The Dire Effects of the Lack of Monetary and Fiscal Coordination

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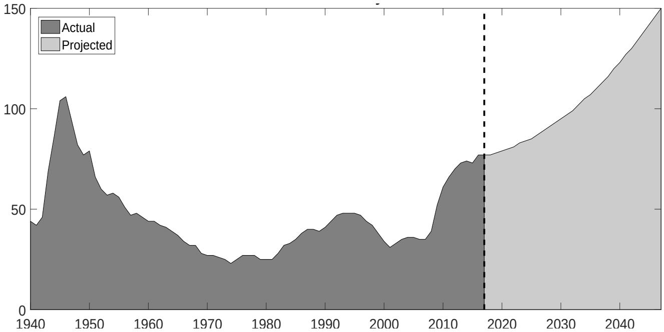
Recessions, Fiscal Imbalances, and Inflation

- Legacies of the Great Recession include a large public debt
- Some scholars have argued that fiscal imbalances have implications for price dynamics
  Sargent and Wallace (1981), Leeper (1991), Sims (1994), Woodford (1994), Cochrane (2001), Bassetto (2002)
- Emphasis on **monetary and fiscal coordination**
- This paper is mainly about the consequences of **lack of coordination**

Is Lack of Coordination a Possibility?



- CBO projections imply that debt is on an **unstable path**

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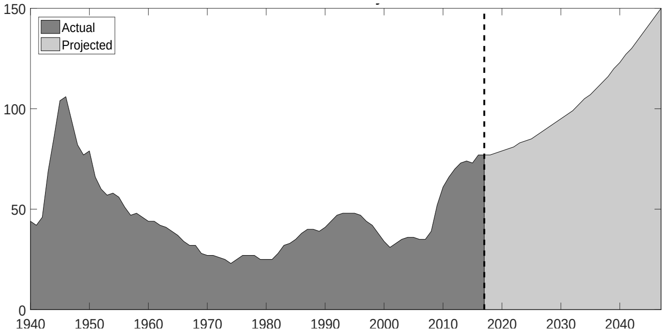

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- Fed ha insisted that **inflation stability** remains a central goal

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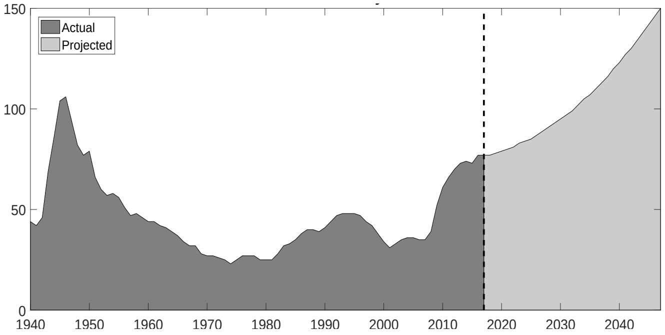

- CBO projections imply that debt is on an **unstable path**
- Fed ha insisted that **inflation stability** remains a central goal
- Suggestive of **possibility of conflict between the two authorities**: Ability of the Fed to control inflation requires fiscal backing

Is Lack of Coordination a Possibility?

"This is the United States government. First of all, you never have to default because you print the money, I hate to tell you, OK?"
(Donald Trump, May 10, 2016, on CNN)

"Moreover, uncertainty regarding fiscal and other economic policies has increased. [...] Participants noted that, in the circumstances of heightened uncertainty, it was especially important that the Committee continue to underscore in its communications that monetary policy would continue to be set to promote attainment of the Committee's statutory objectives of maximum employment and price stability."
(Minutes of the Federal Open Market Committee's meeting of December 13-14, 2016)

$\Rightarrow$ **Uncertainty about future policy mix.**

This Paper

We develop a NK model that features

- Large **contractionary shocks** that trigger large recessions and debt accumulation
- Agents understand that:
    1. Fiscal adjustments would be needed after the large recession
    2. Fiscal authority might be unable or unwilling to make such adjustments
    3. Absent these fiscal adjustments, central bank could let inflation rise to stabilize debt
    4. Central bank might oppose such a change in policy

We use the model to study:

- The **consequences** of the **conflict** between the two authorities
- A policy proposal that resolves the conflict by separating **short-run** and **long-run** fiscal stabilizations

Main Results

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- **Coordinated strategy** to inflate away only debt accumulated during the recession

  $\Longrightarrow$ Milder recession, rather stable inflation, lower uncertainty
- This coordinated strategy also useful to **rule out liquidity traps**

Private Sector: Households

- The representative household maximizes expected utility

$$E_0 \left[\sum_{t=0}^{\infty} \beta^t \exp\left(\bar{d}_{\xi_t^d}\right) \left[\log C_t - h_t\right] \right]$$

  subject to the budget constraint:

$$\begin{aligned} P_t C_t + P_t^m B_t^m + P_t^s B_t^s &= P_t W_t h_t + B_{t-1}^s + \left(1 + \rho P_t^m\right) B_{t-1}^m \\ &\quad + P_t D_t - T_t + TR_t \end{aligned}$$

- Discount factor shock, $\bar{d}_{\xi_t^d}$, can assume two values, high or low ($\bar{d}_H$ or $\bar{d}_L$)
- ξ_t^d follows a Markov-switching process:

$$H^d = \begin{bmatrix} p_{hh} & 1 - p_{ll} \\ 1 - p_{hh} & p_{ll} \end{bmatrix}$$

Private Sector: Firms

Representative firm faces:

- Monopolistic competition
- Sticky prices (Quadratic adjustment cost)
- TFP shocks
- Production function in which labor is the only input

The Government Budget Constraint

- The government budget constraint

$$b^m_t = b^m_{t-1} R^m_{t-1,t} / \left(\Pi_t Y_t / Y_{t-1}\right) - \tau_t + e_t$$

  where all variables are normalized with nominal output

- Government expenditures: $e_t = g_t + tr_t$ with
  - Government purchases (exogenous) as a fraction of output: g_t
  - Transfers-to-output ratio: tr_t

$$\frac{tr_t}{tr^*_t} = \left(\frac{tr_{t-1}}{tr^*_{t-1}}\right)^{\rho_{tr}} \left(\frac{Y_t}{Y^*_t}\right)^{(1-\rho_{tr})\phi_y}$$

Policy Rules

- Fiscal Rule

$$\widetilde{\tau}_t = \rho_{\tau,\xi_t^p}\widetilde{\tau}_{t-1} + \left(1 - \rho_{\tau,\xi_t^p}\right)\left[\delta_{b,\xi_t^p}\widetilde{b}_{t-1}^m + \delta_y\left(\widehat{y}_t - \widehat{y}_t^*\right)\right]$$

- Monetary Rule

$$R_t/R = \left(R_{t-1}/R\right)^{\rho_{R,\xi_t^p}}\left[\left(\Pi_t/\Pi\right)^{\psi_{\pi,\xi_t^p}}\left(Y_t/Y_t^*\right)^{\psi_{y,\xi_t^p}}\right]^{\left(1-\rho_{R,\xi_t^p}\right)}$$

- The Markov-switching process ξ_t^p determines the policy mix *conditional* on the state of demand ξ_t^d

Monetary/Fiscal Policy Mix

When policy regimes are taken in isolation, the two policy rules and the linearized budget constraint are key to determine existence and uniqueness of a REE:

$$\hat{R}_t = \psi_\pi \hat{\pi}_t + ...$$

$$\widetilde{\tau}_t = \delta_b \widetilde{b}^m_{t-1} + ...$$

$$\begin{aligned} \widetilde{b}^m_t &= \beta^{-1}\widetilde{b}^m_{t-1} + ... + b^m\beta^{-1}\left(\hat{R}_{t-1} - ... - \widetilde{\pi}_t\right) - \widetilde{\tau}_t \\ &\rightarrow \widetilde{b}^m_t = \left(\beta^{-1} - \delta_b\right)\widetilde{b}^m_{t-1} + ... + b^m\beta^{-1}\left(\psi_\pi\hat{\pi}_{t-1} - ... - \widetilde{\pi}_t\right) \end{aligned}$$

Policy Regimes

- **High state of demand** ($\xi_t^d = H$):
  - Coordination: Monetary led policy mix (AM/PF):
  $$\psi_\pi = \psi_\pi^M > 1 \qquad \delta_b = \delta_b^M > \beta^{-1} - 1$$
  - Coordination: Fiscally led policy mix (PM/AF):
  $$\psi_\pi = \psi_\pi^F < 1 \qquad \delta_b = \delta_b^F = 0 < \beta^{-1} - 1$$
  - Non-Coordination: Conflict Regime (AM/AF):
  $$\psi_\pi = \psi_\pi^C > 1 \qquad \delta_b = \delta_b^C = 0 < \beta^{-1} - 1$$
- **Low state of demand** ($\xi_t^d = L$): Fiscally-led policy mix (PM/AF)

Evolution of Regimes

The matrix Q^H controls the evolution of regimes in the high state of demand:

$$Q^H = \left[\begin{array}{cc|cc} p_{MM} & 1-p_{FF} & 1-p_{CC} & 0 \\ 1-p_{MM} & p_{FF} & 0 & 1-p_{CC} \\ \hline 0 & 0 & p_{CC} & 0 \\ 0 & 0 & 0 & p_{CC} \end{array}\right]$$

The matrix Q governs the overall evolution of regimes:

$$Q = \begin{bmatrix} p_{hh}Q^H & (1-p_{ll}) \cdot I_4 \\ (1-p_{hh})\, 0.25 \cdot \mathbf{1}_{4\times 4} & p_{ll} \cdot I_4 \end{bmatrix}$$

$\Rightarrow$ Agents take into account the possibility of large recessions and the consequent changes in policy makers' behavior

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Solution

- We solve the MS DSGE model using the method proposed by Farmer, Waggoner, and Zha (2009):

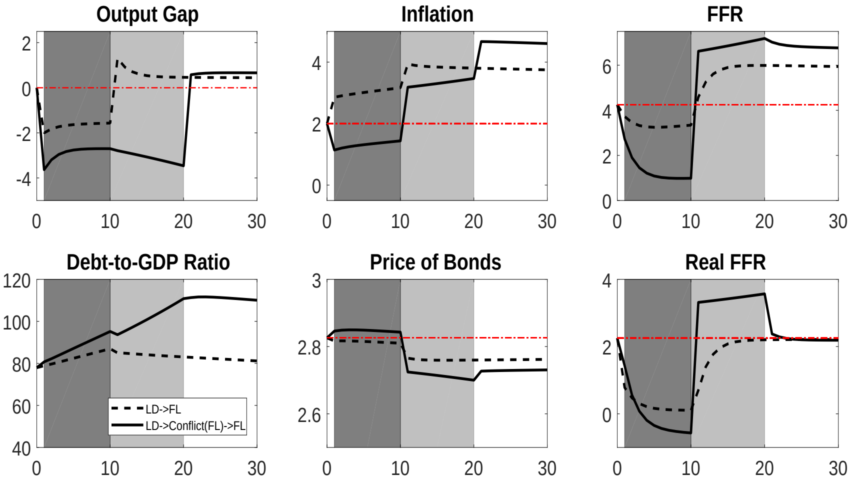
$$S_t = C\left(\xi_t, \theta, Q\right) + T\left(\xi_t, \theta, Q\right) S_{t-1} + R\left(\xi_t, \theta, Q\right) \varepsilon_t$$

- Agents are aware of regime changes and their beliefs matter for the solution of the model
- **Temporary explosive dynamics** are allowed, as long as the model is overall stationary
- This important feature allows us to study the properties of the conflict regime

Parameters (Bianchi and Melosi AER 2017)

Parameter	Value	Parameter	Value	Parameter	Value
$\psi_{\pi,M}$	1.7890	$\rho_{\tau,F}$	0.6501	p_{hh}	0.9999
$\psi_{y,M}$	0.4413	$\psi_{\pi,C}$	2.0000	p_{ll}	0.9465
$\rho_{R,M}$	0.8697	$\rho_{\tau,C}$	0.6501	p_{MM}	0.9902
$\delta_{b,M}$	0.0778	δ_y	0.2814	p_{FF}	0.9932
$\rho_{\tau,M}$	0.9666	ϕ_y	-2.0000	κ	0.0072
$\psi_{\pi,F}$	0.6903	ρ_{tr}	0.4620	$b_0^m/4$	0.7700
$\psi_{y,F}$	0.2655	$\overline{d}_h$	0.0429	100γ	0.4120
$\rho_{R,F}$	0.6576	$\overline{d}_l$	-0.1300	100π	0.5000

Conflict with Fiscally-led Resolution

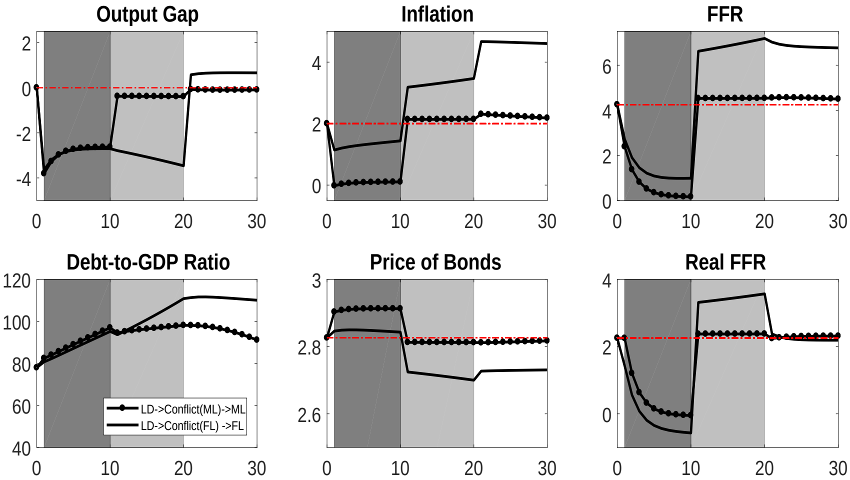


Notes: Response to a negative discrete demand shock (dark gray area). The demand shock switches back to high in period 11. Solid line: Agents expect a conflict between the two authorities following the end of the low demand shock period. The conflict is assumed to occur from period 11 through period 20 (the light gray area). Agents expect that the fiscal authority will prevai after the conflict. Dashed line: Immediate switch to the Fiscally-led regime.

Vicious Circle

- Key mechanism:
  1. Large recession generates debt accumulation: $b \uparrow$
  2. Expectation that eventually debt will be inflated away: $\pi \uparrow$
  3. Central bank increases interest rate more than one-to-one: **Real interest rate** $\uparrow$
  4. Real activity goes down: $y \downarrow$
  5. Low real activity + high real interest rate induce further debt accumulation: $b \uparrow$
- Spiral of low growth, high(er) inflation, debt accumulation
- **Vicious Circle** ends when one of the two authorities gives up

Conflict with Monetary-led Resolution



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Take Away

If the fiscal authority is not **expected** to take the necessary fiscal adjustments

1. The central bank can accommodate these beliefs

   $\Longrightarrow$ persistently high inflation

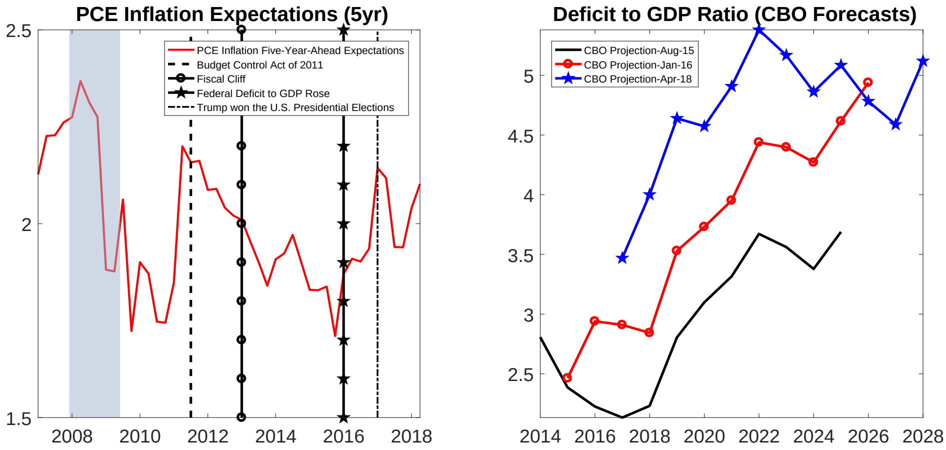
2. The central bank can fight back

   - if the central bank is expected to eventually give up $\Longrightarrow$ spiral of low output, high inflation, and high debt
   - if the fiscal authority is expected to eventually give up $\Longrightarrow$ recession coupled with persistently low inflation, and high debt

$\Longrightarrow$ CB cannot stabilize inflation without fiscal backing

$\Longrightarrow$ Institutional conflicts inevitably lead to **bad outcomes**: **Ineffective** or **detrimental** policy interventions

News and Inflation Expectations After the Great Recession



Notes: Left plot: Five-year ahead PCE ination expectations computed using the mean of forecasts reported in the Survey of Professional Forecasters. Right Plot: CBO's projections for the decit-to-GDP ratio taken in different time periods.

A Coordinated Strategy

- We propose a policy that separates the issue of **long-term fiscal sustainability** from the need of **short-run fiscal intervention**
- Policy makers commit to inflate away *just* the amount of debt resulting from the large recession itself....
- ... in response to private sector's loss of confidence that the necessary fiscal adjustments will ever be taken
- We model a shadow economy to keep track of the amount of debt deriving from the discrete demand shock. Policy makers...
  1. ...do not react to debt and inflation caused by the discrete demand shock, while...
  2. ...follow a monetary-led policy mix in response to all other shocks

A Coordinated Monetary and Fiscal Rule

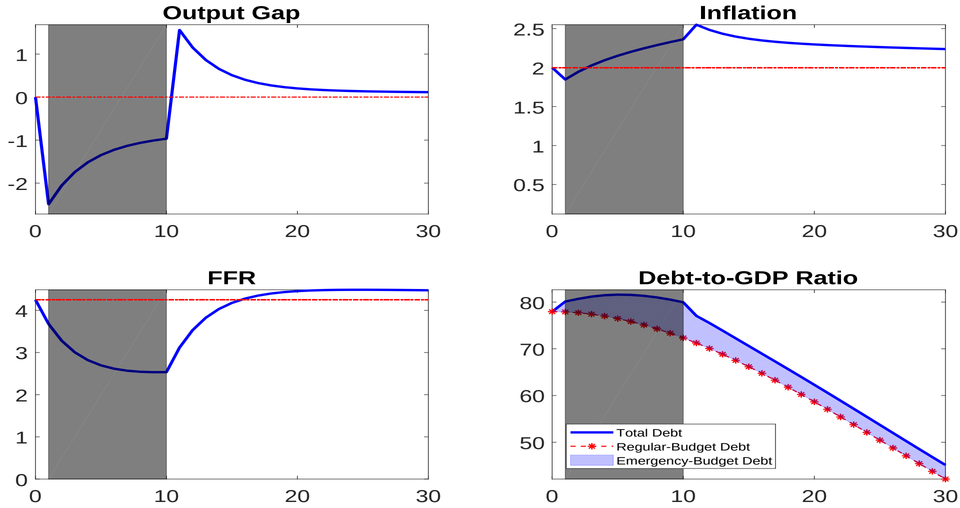
- Policymakers announce policies for regular debt and the **emergency budget** debt

$$\widetilde{\tau}_t = \left(1-\rho_\tau^M\right)\left[\delta_b^M \widetilde{b}_{t-1}^S + \tilde{\delta}_b^F \left(\widetilde{b}_{t-1} - \widetilde{b}_{t-1}^S\right)\right] + \ldots$$

$$\tilde{R}_t = (1-\rho_R^M)\left[\psi_\pi^M \tilde{\pi}_t^S + \tilde{\psi}_\pi^F \left(\tilde{\pi}_t - \tilde{\pi}_t^S\right)\right] + \ldots$$

- The fiscal authority is not responsible for the **emergency budget** debt $\widetilde{b}_t - \widetilde{b}_t^S$: $\tilde{\delta}_b^F = \tilde{\psi}_\pi^F = 0$
- The central bank allows inflation to rise by $\tilde{\pi}_t - \tilde{\pi}_t^S$, which is the amount needed to stabilize the **emergency budget** $\widetilde{b}_t - \widetilde{b}_t^S$
- The targeted inflation and debt are determined in a shadow economy where
  1. There is no discrete demand shock
  2. Policymakers always follow the monetary-led policy mix

Implementation of Coordinated Policies



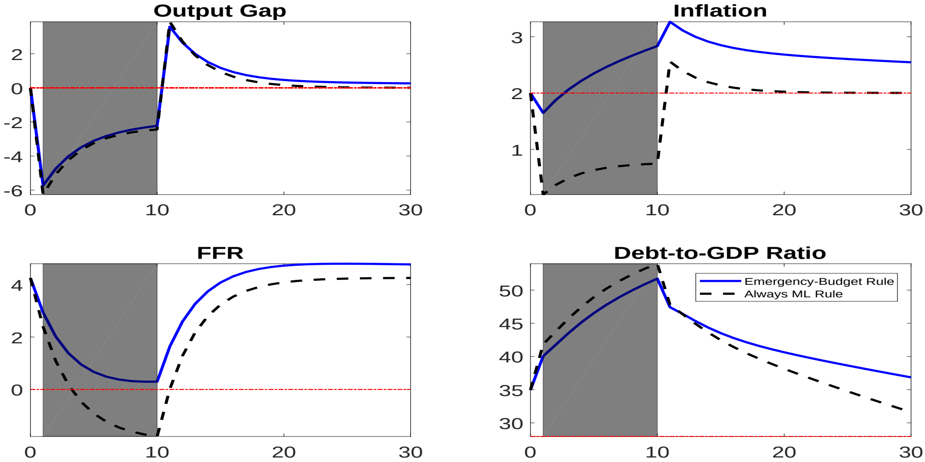
Notes: Response to a negative discrete demand shock (dark gray area) under the coordinated policy rule. The demand shock switches back to high in period 11. The starred line captures the regular debt-to-GDP ratio. The blue shaded area between these two lines captures the emergency-budget debt-to-GDP ratioy.

Avoiding Liquidity Traps

- The **zero lower bound** can be a significant constraint on the ability of a central bank to combat deflation
- Krugman (1998) and Eggertsson and Woodford (2003) suggest to use forward guidance to promise that monetary policy will drive a boom when the central bank will have again room to maneuver
- Our coordinated strategy can also be used to promise a boom at the end of large recessions
- Policymakers can adopt this strategy to rule out liquidity traps (Benhabib, Schmitt-Grohe, Uribe (2002) and Woodford (2003))
- Possible advantage: Easier to convince public if fiscal policy involved
- Historical relevance: Roosevelt's **emergency budgets**

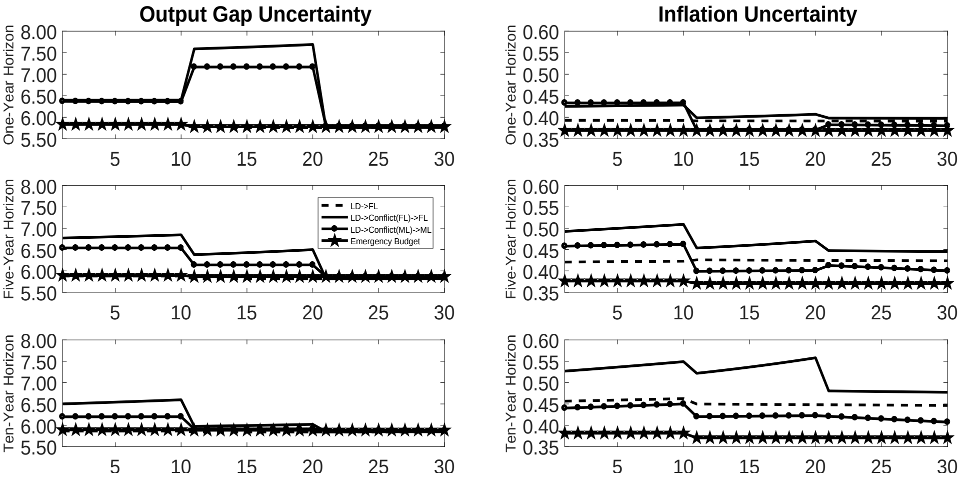
Avoiding Liquidity Traps

- Our proposed policy makes a liquidity trap **fiscally unsustainable**



Notes: Response to a negative discrete demand shock (dark gray area) under the coordinated policy rule (solid line) and a counterfactual scenario in which the economy is always in a Monetary-led regime. The demand shock switches back to high in period 11.

Uncertainty



Notes: Evolution of uncertainty at one-, five-, and ten-year horizon under different scenarios.

Welfare

- Welfare depends on squared deviations of output gap and inflation from their own steady states:

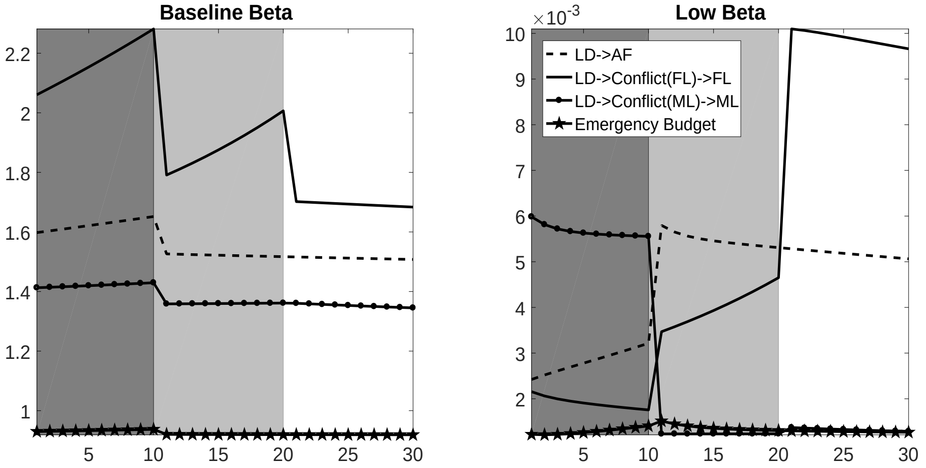
$$\mathbb{L}_t = \sum_{s=0}^{\infty} \beta^s \left[\mathbb{E}_t \left(\Delta p_{t+s}^2 \right) + (\kappa / \upsilon) \, \mathbb{E}_t \left(y_{t+s}^2 \right) \right] \tag{1}$$

- The welfare loss can be computed as:

$$\mathbb{L}_t = \left(e_{\Delta p} + (\kappa / \varepsilon) \, e_y \right) \widetilde{W} \left(I - \beta \widetilde{\Xi} \right)^{-1} \widetilde{Q}_{t|t} \tag{2}$$

where $\widetilde{Q}_{t|t}$ is a vector containing the current squared deviations from the steady state, the matrix product $\widetilde{W} \left(I - \beta \widetilde{\Xi} \right)^{-1} \widetilde{Q}_{t|t}$ computes the present discounted value of expected squared deviations from the steady state, and the column vectors $e_{\Delta p}$ and e_y select the appropriate elements (see Bianchi 2016).

Welfare Losses



Notes: Welfare losses under different scenarios.

Conclusions

- Non-coordinated policies inevitably lead to **bad outcomes** and **high uncertainty**
- The central bank cannot stabilize inflation if the govt is expected to withdraw its backing
- Not only hawkish monetary policy is **ineffective**, but it can also **backfire**
- A coordinated strategy to inflate away just a fraction of debt:
  1. mitigates the recession and stabilizes price dynamics
  2. can be useful to prevent monetary policy from hitting the ZLB
  3. leads to **lower uncertainty** and **higher welfare**

Private Sector: Households

- The representative household maximizes expected utility

$$E_0\left[\sum_{s=0}^{\infty}\beta^t \exp\left(\xi_t^d\right)\left[\log C_t - h_t\right]\right]$$

subject to the budget constraint:

$$\begin{aligned} P_t C_t + P_t^m B_t^m + P_t^s B_t^s &= P_t W_t h_t + B_{t-1}^s + \left(1+\rho P_t^m\right) B_{t-1}^m \\ &\quad + P_t D_t - T_t + TR_t \end{aligned}$$

- Shocks to the discount factor: $\xi_t^d = \bar{d}_{\xi_t^d}$, which can assume two values, high or low ($\overline{d}_H$ or $\overline{d}_L$)

- ξ_t^d follows a Markov-switching process:

$$H^d = \begin{bmatrix} p_{hh} & 1-p_{ll} \\ 1-p_{hh} & p_{ll} \end{bmatrix}$$

Back Woodford Bonds

Private Sector: Firms

- Firms choose their price $P_t(j)$ so to maximize the PV of future profits subject to

1. A downward-sloping demand curve:

$$Y_t(j) = (P_t(j)/P_t)^{-1/\upsilon}\, Y_t$$

2. Quadratic price adjustment cost:

$$AC_t(j) = .5\varphi\,(P_t(j)/P_{t-1}(j) - \Pi)^2\, Y_t(j)P_t(j)/P_t$$

3. The production function

$$Y_t(j) = h_t^{1-\alpha}(j)$$

Back

Woodford's (2001) Bonds

- Govt bonds B_t^m: perpetuity with coupons that decay exponentially
- A bond issued in period t pays ρ^j dollars $t+j$ periods later with $0 \leq \rho < \beta^{-1}$
- It can be shown that: $P_{t-j}^m = \rho^j P_t^m$ for any $j > 0$

$\Longrightarrow$ The equilibrium prices of the (infinitely) many perpetuities are function of the price of the current bond

$\Longrightarrow$ A bond of this type issued k periods ago is equivalent to ρ^k current bonds

$\Longrightarrow$ Do not need to keep track of infinitely many maturities

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Policy Regimes

- **High state of demand** ($\xi_t^d = H$):
  - Monetary led policy mix (AM/PF):
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  - Fiscally led policy mix (PM/AF):
  $$\psi_\pi = \psi_\pi^F < 1 \qquad \delta_b = \delta_b^F = 0 < \beta^{-1} - 1$$
  - Two Fight Regimes (AM/AF):
  $$\psi_\pi = \psi_\pi^C > 1 \qquad \delta_b = \delta_b^C = 0 < \beta^{-1} - 1$$
- **Low state of demand** ($\xi_t^d = L$):
  - Four FL regimes that differ on beliefs about the post-recession policy mix

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