

Incorporating Heterogeneity into Monetary Policy Models: Lessons and Challenges

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5 December 2019

Heterogeneous Agent New Keynesian Models

Explosion of **HANK** models in last 5 years

- **HA**: household labor market risk, save in non-contingent asset(s)
- **NK**: sticky prices or wages, monetary policy rule, fiscal policy rule

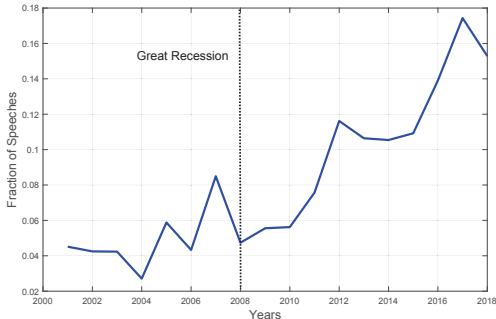
Examples: long list of references on slide 5

Why?

- RA models at odds with micro evidence on hh consumption
- Heterogeneity, inequality and agg demand central in understanding Great Recession and formulating policy in aftermath

Central Banks Agree

- Fraction of speeches at central banks mentioning at least once the words: **heterogeneous, heterogeneity, inequality**



Source: BIS database of central bankers' speeches

Plan

1. Lessons
2. Challenges

New Directions with HANK

1. Does **micro heterogeneity** 'matter' for the response of macro aggregates to macro shocks ?
 - **Matters I:** Alter aggregate IRF to shocks
 - **Matters II:** Alter economic transmission mechanism
 - **Matters III:** Different policy implications

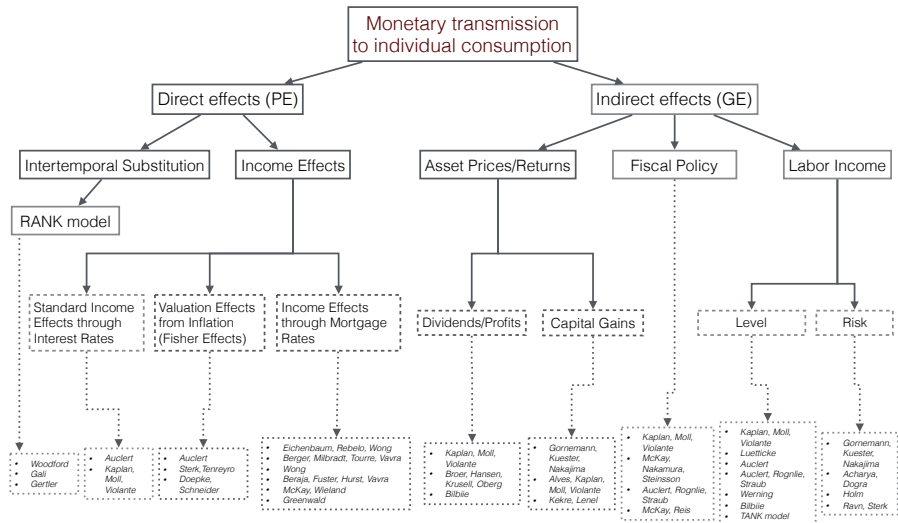
Understand differences through **simple modifications** to RA model?

2. Macro questions that **require heterogeneity** for coherent analysis
 - Some **shocks require heterogeneity** (idios risk, credit limits): micro-foundation for aggregate demand shock
 - **Identification** of aggregate shocks from cross-sectional data
 - **Distributional effects** of aggregate shocks

Monetary Transmission – Key Lessons from HANK

- **RANK**: direct intertemporal substitution effect
- **HANK**: indirect general equilibrium effects
- What matters for consumption response to monetary policy is:
 1. **Investment response**: employment and labor income
 2. **Fiscal response**: government budget constraint
 3. **Cyclicality of risk**: precautionary saving motive
 4. **Cyclicality of liquidity**: how access to / cost of liquidity
 5. **Incidence**: heterogeneous exposure of y to Y

We've come long way since rep agent Euler equation



Policy Lessons from HANK (Optimal Monetary Policy)

- Some papers: welfare depends on distribution \Rightarrow use monetary policy to affect distribution (dist concerns swamp price stability)
 - Here: **put this aside** (targeting principle, central bank mandate, ...) \Rightarrow focus on lessons with classic output-inflation objective
1. Precautionary saving is a force to lower rates (Challe, ...)
 - **RANK**: negative supply shock is inflationary \Rightarrow raise rates
 - **HANK**: unemployment risk $\uparrow \Rightarrow$ precautionary savings $\uparrow \Rightarrow$ aggregate demand $\downarrow \Rightarrow$ force to lower rates

2. Redistributive effects of MP are additional tool to stabilize output

$$dC = \mathbb{E}[MPC_i \times dY_i]$$

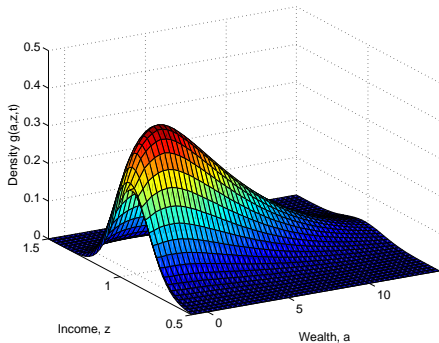
\Rightarrow use MP to redistribute towards high MPC hh's in recessions

3. Others?

Challenges

Full HANK: State Variable = Distribution

- In HANK models – like all HA – relevant state variable = distribution



- Definition of HA model – in general, really no way around this
- Two-edged sword
 - it's what makes the models interesting
 - but also what makes them hard to solve relative to RA

Full HANK: Computational Strategies

1. **Krusell-Smith/DenHaan**: replace dist w 1st moment (or 2nd,.. etc)
 - not always applicable, requires too much micro linearity
2. **“MIT shocks”**: one-time unanticipated Guerrieri-Lorenzoni, Kaplan-Moll-Violante, ...
 - only if small number of eqm prices & aggregate shocks
3. **Reiter**: linearize w.r.t. distribution (think histogram)
Ahn-Kaplan-Moll-Winberry-Wolf, Bayer-Luetticke-PhamDao-Tjaden, McKay-Nakamura-Steinsson ...
4. **Hybrid methods**
e.g. Auclert-Rognlie-Straub “sequence space method” combines ideas from 2 and 3

If you want to invest into this, I recommend **either 3 or 4**

- reason: lend themselves to Bayesian estimation just like RA DSGE
- = current frontier Bayer-Born-Luetticke, Auclert-Rognlie-Straub, delNegro-Dogra-?,Kaplan-Moll-Wolf,...
- slight advantage of 3: state space representation \Rightarrow Kalman etc

More? Master class by Kaplan & myself (in August at UChicago)

Tractable HANK: State Variable \neq Distribution

- Tractable: analytical results that reveal fundamental properties of economic behavior in that class of models (aside: HANK label?)
- Several approaches in the literature (omissions?)
 - **Zero liquidity/no trade**: Bilbiie, Challe, Ravn-Sterk, Werning
 - **Positive liquidity + scaling ass'ns**: Werning
 - **Finite heterogeneity**: Challe, Ragot
 - **CARA**: Acharya-Dogra
 - **Bonds in U**: Hagedorn, Michaillat-Saez, Cantore-Freund
 - **Two-agent (TANK)**: Bilbiie, Kaplan-Moll-Violante, Debortoli-Gali, Cantore-Freund, Sims-Wu
- My personal preference, depending on what goal is:
 1. High/heterogeneous MPCs \rightarrow **two-agent (TANK)**
 2. Time-varying precautionary saving \rightarrow **CARA** or **zero liquidity**
- Do any tractable HANK models combine both?

Full HANK vs Tractable HANK?

Guiding principles:

1. different approaches are complementary
2. choice of model depends on question
3. good idea to be pragmatic

Recall: some questions **require heterogeneity** for coherent analysis

- e.g. if interested in distributional effects, can't use tractable HANK

But what about remaining questions? IRFs to monetary/fiscal shocks?

- **tractable HANK = very useful starting point**, can often capture a lot of economic behavior in full HANK (see previous slide)
- one concern: calibration of tractable model that replicates IRFs of full model for one experiment may not do so for others

Summary: It won't be easy but it'll be worth it

1. Conceptually, integrated approach to macro and distribution
2. Empirically, integrated approach to micro and macro data
3. Better understanding of monetary transmission mechanism
4. Opportunity for collaborations across different groups within Bank