Unconventional Monetary Policy in HANK

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HANK: Heterogeneous Agent New Keynesian models

- Equilibrium framework for quantitative analysis of monetary policy

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- Two building blocks:

(HA) Rich representation of hh portfolios and consumption behavior

   ▶ Bewley-Imrohoroglu-Huggett-Aiyagari-Krusell & Smith + Kaplan & Violante

(NK) Nominal price rigidities

   ▶ Woodford's "cashless limit" insight

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- Goal: contrast monetary policy transmission in HANK and RANK

RANK

Conventional monetary policy in RANK

- Preferences: CRRA with $IES = \frac{1}{\gamma} > 0$ and discount rate $\rho > 0$

- Technology: $Y_t = N_t$

- Prices perfectly rigid: $p_t = 1 \quad \forall t$

- Monetary authority sets time path: $r_t = \rho + e^{-\eta t}(r_0 - \rho), \quad \eta > 0$

- Equilibrium: $C_t(\{r_s, Y_s\}_{s \geq t}) = Y_t, \quad$ and $\quad \lim_{t \to \infty} C_t = \bar{C}$

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- Total effect of monetary policy:

$$C_t = \bar{C} \exp\left(-\frac{1}{\gamma}\int_t^\infty (r_s - \rho)ds\right) \quad \Rightarrow \quad \frac{d\log C_0}{dr_0} = -\frac{1}{\gamma\eta}$$

Monetary transmission in RANK

- Decompose C response by totally differentiating $C_0(\{r_t, Y_t\}_{t \geq 0})$

$$dC_0 = \underbrace{\int_0^\infty \frac{\partial C_0}{\partial r_t} dr_t dt}_{\text{direct response to } r} + \underbrace{\int_0^\infty \frac{\partial C_0}{\partial Y_t} dY_t dt}_{\text{indirect effects due to } Y}$$

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- In our special case:

$$-\frac{d \log C_0}{dr_0} = \frac{1}{\gamma \eta} \left[\underbrace{\frac{\eta}{\rho + \eta}}_{\text{direct response to } r} + \underbrace{\frac{\rho}{\rho + \eta}}_{\text{indirect effects due to } Y} \right]$$

- Plausible quarterly parameterization:

  ▶ $\rho = 0.005$

  ▶ $\eta = 0.5$ (half-life $\simeq 2$ quarters) $\rightarrow direct \equiv \frac{\eta}{\rho + \eta} = 0.99$

Forward guidance puzzle in RANK

- Suppose Fed announces a cut in r at future date τ

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$$-\frac{d\log C_0}{dr_\tau} = \frac{1}{\gamma\eta}\left[\underbrace{e^{-\rho\tau}\frac{\eta}{\rho+\eta}}_{\text{direct response to } r} + \underbrace{1 - e^{-\rho\tau}\frac{\eta}{\rho+\eta}}_{\text{indirect effects due to } Y}\right].$$

- FG equally as effective as conventional MP

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- FG equally as effective as conventional MP

- Relax perfect price rigidity $\rightarrow$ FG even more powerful

- FG triggers a rise in expected inflation that feeds back into lower real r_0, and a stronger rise in C_0 through int. substitution

  ▶ Del Negro, Giannoni and Patterson, 2015

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True also in medium-scale monetary DSGE (e.g., Smets-Wouters)

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- Weak sensitivity of C to r $\leftrightarrow$ "failure of aggregate EE"

  ▶ Hall (1989), Campbell-Mankiw (1989), Attanasio-Weber (2010)

- Strong sensitivity of C to transitory y $\leftrightarrow$ "excess sensitivity"

  ▶ Flavin (1981), Deaton (1992), Jappelli-Pistaferri (2010)

- MPCs vastly heterogeneous $\leftrightarrow$ "hh balance sheet effects"

  ▶ Mian-Sufi (2014), Kaplan-Violante-Wiedner (2014), Cloyne-Ferreira-Surico (2015), Auclert (2016), Wong (2016), Fagereng et al. (2016)

HANK

Model

Firms

- Monopolistic competition among intermediate-good producers

- Quadratic price-adjustment costs à la Rotemberg (1982)

Households

- Face uninsured idiosyncratic labor income risk

- Save in two assets (liquid and illiquid), consume and supply labor

Illiquid assets

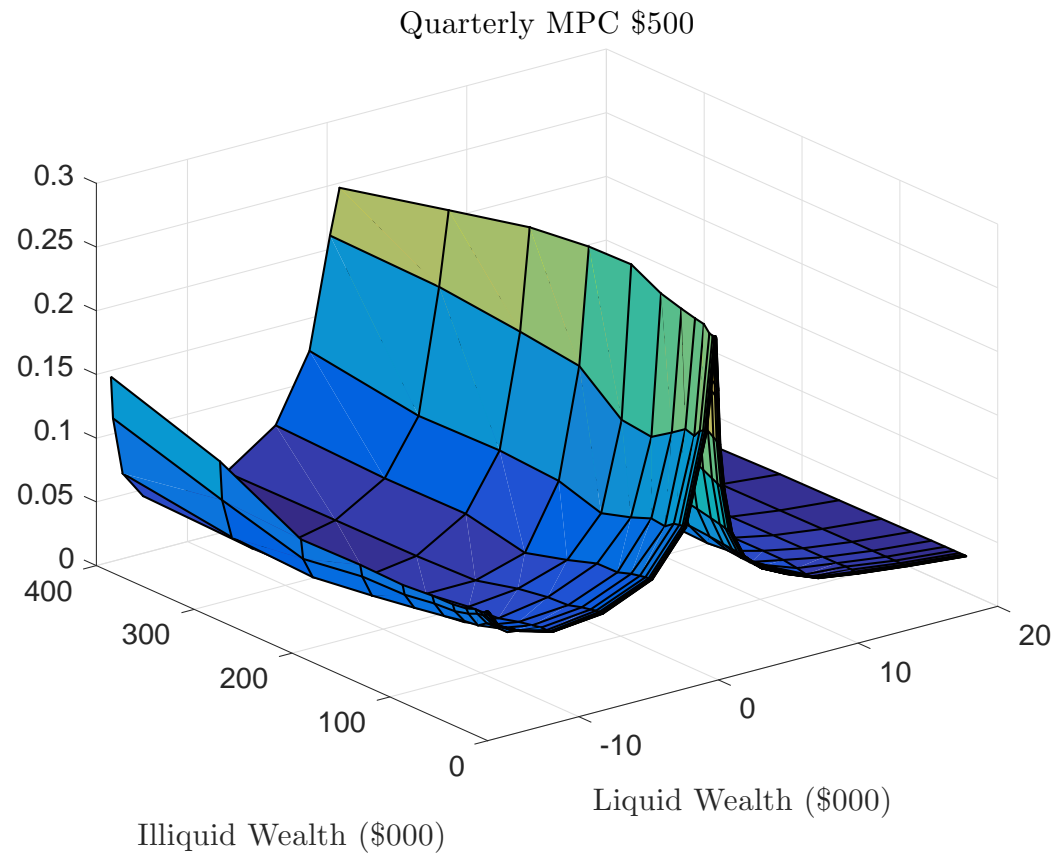- K and shares of intermediate producers (*no arbitrage condition*)

Government

- Issues liquid debt, spends, taxes, and transfers lump-sum

Monetary authority

- Sets nominal rate on liquid assets based on a Taylor rule

Model generates high and heterogeneous MPCs

Quarterly MPC $500

Liquid Wealth ($000)

Illiquid Wealth ($000)

- Average quarterly MPC out of a $500 windfall: 16%

EXPERIMENTS

Expansionary monetary policy

- Innovation $\epsilon < 0$ to the Taylor rule: $i = \bar{r}^b + \phi\pi + \epsilon$

- All experiments: $\epsilon_0 = -0.0025$, i.e. -1% annualized and $\eta = 0.5$

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- Conventional MP: surprise innovation at $t = 0$

- Forward Guidance: announcement at $t = 0$ of innovation at $\tau > t$

- RANK benchmark ($\gamma = 1$):

$$\frac{d \log C_0}{d r_\tau} = -\frac{1}{\gamma\eta} = -2$$

Transmission of conventional MP

$$\Delta C = \text{direct response to } r + \text{indirect GE response}$$

<table>
<tr><td>RANK: 95%</td><td>RANK: 5%</td></tr>
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- **RANK view:**

  ▶ High sensitivity of C to r: **intertemporal substitution**

  ▶ Low sensitivity of C to Y: the RA is a PIH consumer

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- HANK view:

  ▶ Low sensitivity to r: income effect of wealthy offsets int. subst.

  ▶ High sensitivity to Y: sizable share of hand-to-mouth agents

- Saving on interest payments on govt. debt $\rightarrow$ transfers + high MPC of HtM $\rightarrow$ higher demand for C $\rightarrow$ rise in wages $\rightarrow$ ...

Role of fiscal response in determining total effect

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	T adjusts	G adjusts	τ adjusts	B^g adjusts
	(1)	(2)	(3)	(4)
Elasticity of C_0 to r^b	-2.25	-2.04	-2.11	-1.25
Share of Direct Effect:	19%	22%	21%	45%

- Fiscal response to lower interest payments on debt:

  ▶ higher T or lower τ: stimulates AD through MPC of HtM hh

  ▶ G adjusts: translates 1-1 into AD

  ▶ B^g adjusts: no initial stimulus to AD from fiscal side

Forward guidance puzzle

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- Resolution by McKay-Nakamura-Steinsson (2015)

  ▶ Model with uninsurable income risk and borrowing constraints

  ▶ Precautionary motive tempers response of C_0 to future $\downarrow r$

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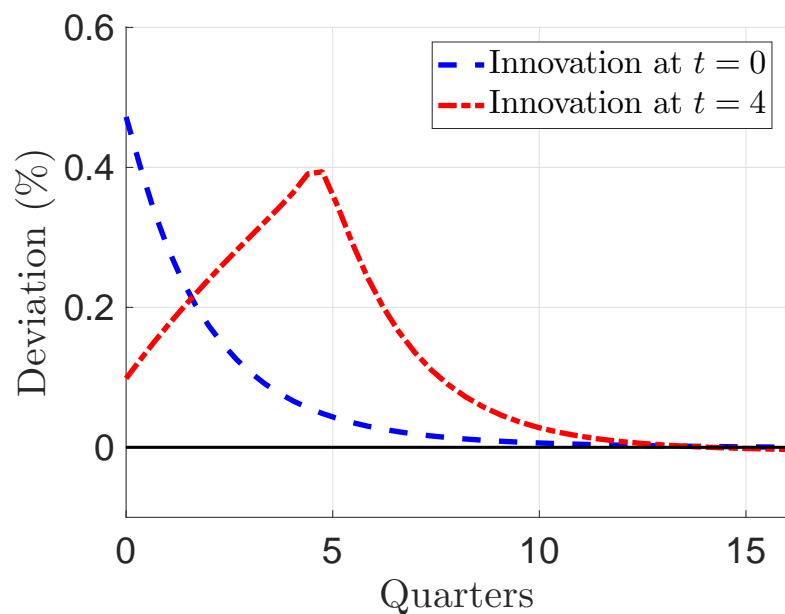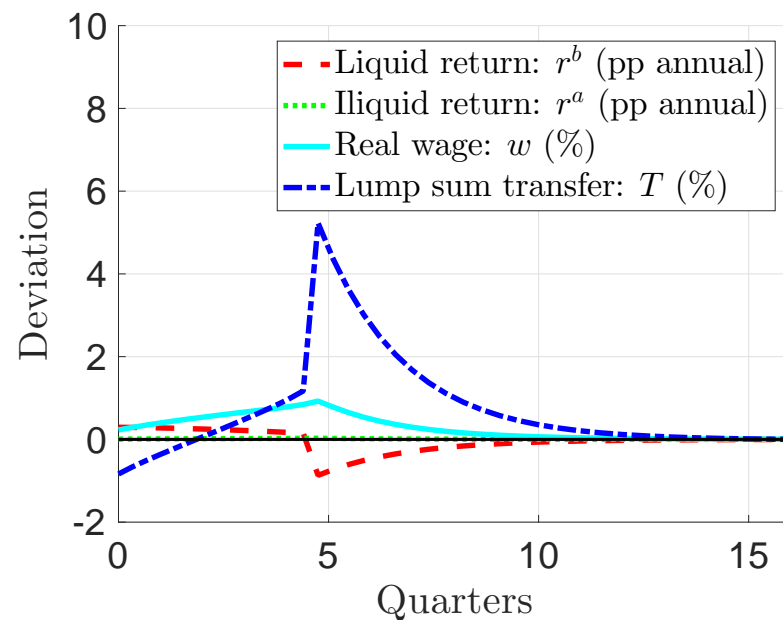 ▶ Precautionary motive tempers response of C_0 to future $\downarrow r$

- Our resolution

  ▶ What makes MP potent is indirect GE effect through $\uparrow AD$

  ▶ HtM are responsible for initial stimulus to AD via $\uparrow T$

  ▶ When r cut is in the future, T accrues to hh only in the future

Forward Guidance in HANK

At $t = 0$, Fed announces a transitory cut in i occurring at $t = 4$

(a) Consumption

(b) Prices and Transfers

Taking stock

- When analyzed through the lenses of an heterogeneous-agent framework:

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    3. Is forward guidance stronger or weaker?

        ▶ A: *Weaker, b/c hand-to-mouth hh provide initial AD stimulus*
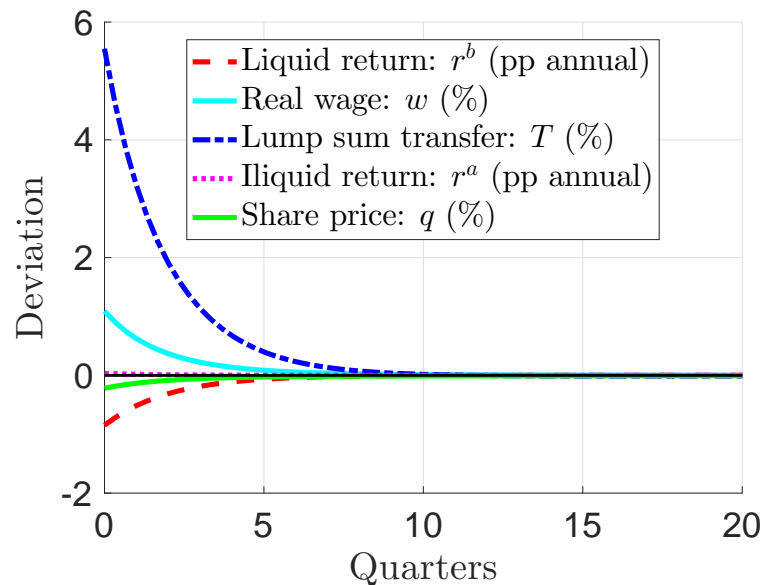
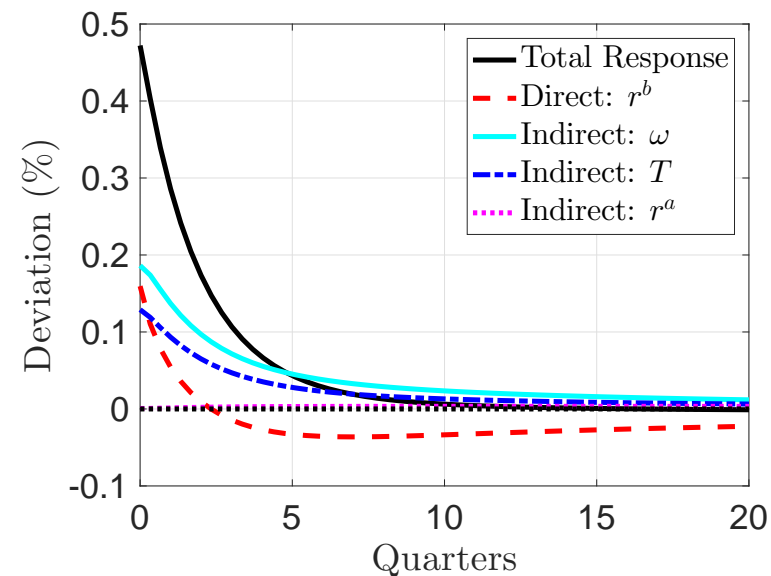# THANKS!

Evidende on MPCs – Norwegian Lotteries
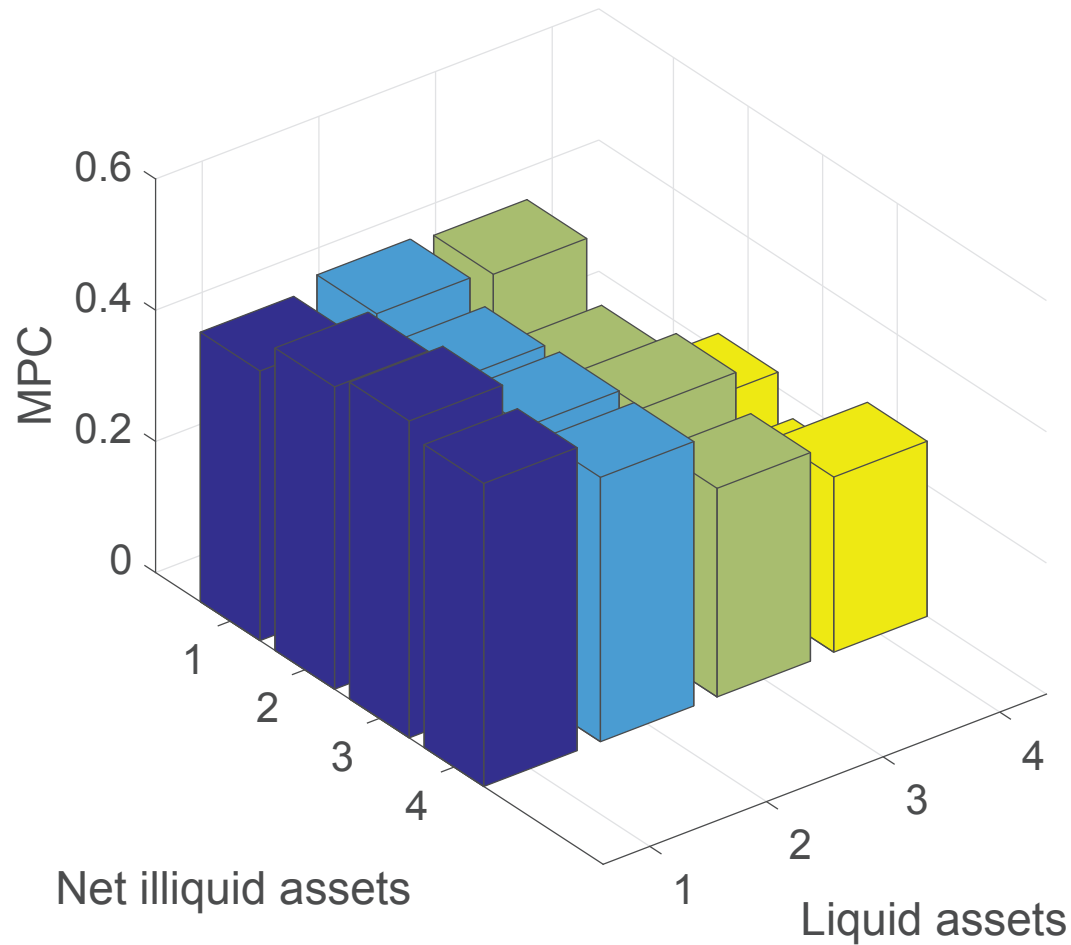
Source: Fagereng, Holm and Natvik (2016)

Transmission of monetary policy shock to C

$$dC_0 = \underbrace{\int_0^\infty \frac{\partial C_0}{\partial r_t^b} dr_t^b dt}_{19\%} + \underbrace{\int_0^\infty \left[\frac{\partial C_0}{\partial r_t^a} dr_t^a + \frac{\partial C_0}{\partial w_t} dw_t + \frac{\partial C_0}{\partial T_t} dT_t \right] dt}_{81\%}$$
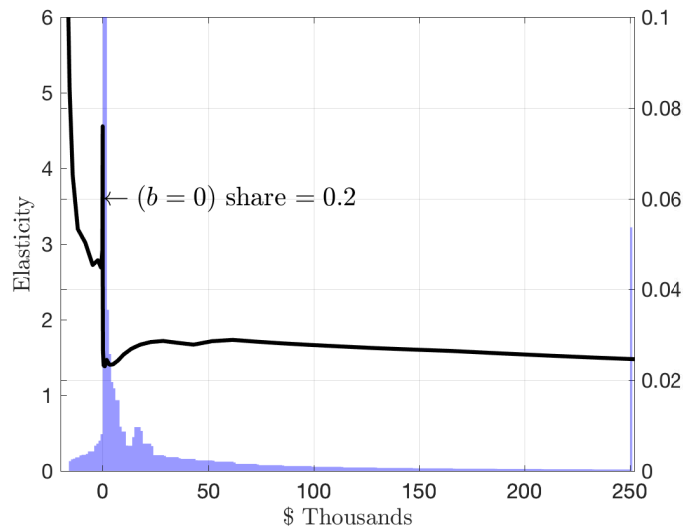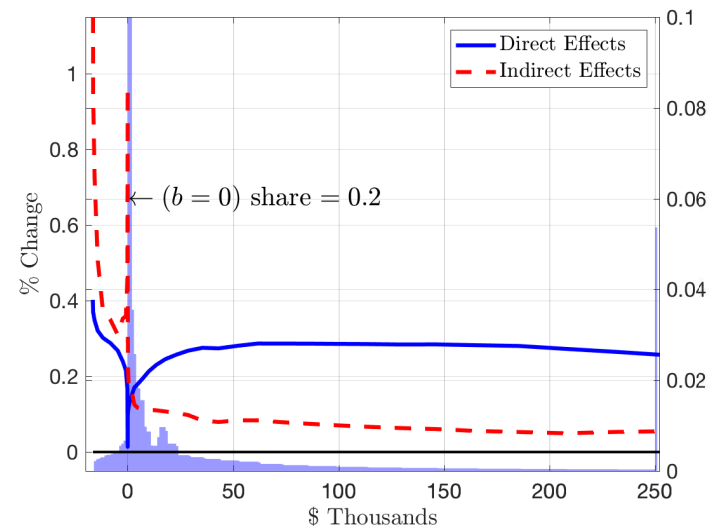

(c) Prices

Legend:
- Liquid return: r^b (pp annual)
- Real wage: w (%)
- Lump sum transfer: T (%)
- Iliquid return: r^a (pp annual)
- Share price: q (%)

(d) Decomposition

Legend:
- Total Response
- Direct: r^b
- Indirect: ω
- Indirect: T
- Indirect: r^a

The distribution of the monetary transmission

(e) Elasticity with respect to r^b

(f) Indirect and direct components

- Aggr. elasticity = c-weighted average of (direct + indirect) at each b