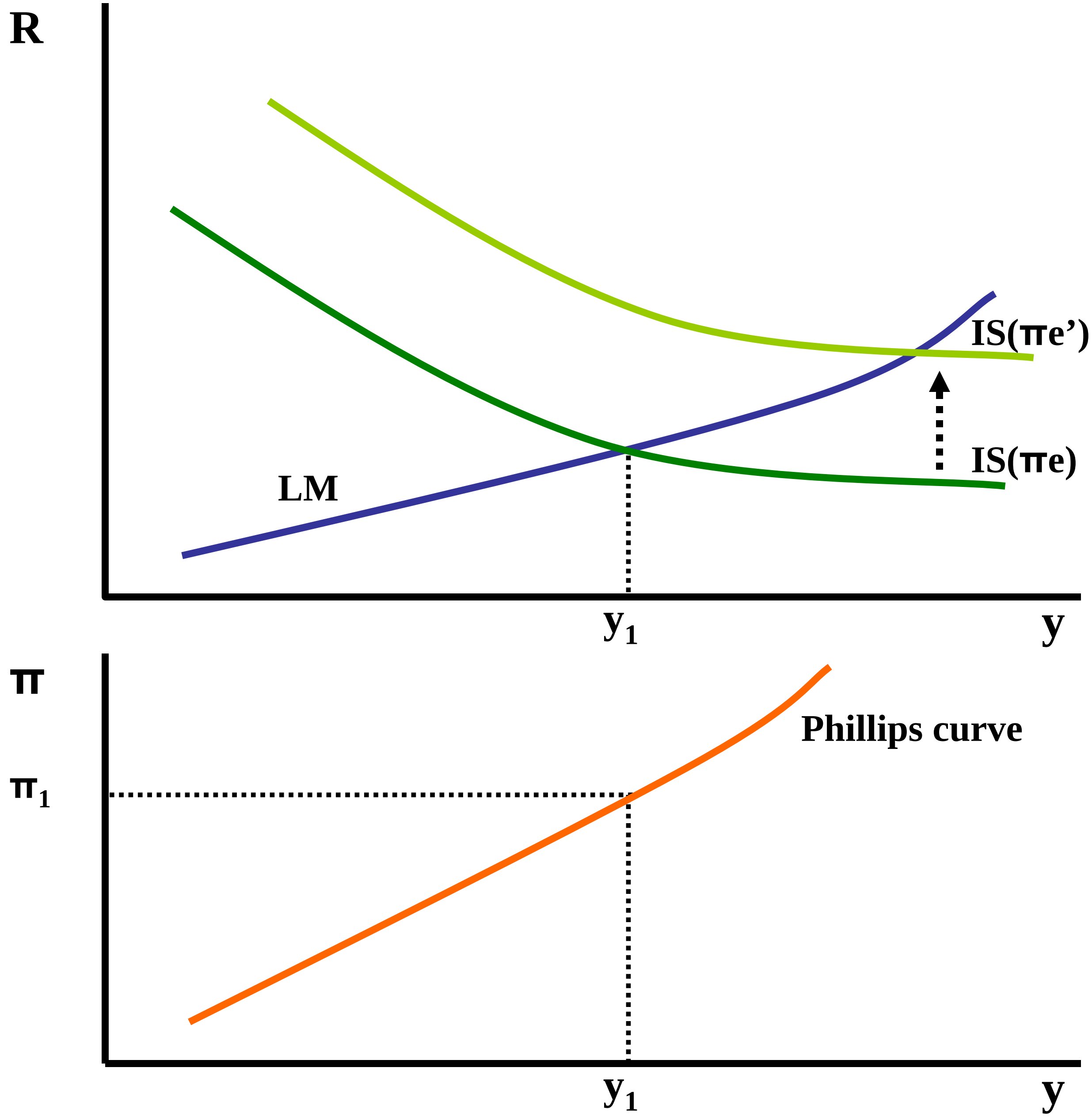
- With $\alpha < 1$, Multiple Equilibria in New Keynesian and Limited Participation Model.

- New Keynesian (CGG) Model.

- Limited Participation Model.

Case where interest rate is aggressive in CGG model prevents inflation expectations from losing their anchor





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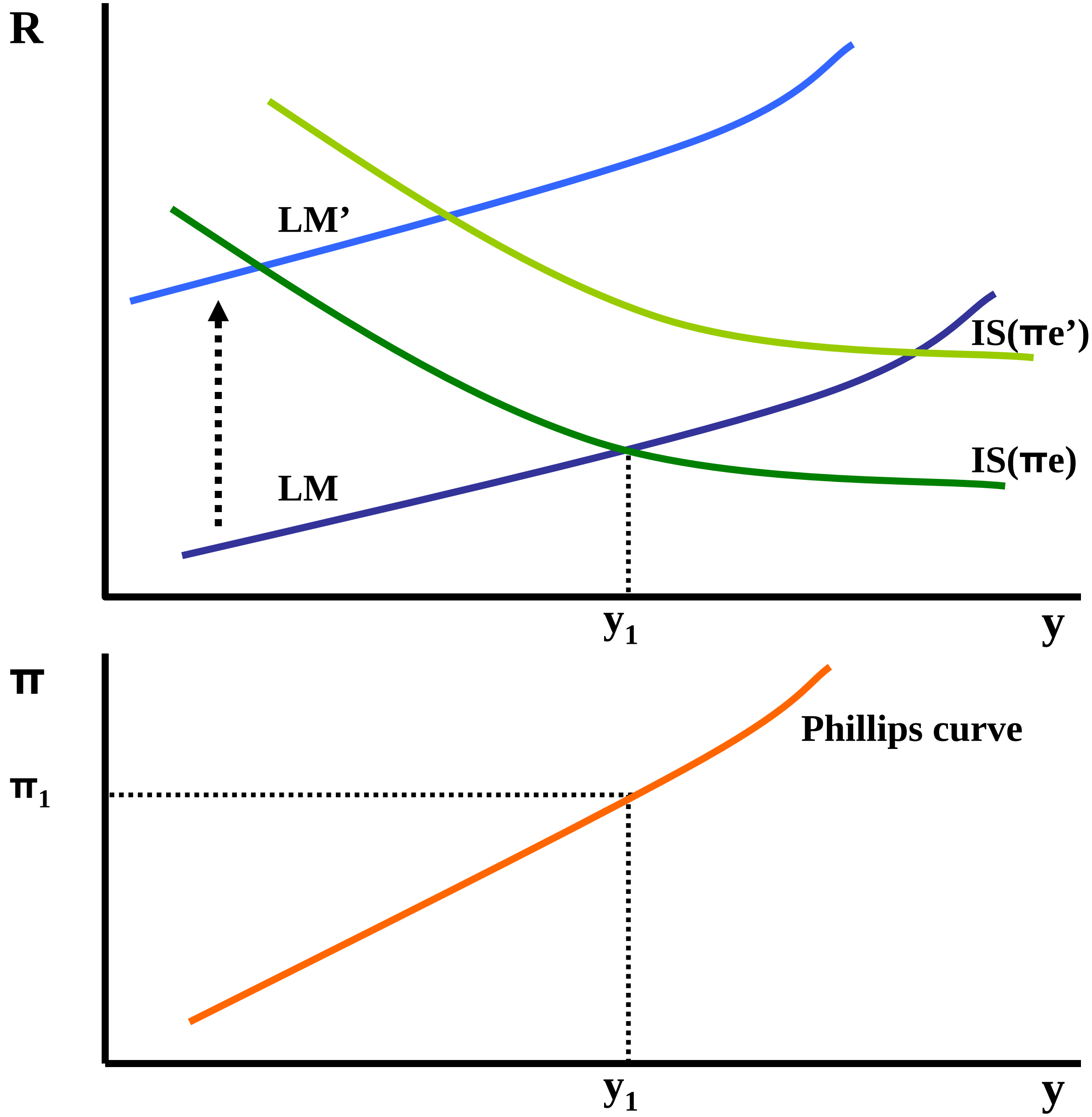
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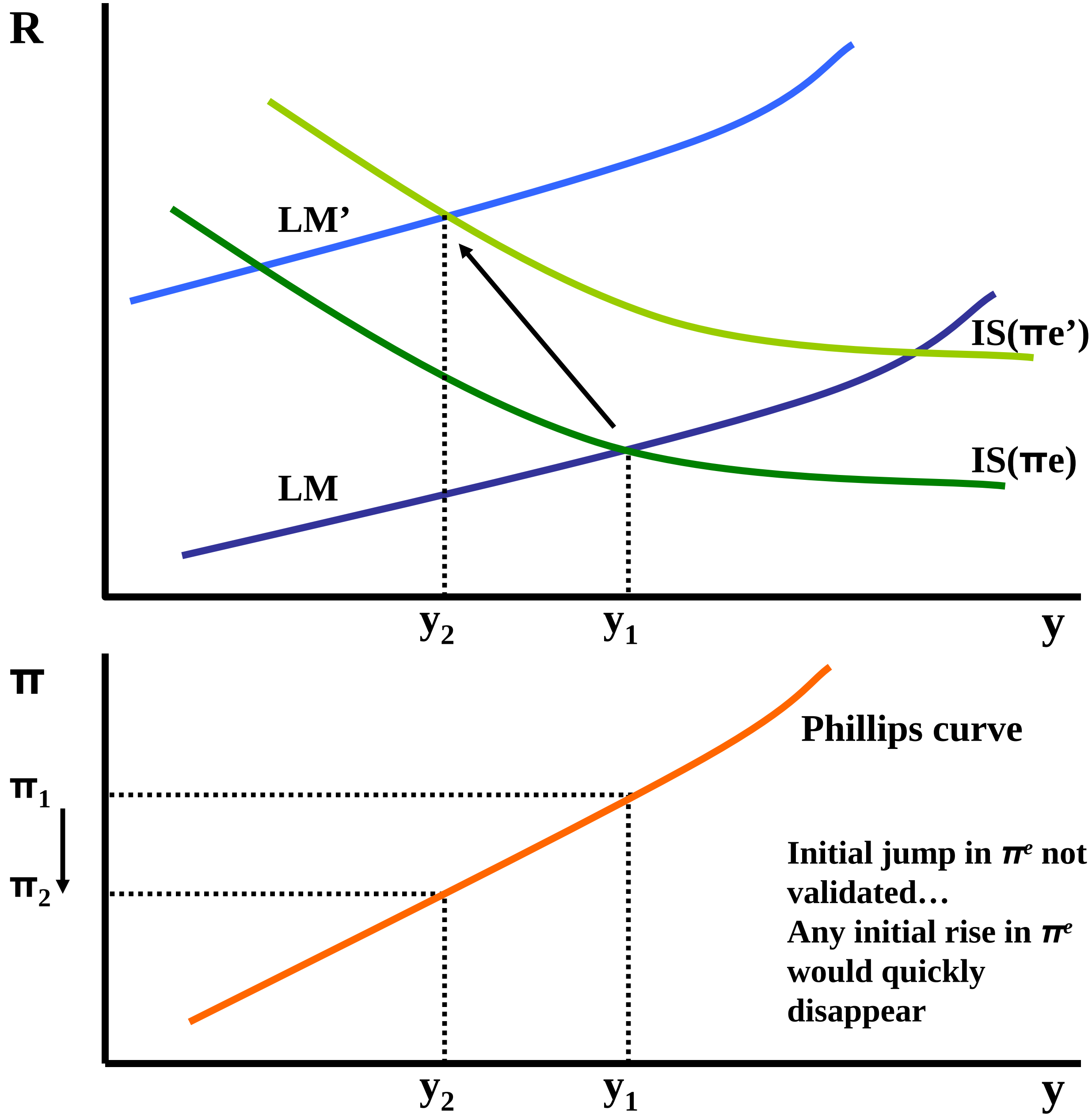
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π1
π2
Initial jump in πe not validated…
Any initial rise in πe would quickly disappear
y2
y1
y

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.

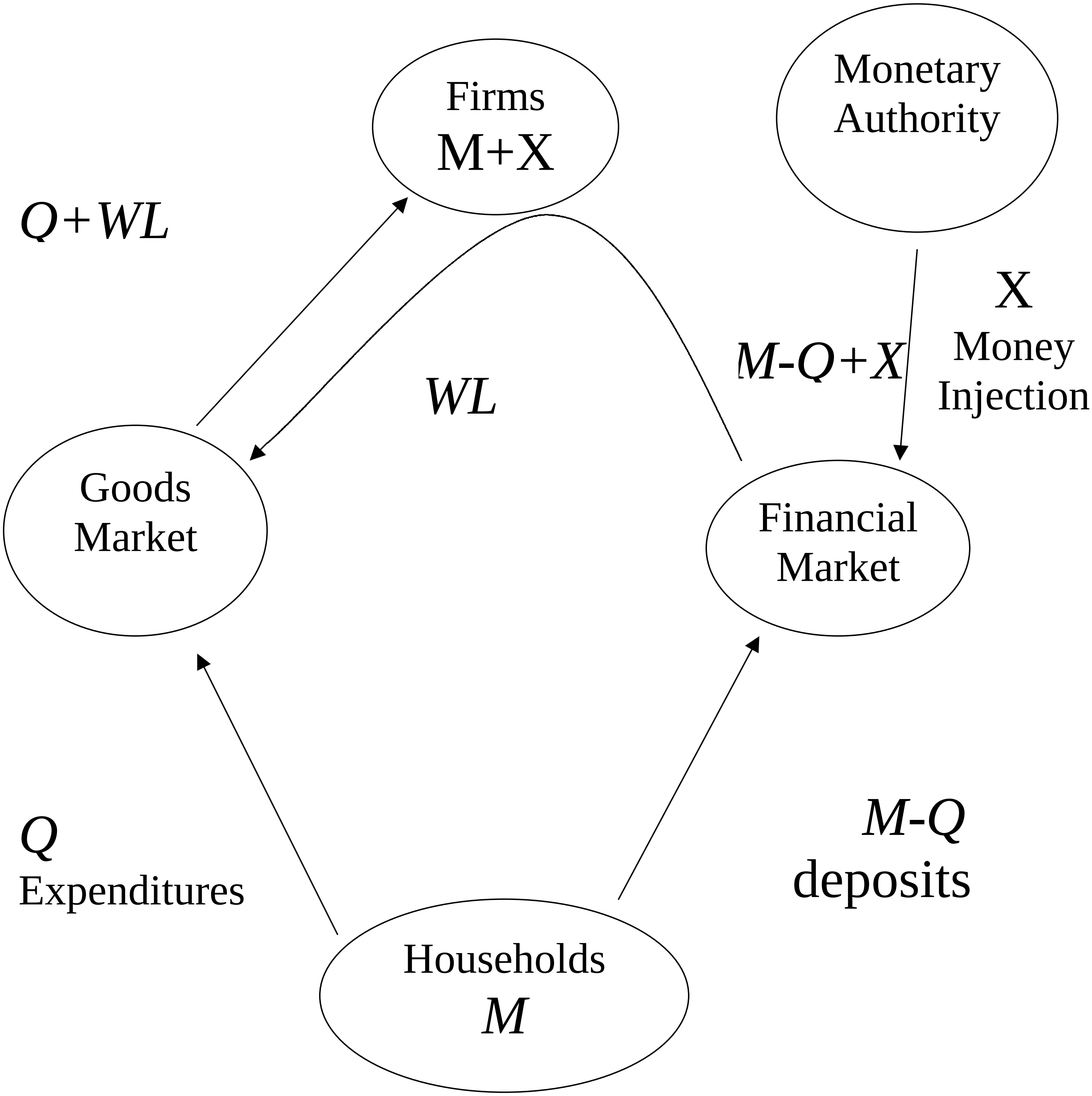
  b. If $\alpha < 1$, $R - \pi^e$ Falls, Stimulating Aggregate Demand

  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



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- 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.

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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:

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

Household Adjustment Costs for Changing Q_t :

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

Steady State Properties:

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

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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

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

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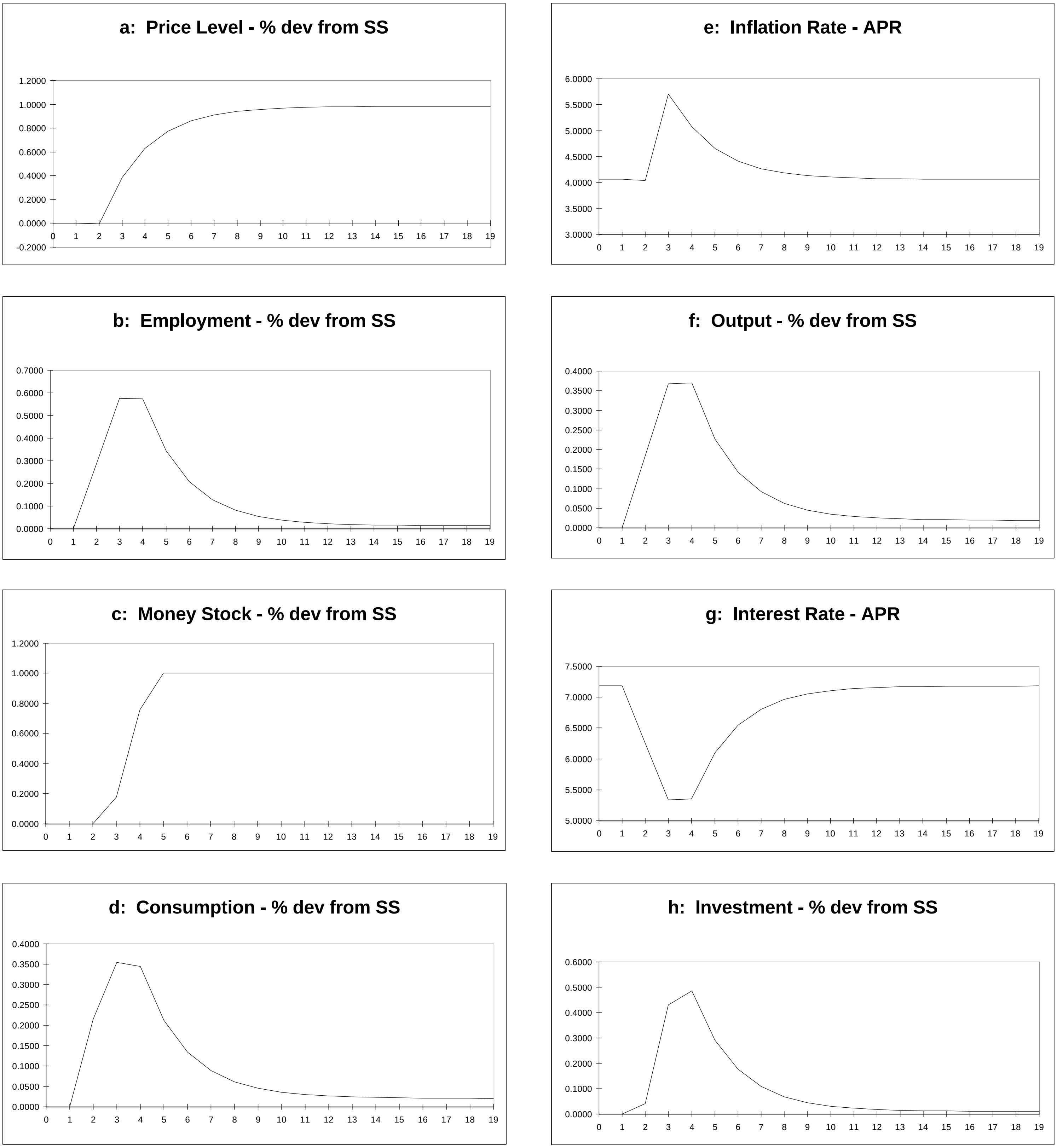
Financial Sector

Loan Demand Equals Supply:

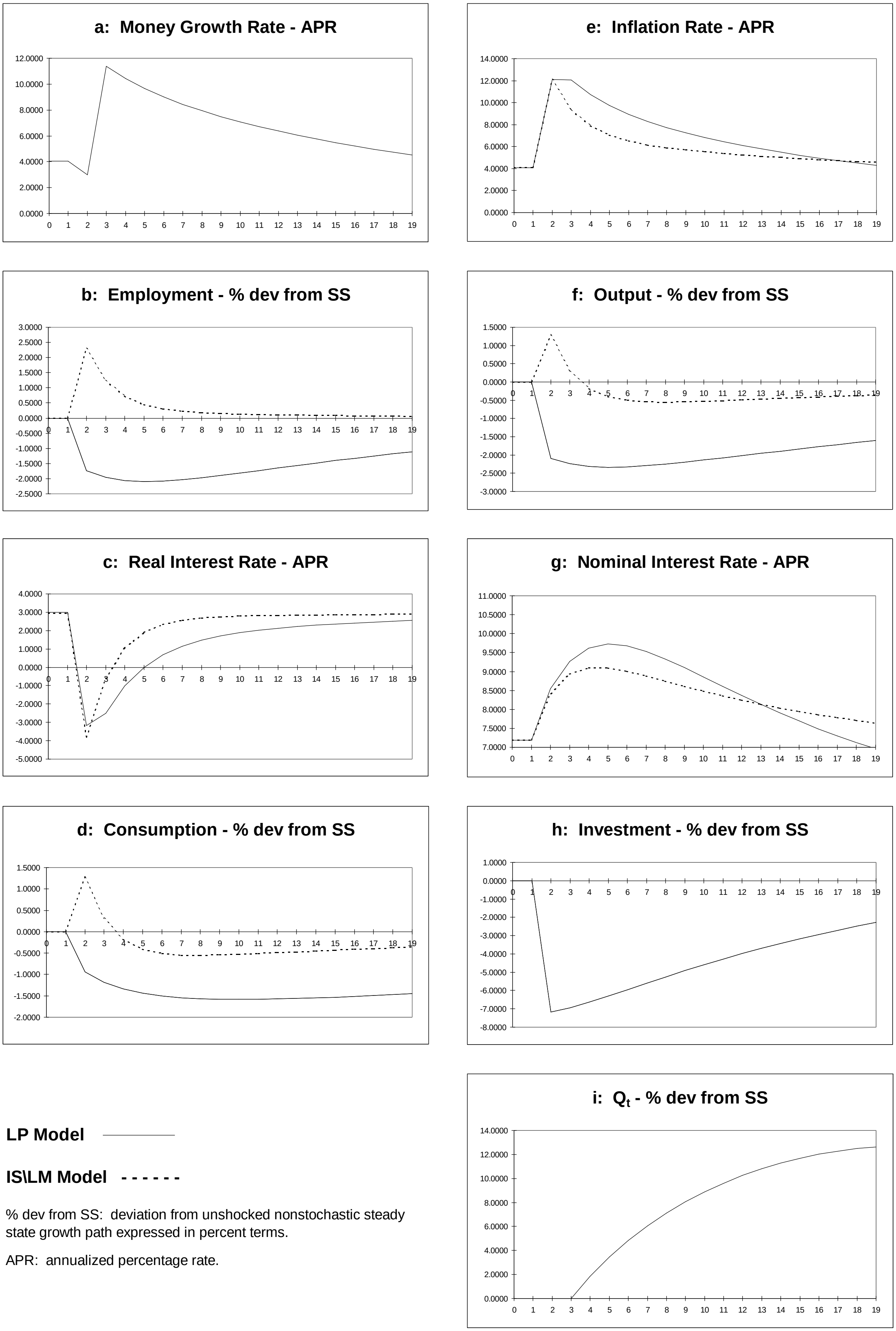
$$W_t L_t = M_t - Q_t + X_t$$

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



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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.

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- 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).

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- A more formal analysis of the example:
  - Core equations:

$$\frac{l_{t+1}}{l_t} = \beta \frac{R_t}{\pi^e_{t+1}}$$

$$\frac{\gamma l_t}{1-l_t} = \frac{1}{R_t}$$

$$\pi^e_{t+1} = R_t^{\frac{1}{\alpha_\pi}} \text{ (Taylor rule)}$$

$$\Rightarrow l_{t+1} = \beta l_t \left[\frac{1-l_t}{\gamma l_t}\right]^{1-\frac{1}{\alpha_\pi}}$$

  - Other equations:

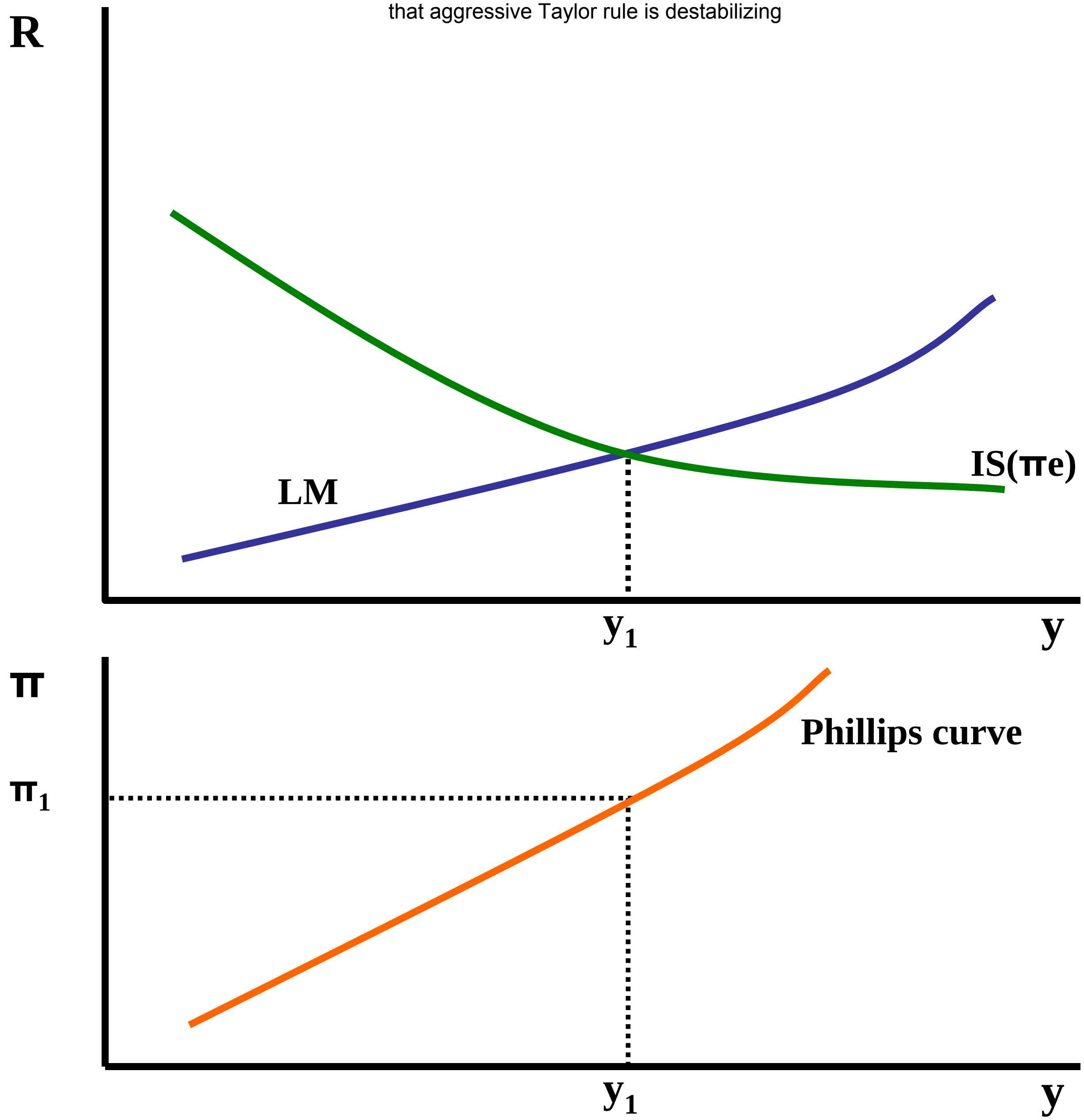
$$R_t = (1-l_t)/(\gamma l_t)$$

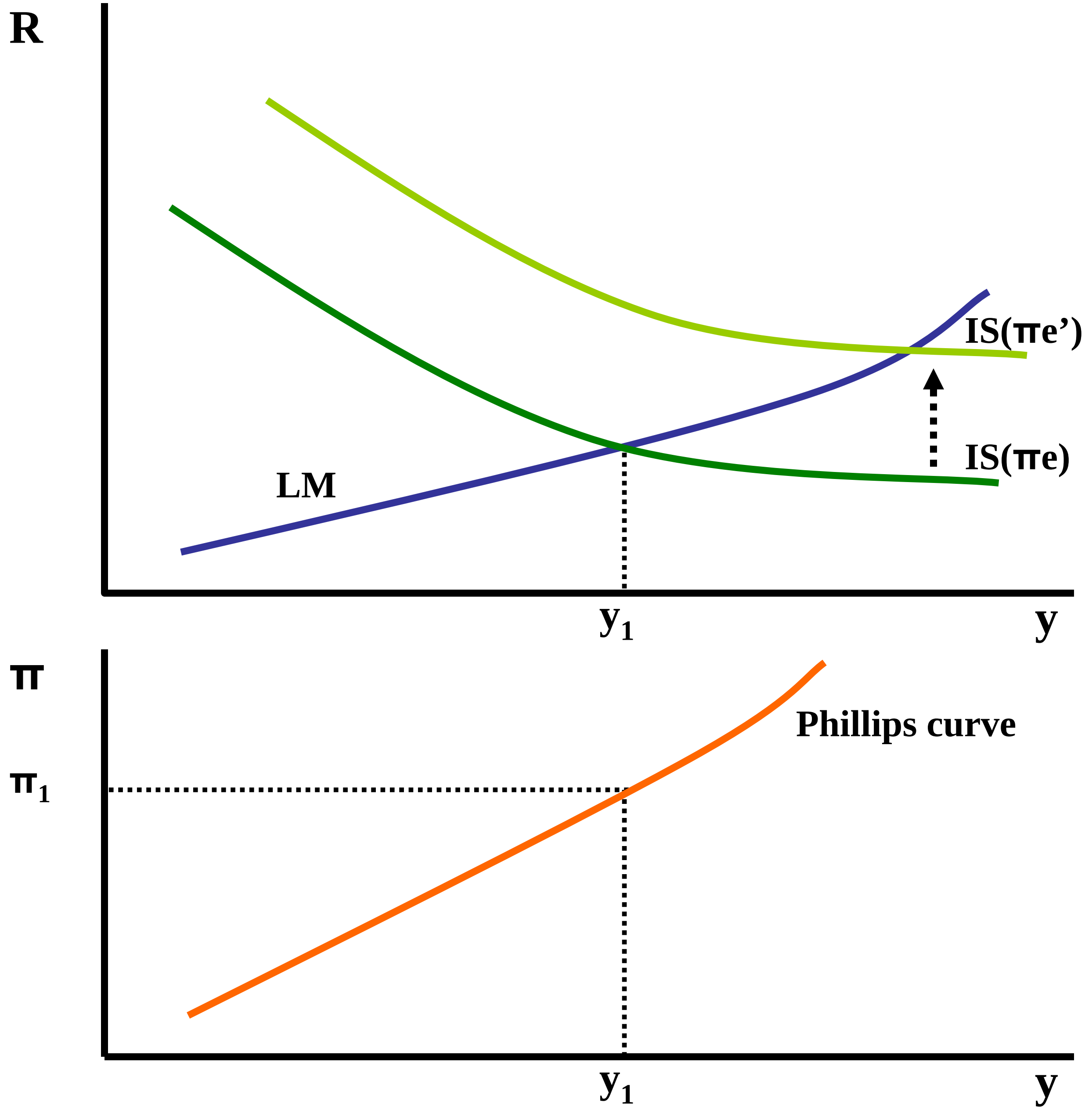
$$\pi^e_{t+1} = R_t^{\frac{1}{\alpha_\pi}}$$

$$\frac{l_{t+1}}{l_t} = \frac{\frac{M_{t+2}}{P_{t+1}}}{\frac{M_{t+1}}{P_t}} = \frac{M_{t+2}}{M_{t+1}} \frac{1}{\pi_{t+1}} = \frac{g_{t+1}}{\pi_{t+1}}$$

$$\Rightarrow g_{t+1} = \pi_{t+1} \frac{l_{t+1}}{l_t}$$

Adding a 'supply-side' channel to CCG model has effect
that aggressive Taylor rule is destabilizing





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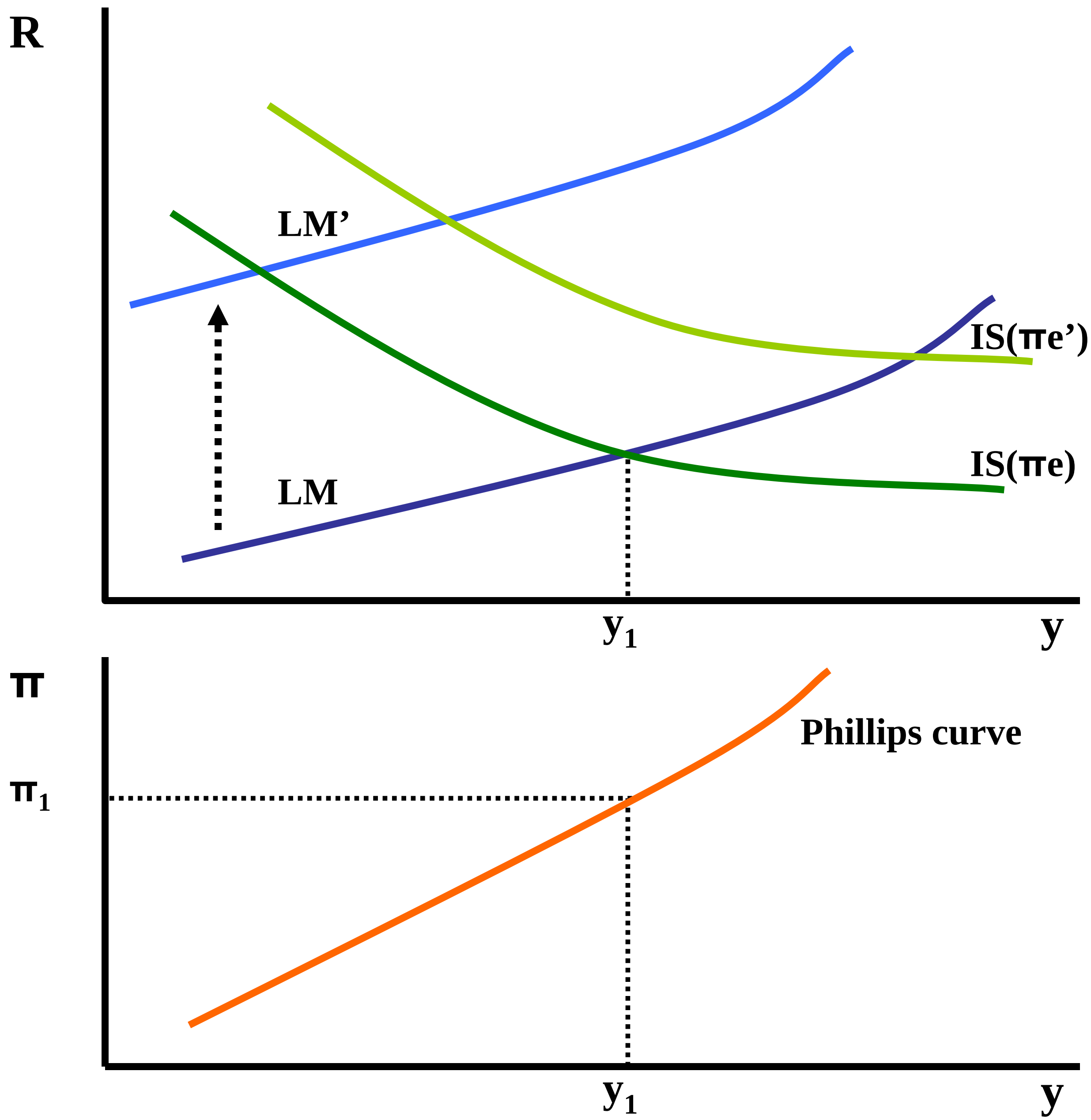
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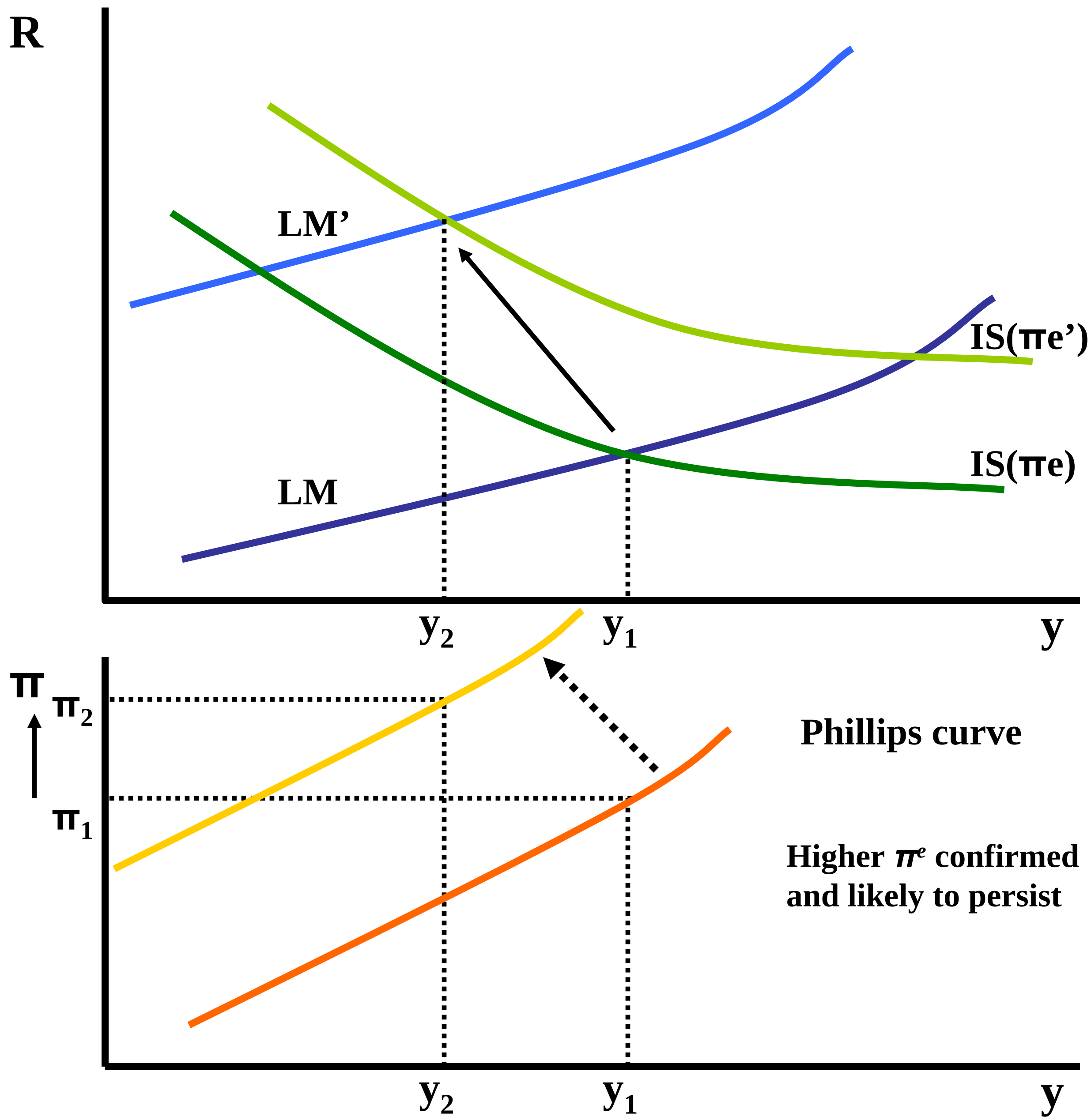
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IS(πe)
y2
y1
y
π
π2
π1
Phillips curve
Higher π^e confirmed
and likely to persist
y2
y1
y

...

- Clarida-Gali-Gertler Model with Supply-Side Channel

$$y_t = -\left(R_t - \pi_{t+1}\right) + y_{t+1} \qquad IS \text{ curve}$$

$$\pi_t = 0.085 y_t + \overbrace{\gamma R_t}^{\text{supply-side channel}} + 0.99\pi_{t+1} \quad \text{Phillips curve}$$

$$R_t = \overbrace{1.5}^{\text{aggressive Taylor rule}} \pi^e_{t+1} \qquad \text{Taylor rule}$$

- Could reflect:
  - working capital requirements
  - other financial frictions
  - evidence in favor: VAR 'price puzzle', direct evidence of extensive short-term firm borrowing.
- 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 α That Prevented Arthur Burns From Stopping Inflation?

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- But, Was it Really Ignorance of the right Value of α 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?

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Barro-Gordon, Kydland-Prescott Model

- Private Economy:
$$y - y^N = \alpha \left(\pi - \pi^e\right), \alpha > 0.$$
- Preferences of Monetary Authority:
$$\frac{1}{2}\left[(y - ky^N)^2 + \gamma \pi^2\right],\ \gamma > 0,\ k < 1.$$
  - $k < 1$: 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:
  - Albanesi, Chari, Christiano, 'Expectation Traps and Monetary Policy,' *Review of Economic Studies*.
  - Chari, Christiano and Eichenbaum, 'Expectation Traps and Discretion,' *Journal of Economic Theory*, 1998.
  - '$k < 0$' due to the presence of monopoly power in the economy (or, could be distortionary taxes).

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- 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.

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- 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.