The Maturity Structure of Debt, Monetary Policy and Expectations Stabilization

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Motivation

- ‘Standard’ view of monetary policy
  - Monetary authority alone determines inflation
  - Fiscal authority guarantees intertemporal solvency of the government
  - Timing, size and composition of government liabilities...
  - ...have no impact on inflation
  - Expectations are ‘anchored’: consistent with central bank’s objectives
Motivation

- Current global environment: concerns over fiscal imbalances and their effects on economic outlook

  - Large fiscal obligations: fiscal limits?

  - Uncertainty about monetary and fiscal adjustments, and economic recovery

  - Anchored expectations?
What we do

- Simple model where both monetary and fiscal policy affect inflation

- Key ingredient:
  - Agents have an incomplete knowledge about the economy: learning
  - Implication: fiscal policy affects inflation dynamics

- Explore how expectations dynamics is affected by fiscal policy
  - Specifically: scale and composition of government debt
This Talk

- Simple NK model of output gap and inflation determination
- Learning and the stability of expectations
- Economic dynamics: response to a monetary contraction
Model

- No capital, constant government spending

- Sticky prices: output is demand-determined

- Forward-looking agents

- Learning

- Simple policy rules
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Public Debt

- Issues two kinds of debt
  - $B_t^s$: One period debt in zero net supply with price $P_t^s = (1 + i_t)^{-1}$
  - $B_t^m$: An asset in positive supply that has the payoff structure

    $$\rho^{T-(t+1)} \text{ for } T \geq t + 1$$

- $P_t^m$ denotes the price of this second asset.

- Duration of the debt is $(1 - \beta \rho)^{-1}; \beta$ discount rate
Monetary and Fiscal Authorities

- Flow budget constraint

\[ P_t^m B_t^m = B_{t-1}^m (1 + \rho P_t^m) - P_t S_t \]

- Fiscal policy maintains intertemporal solvency (‘Passive’)

\[ S_t = \bar{S} \left( \frac{B_{t-1}^m}{B^m} \right)^{\tau_l} \varepsilon_{\tau, t}; \quad 1 < \tau_l < \frac{1 + \beta}{1 - \beta} \]

- Monetary policy controls inflation (‘Active’)

\[ \frac{1 + i_t}{1 + \bar{r}} = \left( \frac{\pi_t}{\pi^*} \right)^{\phi_{\pi}} \left( \frac{Y_t}{\bar{Y}} \right)^{\phi_y} \varepsilon_{i, t}; \quad \phi_{\pi} > 1 \]

- Under rational expectations: standard account of monetary policy
Key Equation 1: Aggregate Consumption

- Households’ consumption decisions:

\[ \hat{C}_t = \]

\[ \bar{s}_C^{-1} \left( \frac{\bar{s}}{\bar{Y}} \right) \left( \hat{b}_{t-1}^m - \hat{\pi}_t + \rho \beta \hat{P}_t^m - \hat{E}_t \sum_{T=t}^{\infty} \beta^{T-t} \left[ (1 - \beta) \hat{s}_T - \beta (\hat{i}_T - \hat{\pi}_{T+1}) \right] \right) \]

\[ + \bar{s}_C^{-1} (1 - \beta) \hat{E}_t \sum_{T=t}^{\infty} \beta^{T-t} x_T - \beta \sigma^{-1} \hat{E}_t \sum_{T=t}^{\infty} \beta^{T-t} (\hat{i}_T - \hat{\pi}_{T+1}) \]

- \( x_T \) denotes income from wages and profits.
Key equation 2: Public Debt

- Price of government debt (Expectations Hypothesis)

\[ \hat{P}^m_t = -\hat{E}_t \sum_{T=t}^{\infty} (\rho \beta)^{T-t} \hat{i}_T \]

- Evolution of public Debt

\[ \hat{b}^m_t = \beta^{-1} \hat{b}^m_{t-1} - \beta^{-1} \hat{\pi}_t + (1 - \rho) \hat{i}_t - (\beta^{-1} - 1) \hat{s}_t \]

\[ + (1 - \rho) \rho \beta \hat{E}_t \sum_{T=t}^{\infty} (\rho \beta)^{T-t} \hat{i}_{T+1} \]
Expectations

- Rational Expectations (RE)

\[ \hat{E}_t^{RE} \pi_{T+1} = \Omega^{RE} \hat{A}_{t-1}, \text{ where } T > t \]

- \( \hat{A}_{t-1} \) : exogenous shocks

- Learning

\[ \hat{E}_t \pi_{T+1} = \Omega^{L}_{c,t-1} + \Omega^{L}_{A,t-1} \hat{A}_{t-1} + \Omega^{L}_{b,t-1} \hat{b}_m^{t-1} + \ldots, \]

- Larger forecasting model
- Debt can affect expectations
- Coefficients updated every period (agents use an econometric model)
Fiscal Policy Matters

- Households intertemporal budget constraint: provided $\frac{S}{Y} > 0$

- Outside RE, agents’ expectations can depend on government debt

- The evolution of public debt depends on expectations about monetary policy
Expectational Stability

- Does learning converge to RE?

- What is the role of fiscal policy?
Figure 1: Stability of expectations.
Intuition: Increase in Inflation Expectations

- Anchored fiscal expectations

\[
\hat{C}_t =
\]

\[
+ \bar{s}_{C}^{-1} (1 - \beta) \hat{E}_t \sum_{T=t}^{\infty} \beta^{T-t} x_T - \beta \sigma^{-1} \hat{E}_t \sum_{T=t}^{\infty} \beta^{T-t} (\phi_{\pi} \hat{\pi}_T - \hat{\pi}_{T+1})
\]

we have substituted for the bond price equation and the monetary policy rule,

\[
\hat{i}_t = \phi_{\pi} \hat{\pi}_t
\]
Intuition: Increase in Inflation Expectations

- Baseline

\[
\hat{C}_t = \bar{s}_C^{-1} \left( \frac{\bar{S}}{\bar{Y}} \right) \hat{b}_{t-1}^m \\
\]

\[+ \bar{s}_C^{-1} (1 - \beta) \hat{E}_t^i \sum_{T=t}^{\infty} \beta^{T-t} [x_T - s_T \hat{\nu}_T] - \beta \sigma^{-1} \hat{E}_t^i \sum_{T=t}^{\infty} \beta^{T-t} (\phi_\pi \hat{\nu}_T - \hat{\nu}_{T+1})
\]

\[+ \bar{s}_C^{-1} \left( \frac{\bar{S}}{\bar{Y}} \right) \hat{E}_t \sum_{T=t}^{\infty} \left[ \beta^{T-t} (\beta \phi_\pi - 1) \hat{\nu}_T - \beta \rho (\beta \rho)^{T-t} (\phi_\pi \hat{\nu}_T) \right].
\]

- we have substituted for the bond price equation and the monetary policy rule,
\[
\hat{\nu}_t = \phi_\pi \hat{\nu}_t
\]
Intuition: Increase in Inflation Expectations

- Using the bond price equation and the monetary policy rule, \( \hat{i_t} = \phi_{\pi}\hat{\pi}_t \),

\[
\hat{b}_t^m = \beta^{-1}\hat{b}_{t-1}^m - \beta^{-1}\hat{\pi}_t + (1 - \rho)\phi_{\pi}\hat{\pi}_t - (\beta^{-1} - 1)\hat{s}_t \\
\quad + (1 - \rho)\rho\hat{\beta}E_t\sum_{T=t}^{\infty}(\rho\beta)^{T-t}\phi_{\pi}\hat{\pi}_{T+1}
\]

- \( \rho = 0 \) or \( \rho = 1 \) deliver stable expectations.
Intuition: Increase in Inflation Expectations

- Using the bond price equation and the monetary policy rule, $\hat{\pi}_t = \phi_\pi \hat{\pi}_t$,

$$\hat{b}_t = \beta^{-1} \hat{b}_{t-1} - \beta^{-1} \hat{\pi}_t + (1 - \rho) \phi_\pi \hat{\pi}_t - (\beta^{-1} - 1) \hat{s}_t$$

$$+ (1 - \rho) \rho \beta \hat{E}_t \sum_{T=t}^{\infty} (\rho \beta)^{T-t} \phi_\pi \hat{\pi}_{T+1}$$

- $\rho = 0$ or $\rho = 1$ deliver stable expectations.
Dynamics

- Impulse response to a monetary contraction

- Compare baseline model with

  - Anchored fiscal expectations
  
  - Short term bonds only ($\rho = 0$)
  
  - Rational Expectations
Dynamics

- Consider impulse response to a i.i.d. monetary policy shock

- Calibration
  - MP parameters: $\phi_\pi = 1.5; \phi_y = 0.5/4$;
  - FP parameters: $\tilde{B}/4\tilde{Y} = 0.7$; $\rho$ implies 5 years average duration of debt
  - Source of fluctuations: technology shock
  - Learning: discounted least squares
Figure 2: Impulse response to a 1% interest rate increase: Inflation.
Figure 3: Impulse response to a 1% interest rate increase: Output.
Conclusion

- Fiscal policy can have important effects on expectations dynamics
  - Fundamentally changes the nature of household and firm responses to shocks
  - Alters the effects of monetary policy

- Monetary policy design should not ignore fiscal policy

- Key role of communication from both Central banks and Fiscal Authorities