New Keynesian Models with Fiscal Price Determination

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Zero bound? *Credit spread, risk premium*, not “the” interest rate
Risks premium and macro: habits

\[ X_t \approx k \sum_{j=0}^{\infty} \phi^j C_{t-j} \quad \text{risk aversion}_t = \gamma \frac{C_t - X_t}{C_t} \]
Risk premium and macro: Investment and Q

\[ 1 + \alpha \frac{i_t}{k_t} = \frac{\text{market}_t}{\text{book}_t} = Q_t \]
The Phillips curve is a disaster – and not causal

CPI inflation and unemployment, 1984-2009
Macro in an era of fiscal constraints

- Fiscal “constraint” – government debt valuation equation.
  $$\frac{B_{t-1} + M_{t-1}}{P_t} = E_t \sum_{j=0}^{\infty} \frac{1}{R_{t,t+j}} s_{t+j}$$

- Needs “Ricardian regime – Treasury to raise taxes to validate larger real value of government debt.
- Don’t worry about deflation spirals!
- Goodbye financial crisis. Hello Sovereign debt crisis. The question for our time:
  1. Will $s, R$ lead to inflation? (Sun 10:15, Sheraton Vail “Fiscal limits.”)
  2. How does macroeconomics work in an era of fiscal constraints?
- Today: Impulse-response functions when $\{s_{t+j}\}$ does not react?
- Larger project: Solve NK indeterminacy with fiscal theory. Different equilibrium selection, implications?
  1. Very simple model
  2. Three-equation NK model
Fiscal constraints in NK models

- Fiscal
  \[
  \frac{B_{t-1}}{P_t} = E_t \sum_{j=0}^{\infty} \beta^j s_{t+j}
  \]
  \[
  \implies (E_{t+1} - E_t) \sum_{j=0}^{\infty} \beta^j s_{t+j} = k \times (\pi_{t+1} - E_t \pi_{t+1})
  \]

- \(B_{t-1}\) means complete control over expected inflation \(E_{t-1}(1/P_t)\), interest rate policy

- Simplest model
  \[
  i_t = r + E_t \pi_{t+1} \text{ (IS, Fisher, FOC)}
  \]
  \[
  i_t = r + \phi \pi_t + x_t \text{ (Taylor rule)}
  \]
  \[
  x_t = \rho x_{t-1} + \varepsilon_t \text{ (Policy shock)}
  \]

- Equilibrium
  \[
  E_t \pi_{t+1} = \phi \pi_t + x_t
  \]
  \[
  \pi_{t+1} = \phi \pi_t + x_t + \delta_{t+1}
  \]

- \(\delta_{t+1}\) selects equilibria. \(\delta_{t+1}\) indexed by fiscal shocks
Impulse-response functions with fiscal constraints

- Equilibrium

\[ \pi_{t+1} = \phi \pi_t + x_t + \delta_{t+1} \]

- NK solution/\( \delta_{t+1} \) choice (\( \phi > 1 \)).

\[
\pi_t = - \sum_{j=0}^{\infty} \frac{1}{\phi^{j+1}} E_t x_{t+j} = - \frac{x_t}{\phi - \rho} \quad \text{Inflation jumps}
\]

\[
\delta_t = - \frac{\varepsilon_t}{\phi - \rho} \quad \text{Fed induces fiscal change}
\]

*Inflation jumps to offset shock.*

- Fiscally-constrained solution: \( \delta_{t+1} = 0 \) in response to \( x \) shock. (\( \phi < 1 \)).

\[
\pi_{t+1} = \phi \pi_t + x_t + 0
\]

\[
\pi_{t+1} = \frac{1}{1 - \phi L} x_t = \frac{1}{1 - \phi L} \frac{1}{1 - \rho L} \varepsilon_t
\]

*No unexpected inflation – no instantaneous response.*
Response to m policy shock – NK model

New-Keynesian response to monetary tightening -- $\rho = 0.80 \phi = 1.20$
Response to monetary tightening with no fiscal change – \( \rho = 0.80 \) \( \phi = 0.90 \)
Response to monetary tightening with no fiscal change: $\rho = 0.80$, $\phi = 0.90$
3-Equation model with fiscal constraints

Model

\[ y_t = E_t y_{t+1} - \sigma r_t + x_{dt} \]

\[ i_t = r_t + E_t \pi_{t+1} \]

\[ \pi_t = \beta E_t \pi_{t+1} + \gamma y_t + x_{\pi t} \]

\[ i_t = \phi \pi t + x_{it} \]

NK solution: \( \phi > 1 \), solve forward, \( \pi \) jumps in response to an \( x_i \) shock

Fiscal solution: \( \phi < 1 \), calculate the response to an \( x_i \) shock with no contemporaneous shock to \( \pi \).

At a minimum, equilibrium selection matters a lot in NK models!
3 Equation model – response to m policy shock

New-Keynesian response to monetary tightening – 3 equation model
3 Eq model with fiscal constraint – response to mp

Response to monetary tightening without fiscal change – 3 equation model

π
i
y
r
x
3 Equation model – comparison