FISCAL THEORY

WITH LONG-TERM DEBT AND FINANCIAL FRICTIONS

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INTRODUCTION

- Conventional wisdom states that inflation is brought under control when interest rates are raised above inflation.

- Two 21st century episodes work against this notion:
  - ZLB period: (2008 - 2015)
  - COVID-19 Pandemic: (2020 - 2022)
- Fiscal theory of the price level (FTPL) serves an alternative theory of inflation

This Paper

- FTPL literature
  - A burgeoning area of research at intersection of public finance & monetary economics
- Finanical Frictions literature
  - Introducing such frictions into models changes inflation dynamics

FTPL AT A GLANCE

Fiscal theory of the price level states:

- *The price level adjusts so that the real value of nominal debt equals the present value of primary surpluses*

One-period frictionless model:

Zero-Coupon Bonds worth \$ 1 $\rightarrow B_0 = P_1 s_1 \quad \Rightarrow \quad \dfrac{B_0}{P_1} = s_1 \leftarrow$ Real tax payments

A backing theory of money —dollars are valuable b/c they're backed by government surpluses

- Dollars can be used to pay taxes, this gives value
- Gold soaked up dollars during gold standard —taxes soak up dollars under fiat system
- If more money is printed up than soaked up by taxes, $P_1 \uparrow$

THIS PAPER

Discount rates are a major driver of inflation in FTPL

- Discount rate determination is strongly influenced by financial markets
- Current and expected future inflation are increasing in discount rates
- Adding financial frictions can help us better understand transmission mechanisms

Main findings:

- Intermediary leverage and credit spreads are major drivers of discount rates
- With these frictions, discount rates absorb a greater amount of inflation following a fiscal shock than the frictionless benchmark

BACKGROUND & MOTIVATION

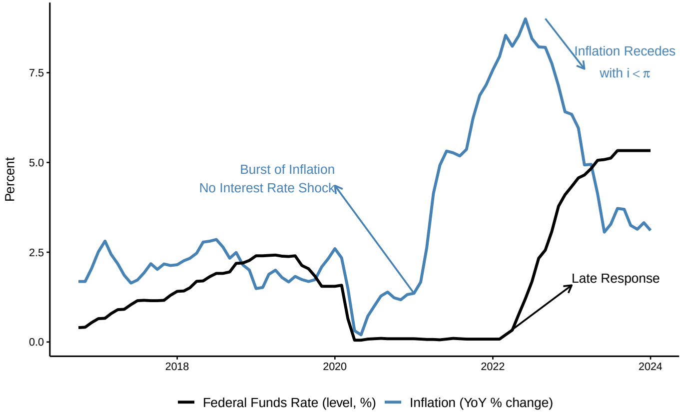


Figure: Inflation vs FFR

BACKROUND & MOTIVATION

- Monetarism argues that monetary aggregates are what matter for inflation
- FTPL and monetarism:
  - Agree: large increase in money supply $\rightarrow$ inflation
  - Disagree: Do massive purchases of bonds create inflation?

  Monetarists say Yes; FTPL says Not Necessarily

BACKGROUND & MOTIVATION

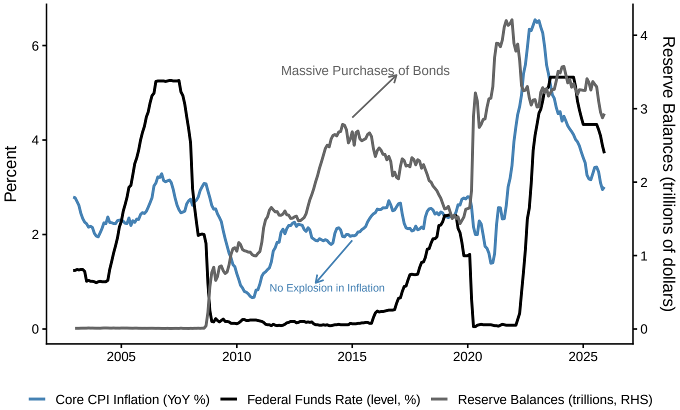


Figure: ’08-Crisis Bond Purchases

RELATED LITERATURE

Fiscal Policy Transmissions to the Price Level

- Origins: Sargent & Wallace (1981); Leeper (1991); Sims (1994); Woodford (1995)
- Historical Episodes: McCallum (1984) "Bond Deficits = Inflationary"; Sims (2011) 70's Inflation
- This paper: how financial intermediaries alter transmission of fiscal shocks to economy

Fiscal Theory

- Fiscal & Monetary Policy Interactions: Leeper, Davig, Chung (2007); Bianchi, Melosi (2019); Cochrane (2022a)
- Fiscal Theory w/ Long-Term Debt: Cochrane (2001); Cochrane (2022b)
- This paper: how financial frictions can be exploited to influence inflation paths

Financial Frictions

- Financial Intermediation in New Keynesian Models: (massive literature) Bernanke, Gertler, Gilchrist (1999); Gertler, Kiyotaki (2010); Brunnermeier, Sannikov (2014); Benigno, Benigno (2022)

OUTLINE

1. Long-Term Debt
2. Financial Frictions
3. Model
4. Analysis
5. Conclusion

LONG-TERM DEBT

$$V_t = M_t + \sum_{j=0}^{\infty} Q_t^{(t+1+j)} B_t^{(t+1+j)}$$

Is the market value of debt, with

$\Rightarrow M_t \equiv$ money

$\Rightarrow B_t^{t+j} \equiv$ zero-coupon debt outstanding at period t, maturing at period $t+j$

$\Rightarrow Q_t^{t+j} \equiv$ that bond's price, with $Q_t^{(t)} = 1$

Ex-Post return on government debt portfolio:

$$R_{t+1} \equiv \frac{M_t + \sum_{j=1}^{\infty} Q_{t+1}^{(t+1+j)} B_t^{(t+1+j)}}{M_t + \sum_{j=1}^{\infty} Q_t^{(t+1+j)} B_t^{(t+1+j)}} \frac{P_t}{P_{t+1}}$$

- How the change in prices overnight affects the value of debt held overnight.

LONG-TERM DEBT

New present value relation:

$$\frac{M_{t-1} + \sum_{j=0}^{\infty} B_{t-1}^{(t+j)} Q_t^{(t+j)}}{P_t} = s_t + \frac{1}{R_{t+1}} \frac{M_{t-1} + \sum_{j=0}^{\infty} B_t^{(t+1+j)} Q_{t+1}^{(t+1+j)}}{P_{t+1}}$$

Which simplifies to:

$$\frac{M_{t-1} + \sum_{j=0}^{\infty} B_{t-1}^{(t+j)} Q_t^{(t+j)}}{P_t} = \sum_{j=0}^{\infty} \beta^j s_{t+j}$$

QE (swapping M one for one for B with *no change* in surpluses) changes maturity structure.
$\Rightarrow M \uparrow B \downarrow$ Yields $\downarrow$ Q $\uparrow \Rightarrow$ P $\uparrow$ *temporarily*

MODEL

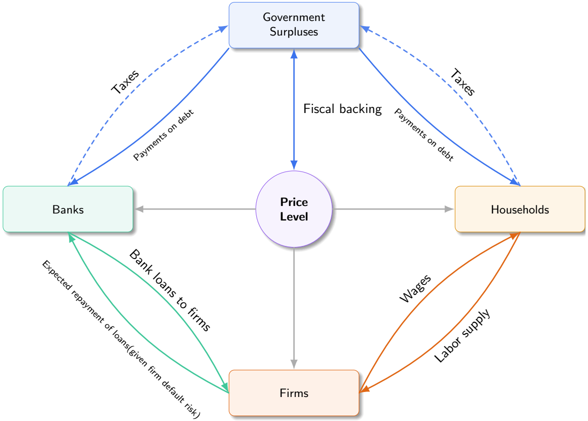


Figure: Model Flowchart

FINANCIAL FRICTIONS

Bank balance sheet:

$$L_t + Q_t B_{b,t} = N_t + D_t \qquad \text{LHS is assets, RHS is liabilities}$$

- Bank issues loans L_t and holds government debt $B_{b,t}$ against net worth N_t and deposits D_t raised from households.

Where

$$Q_t B_{b,t} \equiv \sum_{j=1}^{\infty} B_{b,t}^{t+j} Q_t^{t+j} = B_{b,t} \sum_{j=1}^{\infty} \omega^{j-1} Q_t^{t+j}$$

As $B_{b,t}^{(t+j)} = B_{b,t}\omega^{j-1}$ and $Q_t = \sum_{j=1}^{\infty} \omega^{j-1} Q_t^{t+j}$

Banker's objective function: maximize expected wealth $\mathscr{V}_t$ (Gertler, Kiyotaki (2010))

$$\mathscr{V}_t = E_t \sum_{i=1}^{\infty} (1-\sigma_B)\sigma_B^{i-1} \Lambda_{t,t+i} N_{t+i}$$

- Banks exit and become workers with probability $1-\sigma_B$ per period
- $\Lambda_{t,t+i}$ is the stochastic discount factor

FIRMS

- Firms take out loans from the banks to finance their payrolls:

$$W_t N_{h,t}(i) = L_t(i)$$

- Where W_t - wage and $N_{h,t}(i)$ - labor employed by firm i.
- $L_t(i)$ - loans remunerated at rate - i_t^L; $\phi_{d,t+1}(i)$ - default probability.
- Therefore, the expected value of loan repayment is:

$$(1 + i_t^L)(1 - \phi_{d,t+1}(i))L_t(i)$$

- The monopolistic competitor's profit function, therefore, is given by:

$$\Psi_t(i) = P_t(i)Y_t(i) - (1 + i_t^L)(1 - \phi_{d,t+1}(i))L_t(i)$$

REMAINING CONDITIONS

Surpluses:

$$s_{t+1} = \theta_{s\pi}\pi_{t+1} + \theta_{sx}x_{t+1} + \alpha v_t + u^s_{t+1}$$

with AR(1) disturbance $u^s_{t+1} = \rho u^s_t + \epsilon^s_{t+1}$

Debt:

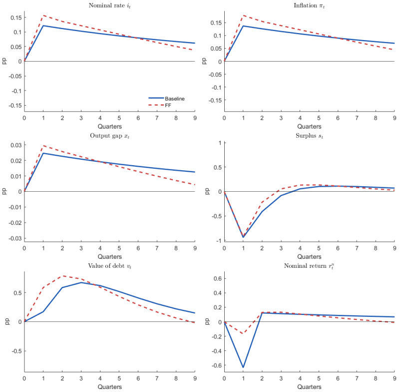
$$\rho v_{t+1} = v_t + r^n_{t+1} - \pi_{t+1} - s_{t+1}$$

Policy Rule:

$$i_t = \theta_{i\pi}\pi_t + \theta_{ix}x_t + u^i_t$$

with AR(1) disturbance $u^i_t = \rho_i u^i_{t-1} + \epsilon^i_t$

FISCAL POLICY SHOCK



FISCAL POLICY SHOCK

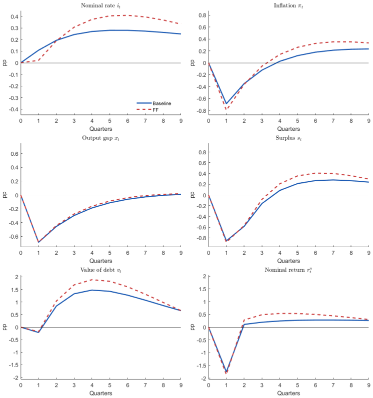
Model	$\Delta E_1 \pi_1$	$-\Delta E_1 (r_1^n)$	$=$	$-\sum_{j=0}^{\infty} \Delta E_1 s_{1+j}$	$+\sum_{j=1}^{\infty} \Delta E_1 \left(r_{1+j}^n - \pi_{1+j}\right)$
Baseline	(0.14)	$-(-0.63)$	$=$	$-(-0.82)$	$+(-0.04)$
FF	(0.18)	$-(-0.17)$	$=$	$-(-1.16)$	$+(-0.81)$

Model	$\sum_{j=0}^{\infty} \omega^j \Delta E_1 \pi_{1+j}$	$=$	$-\sum_{j=0}^{\infty} \rho^j \Delta E_1 s_{1+j}$	$+\sum_{j=1}^{\infty} (\rho^j - \omega^j) \Delta E_1 r_{1+j}$
Baseline	(0.79)	$=$	$-(-0.82)$	$+(-0.02)$
FF	(0.66)	$=$	$-(-1.16)$	$+(-0.50)$

Table: Decomposition for a fiscal shock with policy responses.

Derivations found in Cochrane (2022).

MONETARY POLICY SHOCK



MONETARY POLICY SHOCK

Model	$\Delta E_1 \pi_1$	$-\Delta E_1 (r_1^n)$	$=$	$-\sum_{j=0}^{\infty} \Delta E_1 s_{1+j}$	$+\sum_{j=1}^{\infty} \Delta E_1 \left(r_{1+j}^n - \pi_{1+j}\right)$
Baseline	(-0.69)	$-(-1.75)$	$=$	$-(0.28)$	$+(1.34)$
FF	(-0.80)	$-(-1.86)$	$=$	$-(-1.57)$	$+(-0.51)$

Table: Decomposition for a monetary shock with policy responses.

CONCLUSION

- **Financial frictions fundamentally reshape FTPL transmission**
  - Intermediary leverage and firm marginal costs are key drivers of discount-rate variation
- **Discount rates absorb inflation dynamics**
  - With financial frictions, inflation is absorbed even more through discount rates than in the baseline FTPL model