Discussion of "What drives House Prices?"
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This paper

- Fact: house prices move around a lot
- Can these movements be explained by a two-sector RBC model?
- Davis & Heathcote (2003 IER)
  - model works for quantities, not quite for prices

Discussion

- Baby version to illustrate mechanics
- rents and housing expenditure
- sources of house price movements
- historical boom/bust cycles
- implications for quantities
Mechanism

- 2 sector RBC model (shelter and "food")
- Two important properties:
  (i) Production of shelter is more land-intensive
  (ii) Shelter & food are complements in utility
- Productivity shock in food sector
  → complements: need more shelter to enjoy the food
  → land now scarce since needed to make shelter
  → rental rate of land goes up
  → land prices (and thus house prices) go up
- Productivity growth on average faster in food sector, no balanced growth path
- Regime switching with unknown regime creates slow adjustment of price
Baby Version

- shelter produced from land \( H_t = L_t \)
- food produced from labor \( Y_t = g^t N_t \)
- \( g > 1 \) (on average faster growth in food sector)
- labor supplied inelastically, \( N = 1 \)
  fixed supply of land \( L = 1 \)
- CES utility over food & shelter, intratemporal elasticity \( \varepsilon < 1 \)

\[
\sum_{t=0}^{\infty} \beta^t \log \left( \omega c_t^{\frac{\varepsilon-1}{\varepsilon}} + (1 - \omega) h_t^{\frac{\varepsilon-1}{\varepsilon}} \right)^{\frac{\varepsilon}{\varepsilon-1}}
\]

- Competitive equilibrium
- here, no shocks. do comparative statics wrt \( g \)
- remark: paper also has unbalanced sectoral growth
  solution by log-linearization around "approx. balanced growth path"
Rents, quantities & housing expenditure

- In equilibrium, rents are

\[ p_t^h = \text{intratemporal MRS between shelter & food} \]
\[ = \frac{(1 - \omega)}{\omega} \left( \frac{c_t}{h_t} \right)^{1/\varepsilon} \]
\[ = \frac{(1 - \omega)}{\omega} g^{(1/\varepsilon) t} p_0^h \]

grow because shelter produced from fixed factor land grow faster than productivity if complements \( \varepsilon < 1 \)

- expenditure ratio

\[ \frac{p_t^h h_t}{c_t} = \frac{(1 - \omega)}{\omega} \left( \frac{c_t}{h_t} \right)^{1/\varepsilon - 1} \]
\[ = \frac{(1 - \omega)}{\omega} g^{(1/\varepsilon - 1) t} \]

if \( \varepsilon < 1 \) expenditure share on housing trends up and tends to one
Evidence on housing expenditure shares

... the ratio expenditures on housing services to non-housing consumption expenditures has no long run trend, ...

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Rents and quantities: evidence from volatilities

- Intratemporal FOC

\[ p^h_t = \frac{(1 - \omega) \left( \frac{c_t}{h_t} \right)^{1/\varepsilon}}{\omega} \]

implies relationship between volatilities

\[ \text{vol} \left( \Delta \log p^h_t \right) = \frac{1}{\varepsilon} \text{vol} \left( \Delta \log \left( \frac{c_t}{h_t} \right) \right) \]

- Ballpark numbers (from NIPA aggregates):

  \[ \text{vol} \left( \Delta \log p^h_t \right) \approx 2 \text{ percent} \]
  \[ \text{vol} \left( \Delta \log \left( \frac{c_t}{h_t} \right) \right) \approx 2 \text{ percent} \]

- With \( \varepsilon = 0.2 \): prices five times more volatile than quantities
House prices

- In equilibrium, the house price = present value of rents discounted at real rates

\[ R_{t,t+s} = \frac{1}{\text{intertemporal MRS}} \]

\[ = \beta^{-s} g^s \frac{\omega / c_t + (1 - \omega) g^{\frac{1-\varepsilon}{\varepsilon} s}}{\omega / c_t + (1 - \omega)} \]

- \( c_t \) high enough: \( R_{t,t+s} \) close to constant at \( \beta^{-s} g^{(1/\varepsilon)s} \)
- So

\[ \text{house price} = \sum_{s=0}^{\infty} \frac{1}{R_{t,t+s}} p_h^s \]

\[ = p_h^s \sum_{s=0}^{\infty} \beta^s \frac{\omega / c_t + (1 - \omega)}{g^{(1-1/\varepsilon)s} \omega / c_t + (1 - \omega)} \]

- \( c_t \) high enough: house price proportional to rent
- what about price-rent ratio? can initially increase with \( g \)
Sources of house price movements

- "price-dividend ratio" for housing

\[
\text{price rent ratio} = \frac{\text{house price}}{\text{rent today}} = \frac{\text{present discounted value of rents}}{\text{rent today}}
\]

- decompositions of movements
  (e.g. Campbell-Davis-Gallin-Martin 2009)

\[
\text{price rent ratio} = \text{expected rents} - \text{real rate} + \text{rest}
\]

- **data**: rest is most volatile
- **model**: (at most) expected rents and real rate move, rest is constant
Historical boom/bust episodes

Target boom? 80% Case-Shiller, 50% OFHEO, 30% Census New Homes
Historical boom/bust episodes

Qualitatively, yes — except for 1960s & 70s, end 80s,
Recent episode

Early 2000s (2000-2006), deviations from trend:
Model: 4%
OFHEO detrended: 25%
Implications for quantities

- real estate investment in the model highly volatile
  Figure 12 in the paper
- Davis & Heathcote 2003:
  matches real estate investment
  did not get enough house price volatility
- This paper:
  generates more house price volatility
  does not match quantities
Conclusions

- Very useful exercise
- shelter and food are strong complements (small $\varepsilon$) ➔ implications for volatilities of rents and quantities
- unbalanced sectoral growth has a number of implications (e.g., trending expenditure shares) ➔ provide evidence from model simulations
- qualitatively, model gets boom/bust patterns except for 60s and 70s, end of the 80s
- quantitatively, frictionless model
  - does not generate the large house price movements that we have seen, for example, in the recent episode
  - does not match sectoral investment