Discussion of *Optimal Monetary Policy with $r^* < 0$* by Roberto Billi, Jordi Galí and Anton Nakov

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- How can a CB deal with a permanently negative r^* (and the ensuing permanent liquidity trap)?
  1. It should gradually take the economy to a higher-than-target inflation rate
  2. It can still lean against transitory shocks through full commitment, despite the permament LT
  3. It can rule out sunspots by means of a nonlinear Taylor-type rule, despite the permanent LT

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     - ✓ how to talk the PS into the merits of a rule that calls for a policy-rate hike in a deflation? Learnability?

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Critical (innocuous?) assumptions for isomorphism with benchmark NK model

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⇒ kills financial-wealth effects on consumption

- ✓ implications for steady state real interest rate
- ✓ implications for IS equation
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- definition of intertemporal social welfare function

⇒ only considers generations alive at t

  - ✓ time consistency of optimal consumption plans? (Calvo and Obstfeld, Ecma 1988)
  - ✓ implicit assumption: planner's *generational*-discount factor equals agents' *time*-discount factor?
  - ✓ implications for welfare-based loss function (Nisticò, JEEA 2016)

Comments: A Tractable HANK Model

Nisticò and Seccareccia (2022)

- Low-MPC Savers and high-MPC Borrowers, Idiosyncratic uncertainty
  - ⇒ Stochastic transition between types: $pr(\mathcal{B}_{t+1}|\mathcal{S}_t) = 1 - p_s$; $pr(\mathcal{S}_{t+1}|\mathcal{B}_t) = 1 - p_b$
  - ⇒ precautionary-saving and "anticipative-borrowing" motives
- Credit frictions on the intermediary sector (leverage constraint *à la* Gertler and Karadi, 2011)
  - ⇒ Role for Unconventional Monetary Policy

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⇒ Steady-state real interest rate

$$r^* = -\log \beta - \log \Gamma_s \tag{1}$$

where

$$\Gamma_s \equiv p_s + (1 - p_s) U_c(\bar{C}_s)^{-1} U_c(\bar{C}_b)$$

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$\Rightarrow$ $r^* < 0$ if

- ✓ $\Gamma \equiv \bar{C}_s/\bar{C}_b > 1$: steady-state consumption risk for savers $\Rightarrow$ $\Gamma_s > 1$: precautionary saving
- ✓ Γ and/or $1 - p_s$ large enough

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- With a-cyclical inequality and constant CB balance sheet $\Rightarrow$ perfect isomorphism (BGN, 2022):

$$x_t = E_t x_{t+1} - \sigma^{-1}(i_t - E_t \pi_{t+1} - r_t^*) \tag{2}$$

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$$x_t = \Phi E_t x_{t+1} - \sigma_x^{-1}(i_t - E_t \pi_{t+1} - r_t^*) \tag{3}$$

with $\Phi \equiv 1 + \delta(\chi - 1)(1 - \gamma_s)$ and $\gamma_s \equiv p_s / \Gamma_s$

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- With cyclical inequality and variable CB's reserves $\hat{u}_t$ $\Rightarrow$ generalised IS schedule (NS, 2022):

$$x_t = \Phi E_t x_{t+1} - \sigma_x^{-1}(i_t - E_t \pi_{t+1} - r_t^*) - \delta E_t \Delta u_{t+1} + z^{-1}\delta(1-\gamma_s)(E_t u_{t+1} - \bar{u}) \tag{3}$$

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✓ Transmission channels of UMP:

1. "borrowing-cost channel":
   savers/borrowers $\Rightarrow$ direct effect on borrowers through long-term rate (Sims et al., REStat 2022)
2. additional "idiosyncratic-risk channel":
   stochastic transition (p_s, $\gamma_s < 1$) $\Rightarrow$ direct effect on savers through precautionary saving
3. additional "cyclical-inequality channel":
   counter-cyclical inequality ($\chi, \Phi > 1$) $\Rightarrow$ GE amplification through compounding of future UMP

Equilibrium Determinacy

- Case I. a-cyclical inequality and constant CB balance sheet (BGN, 2022):

$$x_t = E_t x_{t+1} - \sigma^{-1}(i_t - E_t \pi_{t+1} - r_t^*) \quad (4)$$

$$\pi_t = \beta E_t \pi_{t+1} + \kappa x_t \quad (5)$$

$$i_t = \max\{0, r^* + \pi^* + \phi_\pi \pi_t + \phi_x x_t\} \quad (6)$$

$$(7)$$

⇒ **Determinacy condition** (Bullard and Mitra, JME 2002):

$$(1-\beta)\phi_x + \kappa(\phi_\pi - 1) > 0$$

Equilibrium Determinacy

- Case II. cyclical inequality and constant CB balance sheet (Bilbiie, 2018):

$$x_t = \Phi E_t x_{t+1} - \sigma_x^{-1}(i_t - E_t \pi_{t+1} - r_t^*) \quad (4)$$

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$$\sigma_x^{-1}\left[(1-\beta)\phi_x + \kappa(\phi_\pi - 1)\right] > (1-\beta)(\Phi - 1)$$

Equilibrium Determinacy

- Case III. cyclical inequality and variable CB's reserves (NS, 2022):

$$x_t = \Phi E_t x_{t+1} - \sigma_x^{-1}(i_t - E_t \pi_{t+1} - r_t^*) - \delta E_t \Delta u_{t+1} + z^{-1}\delta(1-\gamma_s)(E_t u_{t+1} - \bar{u}) \quad (4)$$

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$$u_t = \bar{u} - \psi_\pi \pi_t - \psi_x x_t \quad (7)$$

$\Rightarrow$ **Determinacy condition**:

$$z^{-1}\delta(1-\gamma_s)\Big[(1-\beta)\psi_x + \kappa\psi_\pi\Big] + \sigma_x^{-1}\Big[(1-\beta)\phi_x + \kappa(\phi_\pi - 1)\Big] > (1-\beta)(\Phi - 1)$$

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⇒ Taylor Principle not necessary for determinacy, if UMP active enough

✓ Local determinacy even under **permanent liquidity trap** if UMP appropriately specified:

$$z^{-1}\delta(1-\gamma_s)\Big[(1-\beta)\psi_x + \kappa\psi_\pi\Big] > \sigma_x^{-1}\kappa + (1-\beta)(\Phi - 1)$$

Transition paths: the benchmark NK model

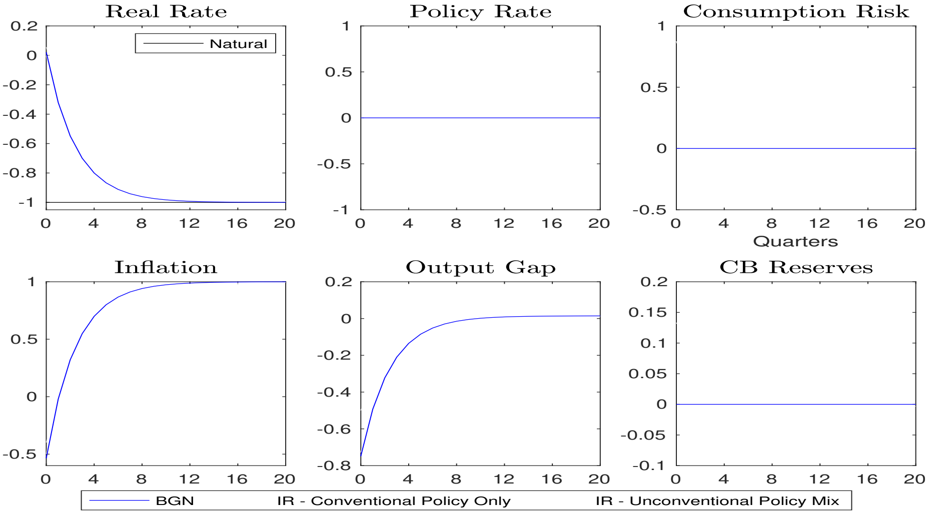


Figure: BGN: no idiosyncratic uncertainty, no UMP

Transition paths: the "conventional" THANK model

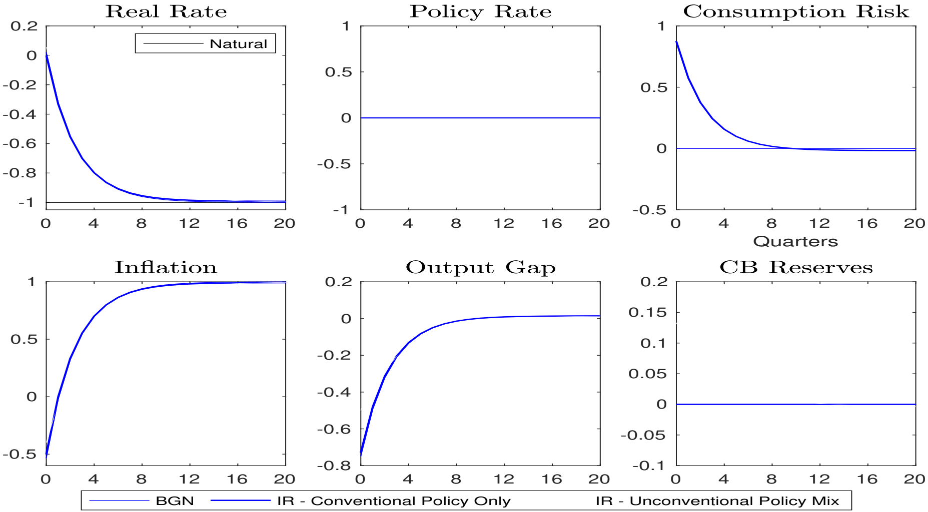


Figure: Idiosyncratic uncertainty, no UMP

Transition paths: the "unconventional" THANK model

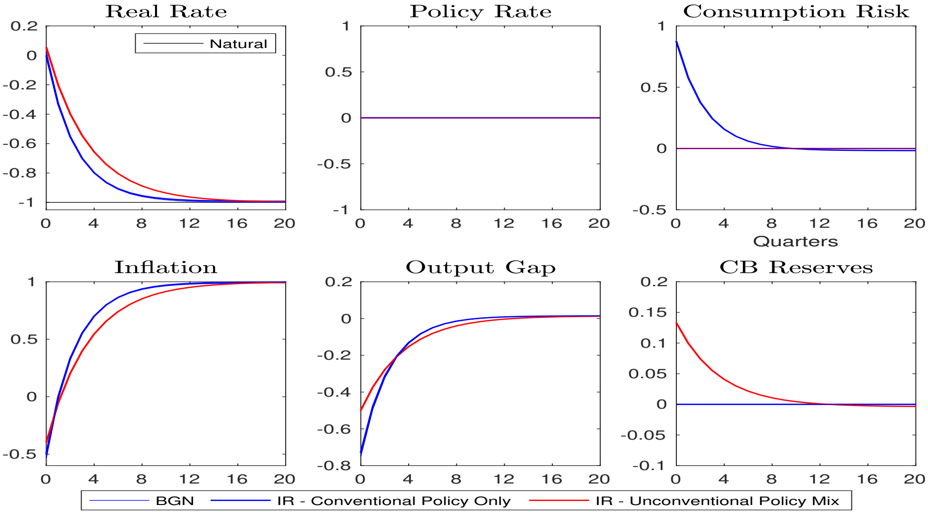
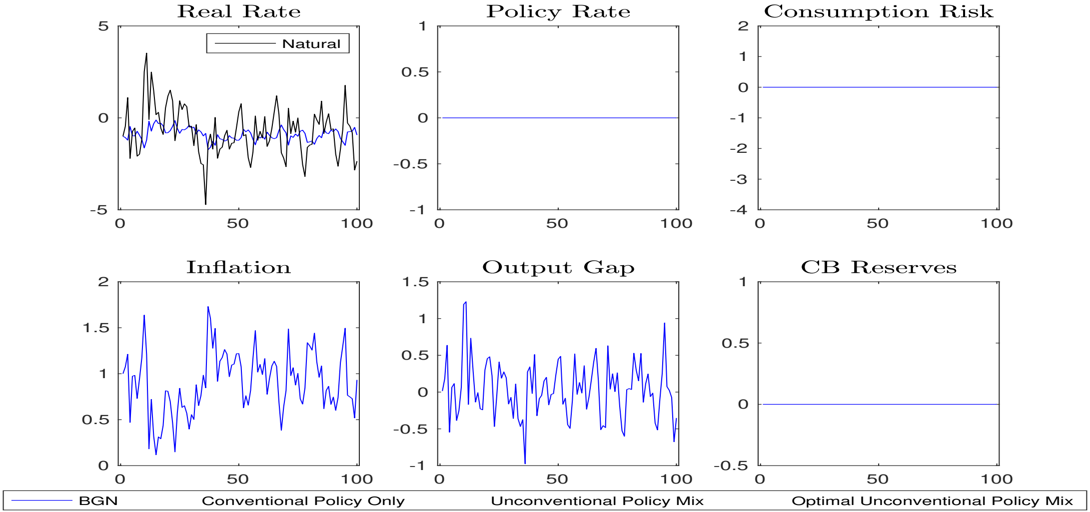


Figure: UMP shuts down idiosyncratic-risk channel ⇒ more gradual and less costly transition to higher $\bar{\pi}$

Stochastic simulations: the benchmark NK model



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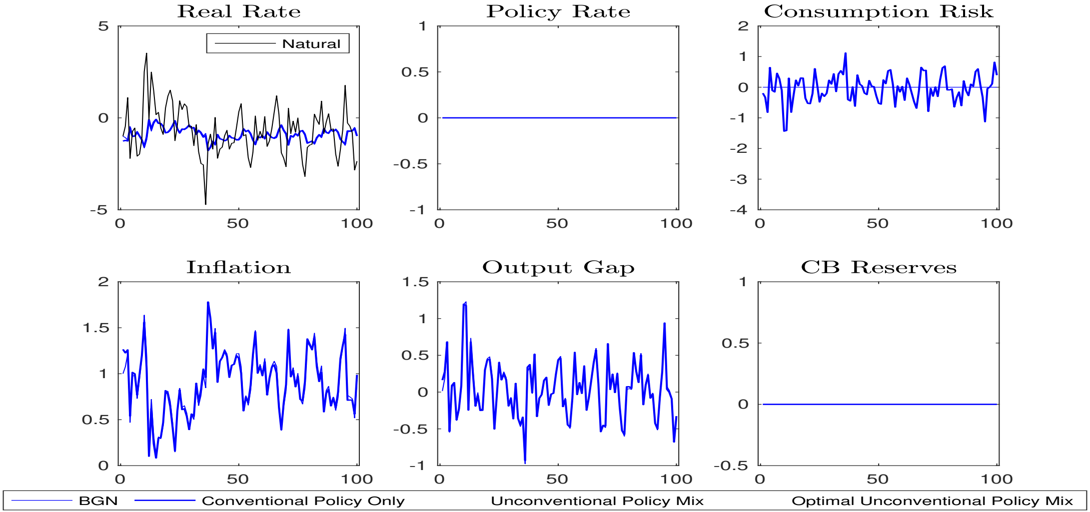

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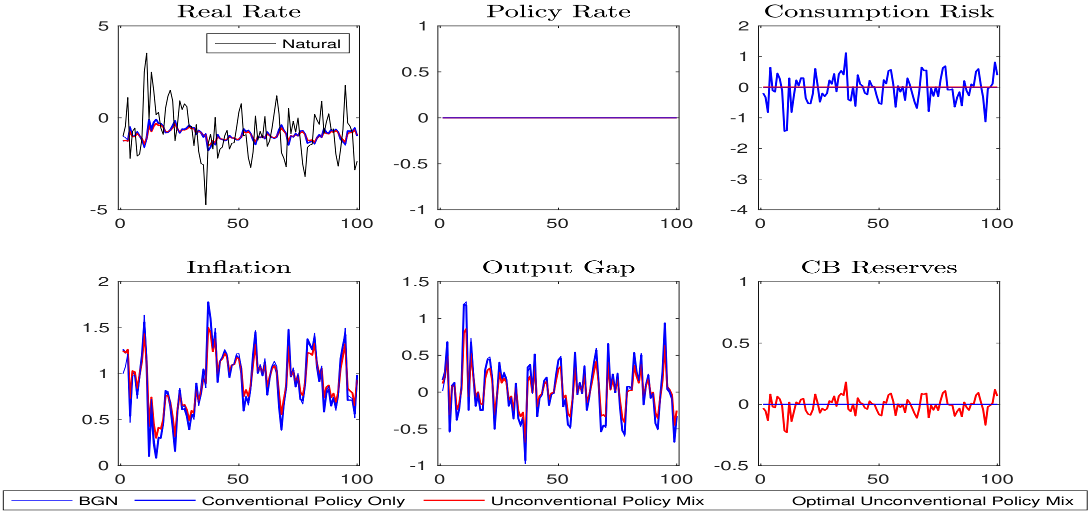

Figure: UMP shuts down idiosyncratic-risk channel $\Rightarrow$ std(π) $\downarrow$ 22% std(x) $\downarrow$ 32%

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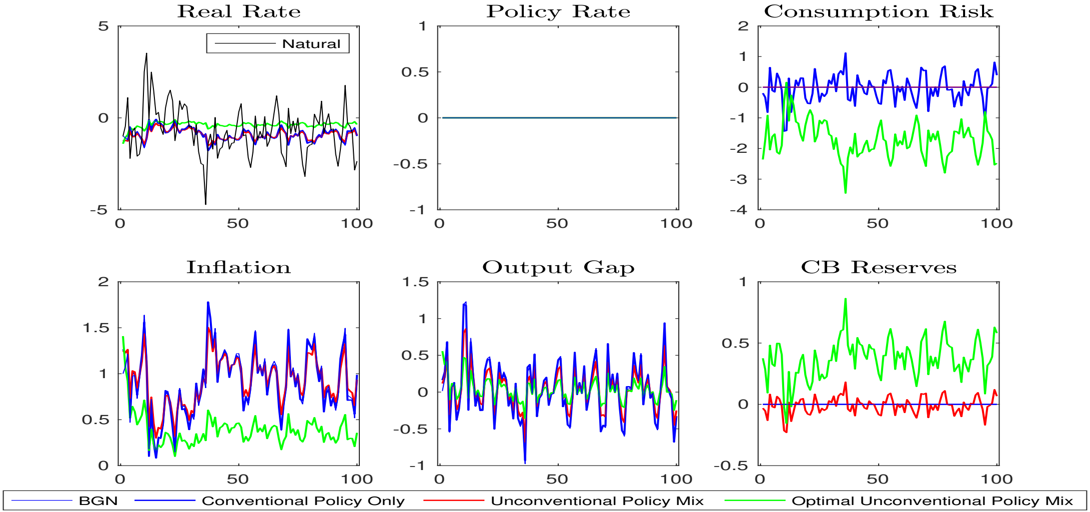

Figure: welfare maximising policy mix $\Rightarrow$ $\bar{\pi} < 1\%$ std(π) $\downarrow$ 47% std(x) $\downarrow$ 59%

Conclusion

- Awesome paper: very insightful
- Communicability of the policy rule; learnability of the resulting equilibrium
- What underlying economic environment?
- A role for unconventional monetary policy?

The distribution of financial wealth across generations

back