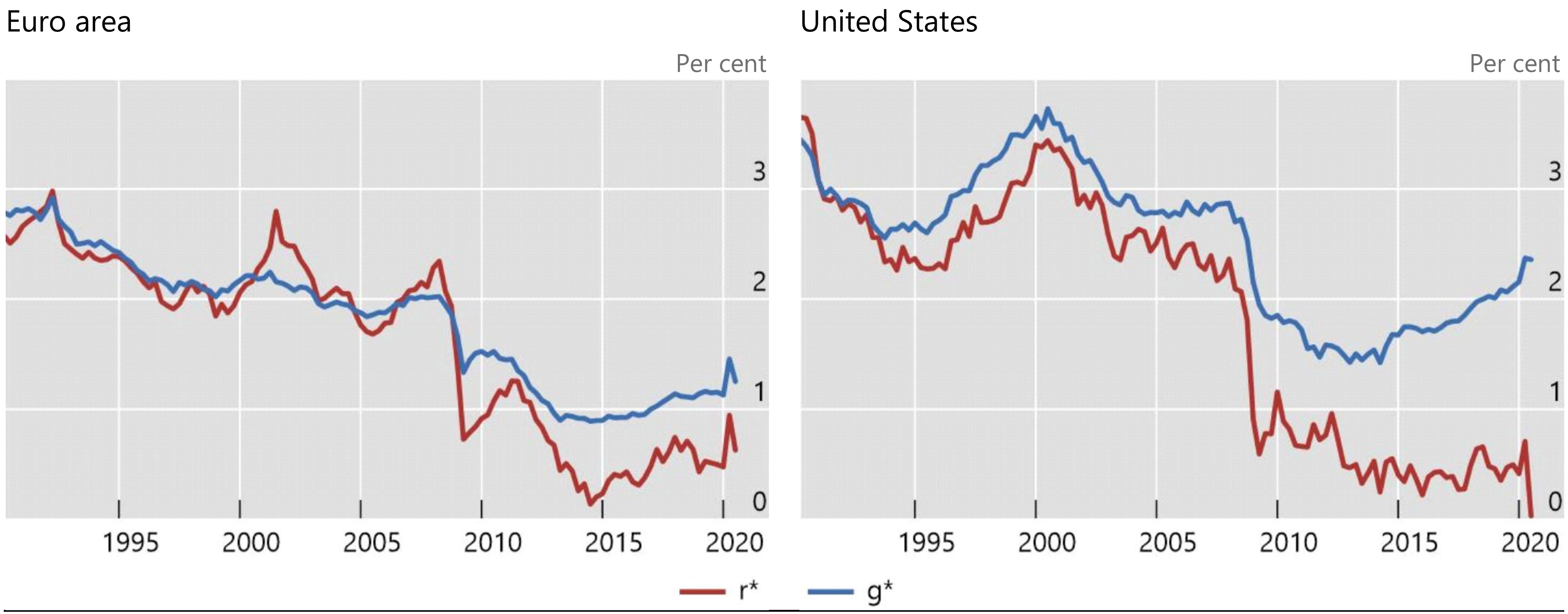
Fiscal-monetary policy interactions in a low interest rate world

Boris Hofmann, Marco J. Lombardi, Benoît Mojon and Athanasios Orphanides

Background: Low r* and r*<g*



Source: Holston et al (2017)

Outline

Goal: Assess the interaction of monetary and fiscal policy in low r* environment

1. Implications of lower r* for conventional monetary policy (ZLB frequency)

2. Effectiveness of central bank balance sheet policy and fiscal policy at low r*
   - For macroeconomic stability and for public debt stability

3. The role of fiscal rules and negative policy rates

Methodology

- Toolbox: small-scale semi-structural model featuring:
  - Short- and long-term interest rates
  - Central bank bond purchases (QE)
  - Fiscal policy and public debt accumulation
  - Expectations formations can be rationale or under learning to allow for de-anchoring

- Simulations of fiscal-monetary interactions
  - Stochastic simulations of the model over a period of 50 years
  - Severe recession scenarios

BIS

The model

IS curve and Phillips curve

- **IS curve**: linking the unemployment gap to long-term real rates and the primary fiscal balance

$$u_t = \phi_u u_{t-1} + (1-\phi_u)E(u_{t+1}) + \alpha_u(r_t^l - r^{l*}) + \alpha_f(pb_t - pb^*) + \epsilon_{u,t}$$

<u>Calibration</u>: ϕ_u=0.5, α_u =0.15, α_f =0.5 (fiscal output multiplier=1), shock SD = 0.45

(calibration of r^{l*} and $pb*$ later)

- **Phillips curve**: linking inflation to the unemployment gap

$$\pi_t = \phi_\pi \pi_{t-1} + (1-\phi_\pi)E(\pi_{t+1}) + \alpha_\pi(u_t - u^*) + \epsilon_{\pi,t}$$

<u>Calibration</u>: ϕ_π=0.5, α_π=0.1 (flat Phillips curve), shock SD = 0.75

π^* = 2%, u^* = 4%

Long-term interest rates

- **Long-term interest rates**: driven by expected short-term rates and the term premium (**5y maturity**)

$$r_t^l = \frac{1}{L}\sum_{j=0}^{L} r_j^s + tp_t, i_t^l = \frac{1}{L}\sum_{j=0}^{L} i_j + tp_t.$$

- **Term premium**: increasing in net supply of debt to public (increasing in *d*-*d**, decreasing in *b*-*b**)

$$tp_t = tp^* + \alpha_{tp}(b_{t-1} - b^*) - \alpha_{tp}(d_{t-1} - d^*)$$

Calibration: α_{tp} = -0.05 (-5 bp for each pp increase in *b*-*b**) based on Li and Wei (2013)

b*=10%, d*=100%

- **Steady state long-term real interest rate:**

$r^{l*} = r^* + tp^*$ = 1.5% (r^* = 0.5% and tp^* = 1%)

Monetary policy

- **Conventional monetary policy**: Follows inertial Taylor rule and faces ZLB constraint

$$i_t = max[i_t^T + \epsilon_{i,t}, 0]$$

$$i_t^T = \theta_i i_{t-1} + (1-\theta_i)[r^* + \pi_{t-1} + \theta_\pi(\pi_{t-1} - \pi^*) + \theta_u(u_{t-1} - u^*)]$$

Calibration: θ_i=0.85, θ_π=0.5, θ_u=2.0 (inertial Taylor (1999) rule)

- **Unconventional monetary policy**: Follows inertial bond holding rule when *i* is at the ZLB

$$b_t = \zeta_b b_{t-1} + (1-\zeta_b)b^* + \zeta_\pi(\pi_{t-1} - \pi^*) + \zeta_u(u_{t-1} - u^*) + \epsilon_{b,t} \quad \text{when } i \text{ is at the ZLB}$$

$$b_t = \zeta_b b_{t-1} + (1-\zeta_b)b^* \quad \text{otherwise}$$

Calibration:

- ζ_b = 0.95 corresponds to a half-life of the balance sheet of over 3 years
- ζ_π = 6.75, ζ_u = 9 (non-inertial Taylor (1999) rule cast on bond holdings based on the response of long-term rates to conventional and unconventional MP shocks)

Fiscal policy

- **Fiscal rule**: expressed in terms of primary balance (as a share of GDP)

$$pb_t = \rho_{pb} pb_{t-1} + (1-\rho_{pb}) pb^* + \psi(u_{t-1} - u^*) + \delta(d_{t-1} - d^*) + \epsilon_{pb,t}$$

  - Fiscal stance depends on unemployment gap and on the deviation of debt from target level

  Calibration: ρ_{pb} = 0.7, ψ = -0.25 (Taylor (2000) fiscal rule), **δ = 0.01** (in baseline)

- **Government debt dynamics**:

$$d_t = (1 + i^d_{q,t} - g_{q,t} - \pi_{q,t}) d_{t-1} - pb_t$$

  - $i^d_{q,t}$, $g_{q,t}$, $\pi_{q,t}$ are respectively the quarterly fractions of the government debt service cost (5-year moving average the bond yield), of the annualised inflation rate and of the annualised real GDP growth $g_t = g^* - 2(u_t - u_{t-1})$ applying Okun's law and setting g*=1.5%

- **Quarterly steady state primary balance**: stabilises *d* at *d** in steady state

$$pb^* = (r^*_q + tp^*_q - g^*_q) d^*$$

Expectations formation

- Agents observe the history of π, u and i
  - Estimate a VAR and use that for forecasting
    - One-period ahead inflation and unemployment
    - L-period ahead inflation (to construct real long-term rates)

- Constant-gain learning as in Orphanides and Williams (2007), κ = 0.02
  - Recursive updating of the VAR coefficients (VAR comprises π, u and i)

$$c_t = c_{t-1} + \kappa R_t^{-1} X_t (Y_t - X_t' c_{t-1}),$$

$$R_t = R_{t-1} + \kappa (X_t X_t' - R_{t-1}),$$

    - Starting point: RE solution

Simulation results

Lower r* makes the ZLB noticeably more binding

	u	*pi*	*rs*	*rl*	*bs*	*pb*	*d*	*ZLB_s*	*ZLB_l*
				FP, r*=2.5					
Mean	4.4	1.5	2.5	3.9	10.0	0.6	113.1	10%	0%
Stdev	0.7	1.6	1.0	0.6	0.0	0.4	12.6		
				FP, r*=0.5					
Mean	4.9	1.1	1.0	2.6	10.0	0.4	134.8	20%	0%
Stdev	0.8	1.6	1.1	0.8	0.0	0.6	24.4		
				FP, r*=0.5, no ZLB					
Mean	4.0	2.0	0.5	1.5	10.0	0.0	100.5	0%	0%
Stdev	0.5	1.5	1.0	0.5	0.0	0.3	4.7		

- Benchmark fiscal rule
- Benchmark interest rate rule
- No balance sheet policy

CB balance sheet policy alleviates ZLB constraint

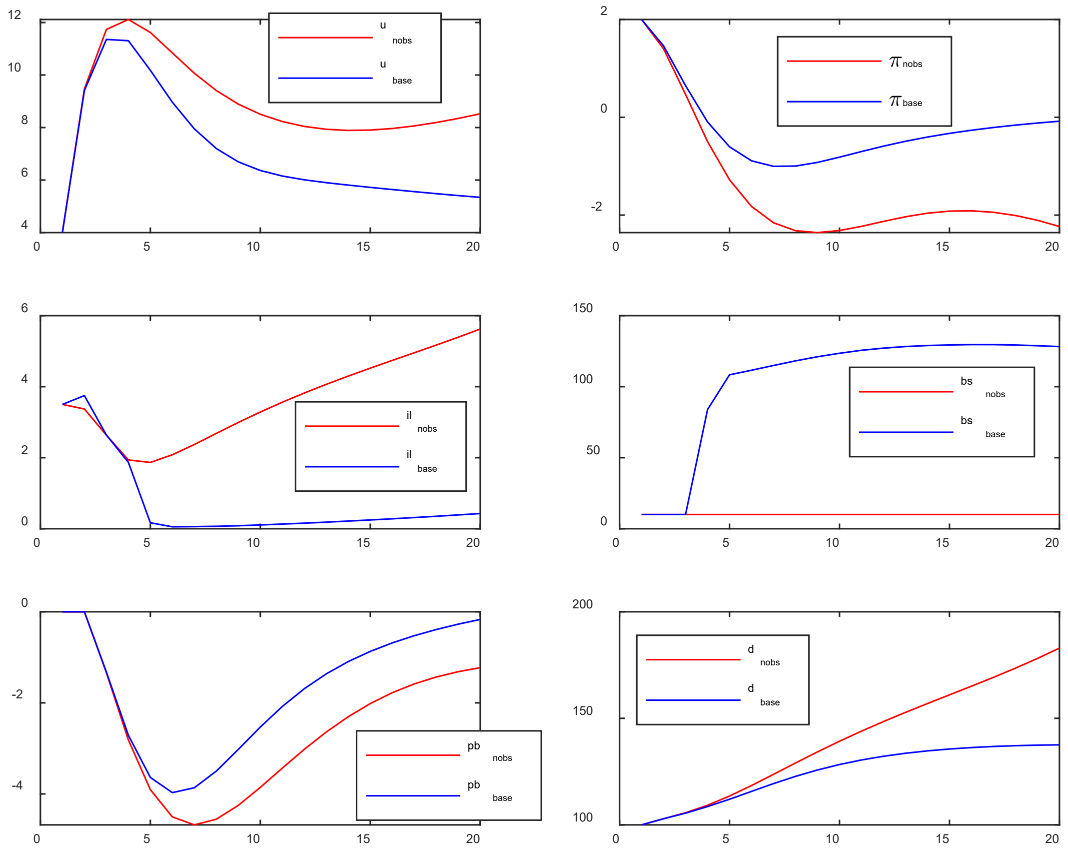
From now on, r*=0.5%

	u	*pi*	*rs*	*rl*	*bs*	*pb*	*d*	*ZLB_s*	*ZLB_l*	*NegTP*
				FP (no BS)						
Mean	4.9	1.1	1.0	2.6	10.0	0.4	134.8	20%	0%	0%
Stdev	0.8	1.6	1.1	0.8	0.0	0.6	24.4			
				FP + BS						
Mean	4.0	2.0	1.1	1.6	22.2	0.0	100.4	9%	14%	28%
Stdev	0.6	1.6	1.0	0.6	8.8	0.3	6.8			

- Benchmark fiscal rule
- Benchmark interest rate rule
- Benchmark balance sheet policy

No balance sheet policy vs baseline

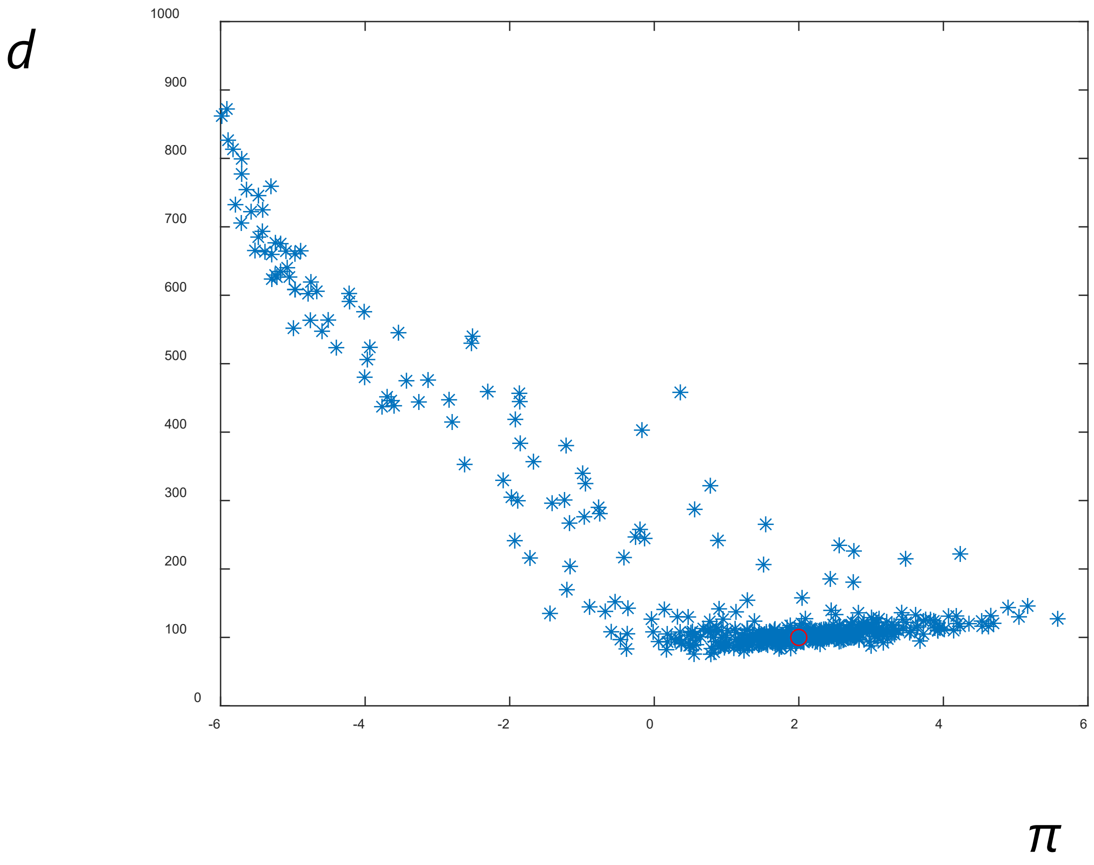
Initial shock: 6pp increase in unemployment, persistence 0.9



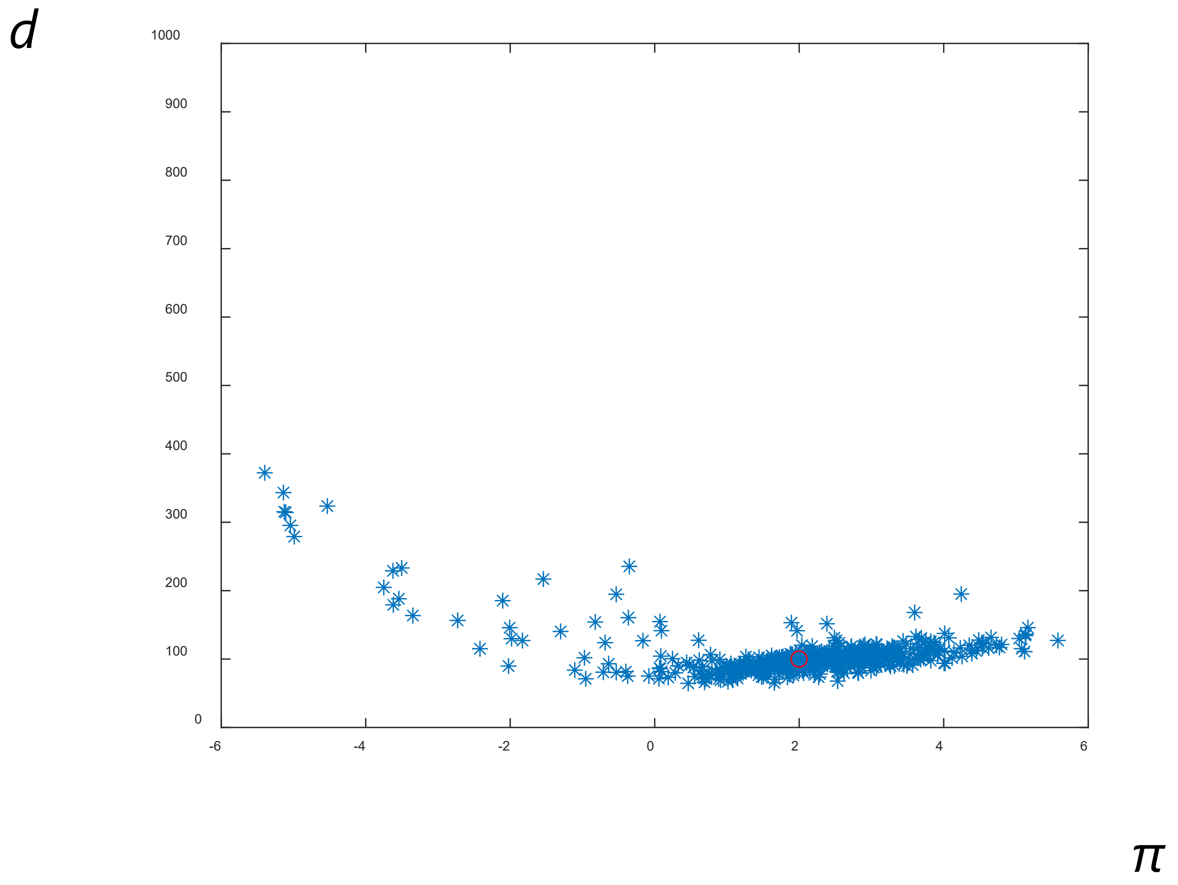
- Without balance sheet policy slower recovery and much higher debt

Debt and inflation under benchmark rules

Only FP



FP + BS



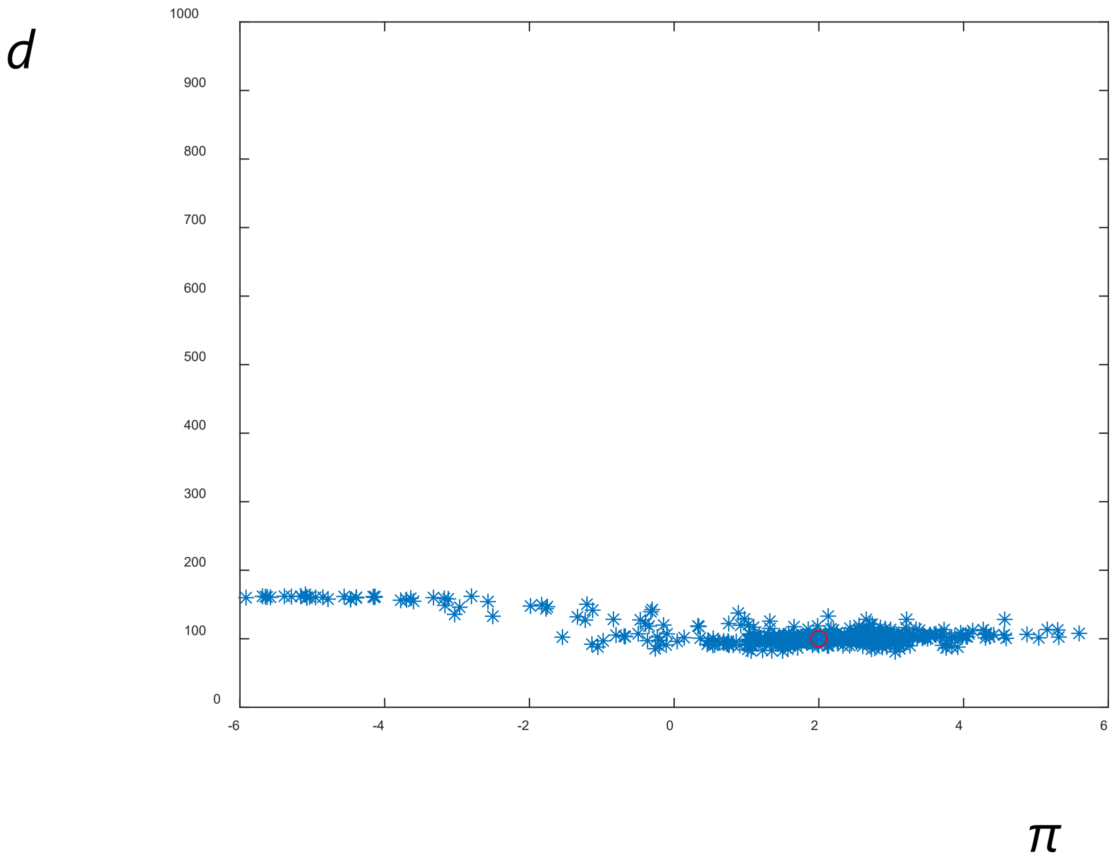
Debt-averse fiscal policy is counterproductive

	u	*pi*	*rs*	*rl*	*bs*	*pb*	*d*	*ZLB_s*	*ZLB_l*	*NegTP*
Debt-averse FP+BS, δ=0.04, r*=0.5										
Mean	4.3	1.6	1.2	1.7	27.3	0.1	102.6	15%	21%	28%
Stdev	0.8	1.7	1.2	0.9	11.8	0.4	5.1			
Benchmark FP+BS, r*=0.5										
Mean	4.0	2.0	1.1	1.6	22.2	0.0	100.4	9%	14%	28%
Stdev	0.6	1.6	1.0	0.6	8.8	0.3	6.8			

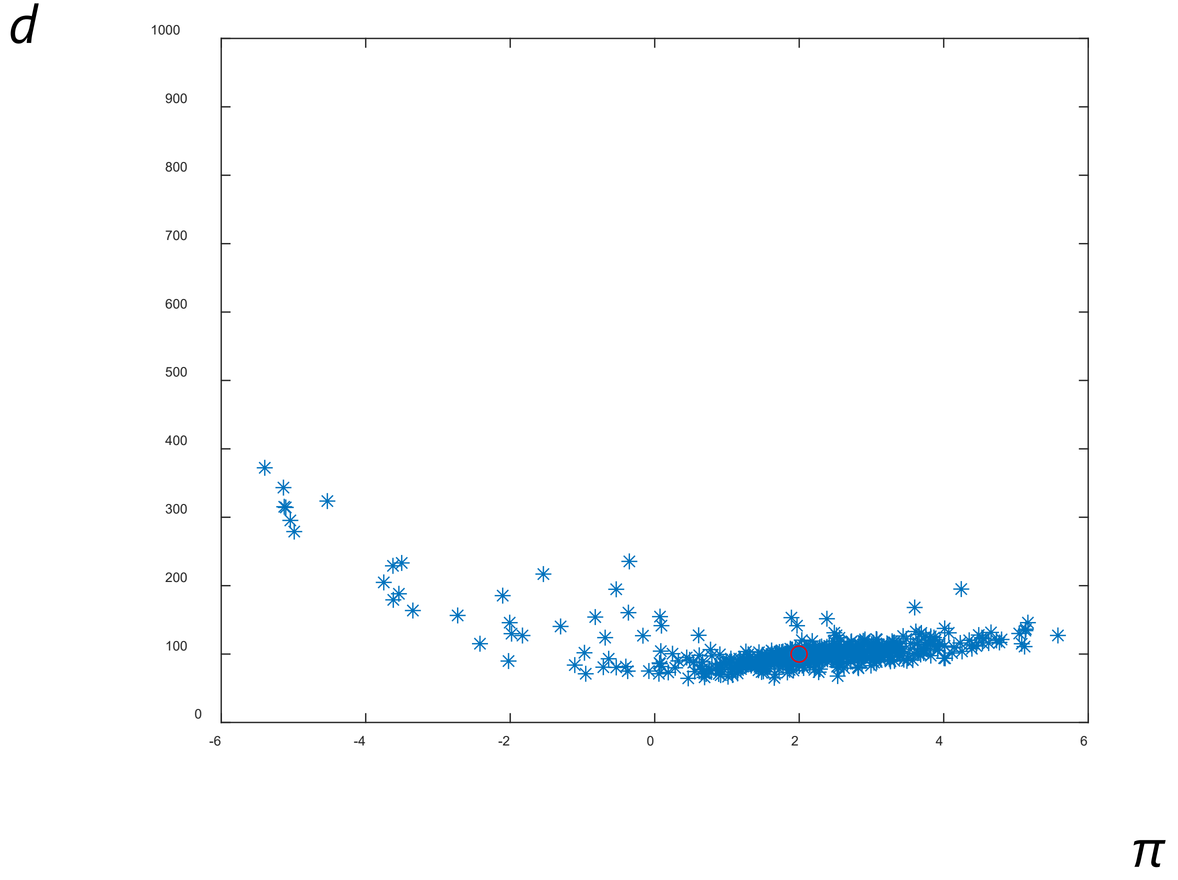
- Benchmark interest rate rule
- Benchmark balance sheet policy

Debt-averse FP vs baseline: Debt and inflation outcomes

Debt-averse FP (δ=0.04) + BS

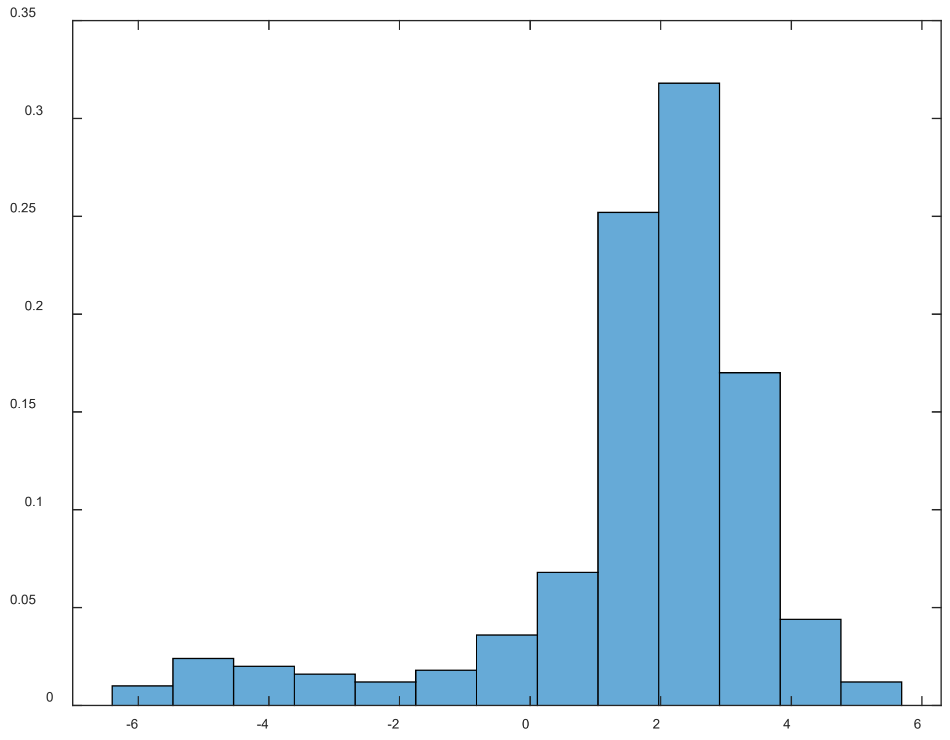


Baseline FP + BS

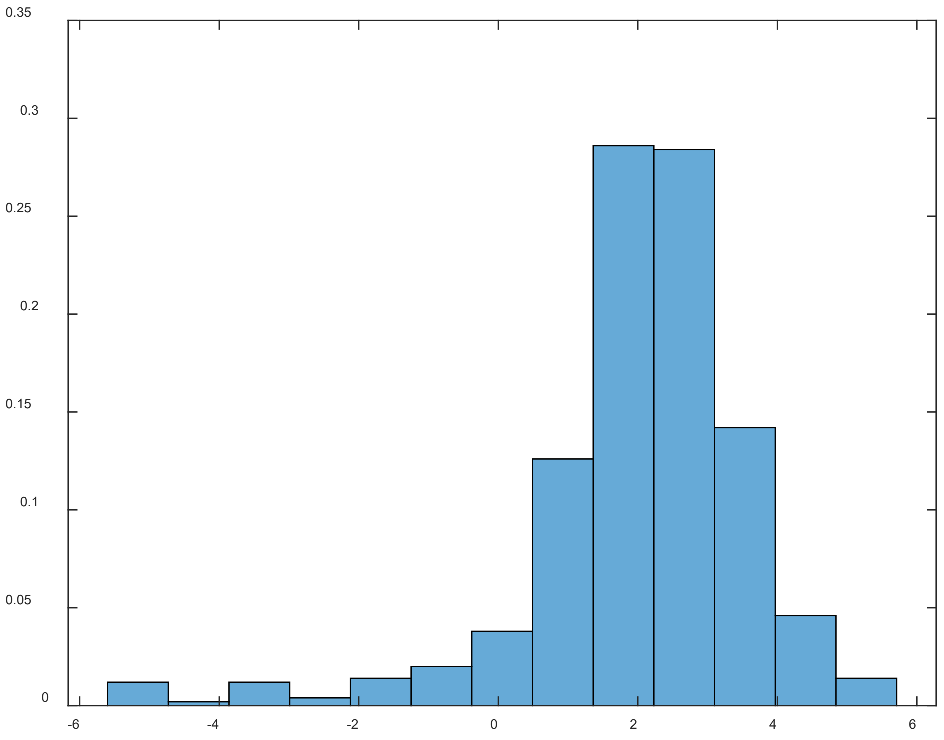


Debt-averse FP vs baseline: Distribution of inflation outcomes

Debt averse FP (δ=0.04)



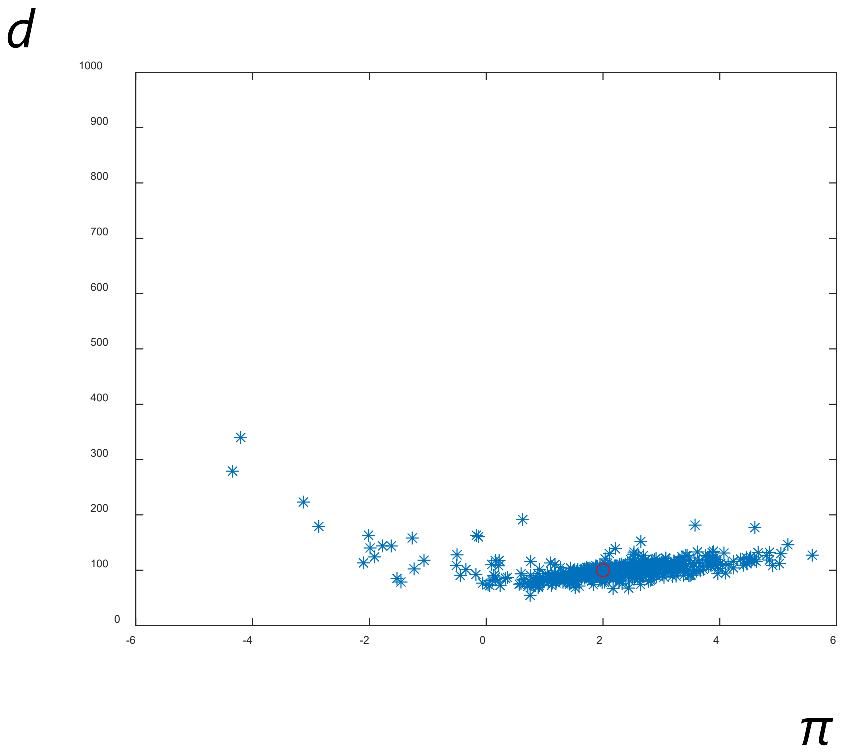
Baseline FP (δ=0.01)



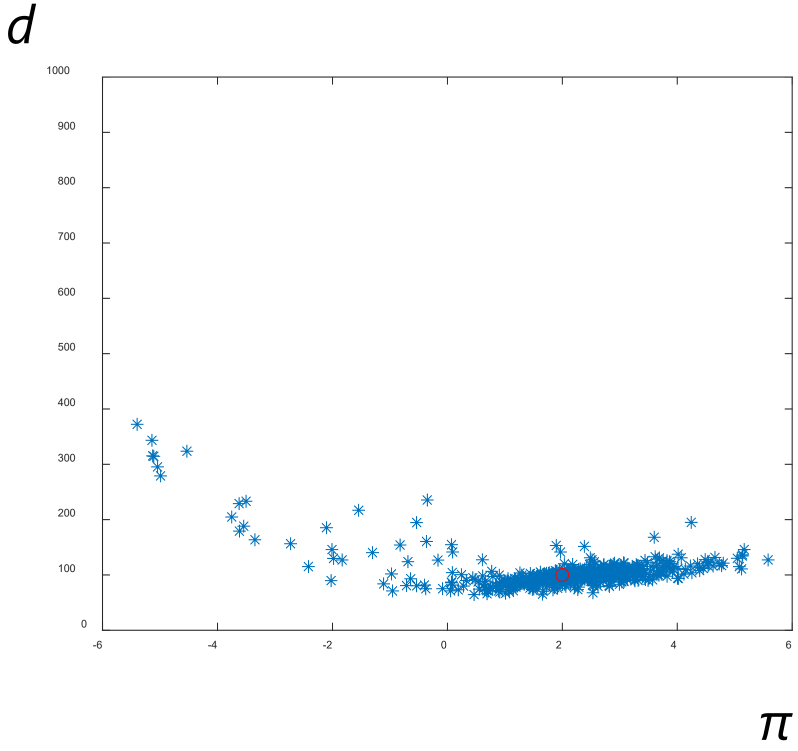
Extra accommodative fiscal policy at the ZLB

$$pb_t = \rho_{pb} pb_{t-1} + (1-\rho_{pb}) pb^* + \psi(u_{t-1} - u^*) + \delta(d_{t-1} - d^*) + \Psi_{ZLB}(i_t - i_t^T) + \epsilon_{pb,t}$$

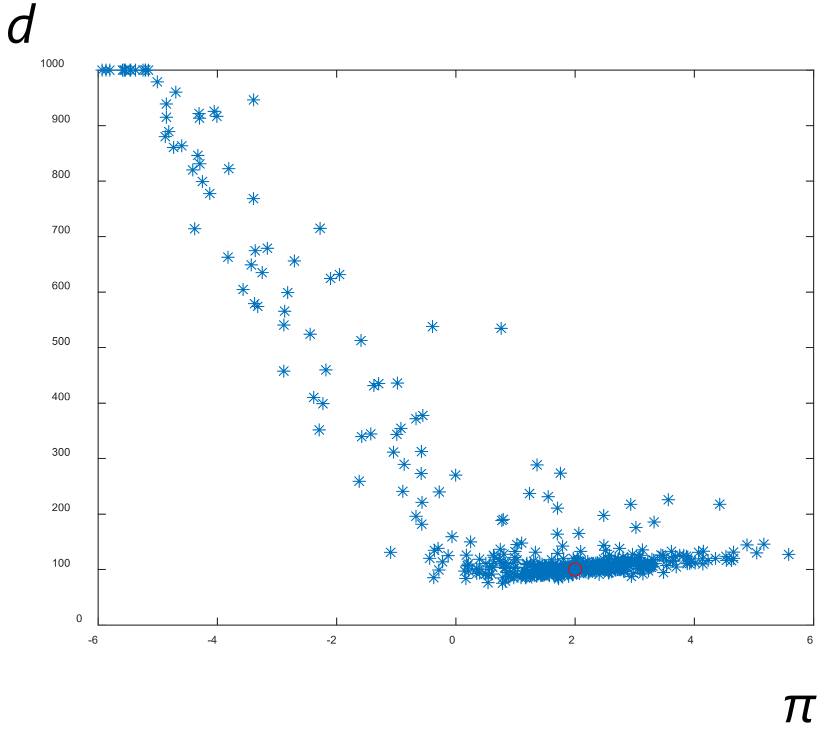
EA FP (Ψ_{ZLB} = 0.5) + BS



Baseline FP + BS

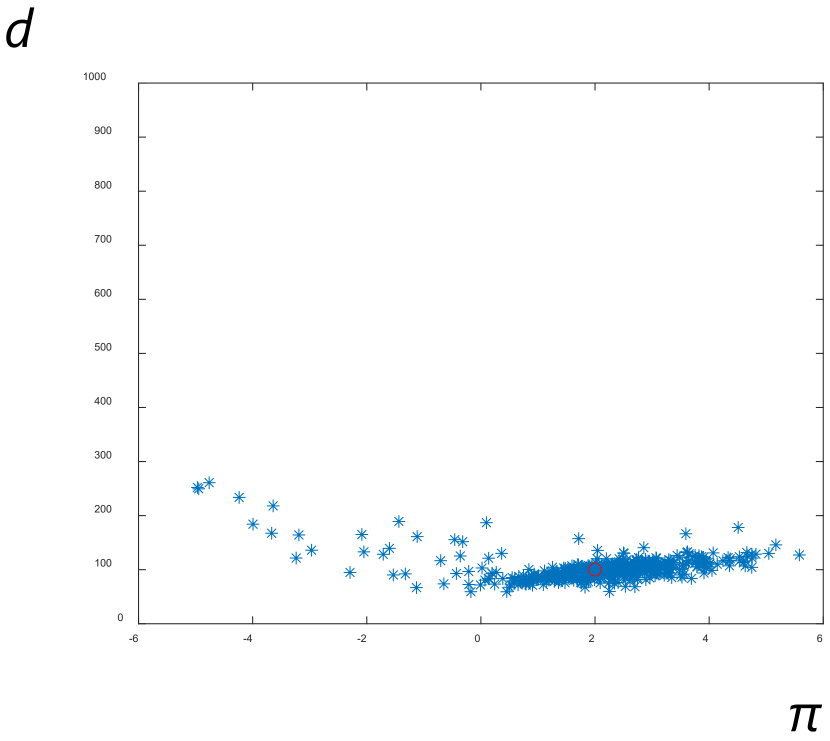


EA FP (Ψ_{ZLB} = 0.5) + no BS

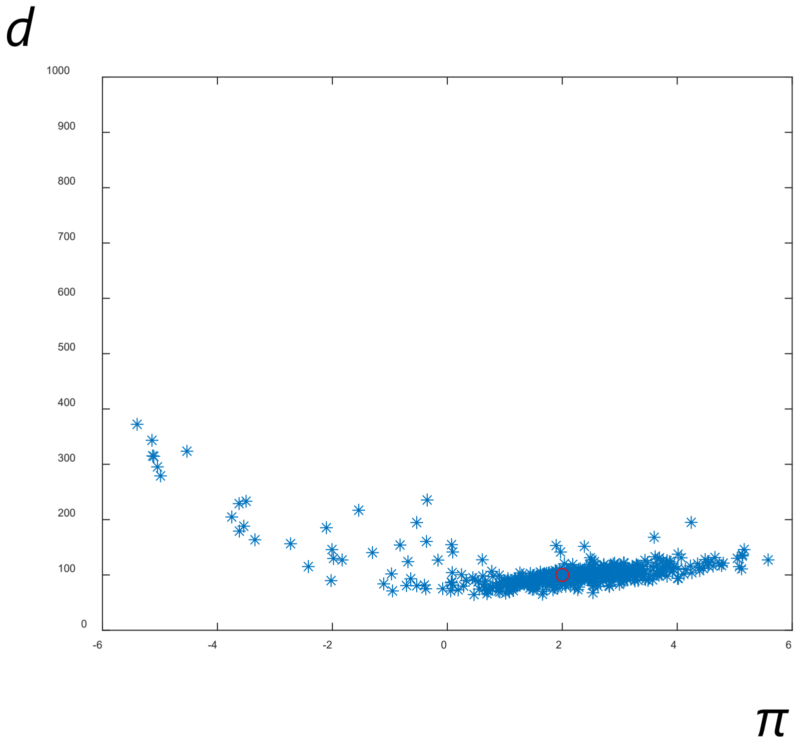


Negative rates (ELB=-0.5%)

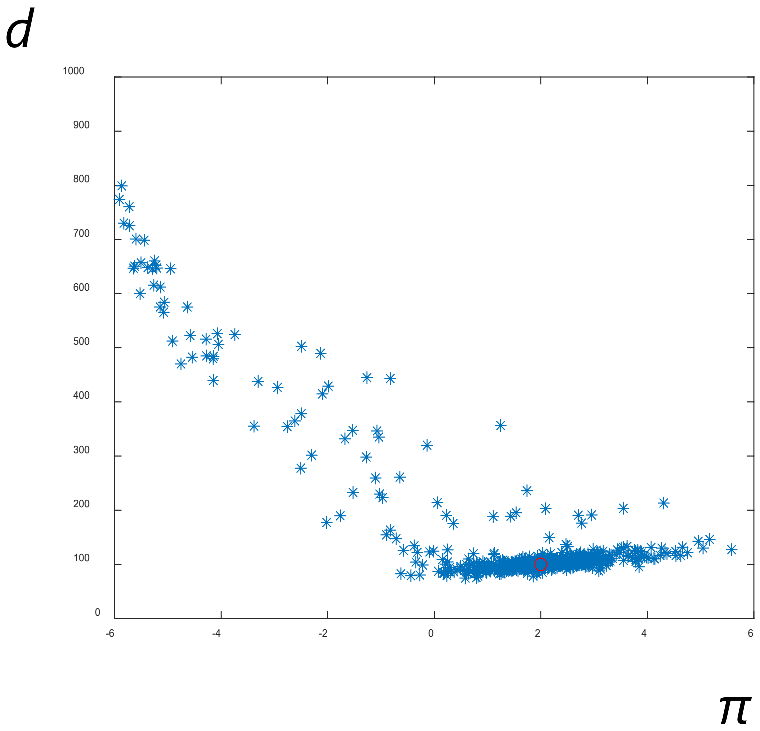
ELB=-0.5% + BS



Baseline ZLB + BS



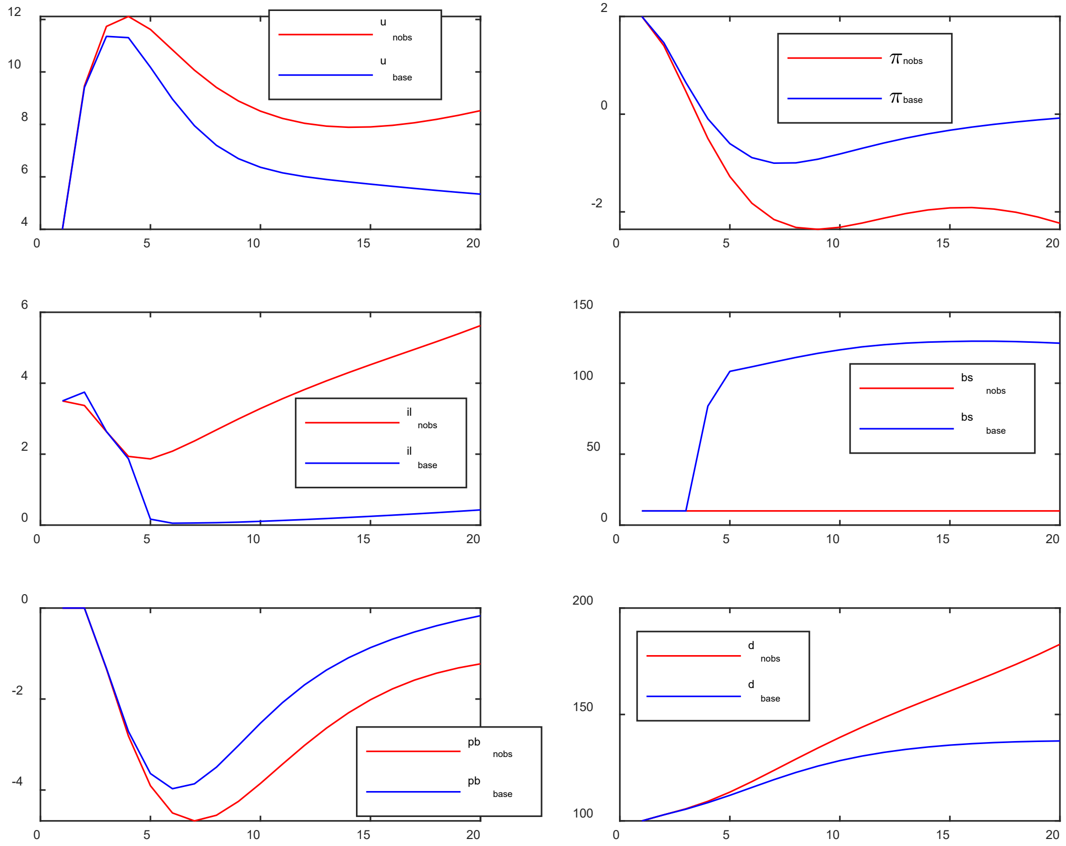
ELB=-0.5% + no BS



Recession scenario

No balance sheet policy vs baseline

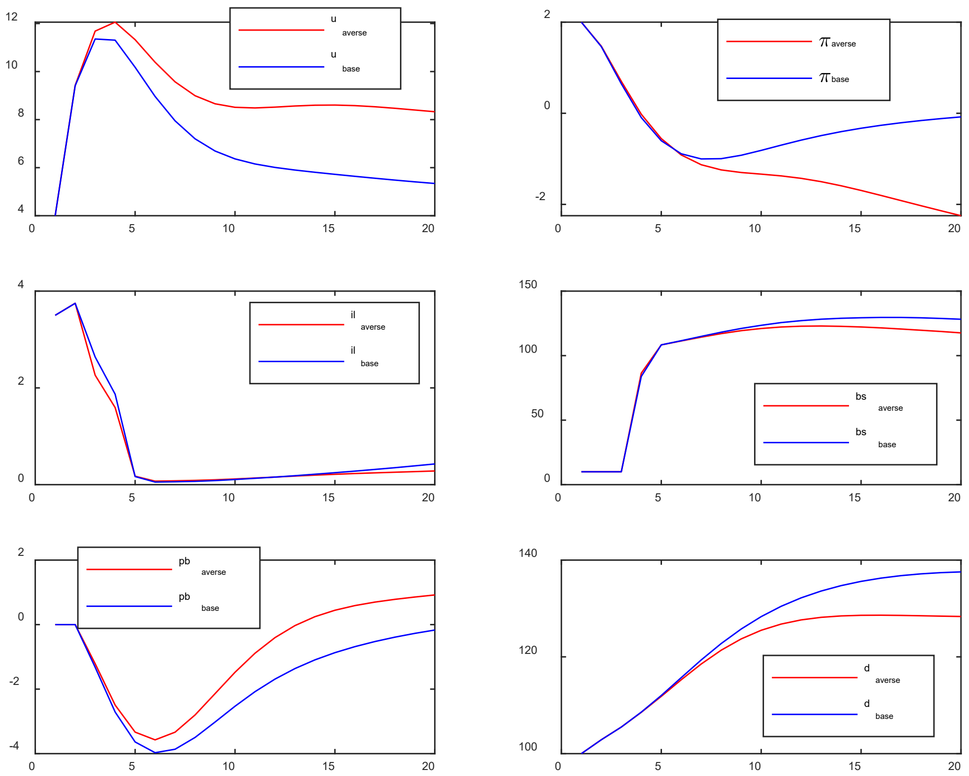
Initial shock: 6pp increase in unemployment, persistence 0.9



- Without balance sheet policy slower recovery and much higher debt

Debt averse fiscal policy (δ=0.04) vs baseline (δ=0.01)

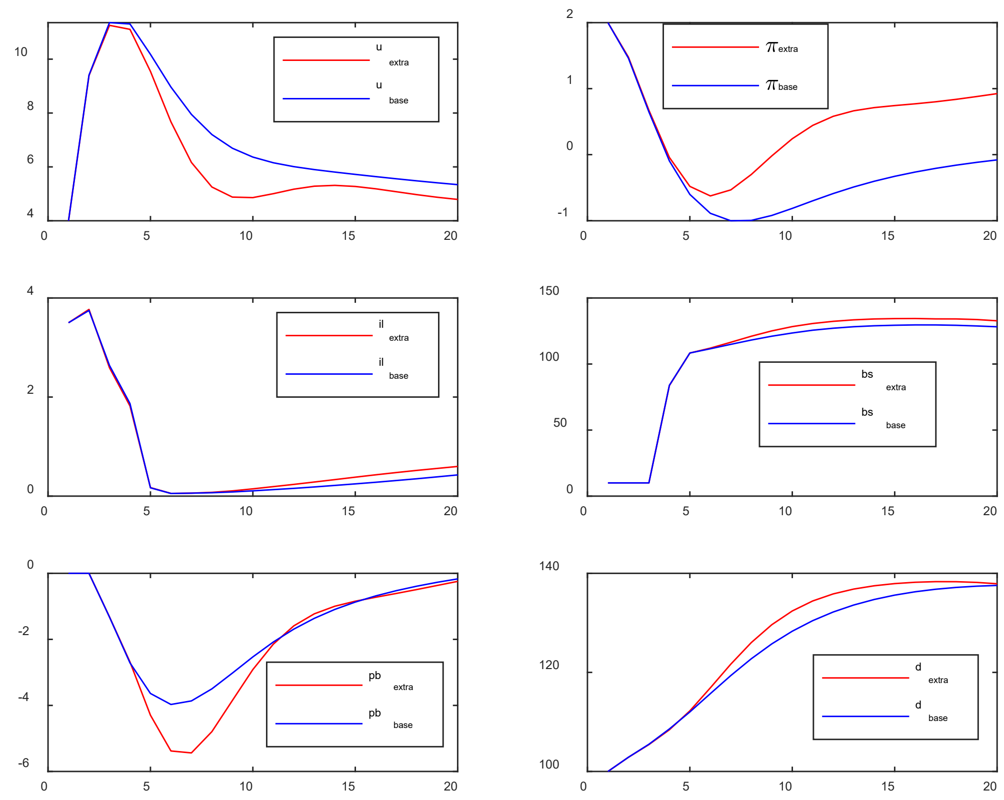
Initial shock: 8pp increase in unemployment, persistence 0.9



- With debt averse fiscal policy slower recovery

Extra accommodative fiscal policy at the ZLB (Ψ_{ZLB} = 0.5) vs baseline

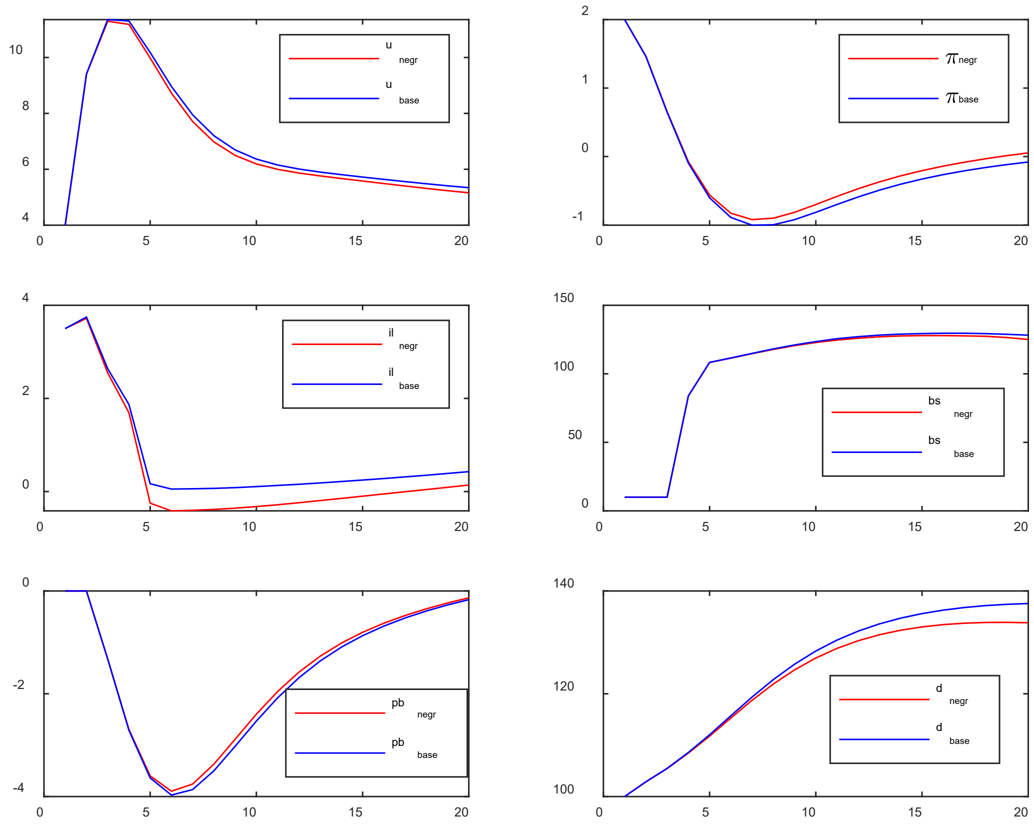
Initial shock: 6pp increase in unemployment, persistence 0.9



- With extra accommodative fiscal policy faster recovery without larger increase in debt

Negative rates (ELB= -0.5) vs baseline

Initial shock: 6pp increase in unemployment, persistence 0.9



- With negative rates slightly faster recovery but noticeable smaller rise in debt

BIS

Restricted

Wrapping up

Key takeaways

- Low r* significantly constrains conventional monetary policy through the ZLB
  - Unemployment and inflation diverge from steady state levels
  - Greater risk of debt deflation

- CB balance sheet policy alleviates ZLB constraints
  - Unemployment and inflation stabilised around steady state levels
  - Stabilises public debt without explicitly aiming to do so

- Fiscal rules matter
  - Excessively debt averse fiscal rules are counterproductive in a low r* world
  - Extra accommodative fiscal policy in case of a binding ZLB constraint enhances both economic and debt stability when combined with CB balance sheet policy

- Combining negative rates with CB balance sheet policy further helps somewhat dampening downturns and containing the associated rise in debt