Can Monetary Policy Create Fiscal Capacity?

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Tim Landvoigt

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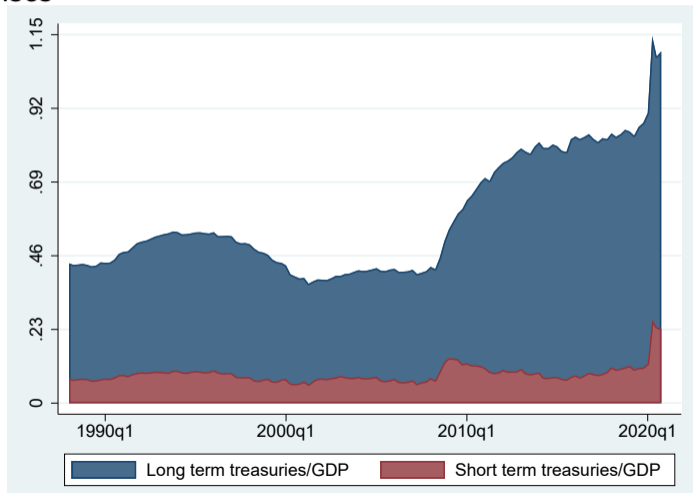
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8th Conference on New Developments in Business Cycle Analysis
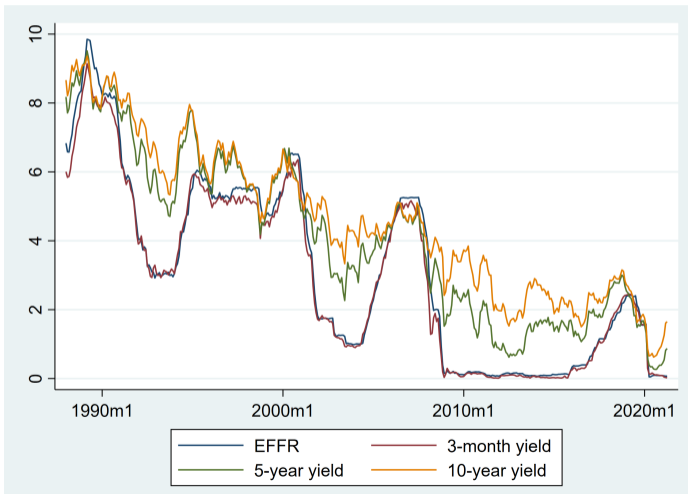Deutsche Bundesbank December 14, 2021

Motivation

- Govt. debt issuance to finance large and persistent primary deficits following GFC and Covid crises
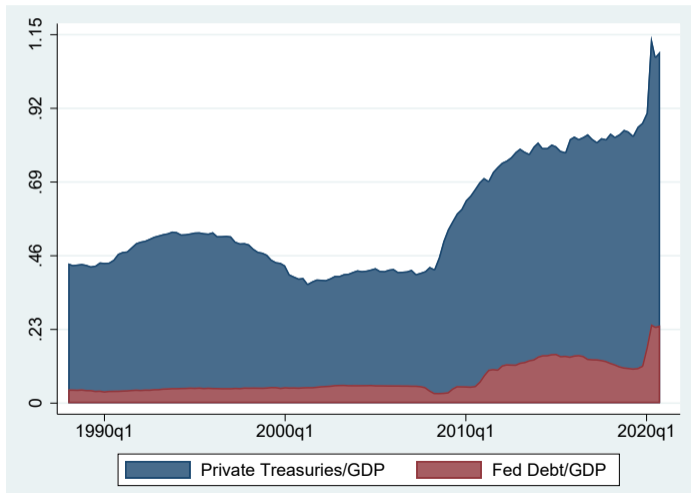
Motivation

- Supported by conventional MP (ZLB)

Motivation

- And by unconventional MP (QE): Fed purchases of Treasuries

Research Question

- How will this debt be repaid?
  - Faster growth, higher inflation, higher tax rates?

- Can monetary policy reduce fiscal burden?
  - Conventional MP: lower ST bond yields
  - Unconventional MP: lower LT bond yields
  - Unconventional MP: higher share of debt held by public that is ST
  - New monetary policy framework: higher inflation

Main Findings

- Study fiscal/monetary interaction during and after economic crisis
  - In a rich NK model with intermediaries, fiscal and monetary authorities
  - Crisis: demand shock with ZLB causes large contraction
  - Analyze macro, financial, and fiscal impact of policies

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  2. Continuation of UMP for longer during recovery lowers debt burden further
     - ⋆ Large announcement effect in crisis: GDP ↑
   - ⋆ LT bond yields lower for longer, reduces government debt service

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  3. UMP lowers the risk of future tax increases
  4. Addtl. govt. transfer spending increases debt but stimulates economy

- Data generating process is the combination of long UMP and additional transfer spending, calibrated to GDP, inflation, deficit change from 19.Q4-20.Q4

Model Overview
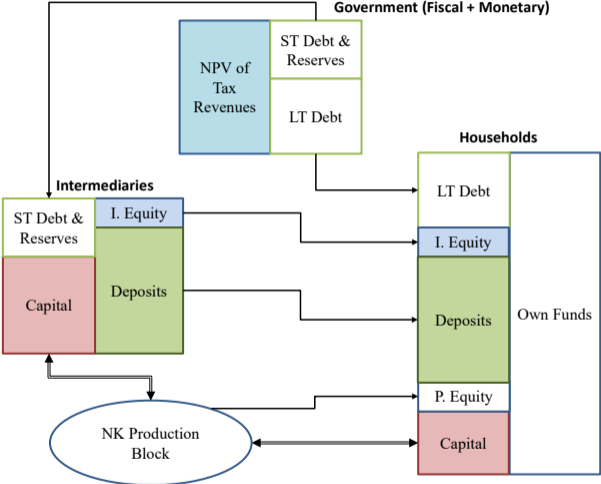
Shocks, Household, and Intermediary

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- Two frictions in household portfolio problem
  - Capital holding cost captures households comp. disadvantage at intermediation
  - Bond holding cost increasing in supply of LT bonds/GDP. Matches term spread + elasticity of bond yield to supply changes (Gabaix & Koijen 2021)

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- Intermediary is firm owned by households with equity issuance cost subject to
  - Regulatory capital requirement

$$\text{Deposits} \leq \nu \left(\text{Reserves} + \nu_K \text{Capital} \right)$$

  - $\star$ ν is Supplementary Leverage Ratio (SLR), ν_K capital risk weight
  - Liquidity coverage cost that captures regulatory Liquidity Coverage Ratio (LCR)

Monetary and Fiscal Policy

- Two Monetary Policy tools
    - Central bank sets **interest rate on reserves**: $i_t^S = \bar{i}^S + \alpha_\pi(\pi_t - \bar{\pi}) + \alpha_y \hat{y}_t$
    - **QE**: through purchases/sales of government debt, CB can change
        - ★ maturity composition of debt held by the public
        - ★ and **allocation of assets** across intermediaries and HH

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  - ST and LT debt issued in fixed proportions over time
  - Govt. spending: goods purchases and transfers to HH
 - Taxation: firm and bank profits (non-distort.) and labor income (distort.)

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- Countercyclical government spending rules: automatic stabilizers
  - cyclical component of output $\hat{Y}_t = Y_t / Z_t^G$
  - Discretionary spending: $G_t = \gamma(\hat{Y}_t) Y_t$
  - Transfer spending: $\Theta_t = \theta(\hat{Y}_t) Y_t$
  - $\gamma'(\hat{Y}_t) < 0$, $\theta'(\hat{Y}_t) < 0$

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- Tax policy with endogenous regime-switching
  - **Regime 1**: tax revenue $\tau_t = \tau(\hat{Y}_t)Y_t$ procyclical, no response to debt/GDP
  - **Regime 2**: passive fiscal policy only in **tails** of debt/GDP distribution

Debt/GDP with Endogenously Regime-Switching Fiscal Policy

- Ergodic distribution of debt/GDP in model
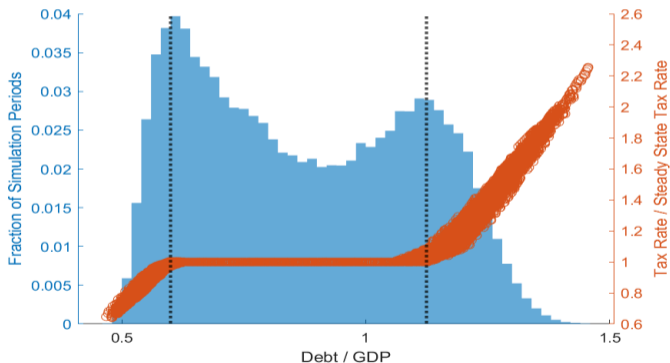
Debt/GDP with Endogenously Regime-Switching Fiscal Policy

- Tax rates adjust for very low ("profligacy") and high ("austerity") debt/GDP to keep debt riskfree and bounded
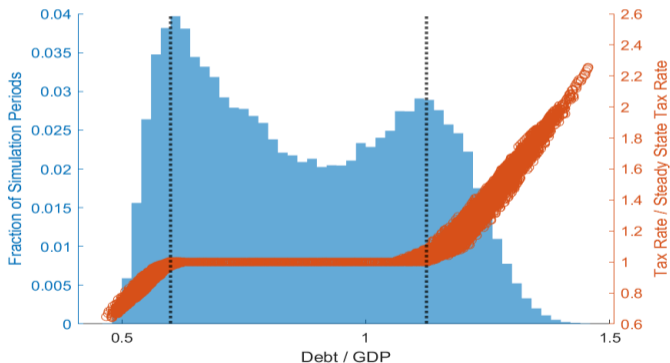
Debt/GDP with Endogenously Regime-Switching Fiscal Policy

- AC of debt/GDP >.99: likely to observe long sample path without fiscal adjustment
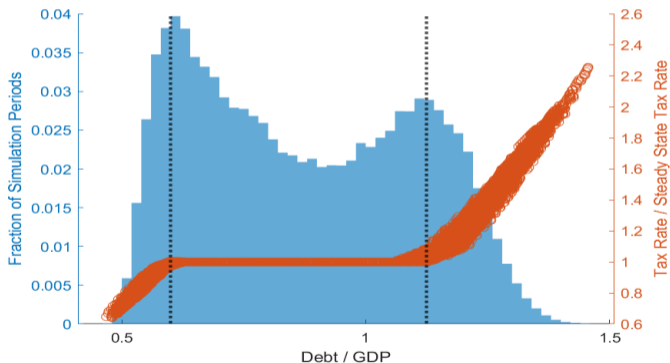
Solution Method and Parameterization

- Global nonlinear solution method
  - State variables: Transitory & permanent productivity, capital stock, wealth distribution (HH, intermediary, gov)
  - Three non-linearities: Occasionally binding intermediary constraint, ZLB, global tax rule (austerity/profligacy)
  - Large risks and risk premia
    - Deterministic steady state far away from ergodic distribution
    - Algorithm finds fixed point such that parameters in Taylor and fiscal rules are centered around **stochastic** "steady state"

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- Key parameters (quarterly)
  - ▶ Productivity shocks
    - ★ $\text{Vol}[g_t] = 1.2\% \rightarrow$ Vol output growth
    - ★ $\text{AC}[g_t] = 0.6 \rightarrow$ AC output growth
    - ★ Standard TFP shocks
    - ★ Perfect correlation between both shocks

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- Key parameters (quarterly)
  - Productivity shocks
  - Preferences
    - IES 1.4 $\rightarrow$ Vol cons growth
    - Risk aversion parameter 20 $\rightarrow$ Unlevered RP on GDP claim 1% per quarter
    - $\implies$ With elastic labor supply, implies Arrow-Pratt RRA coef of 5.4

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- Key parameters (quarterly)
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  - Government
    - ★ Fraction of LT debt: 67%
    - ★ Avg. duration of LT debt: 7.76 year
    - ★ Fiscal rules to match cyclicality of spending, transfers, tax revenue

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  - Frictions
    - ★ Liquidity cost $\rightarrow$ Deposit - Fed funds rate spread (31 bps/quarter)
    - ★ LT bond portfolio cost $\rightarrow$ Term spread (LT-ST) (36 bps/quarter)

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  - Frictions
- Realistic risk premia on fiscal claims and slope of convenience yields
  - Government insures taxpayers and spending recipients in short-run, but fiscal claims inherit long-run output risk (Jiang et al. 20) (Fiscal risk)
  - Convenience yields decreasing in supply of government debt (Krishnamurthy and Vissing-Jorgensen 12) (Conv. yields)

Fiscal/Monetary Policy in Crisis

- Crisis: bad TFP shock $+$ aggr. demand shock (increase in discount factor β)
  - Aggr. demand shock: unanticipated, dissipates with prob. 0.5 each quarter
  - Impose ZLB for duration of shock (shadow rate very negative)

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  1. Automatic Stabilizers: Only conv. monetary and fiscal policy rules
  2. UMP: Unconventional Monetary Policy
     - QE: central bank buys 40% of supply of LT bonds by issuing reserves
     - Relaxation of SLR for reserves
     - Inflation target increase from 2% to 3%

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  5. Long Combo: Policies continuing post-crisis with qtrly persistence of 0.9
     - Agents have correct expectations from start (forward guidance)

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- Find the mix of negative demand and supply shocks to generate observed GDP, inflation, and deficit/gdp changes between 2019.Q4 and 2020.Q4 under the Long Combo policy (the "data generating policy")

Crisis and Recovery: Macro Aggregates

- **Long Combo**: Match −2.75% in GDP, 1.5% in inflation, ZLB
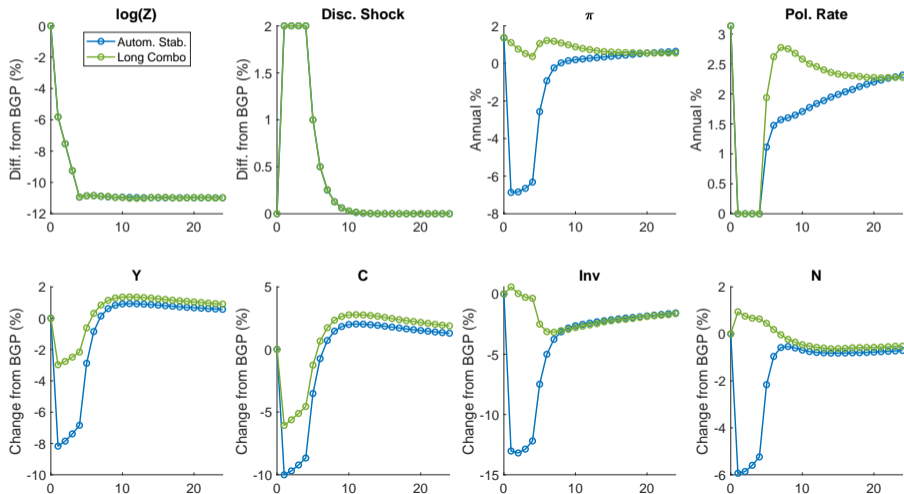
Crisis and Recovery: Macro Aggregates

- **Automatic Stabilizers**: GDP falls 8%, cons 10%, inv 13%, 7% deflation
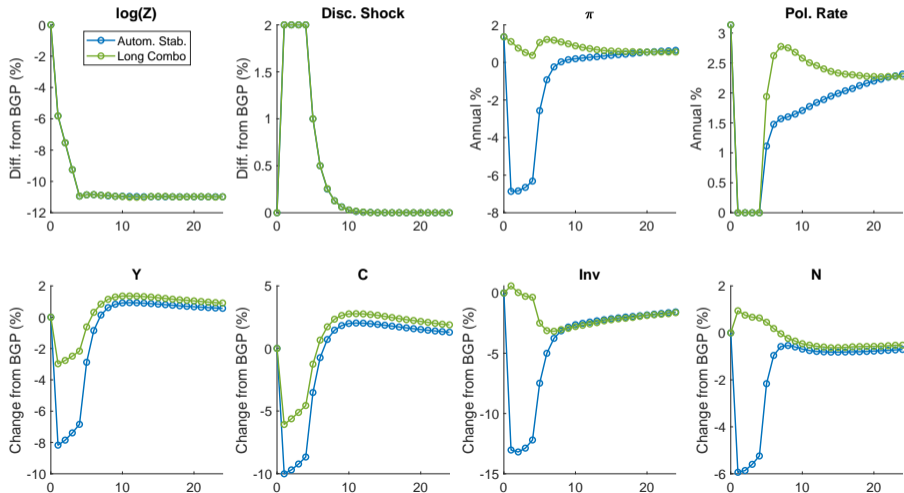
Crisis and Recovery: Macro Aggregates

- Combo: shorter duration of policies, announcement effect
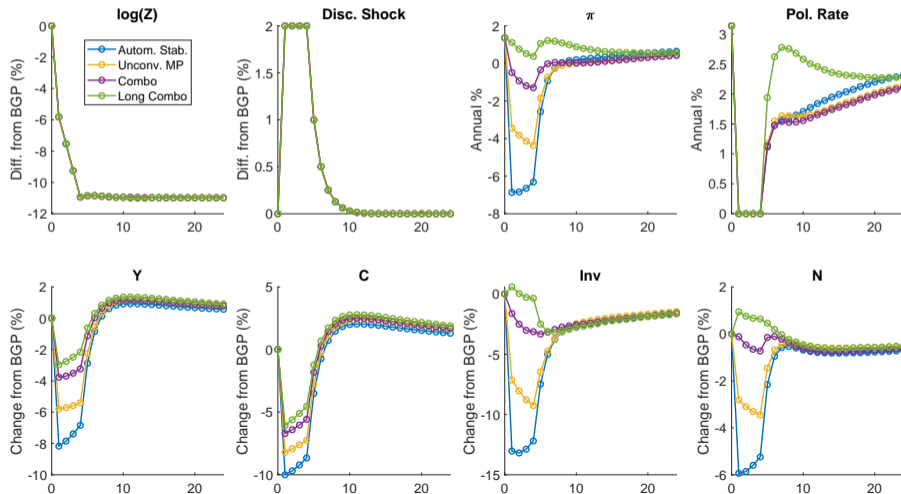
Crisis and Recovery: Macro Aggregates

- UMP = Combo − transfers: accounts for 1/3 of total policy effect
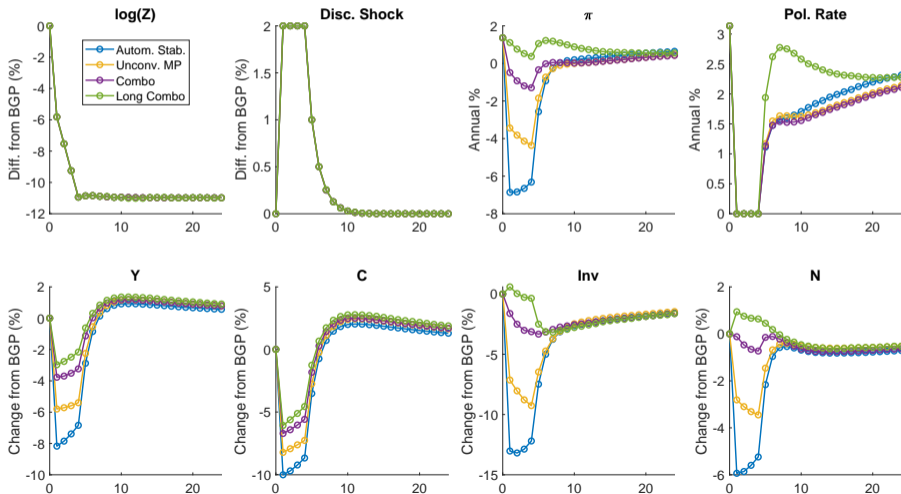
Crisis and Recovery: Government Debt

- **Long Combo**: Match primary surplus/GDP of -13.5%
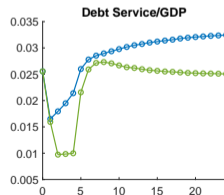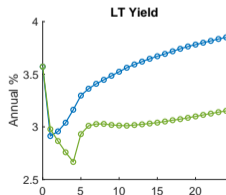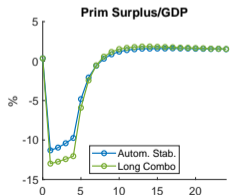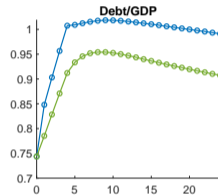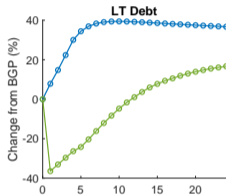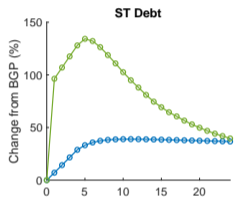
Crisis and Recovery: Government Debt

- **Fiscal capacity**: Long Combo policy mix lowered debt/GDP by 8% points
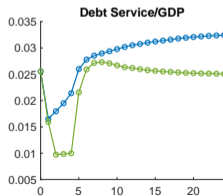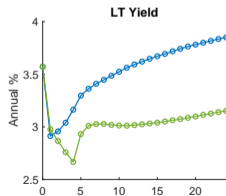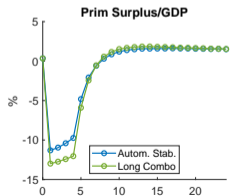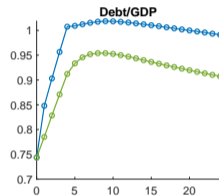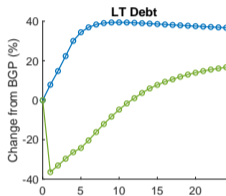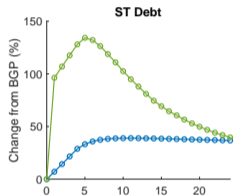
Crisis and Recovery: Government Debt

- UMP depresses LT yields and cuts debt service by 0.5% of GDP
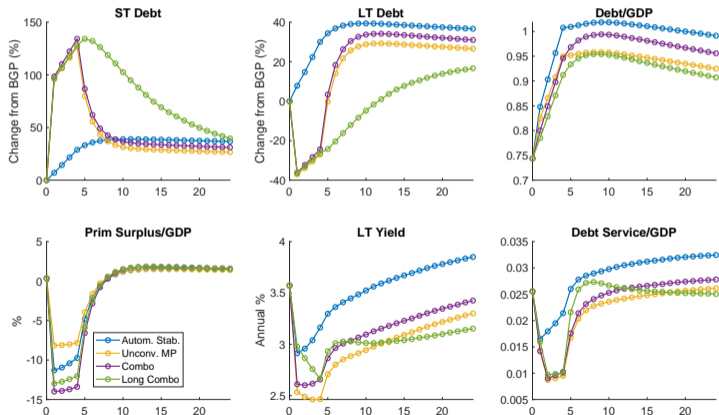
Crisis and Recovery: Government Debt

- Cuts debt/GDP by 6.5% points after 5 years
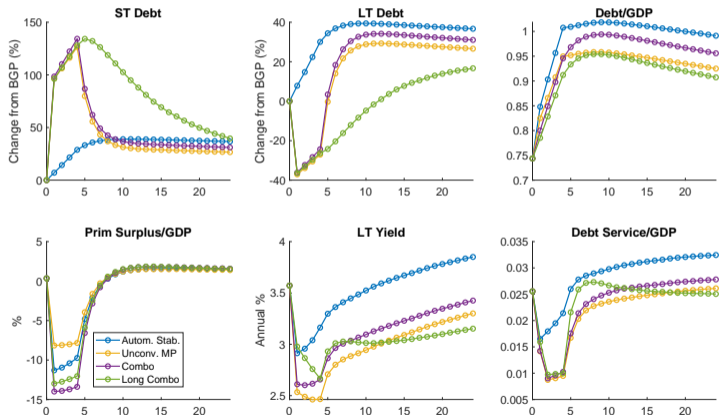
Economic Mechanism for QE

- UMP acts as positive aggregate demand shock by stimulating consumption and discouraging savings
- Why does QE specifically have this effect?
  1. QE buys LT debt from HH and turns it into bank reserves
  2. Reserves are better collateral for banks than firm capital (loans to firms) $\Rightarrow$ banks shed firm capital: *crowding out channel* of QE
  3. Households must absorb this firm capital, but are worse at intermediation
  4. Net effect: HH earn lower return on wealth, consume more, save less (NK substitution effect)
  5. Sets off boost to aggregate demand, firm hiring/investment, higher wages and prices

State dependence: QE in good times has weak effects

- QE acts like aggregate demand shock, but effect 10x smaller when temporary QE is done in normal times
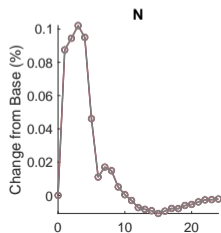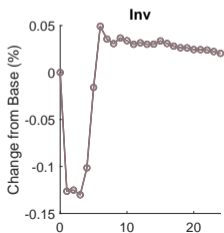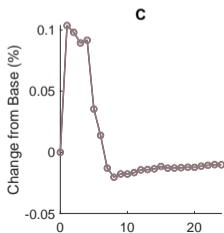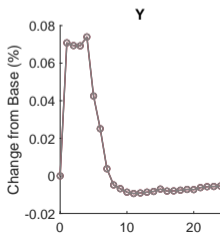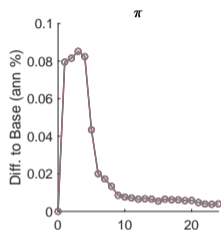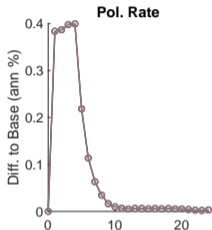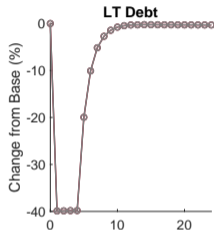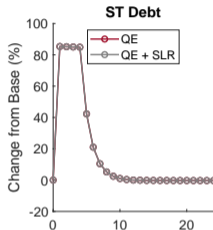
Duration Dependence: Permanent QE

- Permanent QE (= shorter govt debt maturity) acts like a negative supply shock in neoclassical model: $K \downarrow$
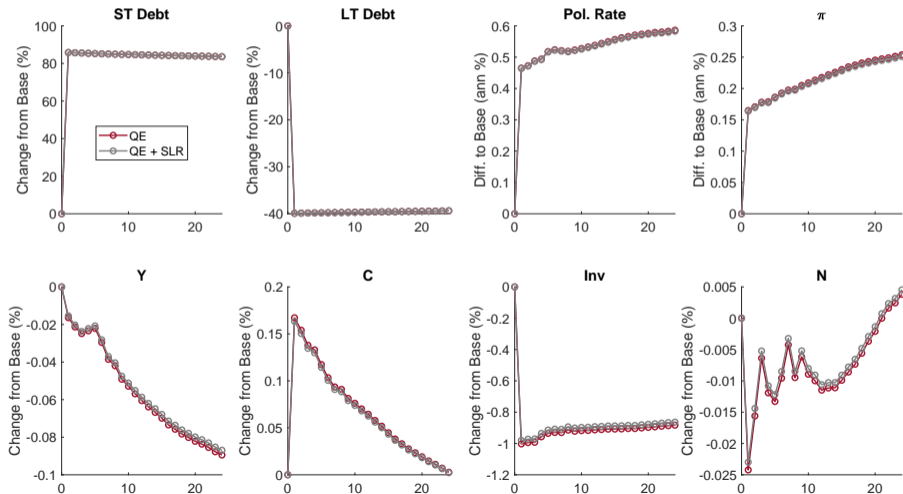
New Monetary Policy Framework: Policy Duration

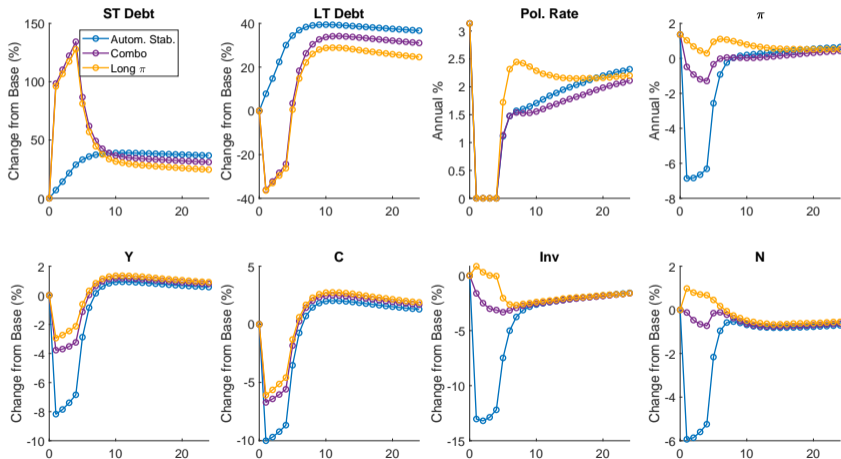- All benefits from longer policy duration come from inflation target, long QE and transfers are unimportant
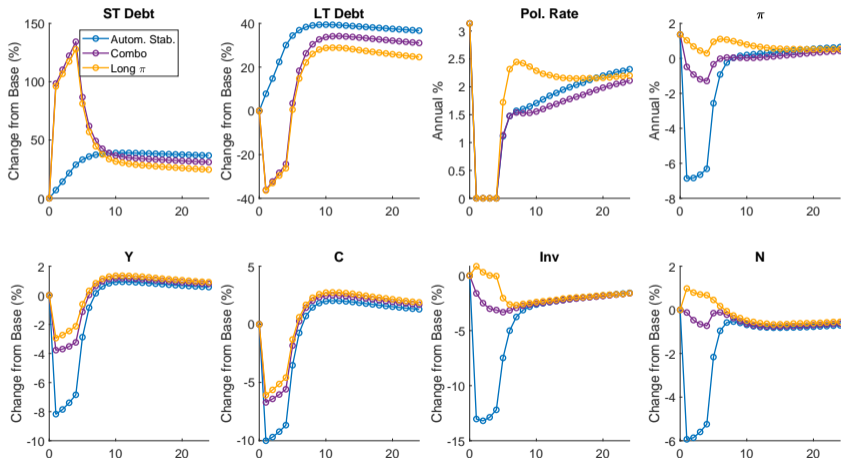
New Monetary Policy Framework: Policy Duration

- Stimulative effect from announcing higher inflation target for longer
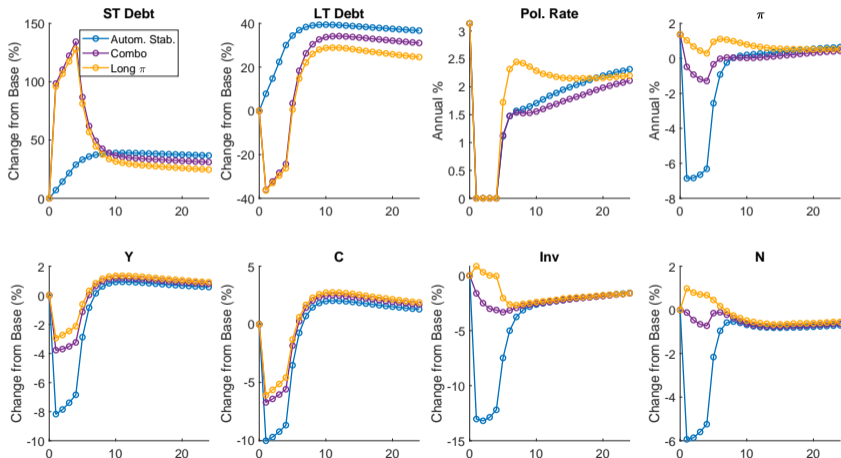
New Monetary Policy Framework: Policy Duration

- Higher π^* lowers deflation today, increases real rate, demand $\uparrow$

Fiscal Risk Avoidance Channel of UMP

- Only fiscal policy: substantial risk of explosive debt growth
- Long-term support from Fed: reduction in average debt and risk of tax increase; stimulates consumption
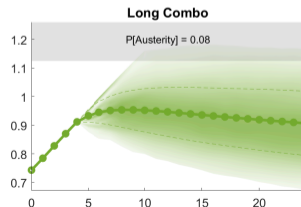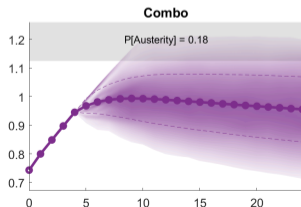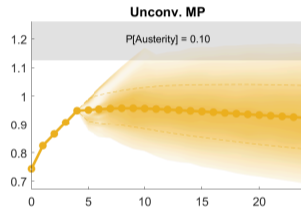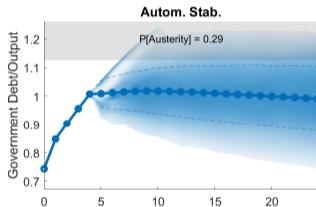
Conclusion

- Conventional monetary and fiscal policy insufficient to fight crises; result in substantial risk of future tax increases

- Unconventional monetary policy not only helps to stabilize the economy but also to lower the debt burden and reduces risk of future tax hikes

- QE crowds out fin sector lending, crowds in liquidity.
  - ▶ Temporary QE in response to crisis acts like positive aggregate demand shock. Effective to combat demand-driven crises.
  - ▶ Permanent QE acts like negative supply shock by crowding out investment

- Technical contributions
  - ▶ Solve NK model with non-trivial risk (premia), constrained intermediary, and ZLB
  - ▶ Global fiscal rule for debt stationarity
  - ▶ Consistent with observed risk properties of tax and spending processes

Robustness

- Taxes adjust continuously to changes in debt/GDP Details
  - Does not accord well with observation of actual fiscal policy
  - Results in tax claim that is insufficiently risky in short-to-medium run
  - Does not generate large run-up in debt
  - Higher policy effectiveness: larger $\Uparrow$ GDP and $\downarrow$ debt/GDP

- Lower risk aversion Details

- Permanent and transitory productivity shocks imperfectly correlated Details

Robustness

- Taxes adjust continuously to changes in debt/GDP `Details`

- Lower risk aversion `Details`
  - Recalibrate to match real rate, term spread
  - Unrealistically low risk premia $\Rightarrow$ govt debt portfolio insufficiently risky in the long-run
  - Lower policy effectiveness

- Permanent and transitory productivity shocks imperfectly correlated `Details`

Robustness

- Taxes adjust continuously to changes in debt/GDP [Details]

- Lower risk aversion [Details]

- Permanent and transitory productivity shocks imperfectly correlated [Details]
  - Worse fit for term structure
  - Worse fit for risk premia on T and G claims (corr. ΔT and ΔY)
  - Main policies give qualitatively similar results

Intermediary Problem

$$V^I(W_t^I, \mathcal{S}_t) = \max_{e_t^I, B_t^{I,S}, X_t^{I,K}, D_t^I} \chi_0 W_t^I - e_t^I + \mathsf{E}_t\left[\mathcal{M}_{t,t+1}V^I(W_{t+1}^I, \mathcal{S}_{t+1})\right]$$

subject to:

$$(1 - \chi_0^I)W_t^I + e_t^I - \chi_1\frac{(e_t^I)^2}{2} \geq Q_t X_t^{I,K} + p_t^S B_t^{I,S} - (p_t^D - \rho_t(D_t^I, B_t^{I,S}))D_t^I,$$

$$W_{t+1}^I = \exp(-g_{t+1})\left[\left(r_{t+1}^K + (1 - \delta_K)Q_{t+1}\right)X_t^{I,K} + B_t^{I,S} - D_t^I\right],$$

$$D_t^I \leq \nu\left(X_t^{I,S} + \nu_K Q_t X_t^{I,K}\right),$$

$$X_t^{I,K} \geq 0$$

$$\mathcal{M}_{t,t+1} = \beta\exp((1 - \gamma)g_{t+1})\left(\frac{C_{t+1}}{C_t}\right)^{-1}\left(\frac{C_{t+1}^{1-\psi}(D_{t+1}^H)^\psi}{C_t^{1-\psi}(D_t^H)^\psi}\right)^{1-\varphi}\left(\frac{V_{t+1}^H}{CE_t}\right)^{\frac{\varphi-\gamma}{1-\varphi}}$$

$$\rho_t(D_t^I, X_t^{I,S}) = \varrho_0\bar{D}\left(\frac{X_t^{I,S}}{\bar{\bar{D}}D_t^I}\right)^{1-\varrho_1}$$

Debt and Taxes

- Data: high debt/GDP does not coincide higher taxes or surpluses

	Dependent variable:					
	Δ Tax Rev.	Δ Pr. Sur.	Δ Tax Rev.	Δ Pr. Sur	Δ Tax. Rev.	Δ Pr. Surp.
	Data	Data	Model	Model	Model	Model
	(1)	(2)	(3)	(4)	(5)	(6)
Δ Debt/GDP	−0.075***	−0.312***	−0.009**	−0.088***	−0.043***	−0.107***
	(0.012)	(0.032)	(0.004)	(0.003)	(0.001)	(0.001)
Prof.					−0.001***	−0.003***
					(0.0001)	(0.0002)
Aus.					0.001***	0.003***
					(0.0001)	(0.0002)
Δ Debt/GDP × Prof.					0.089***	0.030***
					(0.002)	(0.003)
Δ Debt/GDP × Aus.					0.109***	0.063***
					(0.001)	(0.002)
Observations	272	272	119,976	119,976	119,976	119,976
R^2	0.123	0.258	0.006	0.098	0.166	0.116
Note:					*$p<0.1$; **$p<0.05$; ***$p<0.01$	

back

Debt and Taxes

- Yet compatible with active monetary / passive fiscal regime

	Dependent variable:					
	Δ Tax Rev.	Δ Pr. Sur.	Δ Tax Rev.	Δ Pr. Sur	Δ Tax. Rev.	Δ Pr. Surp.
	Data	Data	Model	Model	Model	Model
	(1)	(2)	(3)	(4)	(5)	(6)
Δ Debt/GDP	−0.075***	−0.312***	−0.009**	−0.088***	−0.043***	−0.107***
	(0.012)	(0.032)	(0.004)	(0.003)	(0.001)	(0.001)
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Note:					*$p<0.1$; **$p<0.05$; ***$p<0.01$	

back

Campbell-Shiller Decomposition Debt/GDP

- Variation in debt/GDP mostly **does not** reflect future surpluses or returns
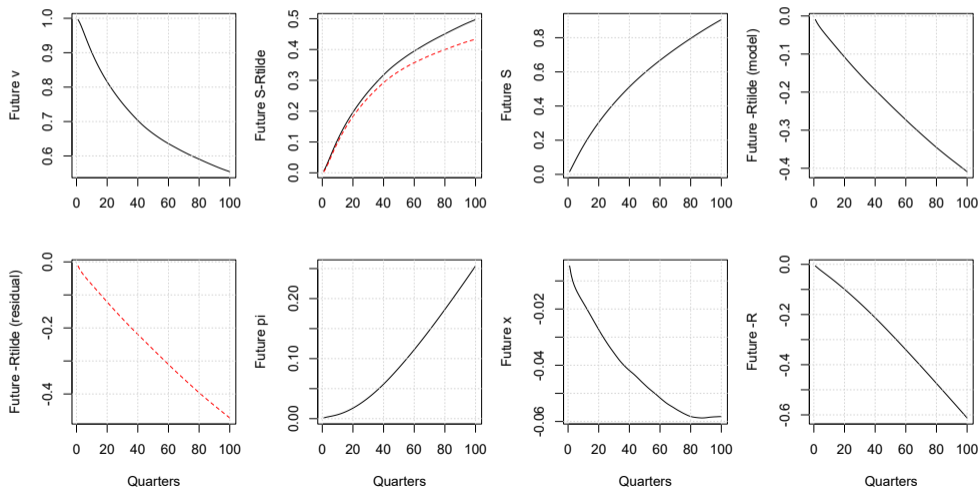
Campbell-Shiller Decomposition Debt/GDP

- The dogs that did not bark (Jiang et al. 2021)
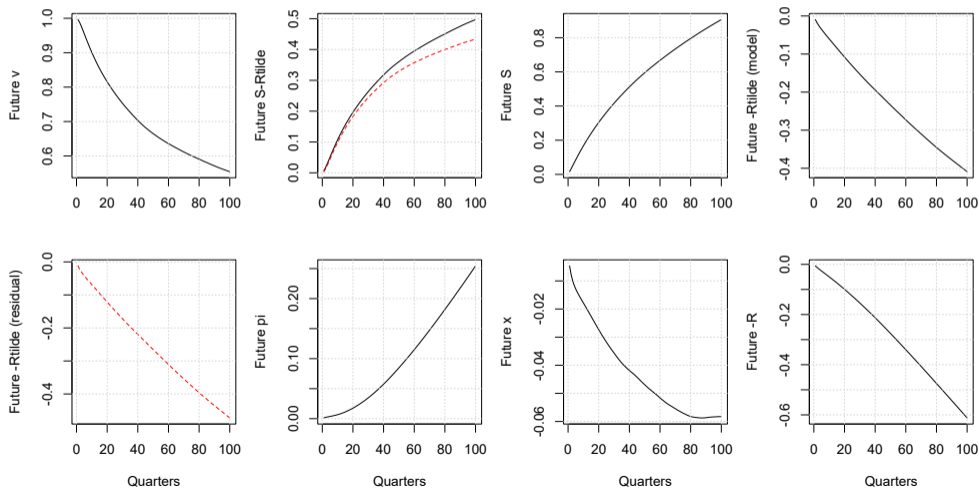
Fiscal Risk: Model and Data

- Government provides insurance to taxpayers and spending recipients in short-run
- Tax and spending claims co-integrated with output in long-run, inherit long-run output risk (Jiang et al. 20)

Beta of Fiscal Claims

Expected Excess Return on Fiscal Claims

— Taxes
— Spending
— GDP

back
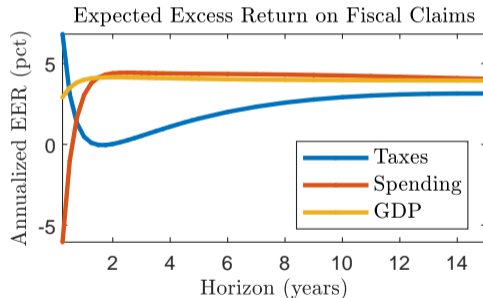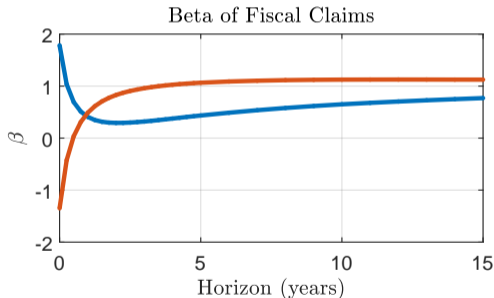
Fiscal Risk: Model and Data

- Term structure of risk premia reflects beta profile: stabilization policy in short-run and long-run risk of GDP claim at low frequencies (right panel)

Beta of Fiscal Claims

Expected Excess Return on Fiscal Claims
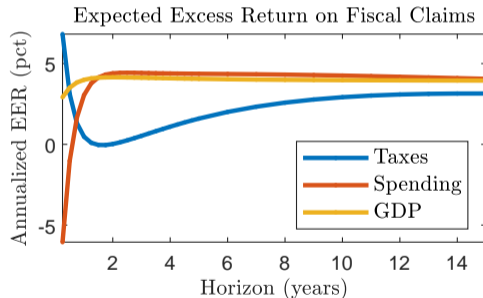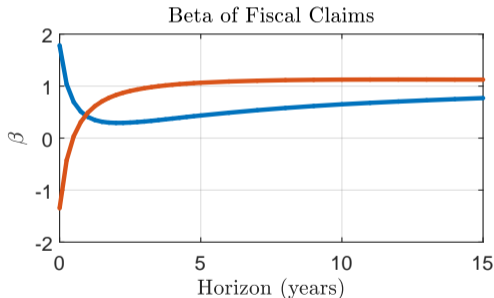
Fiscal Risk: Model and Data

- Keeping debt safe (insuring bondholders) requires reducing riskiness of taxes at intermediate frequencies, i.s., shifting the risk onto the taxpayers

Beta of Fiscal Claims

Expected Excess Return on Fiscal Claims

- Taxes
- Spending
- GDP
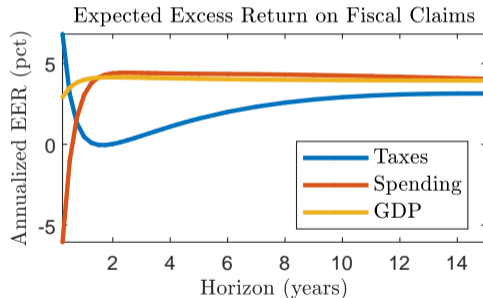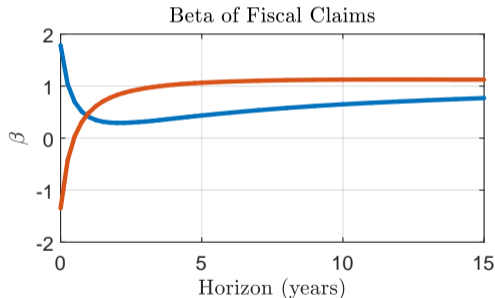
Convenience Yields Declining in Debt/GDP

- Mkt. value govt. debt = EPDV[Surpluses] + EPDV[Convenience Yields]
- Downward sloping demand for liquidity (Krishnamurty and Vissing-Jorgensen 12)

- QE: Fed buys LT bonds by issuing reserves
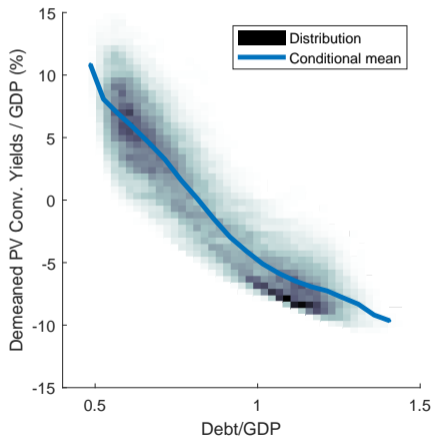
Decomposing UMP in a Crisis: Macro rel. to Baseline
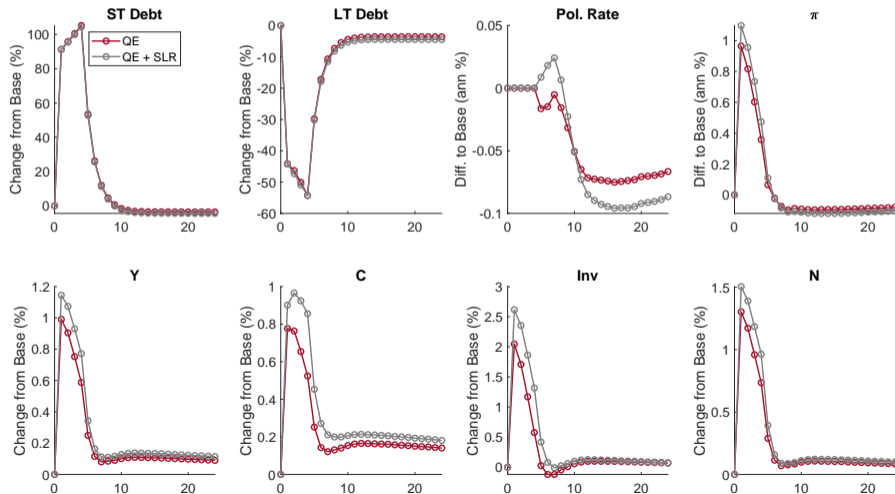
- Intermediaries raise deposit supply, dividends to households

- Positive demand shock: consumption, output rise

- Relaxing SLR amplifies the positive demand shock

- UMP: QE + higher inflation target (3%)
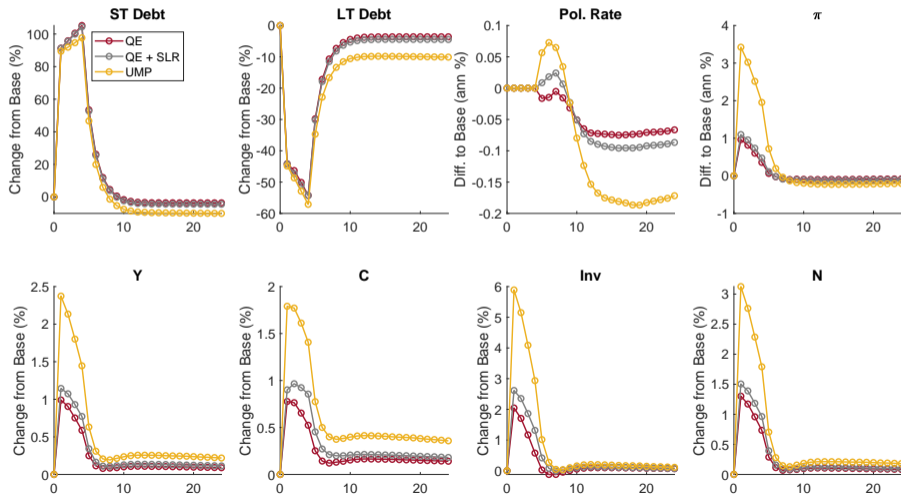
Decomposing UMP in a Crisis: Fiscal rel. to Baseline

- QE reduces debt service costs

- SLR relaxation & inflation target reduce cyclical deficits

- 1/2 reduction in debt/gdp from inflation target, 1/3 from QE, rest from SLR
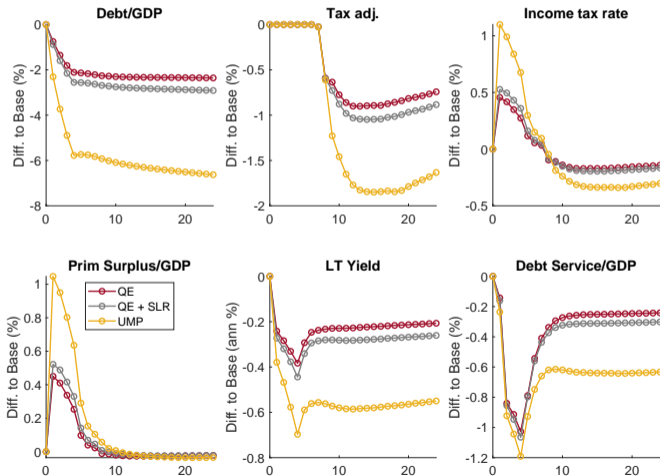
Addl Transfer Spending: Macro Aggregates

- Extra transfer sending of 8% of GDP: PE fiscal multiplier of $\approx$ 0.3
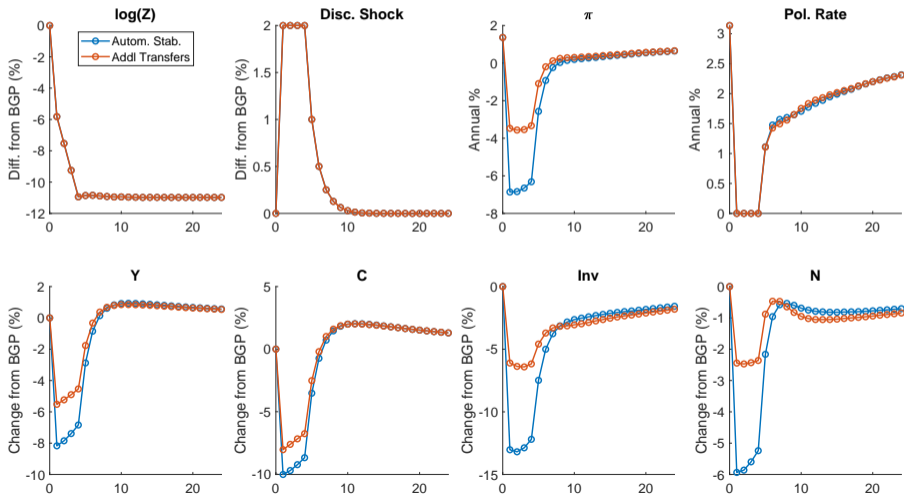
Addl Transfer Spending: Government Debt

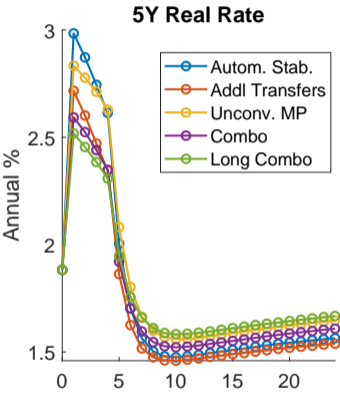- Large stimulative effect increases deficits by less than 8%: GE fiscal multiplier $\approx$ 0.5
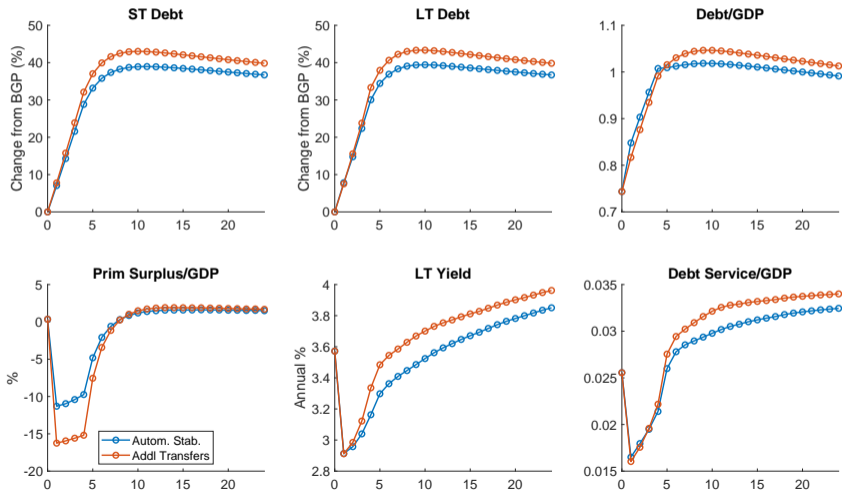
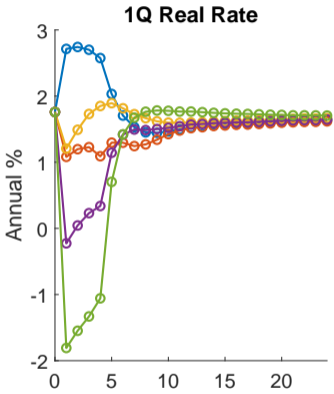# Crisis and Recovery: Government Debt

- UMP lowers debt service costs, helps fiscal authority afford additional transfers
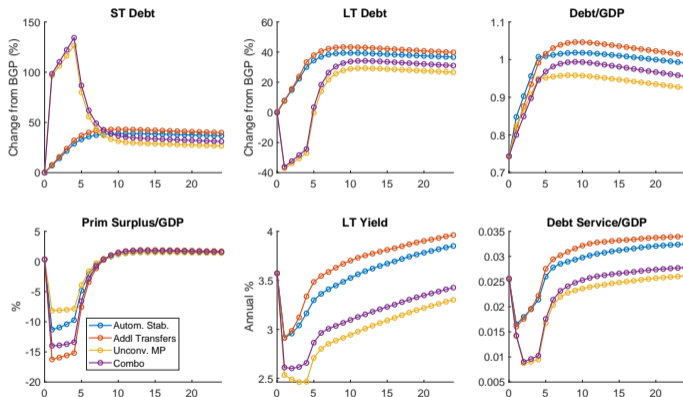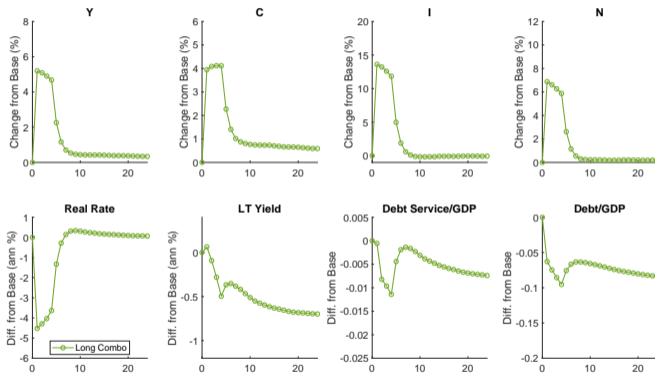
Crisis and Recovery: Interest Rates

Robustness: Policy Effects Under Alternative Parameters

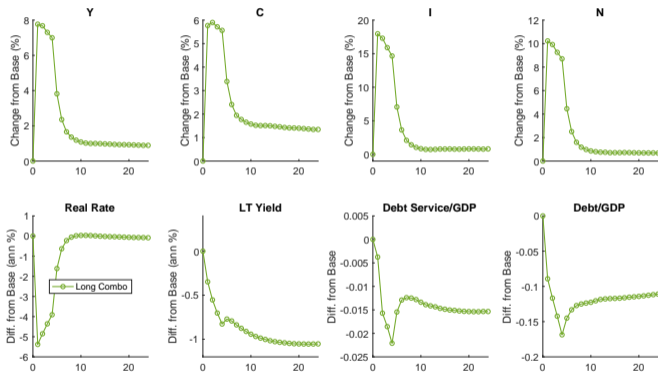- Baseline parameters: Long Combo vs. Autom. Stabilizers (Base)

Smooth Tax   Low RRA   Uncorr. Shocks   Back

Robustness: Policy Effects Under Alternative Parameters

- Smooth tax rule: $\tau_\Delta(\hat{Y}_t, \Delta_t) > 0 \quad \forall \Delta_t$
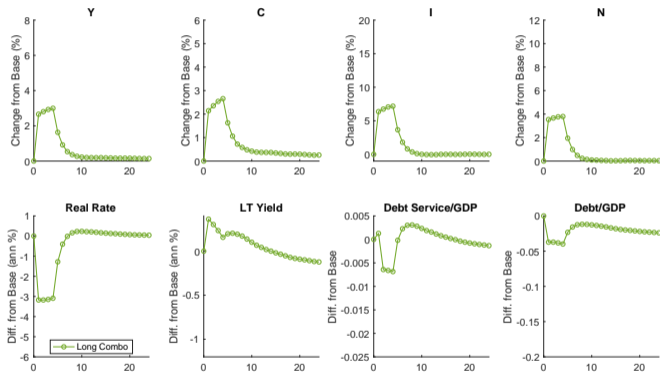

Baseline   Low RRA   Uncorr. Shocks   Back

Robustness: Policy Effects Under Alternative Parameters

- Lower RRA: $\sigma = 2$
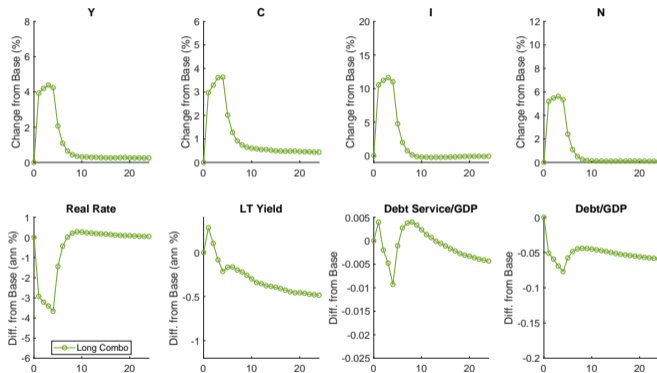

Baseline   Smooth Tax   Uncorr. Shocks   Back

Robustness: Policy Effects Under Alternative Parameters

- Uncorrelated TFP shocks

Baseline   Smooth Tax   Low RRA   Back

Bibliography I