Natural Expectations and Home Equity Extraction

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A model of boom in households’ home equity loans

- Explanations for the 2000’s exuberance in housing market
  1. asymmetric information and wrong incentives
  2. special shocks
  3. biased expectations

- This paper takes on the third approach

- A model where households and banks interact on a credit market
  - households consume and borrow from banks
  - households can default on their debt
  - households pledge their house as credit collateral
  - banks offer loans accordingly
  - agents have “natural” rather than “rational” expectations

- Show the model does a good job at replicating the boom in home-equity loans observed over the 2000s
The model
Households (1/2)

- $T$ periods
- Each period, households
  - receive a (fixed) income
  - borrow new debt
  - consume
  - pay interests or default and sell (and rent) the house
- Last period, households sell their home and reimburse their debt (or default)
The model
Households (2/2)

- Exogenous house price growth rate: \( r_{t+1}^h = \mu_t + \sigma \varepsilon_{t+1} \)

- Default proba:
  \[
  \text{Pr}\left\{ (1 + \gamma)p_t h \sigma \varepsilon_{t+1} \leq (1 + r_t)d_t - (1 + \gamma)p_t h \left[ 1 + \tilde{E}_{H,t}(r_{t+1}^h) \right] \right\}
  \]

- Debt demand \( d_t^H \)
  - decreases with interest rate, \( r_t \)
  - increases with expected future house prices, \( \tilde{E}_{H,t}(p_{t+1}) \), as they can then reimburse a higher debt in the future
The model
Banks and equilibrium

- Debt supply $d_t^B$
  - increases with interest rate, $r_t$ (increase profitability of loan);
  - increases with expected future house prices, $\tilde{E}_{B,t}(p_{t+1})$, as default proba then decreases (and expected collateral value increases);

- $d_t^H = d_t^B$ determines the interest rate on loans $r_t$

- An increase in $\tilde{E}_{i,t}(r^h_{t+1})$, $i = H, B$, increases debt $d$
The model
Expectations

- Exogenous house price growth rate: \( r_{t+1}^h = \mu_t + \sigma \varepsilon_{t+1} \)
- Postulated DGP: \( \mu_t = \mu + \phi(L)r_t^h \)
- Rational expectations: \( \tilde{E}_{i,t}(r_{t+1}^h) = E_t(r_{t+1}^h) = \mu_t \)
- Assume a form of “natural” expectations
  - Simplified dynamics: \( \tilde{E}_{i,t}(r_{t+1}^h) = \mu + \phi r_t^h = \tilde{\mu}_t \)
- Show it can generate persistently biased beliefs
  - effects of \( \varepsilon_{t+1} \) on \( \tilde{\mu}_t \) last more compared to effects on \( \mu_t \)
  - this can replicate the house price forecasts of a financial expert in early 2000
The model

Simulations

- Assume true DGP is AR(2) \( r_t^h = \phi(L)r_t^h + \sigma \varepsilon_t \) is an AR(2)
- Assume natural expectation is AR(1) \( r_t^h = \phi r_t^h + \sigma \varepsilon_t \)
- Estimate both models on annual data
- Pick up values for remaining parameters
- Simulate 10 years of data (recursively starting end-period \( T \))
Comments
Is “natural” irrational?

- Paper compare models ex-post using information criteria (goodness of fit)
  - AR(p) has a better fit than AR(1) model in-sample

- However, agents have to forecast in real-time
  - Is it the case that the AR(p) model beats the AR(1) model if you compare out-of-sample forecast performances?

- Actually isn’t it the case that an even simpler model (more “natural”?) \( \hat{E}_{i,t}(r_t^h) = r_{t-1}^h \) would do even better than AR(1)?

- Do all these statistical models beat the forecasts of the expert (supposed to be natural) out-of-sample?
Are observed forecasts irrational?

- Assume DGP is

\[ r_{t+1}^h = \mu_t + \Phi(L)X_t + \varepsilon_{t+1}, \quad \mu_t = \mu_{t-1} + \nu_t \]

- And that agent only observe a noisy version of the factors

\[ \tilde{X}_t = X_t + \eta_t \]

- So double problem: extract long-term from short-term fluctuations relying on noisy information about the true state
  - Andrade-Crump-Eusepi-Moench (2013): show this class of models captures a wide range of survey macro expectations’ characteristics (consensus, cross-section dispersion)

- It could rationalize the observed ex-post “bias” in beliefs without assuming agents use wrong models
What is the sequence of house price shocks that triggers the boom and bust in the model?

It would be interesting to show the default rate induced by the simulations

Discuss further the way rental cost and collateral that is recovered by banks are calibrated

An extension (other paper) where house prices are affected by biased beliefs (Burnside-Eichenbaum-Rebelo, 2013)?