The New Keynesian Model and Monetary Doctrines

Livio Maya

The Price Level

- What determines the price level? Inflation?
- How to model modern institutions? Central banks, interest targets, forward guidance etc?
- Theory accompanies institutional change. Metallic standards, fiduciary money, central banking, credit cards, crypto...
- This presentation: some old theory, but mainly the New-Keynesian Model
    - How does it pin down the price level? Does it indeed?
    - What are its dynamic properties?
    - What story does it tell? What vision of the economy does it translate?

The NK Model: Some Experiments

- Private sector block:

$$y_t = E_t y_{t+1} - \gamma \left(i_t - E_t \pi_{t+1} \right)$$
$$\pi_t = \beta E_t \pi_{t+1} + \kappa y_t$$

- Add a Taylor Rule:

$$i_t = \phi \pi_t + u_t \qquad \phi > 1$$
$$u_t = \rho u_{t-1} + \varepsilon_t$$

- Effect of monetary shock $\varepsilon_0 = 1$
  - Low persistency $\rho = 0.5$

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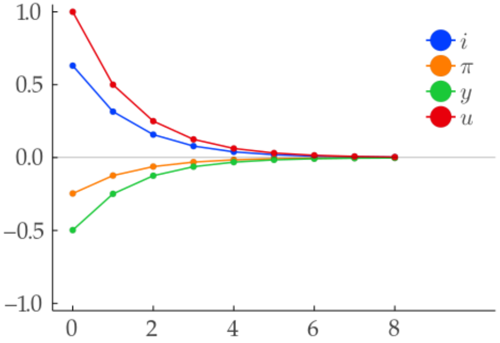

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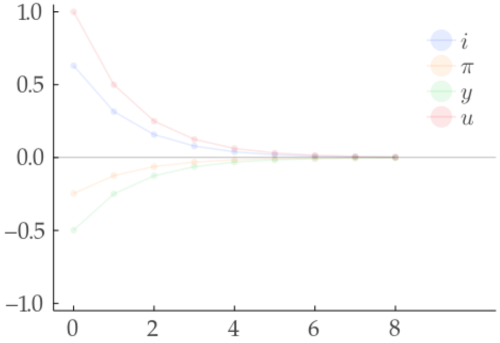

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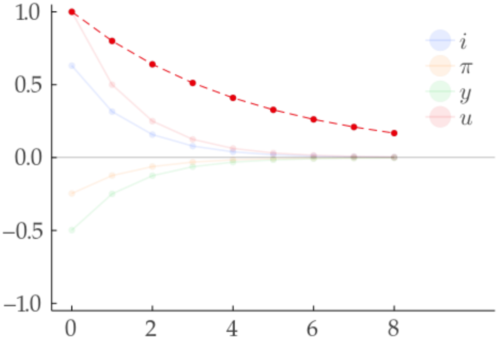

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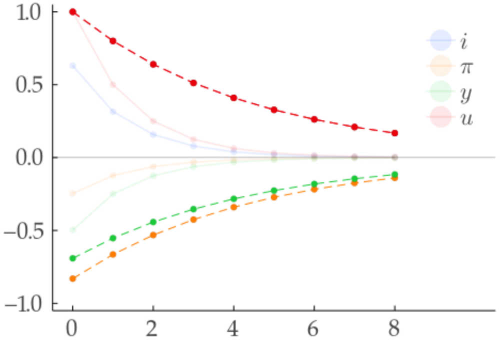

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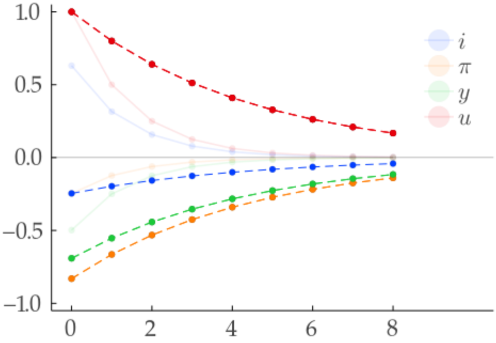
  - High persistency $\rho = 0.9$
- Role of interest? CB magical powers?



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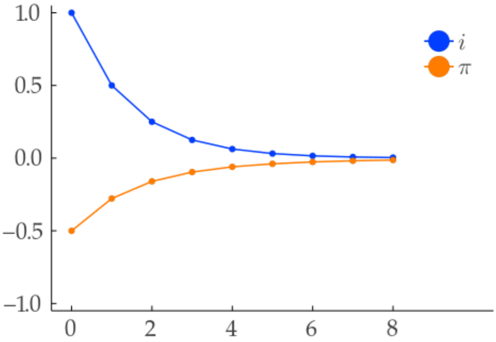

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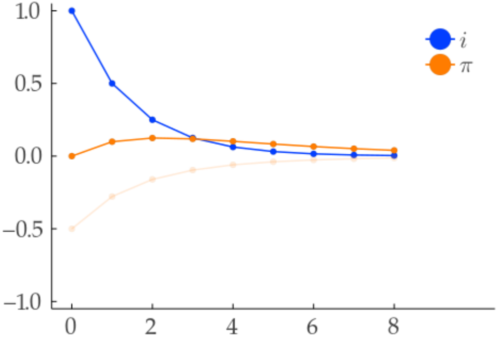

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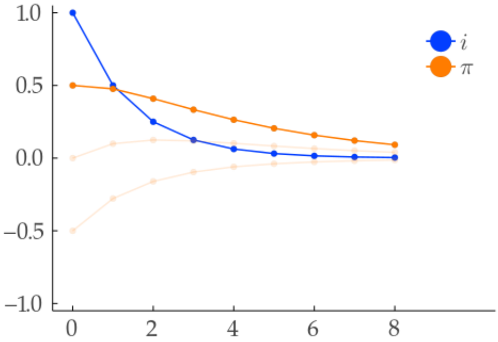

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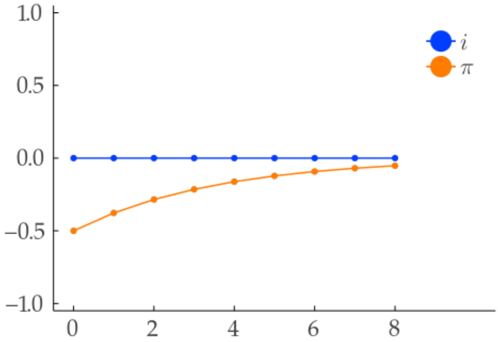
- Where is inflation coming from?



Some Monetary Theory History

How did we get here?

- Commodities money (*"I value because I can eat"*)
- Commodities standard (*"I value because I can trade for something I can eat"*)
- The Quantity Theory (*"I value because it is convenient"*)
    - Fisher, Pigou
    - $MV = PY$
    - $i_t = r_t + E_t \pi_{t+1}$

Some Monetary Theory History

How did we get here?

- Original Keynesianism (*"It is not about money"*)
  - Wage price spirals, unions, bargaining power, NRA...
  - Static Phillips curve in the 1960s
- Monetarism (*"It is all about money; and who controls it"*)
  - Central banks at the center of inflation debate
  - Business cycles + Inflation follows from Fed action: 4% rule
  - Friedman (1968): "Central banks can't peg interest rate" + Long-run neutrality

Interest Targeting

Criticisms of interest pegs

- Instability (Friedman, Bernanke, Krugman...)
  - Unstable equilibria: interest pegs lead to spirals
  - Adaptive expectations and Old-Keynesian models
- Indeterminacy (Sargent and Wallace (1975))
  - Frictionless model with constant output:

$$i_t = 0 \implies E_t \pi_{t+1} = 0$$

  - What about unexpected inflation $\Delta E_t \pi_t = (E_t - E_{t-1})\pi_t$?
  - Rational expectations and New-Keynesian models

Interest Targeting

- Original system

$$y_t = y^e_{t+1} - \gamma \left(i_t - \pi^e_{t+1} \right)$$
$$\pi_t = \beta \pi^e_{t+1} + \kappa y_t$$

- Static IS, $\beta = 1$, Taylor rule

$$y_t = -\gamma \left(i_t - \pi^e_{t+1} \right)$$
$$\pi_t = \pi^e_{t+1} + \kappa y_t$$
$$i_t = \phi \pi_t + \varepsilon_t$$

- Interest peg: $\phi = 0$
- Replace and re-organize:

$$(1 + \kappa\gamma\phi)\pi_t = (1 + \kappa\gamma)\pi_{t-1} - \kappa\gamma\varepsilon_t$$

Old Keynesian Models

$$(1 + \kappa\gamma\phi)\pi_t = (1 + \kappa\gamma)\pi_{t-1} - \kappa\gamma\varepsilon_t$$

- Adaptive expectations: $\pi^e_{t+1} = \pi_{t-1}$

$$\pi_t = \frac{1 + \kappa\gamma}{1 + \kappa\gamma\phi}\pi_{t-1} - c\varepsilon_t$$

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- Taylor Principle: $\phi > 1$
  - $\uparrow$ Interest $\implies \downarrow$ demand $\implies \downarrow$ Inflation

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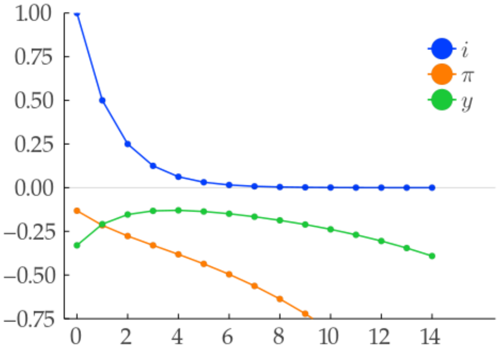

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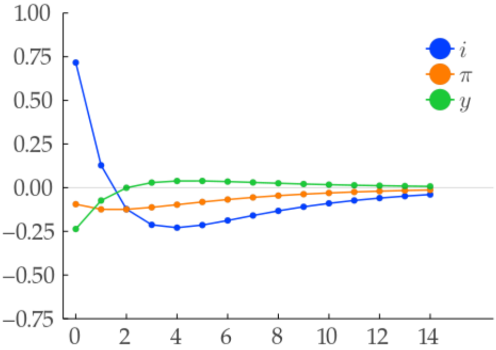

New Keynesian Models

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- Rational Expectations: $\pi^e_{t+1} = E_t\pi_{t+1}$

$$E_t\pi_{t+1} = \frac{1 + \kappa\gamma\phi}{1 + \kappa\gamma}\pi_t - c\varepsilon_t$$

- Interest peg $\phi = 0$ is stable, but inderterminate (unexpected inflation?)
- $\phi > 1$ is unstable. Solve forward (present as function of future)

$$\begin{aligned} \pi_t &= \alpha E_t\pi_{t+1} + \varepsilon_t \qquad |\alpha| < 1 \\ &= \sum_{i=0}^{\infty} \alpha^i \varepsilon_{t+i} + \lim_{i\to\infty} \alpha^i E_t\pi_{t+i} \end{aligned}$$

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- Can we do $\lim_{i \to \infty} \alpha^i E_t \pi_{t+i} = 0$?

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- Equilibrium: $\beta = (1+r)$, $\Pi_{t+1} = \Phi(\Pi_t)$

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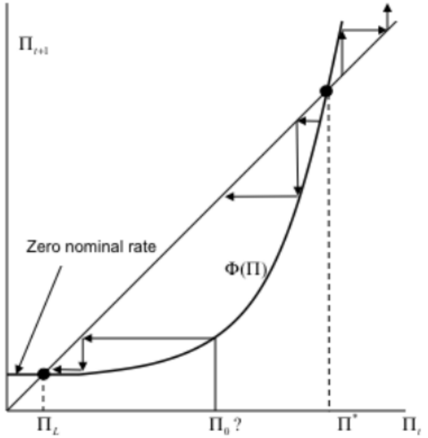
- Equilibrium: $\beta = (1+r)$, $\Pi_{t+1} = \Phi(\Pi_t)$
- "Good" steady state: $\Phi'(\Pi^*) > 1$
- Rule out explosiveness?
  - "Unreasonable"
  - CB "intervention"
  - Blow up the world



Pruning Equilibria

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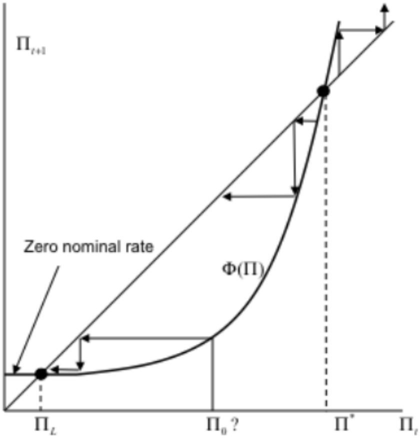
- "Bad" equilibrium $\Phi'(\Pi_L) < 1$?



Interpreting the NK Model - Frictionless Case

- Anomalies still haunt
- Frictionless case $i_t = E_t \pi_{t+1}$ with peg $i_t = 0$:

$$E_t \pi_{t+1} = 0$$

1 stable root to 1 forward-looking $\implies$ indeterminacy

- $\phi > 1$ introduces an unstable root and yields determinacy if spirals ruled out

$$E_t \pi_{t+1} = \phi \pi_t \implies \pi_t = 0$$

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- Just set up the right interest rule!

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- $\phi > 1 \implies$ unstable $\implies \pi_t = \pi_t^*$
- Now, define $u_t = E_t \pi_{t+1}^* - \phi \pi_t^*$:

$$i_t = \phi \pi_t + u_t$$

  This is where we started! (But not AR(1))

Interpreting the NK Model - Frictionless Case

Lessons:

- The model does not pin down unexpected inflation $\Delta E_t \pi_t$
- $\phi > 1$ provides unstable root, selects $\Delta E_t \pi_t$. How?
  - Via interest rule, central bank threats spiral $|\pi_t| \to \infty$
  - Agents abominate spirals, jump to π_t^* (problem is here)
- The central bank chooses $\Delta E_t \pi_t$
- No "stimulate demand" (no frictions!)

Interpreting the NK Model

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y_t &= E_t y_{t+1} - \gamma \left(i_t - E_t \pi_{t+1} \right) \\
\pi_t &= \beta E_t \pi_{t+1} + \kappa y_t
\end{aligned}
$$

- NK model determines y_t and $E_t \pi_{t+1}$, stable
- Suppose $E_t \pi_{t+1}$ given. Choose $\{i_t^*\}$ stable, stochastic target π_t^*

$$
\begin{aligned}
i_t^* - E_t \pi_{t+1}^* &= i_t - E_t \pi_{t+1} && \text{(Private Sector)} \\
i_t &= i_t^* + \phi \left(\pi_t - \pi_t^* \right) && \text{(Rule)}
\end{aligned}
$$

- Equilibrium:

$$
\begin{aligned}
i_t &= i_t^* \\
\pi_t &= E_{t-1} \pi_t + \Delta E_t \pi_t^*
\end{aligned}
$$

Title

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References