Discussion of "Imperfect Risk-Sharing and the Business Cycle" by Berger, Bocola & Dovis

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    - Show all economies in that class admit a reprepresentative agent formulation with time varying preferences
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  - Show how to measure the time-varying preferences using only micro data on consumption and hours, do so using CEX
- What they find:
  - Heterogeneity accounts for about 20% of the drop in output in the Great Recession
  - Appears driven by worsening risk-sharing, as opposed to increase in volatility of income risk

Why we should care

- Proliferation of HA models being used for positive and policy analysis of cycles
    - Problem: HA models tend to be black boxes
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  - How much does the micro data inform the macro side
- Provides nice mix of theory and empirical work to directly address the importance of heterogeneity in a wide class of models
- Gives us a ballpark estimate of the importance of heterogeneity for aggregates
- Can provide key evidence to help discipline our macro models

Household Problem

Households are expected utility maximizers, choose consumpting, savings and labor:

$$\max_{c,l,b,\{a_k\}_{k\in\mathcal{K}}} \sum_t \sum_{s^t} \beta^t \mathrm{Pr}(s^t|s_0)\tilde{\theta}(z_t)\left[\frac{c(s^t)^{1-\sigma}}{1-\sigma} - \chi\frac{l(s^t)^{1+\nu}}{1+\nu}\right]$$

subject to:

$$\begin{aligned} P(z^t)c(s^t)+ & \sum_{k\in\mathcal{K}} q_k(s^t)a_k(s^t) + \mathcal{T}\left(\left\{a_k\left(s^{t-1}\right)\right\},\left\{a_k\left(s^t\right)\right\},s^t\right) + \frac{b(s^t)}{i(z^t)} \\ \leq \quad & W(z^t)e(v_t)l(s^t) + b(s^{t-1}) + \sum_{k\in\mathcal{K}} R_k\left(s^{t-1},s_t\right)a_k\left(s^{t-1}\right) \\ & \mathcal{H}\left(b(s^t),\{a_j(s^t)\}_{k\in\mathcal{K}},s^t\right) \geq 0 \qquad \mathcal{H}_b \geq 0 \end{aligned}$$

Deriving the representation

Euler equation for HH that values risk-free bond the most

$$\frac{1}{i(z^t)} = \beta \max_{\nu^t} \sum_{s_{t+1}} \Pr(s^{t+1}|s^t) \left\{ \frac{\theta(z_t)}{1+\pi(z^{t+1})} \left(\frac{c(s^t, s_{t+1})}{c(s^t)} \right)^{-\sigma} \right\}$$

Then aggregates follow:

$$\frac{1}{i(z^t)} = \beta \max_{\nu^t} \sum_{s_{t+1}} \Pr(s^{t+1}|s^t) \left\{ \frac{\theta(z_t)\beta(\nu_t, z^{t+1})}{1+\pi(z^{t+1})} \left(\frac{C(z^{t+1})}{C(z^t)} \right)^{-\sigma} \right\}$$

where

$$\beta(\nu_t, z^{t+1}) \equiv \sum_{\nu_{t+1}} \Pr(\nu_{t+1}|z^{t+1}, \nu^t) \left(\frac{c(\nu^t, z^t)/C(z^t)}{c(\nu^{t+1}, z^{t+1})/C(z^{t+1})} \right)^{-\sigma}$$

Key assumptions / Limitations

- Homogenous, isoelastic preferences across all households
  - Preference heterogeneity common device used in HA models to match data
  - Heterogeneity in β or σ can't be indentified by their procedure
  - How far off is the analysis if there is "typical" heterogeneity in preferences?
- All households on their labor supply curves
  - Unemployment?
  - Non-convexities in participation?

Key assumptions / Limitations

- Asset structure: flexible, no frictions in trading b

$$\frac{1}{i(z^t)} = \beta \max_{\nu^t} \sum_{s_{t+1}} \Pr(s^{t+1}|s^t) \left\{ \frac{\theta(z_t)}{1+\pi(z^{t+1})} \left(\frac{c(s^t, s_{t+1})}{c(s^t)} \right)^{-\sigma} \right\}$$

  - When is it a result and when is it an assumption that one HH is one Euler Equation?
  - Alternative risk-sharing arrangements, e.g. Alvarez & Jermann (2000) would result in the max being inside the summation
  - What if $a_k(s^t)$ spans b?
  - How frictionless is it to hold T-bills?
  - How important is it that all transaction costs are psychic (i.e. not in resource constraint)?

Measuring $\beta(\nu_t, z^{t+1})$

- Recall the fictitious rep-agent has discount factor given by:

$$\beta(\nu_t, z^{t+1}) \equiv \sum_{\nu_{t+1}} \Pr(\nu_{t+1} | z^{t+1}, \nu^t) \left(\frac{c(\nu^t, z^t)/C(z^t)}{c(\nu^{t+1}, z^{t+1})/C(z^{t+1})} \right)^{-\sigma}$$

- Need to take a stand on *expectations*, they only see *realizations*
- Group households by relevant state variables of one asset HA model (income/wealth), pretend realized values of the group are the individual expectation:
  - Housing and mortgage status, esp in GR?
  - More sophisticated matching techniques from micro or ML literature?

MEASURING $\beta(\nu_t, z^{t+1})$

- They residualize micro data on features absent from their model, e.g. age, education, race, sex
  - Is this innocuous? If young households are constrained exactly because they are young how should we think about their residualized consumption growth?
  - If you simulated data from OLG model with perfect risk-sharing within cohort (but not across) and then residualized that data what would your procedure recover vis-a-vis the truth?
- Why exclude retirees?
  - Model should tell us they are most likely to be on EE
  - Cleanest group to estimate highest valuation on

Policy counterfactual

- They estimate AR(1) processes for $\{\beta, \omega\}$ and then run aggregate counterfactuals
  - $\{\beta, \omega\}$ are themselves endogenous, hard to interpret
  - Don't allow for any feedback between the estimation of other parameters/shocks and the processes
- In Chari, Kehoe and McGrattan (2007) can isolate the direct effect of zeroing out the β wedge, unclear how one could do that in this environment
- My view: more interesting to use βs as a model diagnostic for calibrated HA models