

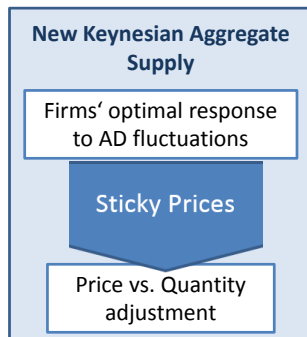
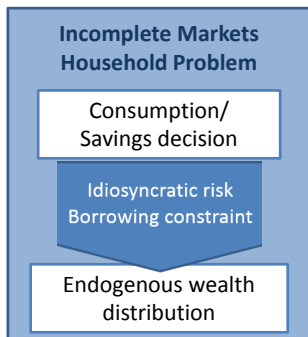
# Household Heterogeneity and Macroeconomic Shocks

Ralph Luetticke

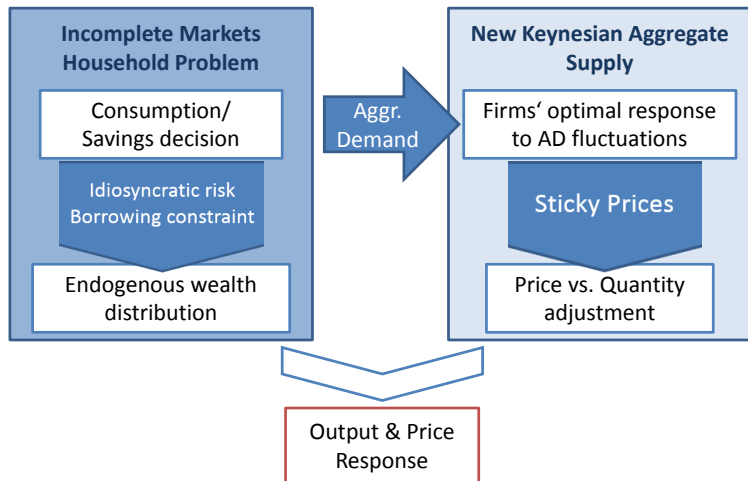
University College London

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# Heterogeneous Agents New Keynesian (HANK)



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# Incomplete Markets (IM) Household Problem

Decision	Determined by	Relevant input	CM	IM
	sequence of Euler equations	real rate	x	x
intertemporal consumption -savings	life-time budget	life-time income	x	x
	<b>borrowing constraints</b>	<b>current income &amp; asset portfolio</b>		x x

# IM Consumption Euler Equation

Individual consumption Euler equation:

$$u'(c_{i,t}) \geq \beta R_t \mathbb{E}_{i,t} \{u'(c_{i,t+1})\}$$

Approximate aggregate consumption Euler equation:

$$u'(C_t^R) = \beta R_t \mathbb{E}_t \{u'(C_{t+1}^R) \Phi_{t+1}^{mean} \Phi_{t+1}^{var}\}$$

(for unconstrained households, see Debortoli & Gali, 2017)

## Incomplete markets household problem

- Sizable average MPC out of transitory income changes
- Distribution of MPCs driven by portfolios
- Consumption/savings respond to idiosyncratic risk
- Lower sensitivity to interest rate changes

## New Keynesian Phillips Curve

- Aggregate demand effects
- Role for monetary and fiscal stabilization policy

# What can we learn from HANK?

## Positive Contributions

- Reassess “old” macroeconomic shocks
- Assess distributional responses
- Assess “new” macroeconomic shocks

## Normative Contributions

- Reassess optimal policy

# Assess “new” macroeconomic shocks

Aggregate shocks that directly interact with household heterogeneity

- Idiosyncratic income risk (Bayer et al, 2017)
- Income inequality (Auclert & Rognlie, 2018)
- Fiscal transfers (Oh & Reis, 2012)
- Borrowing constraints (Guerrieri & Lorenzoni, 2017)



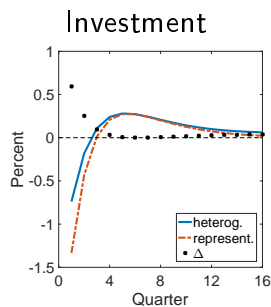
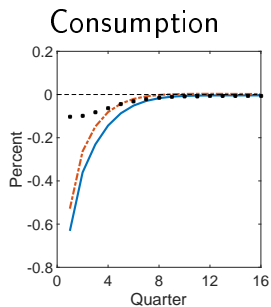
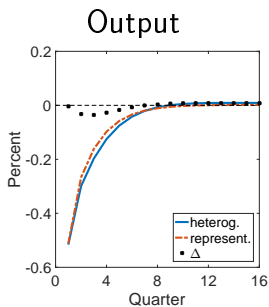
# Reassess “old” macroeconomic shocks

- Focus on monetary policy (most studied)
- Theoretical results
- Quantitative assessments
- Forward guidance

# Werning (2015) on HANK vs RANK

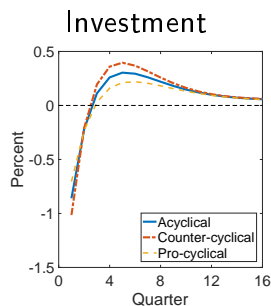
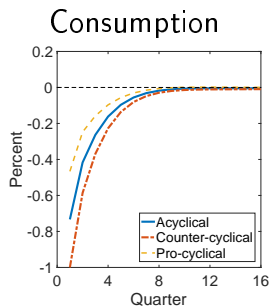
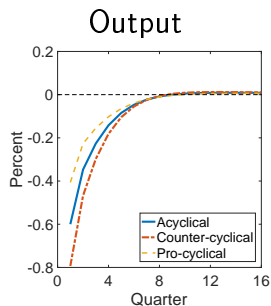
<b>Assumptions on</b>			<b>Response of aggregate</b>
<b>Income Risk</b>	<b>Liquidity</b>		<b>consumption to interest rates</b>
countercyclical	procyclical	→	higher sensitivity
acyclical	acyclical	→	'As if' representative agent
procyclical	countercyclical	→	lower sensitivity

# HANK with portfolio choice (Luetticke, 2017)



# HANK with portfolio choice (Luetticke, 2017)

Cyclical risk matters:

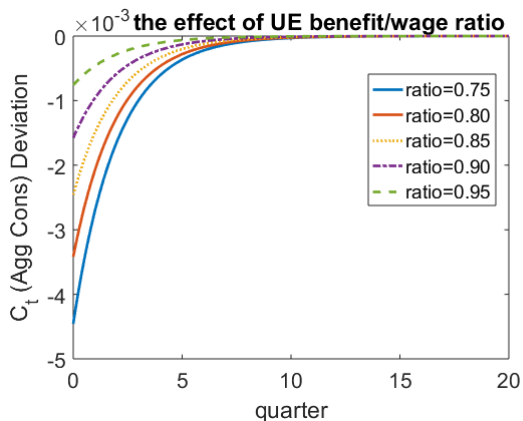


# HANK meets SAM (Ravn & Sterk, 2016)

- Endogenous UE risk via search&matching model
- Labor market tightness shows up in Euler equation
- Monetary policy has (in)direct effect on intertemporal substitution through its effect on the labor market

$$-\mu \widehat{c}_{e,s} + \mu \beta \bar{R} \mathbb{E}_s \widehat{c}_{e,s+1} = \widehat{R}_s - \mathbb{E}_s \widehat{\Pi}_{s+1} - \underbrace{\beta \bar{R} \Theta^F \mathbb{E}_s \widehat{\eta}_{s+1}}_{\text{endogenous risk wedge}},$$
$$\Theta^F \equiv \omega \eta \left( (\vartheta/w)^{-\mu} - 1 \right) - \chi \mu \omega (1 - \eta).$$

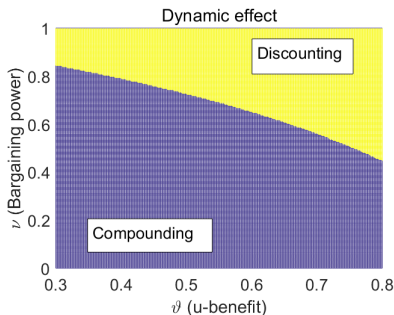
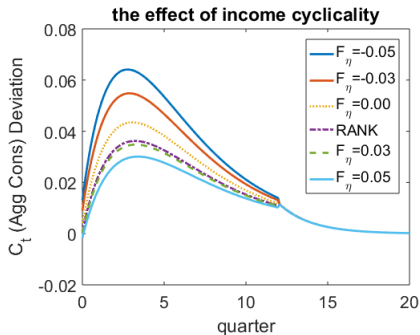
# HANK meets SAM (Ravn & Sterk, 2016)



- McKay-Nakamura-Steinsson (2016): Effect of forward guidance smaller in HANK
- Werning's results apply: Cyclical risk and liquidity key for effect of FG

# HANK meets SAM (Kim, 2017)

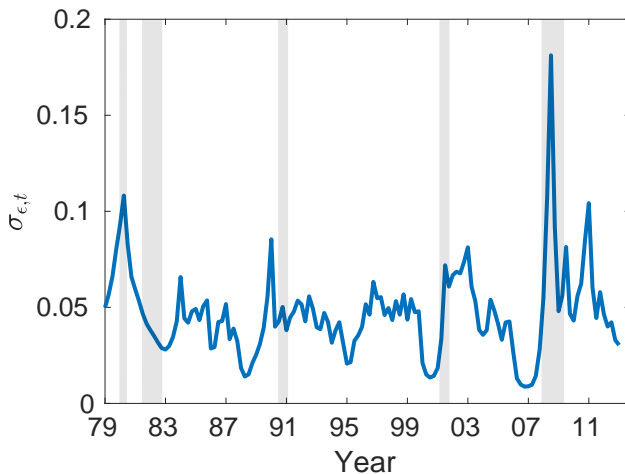
Forward guidance can be more or less powerful in HANK relative to complete markets depending on the cyclical nature of income risk





# Empirical Evidence: Idiosyncratic Risk

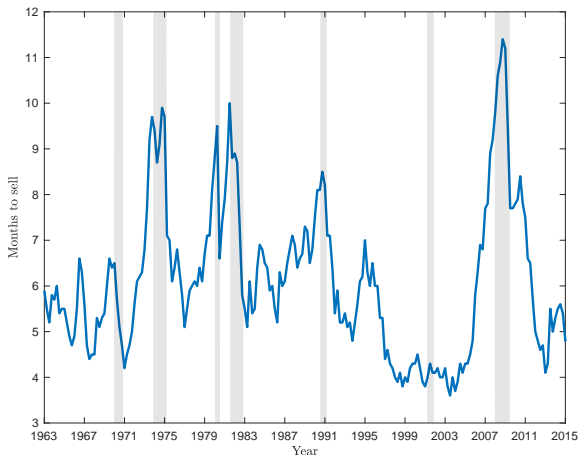
Variance of persistent income shocks is counter-cyclical



Source: Bayer et al (2017)

# Empirical Evidence: Liquidity

Time to sell a house is counter-cyclical (pro-cyclical liquidity)



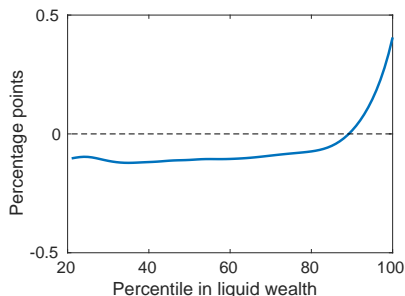
Source: Bayer & Luetticke (2018)

# Assess distributional responses

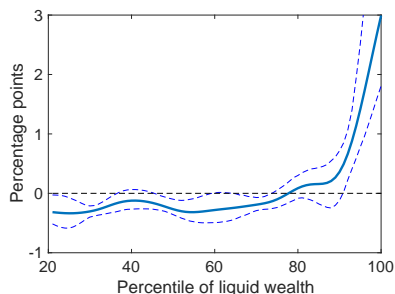
- Quantify distributional consequences of aggregate shocks and systematic policy responses
- Differential responses across households can be used for identification
  - HANK models speak to macro and micro data

# Assess distributional responses

- Differential savings response across households to monetary shocks (interest rate hike)
- Change in liquid-nominal to illiquid-real asset holdings:



Model



Data (SCF, 1983-2007)

Source: Luetticke (2017)

- Normative implications are a different question altogether (Equivalence of IRFs does not imply equivalence of optimal policy)

Examples:

- Weight of inflation vs output in Taylor rule (Gornemann et al, 2013)
- Fiscal vs monetary stabilization (Bayer et al, 2017)

# What can we learn from HANK?

- Enlarges the set of questions we can answer
- Provides new identification via heterogeneity in responses
- Opens up new perspectives on normative results
  - Trade-off between equity and efficiency?
  - No optimal equilibrium with incomplete markets (Hart, 1975)
  - Asset supply key for welfare

# What can we learn from HANK?

Positive results depend on business cycle response of

- Idiosyncratic risk
- Liquidity

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Ultimately a quantitative questions!

# Looking ahead

- Micro-foundation of labor income risk
- Micro-foundation of liquidity (asset supply)
- Gross and nominal asset positions
- Optimal policy

# Numerical challenges

- Endogenous distribution is a state
- High dimensional heterogeneity is numerically challenging:  
e.g. joint-distribution over income and two assets has  
 $100 * 100 * 100 = 1.000.000$  states

Need to approximate distribution:

- Discrete time
  - Bayer et al (2017): Copula function
  - Krusell et al (2017): One-time anticipated shocks
- Continuous time
  - Ahn et al (2017): Projection on lower dim. state space