Why the Federal Reserve Cuts Rates when Public Debt Rises

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Does public debt influence Federal Reserve decisions?

- **Prevailing view:** Fed is independent
  - Does not directly react to public debt
  - Reacts only to variations in inflation and output gap (Fed's dual mandate)
- **Alternative view:** Fed accommodates fiscal authority (Political pressure)
  - Fed reduces policy rate when public debt increases
  - Eases government borrowing costs

Contribution 1: New empirical finding

- **New fact:** when public debt ↑, Federal Reserve ↓ policy rate
  - Controlling for output gap and inflation
- Plausible interpretation: Federal Reserve accommodates fiscal authority
  1. Hard to believe for USA (Fed's dual mandate + independence)
  2. Provide supportive evidence against this (in the paper)
- Empirically **rule out** other possible explanations (in the paper)
  - E.g. debt being informative about future economic conditions
- Standard macro model **cannot** explain the fact
  - New Keynesian: when debt ↑, rates ↑ to arrest any fiscal-led inflation

Contribution 2: New explanation for the finding

- **Main idea:** Fed reacts to information contained in debt about the natural rate
  - Equilibrium interest rate under flexible price
  - Optimal to do so

- **Model's key ingredients**:
  1. Incomplete markets ⇒ public debt serves as buffer stock or private liquidity
     - Demand for debt depends on the level of the interest rate (as in heter agent model)
  2. Shocks to households' demand for public debt (liquidity or safety shocks)
     - Interpretation: risk ↑ ⇒ demand of public debt ↑
  3. Monetary authority tracks, at least partially, natural rate

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  3. Monetary authority tracks, at least partially, natural rate
- **Mechanism:** movements in debt are informative about the natural rate

$$\text{liquidity shock} \uparrow \implies \left\{ \begin{array}{ll} \text{natural rate} \downarrow & \implies \\ \text{debt} \uparrow & \not\Longrightarrow \end{array} \right\} \text{policy rate} \downarrow$$

Contribution 3: Corroborative evidence

- **Mechanism:** movements in debt are informative about the natural rate
  - Fed uses this information when setting the policy rate
- **Two arguments** to corroborate the mechanism:
  1. Quantitative model with shocks to households' demand for debt
     - Shocks generate corr(debt,natural rate)<0
     - Shocks drive the business cycle
  2. When controlling for **new measure** of natural rate based on debt,
     $\uparrow$ debt $\not\Rightarrow$ policy rate $\downarrow$

Outline

1. Document that debt $\uparrow \implies$ nominal rate $\downarrow$
2. Model
3. New estimate of natural rate based on debt.
   Conditional on this estimate, debt $\uparrow \not\Longrightarrow$ policy rate $\downarrow$

Does debt influence Fed decisions?

$$r_t = \alpha\pi_t + \beta y_t + \gamma d_t + \rho_1 r_{t-1} + \rho_2 r_{t-2} + u_t$$

- where d_t is the public debt-to-GDP ratio: novel term w.r.t. literature

Does debt influence Fed decisions?

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- where d_t is the public debt-to-GDP ratio: novel term w.r.t. literature
- Sample period: 1979q3-2019q4 (quarterly data for USA)
- Interest rate, r_t is FFR and Wu-Xia shadow rate (2009q1-2015q4)
- Inflation, π_t measured as CPI inflation
- Output gap, y_t, from CBO estimates
- Debt, d_t, is market value of gross federal debt over GDP
- α, β, and γ are divided by $1 - \rho_1 - \rho_2 \equiv 1 - \rho \rightarrow$ interpret coefficients as the long run effect
  - increase of 10 pp. of debt-to-gdp affects r_t by $\gamma/(1 - \rho)$

Estimates of the Taylor rule with debt

$$r_t = \alpha\pi_t + \beta y_t + \gamma d_t + \rho_1 r_{t-1} + \rho_2 r_{t-2} + u_t$$

	(1) OLS	(2) GMM	(3) GMM BC	(4) GMM Shocks	(5) GMM HP
π_t^{cpi}	1.17***	1.11***	1.30***	1.18***	0.42***
	(0.25)	(0.22)	(0.17)	(0.12)	(0.06)
y_t	0.60***	0.73***	0.84***	0.45***	0.34***
	(0.19)	(0.17)	(0.16)	(0.11)	(0.07)
d_t	-0.74***	-0.80***	-0.55***	-0.95***	-0.35***
	(0.22)	(0.18)	(0.16)	(0.10)	(0.05)

- Increase of debt-to-GDP by 10 pp. reduces r_t by $\approx$ .7%

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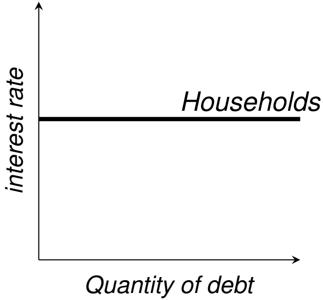
Textbook New-Keynesian model



$$y_t = \mathbb{E}_t y_{t+1} - (r_t - \mathbb{E}_t \pi_{t+1}) \qquad \text{(IS)}$$

$$\pi_t = \beta \, \mathbb{E}_t \pi_{t+1} + \kappa \, y_t, \qquad \text{(PC)}$$

$$r_t = \phi_\pi \, \pi_t + \phi_y \, y_t \qquad \text{(TR)}$$

- y_t is output gap, π_t inflation, r_t the nominal rate

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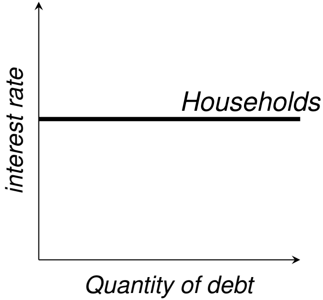

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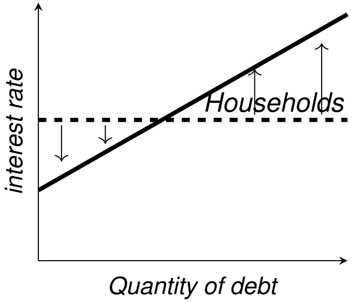
- y_t is output gap, π_t inflation, r_t the nominal rate
- No notion of liquidity
- Nominal rate and natural rate independent of quantity of debt
  - Natural rate is equilibrium interest rate under flexible price

Assumption 1: Bond in the utility



$$y_t = \mathbb{E}_t y_{t+1} - (r_t - \mathbb{E}_t \pi_{t+1}) + \alpha d_t \qquad \text{(EE)}$$

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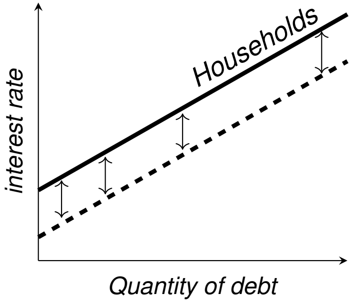
- d_t is bond/debt

- Households' demand varies with interest rate (as in Aiyagari)
- Bond/gov't debt in utility as simple HANK: bonds affect aggregate variables
  - Kaplan & Violante (2018); Auclert, Rognlie & Straub (2024,2025)
- **Implication:** natural rate depends on the level of debt

Assumption 2: Shocks to utility value of bonds, η_t



$$y_t = \mathbb{E}_t y_{t+1} - (r_t - \mathbb{E}_t \pi_{t+1}) + \alpha d_t - \eta_t \quad \text{(EE)}$$

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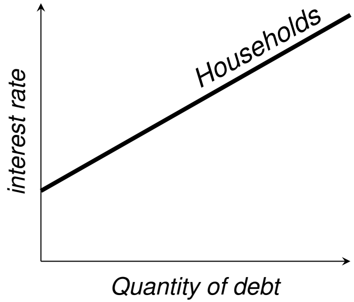
- η_t shocks to households' demand for debt (liquidity or safety shocks)
- η_t can be interpreted as:
  a. Idiosyncratic risk shock in Aiyagari (risk $\uparrow \Rightarrow$ demand of bonds $\uparrow$)
  b. Tighter borrowing conditions

Assumption 3: Monetary authority target the natural rate, r_t^*



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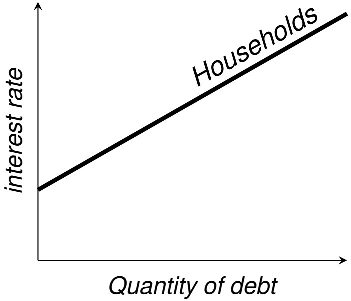
$$\pi_t = \beta \, \mathbb{E}_t \pi_{t+1} + \kappa \, y_t, \quad \text{(PC)}$$

$$r_t = \phi_{r^*} r_t^* + \phi_\pi \pi_t + \phi_y y_t \quad \text{(TR)}$$

- ϕ_{r^*}=1 implements the first best (divine coincidence)
- $\phi_{r^*} \neq$1 can be interpreted as monetary authority:
  a. does not want to have very volatile interest rate (interest rate smoothing)
  b. cannot perfectly observe the natural rate

Fiscal authority: budget constraint



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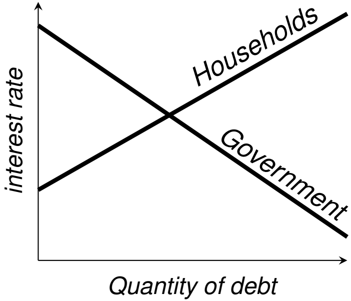
$$r_t = \phi_{r^*} r_t^* + \phi_\pi\, \pi_t + \phi_y\, y_t \quad \text{(TR)}$$

$$d_t = R\,(r_{t-1} + d_{t-1} - \pi_t) - \frac{T}{D} tax_t \quad \text{(gov't b.c.)}$$

- tax_t are lump-sum taxes, and T its steady state value

Fiscal authority: tax rule



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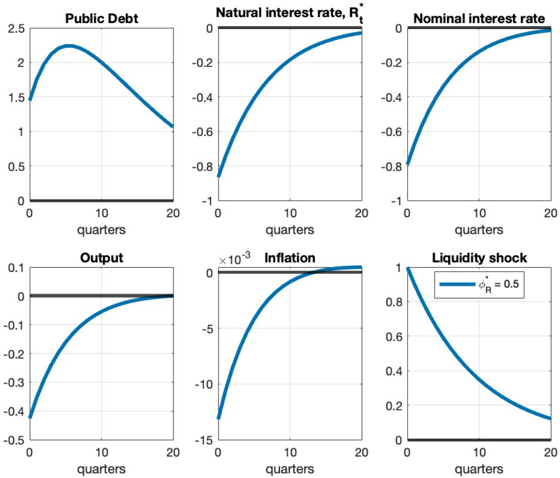
$$tax_t = \tau_y y_t + \tau_d d_{t-1} + \tau_R (r_t - \mathbb{E}_t \pi_{t+1}) + \varepsilon_t \quad \text{(tax rule)}$$

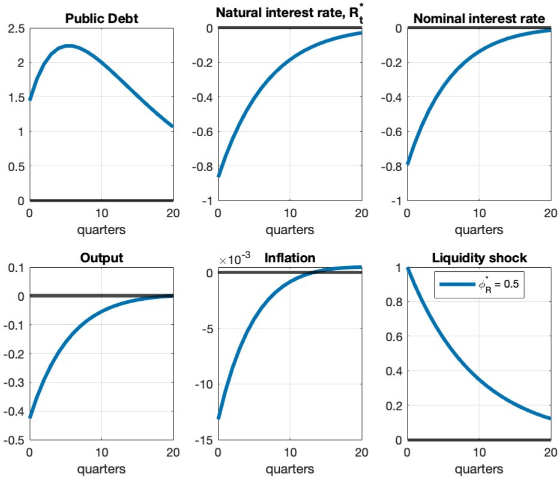
- $\tau_R \approx$ controls the slope of the supply of debt in the figure
  - Gov't supplies more debt when cheaper to do so
- ε_t are tax (supply) shocks
  - Remark: η_t are liquidity (demand) shocks

Impulse response functions to a liquidity shock



- Liquidity shocks $\text{corr}(d_t, r_t^*) < 0$ and $\text{corr}(d_t, r_t) < 0$

Impulse response functions to a liquidity shock

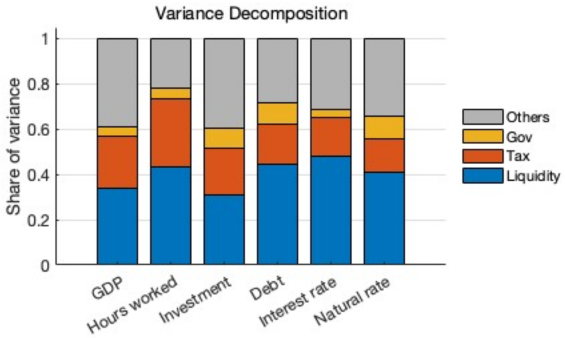


- Liquidity shocks corr$(d_t, r^*_t) < 0$ and corr$(d_t, r_t) < 0$
- Other shocks such as fiscal shocks generate corr$(d_t, r_t) > 0$

Tax shock

How important are liquidity shocks in explaining variations in debt, policy rate and natural rate?

- Extend the model adding standard DSGE frictions
- Estimate the model and compute variance decomposition



- Liquidity shocks are the main business cycle driver

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Model's implication

- Debt influences monetary decision through the natural rate, r_t^*, not directly
- Controlling for r_t^* **should remove** significance of debt in Taylor rule,

  $$r_t = \alpha\pi_t + \beta y_t + \gamma d_t + \phi r_t^* + \rho_1 r_{t-1} + \rho_2 r_{t-2} + u_t, \qquad \hat{\gamma} = 0, \quad \hat{\phi} > 0$$

- Construct a **new** measure of the natural rate, $r_t^{*,d}$, using information on debt
  - Estimate a time-varying parameter VAR

Model

Taylor rule with debt and $r_t^{*,d}$

$$r_t = \alpha\pi_t + \beta y_t + \gamma d_t + \phi r_t^{*,d} + \rho_1 r_{t-1} + \rho_2 r_{t-2} + u_t$$

	(1) OLS	(2) GMM	(3) GMM BC	(4) GMM Shocks
π_t	1.12***	1.12***	1.13***	1.12***
	(0.16)	(0.09)	(0.07)	(0.07)
y_t	0.26*	0.09	0.20***	0.19***
	(0.16)	(0.06)	(0.07)	(0.05)
d_t	-0.16	0.13	-0.02	-0.09
	(0.22)	(0.09)	(0.11)	(0.19)
$r_t^{*,d}$	1.20***	1.69***	1.43***	1.30***
	(0.37)	(0.13)	(0.15)	(0.23)

- debt is not significant any more. Evidence that debt is informative about r_t^*
- Debt still significant when using literature's r_t^* measures

▸ LM

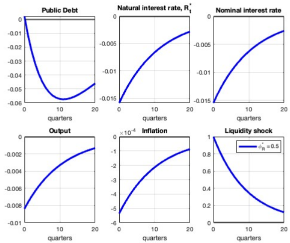
Conclusions

- **Fact**: Fed decreases policy rate when public debt increases
- **Why?** Debt contains information about natural rate, r_t^*, and corr(debt,r_t^*)<0
  - When controlling for $r_t^{*,debt}$ debt does not affect Fed's interest rate decisions
- What if shocks to supply of debt were dominant business cycle drivers?
  - Fed would have increased policy rate and not reduced it when debt increases
- Moving forward, we **should not** expect that Fed systematically decreases rate when debt increases

Thank You

Back up slides

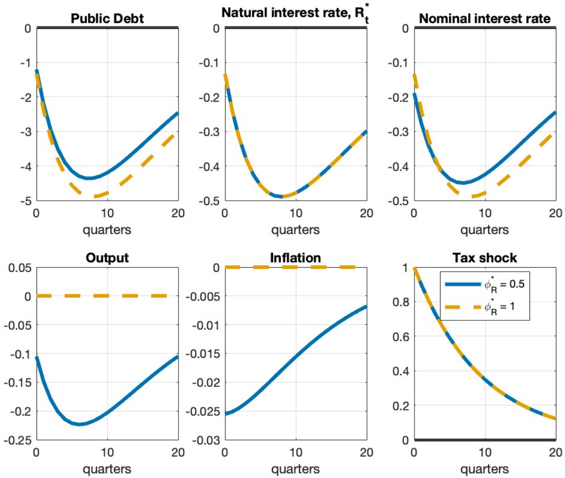
IRFs to a liquidity shock - $\tau_R = 0$



- If τ_R “small”, corr$(d_t, R_t^*) < 0$, independently of the Taylor rule

back

IRFs to a fiscal shock



- Debt and policy rate comoves

back

Estimating natural rate using information on debt

- Following Lubik-Matthes, estimate VAR with time varying parameters:

$$y_t = c_t + B_{1,t} y_{t-1} + \cdots + B_{k,t} y_{t-k} + u_t, \qquad var(u_t) = \Omega_t$$

- where $B_{.,t}$ follow a random walk, and $A_t \Omega_t A_t' = \Sigma_t \Sigma_t$
- Standard variables:
  1. Real GDP growth rate
  2. Inflation
  3. Real interest rate
- Novelty: Add public debt over GDP in the TVP-VAR
- Parametrization: 1 lag and priors as Primiceri 2005
- $r_t^{*,d}$ constructed as the 5-year forecast of the real interest rate Figure back

Time varying parameter VAR

- the model is:

$$y_t = c_t + B_{1,t} y_{t-1} + \cdots + B_{k,t} y_{t-k} + A_t^{-1} \Sigma_t \epsilon_t, \qquad var(\epsilon_t) = I, \qquad A_t \Omega_t A_t' = \Sigma_t \Sigma_t$$

  where Σ_t is diagonal with entry and A_t is lower triangular
- The dynamics of the model's time varying parameters are:

$$\begin{aligned} B_t &= B_{t-1} + \nu_t, \\ \alpha_t &= \alpha_{t-1} + \zeta_t, \\ \log \sigma_t &= \log \sigma_{t-1} + \eta_t, \end{aligned}$$

  where B_t are the stacked coeffs of the VAR, α_t the stacked entries of A_t, and σ_t the stacked entries of Σ_t
- all the innovations are uncorrelated

back

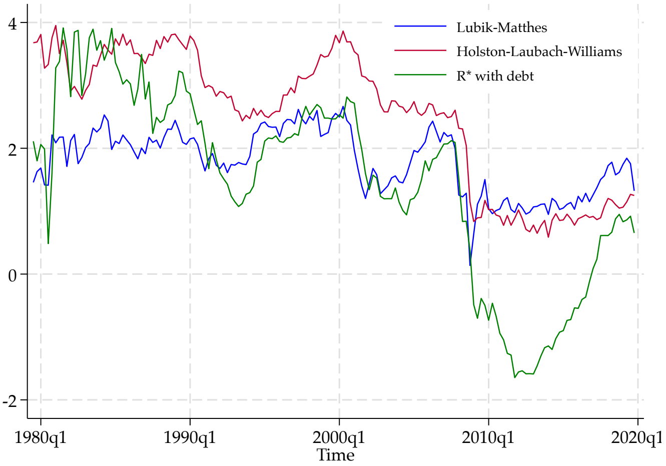
Taylor rule using Lubik-Matthes natural rate

	(1) OLS	(2) GMM	(3) GMM BC	(4) GMM EBP	(5) GMM Shocks
π_t	1.15***	1.19***	1.23***	1.20***	1.02***
	(0.11)	(0.08)	(0.06)	(0.08)	(0.05)
y_t	-0.14	-0.07	-0.11*	-0.07	-0.36***
	(0.12)	(0.08)	(0.06)	(0.08)	(0.05)
d_t	-0.28**	-0.34***	-0.25***	-0.29***	-0.20***
	(0.12)	(0.08)	(0.07)	(0.08)	(0.06)
$R_t^{*,lm}$	4.41***	3.66***	4.12***	3.84***	5.14***
	(0.63)	(0.40)	(0.37)	(0.35)	(0.31)

- Public debt is still negative and significant

back

Time series of R_t^*



back

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Observable variables

The observable variables in the model are:

1. GDP growth
2. Consumption growth
3. Investment growth
4. Hours worked
5. Price inflation
6. Real growth wage Federal funds rate
7. Public debt growth

back

Priors and Posteriors - structural parameters

back

Parameter	Distribution	Prior Mean	Prior Std. Dev.	Post Mode	Post Std. Dev.
alphaa	norm	0.300	0.0500	0.2146	0.0186
iota_p	beta	0.500	0.1500	0.3409	0.0937
iota_w	beta	0.500	0.1500	0.3010	0.0736
gamma_estim	norm	0.500	0.0300	0.4929	0.0266
h	beta	0.500	0.1000	0.7674	0.0479
lambda_p_ss	norm	0.150	0.0500	0.2158	0.0401
lambda_w_ss	norm	0.150	0.0500	0.1290	0.0528
L_ss_estim	norm	0.000	0.5000	0.6407	0.3694
pi_ss_estim	norm	0.500	0.1000	0.5176	0.0566
beta_estim	gamm	0.250	0.2000	0.0511	0.0652
nu	gamm	2.000	0.7500	2.5535	0.8184
xi_p	beta	0.660	0.1000	0.9711	0.0065
xi_w	beta	0.660	0.1000	0.7942	0.0400
chi	gamm	5.000	1.0000	5.3331	0.9906
Sdoupr_p	gamm	4.000	1.0000	1.7512	0.4395
phi_pi	norm	1.700	0.3000	1.2734	0.1918
phi_x	norm	0.130	0.0500	-0.0419	0.0296
phi_dx	norm	0.130	0.0500	0.0845	0.0294
phi_r	beta	0.600	0.1000	0.7944	0.0362
phi_Rstar	norm	1.000	0.1500	0.5035	0.1507
phi_tax	beta	0.600	0.2000	0.1070	0.0276
phi_B	gamm	0.400	0.1000	0.1996	0.0495
tau_d	norm	0.150	0.1000	0.2554	0.0354
tau_g	gamm	1.000	0.4000	1.4760	0.1996
tau_y	gamm	0.330	0.1000	0.2443	0.0648
tau_yy	gamm	0.330	0.1000	0.1125	0.0339
d_y	norm	0.650	0.5000	0.6346	0.0109

Priors and Posteriors - shocks parameters

back

Parameter	Distribution	Prior Mean	Prior Std. Dev.	Post Mode	Post Std. Dev.
rho_eta	beta	0.600	0.2000	0.9831	0.0069
rho_mps	beta	0.400	0.2000	0.0720	0.0581
rho_z	beta	0.600	0.2000	0.0999	0.0528
rho_mu	beta	0.600	0.2000	0.6429	0.2691
rho_p	beta	0.600	0.2000	0.8409	0.0375
rho_w	beta	0.600	0.2000	0.9306	0.0133
theta_p	beta	0.500	0.2000	0.8094	0.0431
theta_w	beta	0.500	0.2000	0.9383	0.0111
rho_b	beta	0.600	0.2000	0.4809	0.1329
rho_g	beta	0.600	0.2000	0.9670	0.0069
rho_tax	beta	0.400	0.2000	0.9579	0.0088
e_mps	invg	0.100	1.0000	0.1820	0.0113
e_eta	invg	0.500	1.0000	0.6473	0.1171
e_z	invg	0.500	1.0000	0.7288	0.0492
e_b	invg	0.100	1.0000	0.0732	0.0228
e_g	invg	0.500	1.0000	0.5769	0.0363
e_mu	invg	0.500	1.0000	0.2510	0.1025
e_tax_shock	invg	0.500	1.0000	0.5726	0.0730
e_lambda_p_aux	invg	0.100	1.0000	0.1143	0.0096
e_lambda_w_aux	invg	0.100	1.0000	0.4093	0.0257
e_me_debt	invg	0.100	1.0000	1.2170	0.1019

Variance decomposition in Spectral Domain

	Preference	Liquidity	Govt spending	Price markup	Wage markup	Monetary policy	Investment	Tax	TFP
GDP	0.05	0.34	0.04	0.01	0.00	0.05	0.04	0.23	0.24
Consumption	0.27	0.14	0.21	0.00	0.01	0.03	0.01	0.09	0.24
Investment	0.10	0.31	0.09	0.02	0.01	0.04	0.18	0.21	0.05
Hours worked	0.06	0.44	0.05	0.01	0.00	0.07	0.04	0.30	0.04
Wage	0.00	0.06	0.01	0.06	0.72	0.00	0.00	0.04	0.11
Inflation	0.00	0.12	0.02	0.80	0.04	0.00	0.00	0.02	0.00
Debt	0.06	0.45	0.09	0.02	0.00	0.10	0.04	0.18	0.05
Interest rate	0.03	0.48	0.04	0.04	0.00	0.24	0.00	0.17	0.00
Natural rate	0.14	0.41	0.10	0.00	0.00	0.00	0.06	0.15	0.14

- Liquidity shocks are the main business cycle driver

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