Discussion:
Habits and Leverage
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Background

  - Key channel: time-varying discount rate
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- Success on explaining aggregate stock market
  - High equity premium, volatile stock return
  - Procyclical and persistent variations in price-dividend ratio
  - Return predictability
  - Match conventional moments on the consumption side.
This Paper

- External habit + investor heterogeneity:
  - Initial wealth shares, \(w_i\)
  - Habit sensitivity, \(a_i\)
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- External habit + investor heterogeneity:
  - Initial wealth shares, $w_i$
  - Habit sensitivity, $a_i$

- Implications:
  - Aggregation property: Maintain the success of MSV.
  - **Main focus:** Rich heterogeneity: trading, leverage, risk sharing, wealth distribution
Investors have heterogenous wealth shares \((w_i)\) and external habit preferences:

\[
u(C_{i,t}, X_{i,t}, t) = e^{-\rho_t} \log(C_{it} - \psi_{it} D_t)\]

Agent-specific habit multiplier factor:

\[
\psi_{it} = \frac{a_i}{Y_t} Y_t + \frac{b_i}{Y_t} Y_t
\]

Exogenous process:

- Endowment dynamics:

\[
\frac{dD_t}{D_t} = \mu_D dt + \sigma_D (Y_t) dZ_t
\]

- The recession indicator, \(Y_t\), follows:

\[
dY_t = \kappa (\bar{Y} - Y_t) dt - \nu Y_t \left[ \frac{dD_t}{D_t} - \mu_D dt \right]
\]
Model Setup

- Effective risk aversion (RRA):

\[
\text{Curv}_{it} = - \frac{C_{it} \, u_{cc}(C_{it}, X_{it}, t)}{u_c(C_{it}, X_{it}, t)}
\]

\[
= 1 + \frac{a_i \, (Y_t - \lambda) + \lambda - 1}{w_i \, \bar{Y} - a_i \, (\bar{Y} - \lambda) - \lambda + 1}
\]

- Higher endowment share \( w_i \), and/or lower habit sensitivity \( a_i \) \( \implies \) lower RRA, higher risk tolerance

- Agents have different sensitivity to changes in \( Y_t \), through \( a_i \)
Model Setup

- Risk sharing rule:

\[
\tau_{it} = C_{it} - w_i D_t = - (w_i - a_i) \left(1 - \frac{\bar{Y}}{Y_t}\right) D_t
\]

- Low risk tolerance agents \((w_i - a_i < 0)\)
  - receive transfer \(\tau_{it} > 0\) in bad times \((Y_t > \bar{Y})\);
  - provide transfer \(\tau_{it} < 0\) in good times \((Y_t < \bar{Y})\).

- High risk tolerance agents \((w_i - a_i > 0)\) insures low tolerance agents.

- Special case: if \(\nu = 0\), then \(\tau_{it} = 0\).
  - Habits are the key to deliver the time varying risk sharing.
Decentralization and Implications

- With single state variable \( S_t = \frac{1}{Y_t} \) and no frictions, model can generate:
  
  **Trading:** high tolerance agents \( w_i > a_i \) are levered agents. High tolerance agents \( w_i > a_i \) are trend chasers. In bad time, levered agents deliverable and create “selling pressure.”

  **Leverage:** Procyclical debt-to-output ratio, countercyclical debt-to-asset ratio. High aggregate leverage \( \text{high pd, low } E_t(\text{r}), \text{low } \text{Vol}(\text{r}) \), contemporaneous consumption boom and lower future consumption growth for levered agents.

  Leverage is a priced factor: positive price for book leverage risk, negative price for market leverage risk.

  **Endogenous wealth dynamics and wealth dispersion.**
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- **Endogenous wealth dynamics and wealth dispersion.**
Rich heterogeneity is the main contribution: trading, leverage and risk sharing among heterogeneous agents.

Main comments:

- Target the heterogeneity to the micro data
- Demonstrate quantitative importance of this frictionless channel.
Comment I
Wealth Distribution

- Unconditional distribution of wealth in the model (figure 2, panel B):

- Saez and Zucman (2015): About 72% of net household wealth are held by top 10% (Sample 2000-2012).
- The wealth inequality in the model seems too small.
Comment I
Wealth Distribution

- Saez and Zucman (2015): Figure 6, top 10% wealth share in U.S.
- Significant time-variation, low frequency secular trend
Comment I
Wealth Distribution

- In the model, the wealth share:

\[
\frac{W_{it}}{\int_j W_{jt}dj} = a_i + (w_i - a_i) \frac{(\rho + k) \bar{Y}/Y_t}{\rho + k \bar{Y}/Y_t}
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- At the steady state:

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\frac{\bar{W}_i}{\int_j \bar{W}_j dj} = w_i
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- A procedure to identify the distribution of \(w_i\) and \(a_i\)
  - Choose \(w_i\) to match the unconditional wealth distribution
  - Choose \(a_i\) to match the time variations of the conditional distribution
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- In the model, wealth share only depends on single variable \( Y_t \), difficult to match the low-frequency secular trend.
Comment I
Consumption Distribution

- Consumption rule:

\[ s_{it} = \frac{C_{it}}{D_t} = a_i + (w_i - a_i) \frac{\bar{Y}}{Y_t} \]

- We could also identify the distribution of \( w_i \) and \( a_i \) through individual consumption data.
Comment II

Identity

- The paper considers the levered agents as the intermediary.
- Equivalently, the household sector is a hybrid of household and intermediary.
- But the model calibration suggests levered agents consistent of
  - very poor people with low habit sensitivity, low $w_i$ and $a_i$
  - very wealthy people, high $w_i$
- Map the model to the real world:
  - Who are $w_i - a_i > 0$ agents?
  - Who are intermediary?
Comment III
Model Comparison and Policy Implications

- Li (2016): Lucas economy + financial intermediary (debt financing constraint)
- Augmented SDF to price the stock market:

\[ \tilde{M}_{t+1} = M_{t+1} \frac{(1 - \lambda) + \lambda \mu_{t+1}}{\mu_t} \]

- Marginal value of the net worth of the financial intermediary.
Effective risk aversion is countercyclical, despite the economy is driven by i.i.d. homeskedastic consumption growth shock.

Figure 3: Effective risk aversion as a Function of Scaled Net Worth, $\hat{n}$
Observational equivalence in various dimensions:

<table>
<thead>
<tr>
<th></th>
<th>This paper</th>
<th>F.I. Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>time-varying RRA</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>procyclical book lev.</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>counercyclical mkt. lev.</td>
<td>Yes</td>
<td>Yes</td>
</tr>
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<td>lev. risk is priced factor</td>
<td>Yes</td>
<td>Yes</td>
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<td>return predictability</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>time-varying asset vol</td>
<td>Exogenous</td>
<td>Endogenous</td>
</tr>
<tr>
<td>persistent pd ratio</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Quote "Our point here is not to claim that these frictions [i.e. financial frictions] are not important but simply to offer an alternative explanation that is consistent with complete markets and that matches what we know from the asset pricing literature." [page 4 of the paper]
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But two models have different policy implications in financial crisis.

Important to show quantitative relevance of this frictionless channel.

Suggestions: target unique features in the heterogeneity to data.

Trading behaviors, wealth distribution, risk sharing and consumption distribution

Need more empirical work here.
Comment IV
Forward v.s. Backward Looking

- A general question for the external habit model.
- In habit model, asset pricing is backward looking.

Fig. 12: Price-dividend Ratio and Backward Consumption Growth

This figure plots the $R^2$ for regressing future log price-dividend ratio onto distributed lags of consumption growth:

$$ p_{t+1} - d_{t+1} = \alpha_0 + \sum_{j=1}^{L} \alpha_j \Delta c_{t+1-j} + u_{t+1} $$
Conclusive Remarks

- A new workhorse model
  - Frictionless: complete market, no other frictions
  - Aggregation property and model tractability
  - Maintain the success of asset pricing on the aggregate
  - Rich heterogeneity: risk sharing, trade, leverage and wealth dynamics/dispersion

Major comments:
- Bring the heterogeneity to the micro level data
- Establish the quantitative relevance of the model mechanism
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