House Prices and Consumer Spending

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Motivation

• Growing empirical evidence of housing wealth effects on non-durable spending
• Simplest theoretical models predict small housing wealth effects
• Broad Questions:
  • Tighter link between theory and data, what do models really predict?
  • How do elasticities depend on joint distribution of assets (housing, non-housing, debt)?
  • Does it matter what shock causes house price movements?
  • Should policy makers pay attention to average debt, distribution of debt, aggregate house prices, local house prices?
  • Are there times when the economy is particularly “fragile” to asset price driven recessions?
  • Should policy makers regulate leverage or engage in debt forgiveness?
More Specific Questions

• Narrow goal:
  • Taking micro estimates at face value:
    • Build consumption model with realistic features to try to rationalize large elasticities
    • Decompose importance of various channels: direct wealth effects, collateral effects, bequest motives, house price bubbles, etc.
  • Use theoretical model to inform micro estimates:
    • Does geographic estimation identify aggregate effects?
    • Aggregate elasticities vs. average elasticities
    • Relative elasticities vs. absolute elasticities
Elasticities

• Wide range of empirical estimates, but most recent estimates during Great Recession pretty large:
  - Mian-Sufi: Elasticity of 0.46 to explain differential consumption responses (non-grocery non-durables)
  - Case-Quigley-Shiller find a range of elasticities using state-level US data of .07-.18
  - Campbell-Cocco find larger elasticities using UK micro data, even as large as 1
    - Lots of heterogeneity by age
• Tough identification issues: Can theory help reconcile differences?
  - Age, geographical aggregation, time-series vs. cross-section
  - Attanasio-Weber claim is mostly income expectations
Simple Theoretical Benchmarks

• Sinai and Souleles 2005: Fully illiquid housing: If never move or die, housing isn’t wealth, elasticity of zero
• PIH: Fully liquid housing, will show generates tiny housing wealth effects
• Goal for now: a realistic model is something in between, what does it imply?
Main message of theory for now

- Relationships in more realistic models quickly become complicated:
- Can potentially get very big elasticities when introduce risk, collateral, leverage, etc.
  - But other effects like option to rent work in opposite direction
- Aggregate elasticity depends heavily on initial conditions for housing/debt distribution
- Implies large variation in elasticities in the cross section
- Models need to be taken carefully to data to get reliable predictions
Permanent income

- Benchmark: permanent income model with housing
- Preferences
  \[ U(C_t, H_t) = \frac{(C_t^\alpha H_t^{1-\alpha})^{1-\sigma}}{1-\sigma} \]
- Budget constraint
  \[ C_t + P_t H_t + A_t = Y_t + (1-\delta) P_{t-1} H_{t-1} + (1+r) A_{t-1} \]
- No income uncertainty, constant house prices
  \[ \beta (1+r) = 1 \]
- We get
  \[ C_t = \alpha (1-q) \left[ \sum_{j=0} q^j Y_{t+j} + (1-\delta) P H_{t-1} + (1+r) A_{t-1} \right] \]
Permanent income (continued)

• Elasticity

\[
\frac{dC}{C} = \frac{dP}{P} \frac{PH_{t-1}}{\sum_{j=0}^{\infty} q^j Y_{t+j} + (1 - \delta) PH_{t-1} + (1 + r) A_{t-1}}
\]

• Set \( r = 2.5\% \), then human wealth is \( Y/r = 40 \cdot Y \)

• Set \( PH = 1.5 \cdot Y \) and \( A = 1.5 \cdot Y \)

  \[ \text{elasticity} = 0.0349 \]

• Suppose household debt goes up by \( 1 \cdot Y \), so \( A = 0.5 \cdot Y \)

  \[ \text{elasticity} = 0.0357 \]
Permanent income (continued)

• Implication 1: aggregate elasticity small
• Implication 2: aggregate elasticity minimally affected by household debt
• Implication 3: in cross section older agents have larger elasticity, differences in debt have small role
Precautionary saving model

- Income is stochastic, AR1
  \[ \log Y_t = \rho \log Y_{t-1} + \varepsilon_t \]
- Impatient households
  \[ \beta (1 + r) < 1 \]
- Value function
  \[ V(W_t, Y_t) = \max U(C_t, H_t) + \beta E[V(W_{t+1}, Y_{t+1})] \]

subject to
  \[ C_t + P \cdot H_t + A_t = Y_t + W_t \]
  \[ W_{t+1} = (1 + r) A_t + (1 - \delta) P \cdot H_t \]
  \[ -A_t \leq (1 - \theta) \frac{1 - \delta}{1 + r} P \cdot H_t \]
Parameters

• Income process
  \[ \rho = 0.91, \quad \sigma_\epsilon = 0.15 \]

• Set \( r = 2.5\% \)
• Set \( \theta = 0.2 \) and \( \sigma = 1 \)
• Choose \( \alpha = 0.897 \) to match \( PH/Y = 1.5 \)
• Choose \( \beta = 0.969 \) to match \( A/Y = 1.5 \)
State-dependent elasticity

- Find change in $r$ that leads to $A/Y = 0.5$ in new steady state
- Compute elasticity to different size shocks in the two regimes

Elasticity of aggregate consumption

<table>
<thead>
<tr>
<th>$r$</th>
<th>$A/Y$</th>
<th>$PH/Y$</th>
<th>$-20%$</th>
<th>$-10%$</th>
<th>$+10%$</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.50%</td>
<td>1.50</td>
<td>1.50</td>
<td>0.177</td>
<td>0.169</td>
<td>0.112</td>
</tr>
<tr>
<td>2.19%</td>
<td>0.50</td>
<td>1.51</td>
<td>0.246</td>
<td>0.230</td>
<td>0.155</td>
</tr>
</tbody>
</table>
Why large effects?

- Heterogeneity + concave consumption functions
- Agents with low net worth who own a house are in the steepest part of the consumption function
- Agents with low net worth who own a house are levered and are hit most by the price change
- House values determine borrowing capacity
Cross section

Average elasticities

Wealth distribution
Two decompositions

• Marginal propensity to consume and housing to consumption ratio

\[
\frac{dC}{C} \frac{dP}{P} = \frac{dC}{dW} \frac{dP}{P} \cdot H \frac{dP}{P} = \frac{dC}{dW} \frac{PH}{C}
\]

• Wealth elasticity and leverage

\[
\frac{dC}{C} \frac{dP}{P} = \frac{dC}{dW} \frac{PH}{W}
\]
Two decompositions (continued)

Decomposition 1

Decomposition 2

MPC

C/(PH)

elasticity to net worth

PH/W
Why low net worth agents so levered?

• Because housing enters the utility function
• Housing holdings are not proportional to net worth (Diaz and Luengo-Prado)
• Look at $PH/Y$ and $W/Y$ in model (data)
Housing and net worth

Model policies

SCF 2007 (conditional mean by decile)
Life-Cycle Considerations

- For now, just worked with infinite horizon model
- Life-cycle might matter
  - Income increases with lifetime, then retire
  - Asset accumulation for retirement
  - Endogenous leverage by age
Bewley $\theta = 1$
Bewley $\theta = 0.2$
Introducing More Realism

- Model ignores illiquid nature of housing (in limit if housing is just an endowment, no housing wealth effects)
- Model ignores rental margin: poor households forced to lever up and purchase house when would probably rather rent
- Introduce fixed costs of housing adjustment + rental choice
  - Calibrate to match average HO rate in economy
  - Find it makes a big difference!
  - Requires more complicated numerical solutions, but can still do various comparative statics exercises to understand
Baseline results
Baseline: home-owners only
What’s Driving the Difference?

- Fixed costs or rental margin?
Fixed costs

- Shut down rental market and look at role of fixed costs:
Fixed costs

- Turning rental market back on doesn’t change importance of fixed costs much
Rental Market Very Important

Age Profile of Average elasticity

- ave ho=1
- ave ho=.86
- ave ho=.76
- ave ho=.68
- ave ho=.33
Option to Rent Matters Even For Homeowners’ Elasticities

Age Profile of Average Elasticity for Home Owners

- ave ho=1
- ave ho=.86
- ave ho=.76
- ave ho=.68
- ave ho=.33
Role of Leverage

- With no rental option, young households much more levered:
Varying Strength of Collateral Channel

age profile of average elasticity

- theta=1
- theta=.65
- theta=.35
- theta=.25
- theta=.2
- theta=.15
Age-Income Effects Vs. Debt Positions

Age Profile of Average Elasticity (no rental market, theta=.25)
What causes price dynamics?

- So far we have taken an exogenous shock to house prices
- We have not looked at demand for housing
- (it goes in the wrong direction!)
- How can we generate a boom-bust in house prices, construction, credit and consumption?
- Let’s try an irrational bubble episode
Bubble

- Start at steady state with $P_t$ constant
- At date $T$, unexpected shift in expectations of future appreciation
  \[
  E_T \frac{P_{T+1}}{P_T} = 1 + g = 1 + 2\%
  \]
  with $E_T P_{T+1} = E_T P_{T+2} = \ldots$
- Suppose in equilibrium this produces a large appreciation
  \[
  \frac{P_T}{P_{T-1}} = 1 + 20\%
  \]
- At $T + 1$ expected appreciation goes back to 0
  \[
  E_{T+1} \frac{P_{T+2}}{P_{T+1}} = 1
  \]
- Suppose in equilibrium this brings prices back to initial level
  \[
  P_{T+1} = P_{T-1}
  \]
Bubble (continued)
Back to elasticities

- Implied elasticity on the way up is 0.114, consistent with initial experiment in the high $A$ regime.
- Implied elasticity on the way down is 0.240, which is close to the low $A$ regime.
- But here $A$ is not going down as much (from 1.5 to 1.2).
Conclusions

- Theoretical implications for elasticity much more complicated than simple benchmarks imply
- More work decomposing effects, taking to data
- Hopefully interesting policy conclusions
- Also want to return to rationalizing disparate micro estimates