Matteo Iacoviello (2005) - House Prices, Borrowing Constraints, and Monetary Policy in the Business Cycle

Robert Kirkby

UC3M

2011

Introduction

- This paper aims to quantify the importance of housing for the business cycle and monetary policy.
- Uses a New-Keynesian sticky-price framework.
- Housing is used as collateral for borrowing, and debt contracts are nominal.
- Model is then used to investigate some policy issues.

Based on IRFs from VAR of detrended real GDP (Y), change in the log of GDP deflator (π), detrended real house prices (q), and the Fed Funds rate (R), the model aims to replicate the following observations:

1. A negative response of nominal prices, real housing prices, & GDP to tight money.
2. A significant negative response of real housing prices & a negative but small response of output to a positive inflation disturbance.
3. A positive comovement of asset prices and output in reponse to asset price shocks and to output shocks. Taken together, these indicate a two-way interaction between housing prices and output.

- Economy populated by entrepreneurs and patient households, infinitely lived and of measure one.
- 'Patient' as they have lower discount rates.
- In addition there are retailers and a central bank.

Patient Households

Consume, work and demand real estate & money. Denoted with a prime.

$$E_0 \sum_{t=0}^{\infty} \beta^t (lnc'_t + jlnh'_t - \frac{1}{\eta} L'^{\eta}_t + \chi ln(M'_t/P_t))$$

$$s.t\ c'_t + q_t \Delta h'_t + R_{t-1} b'_{t-1}/\pi_t = b'_t + w'_t L'_t + F_t + T'_t - \Delta M'_t/P_t$$

Entrepreneurs

Produce a homogeneous good hiring HH labour & combining it with collaterizable real estate. This good is sold to retailers.

$$max E_0 \sum_{t=0}^{\infty} \gamma^t lnc_t$$

$$s.t.\ Y_t = A(h_{t-1})^{\upsilon}(L_t)^{1-\upsilon}$$

$$Y_t/X_t + b_t = c_t + q_t \Delta h_t + R_{t-1} b_{t-1}/\pi_t + w_t' L_t$$

$$b_t \leq m E_t[q_{t+1} h_t \pi_{t+1}/R_t]$$

where $\gamma < \beta$. The borrowing constraint will be made to bind in the steady-state (this would occour absent uncertainty).

Retailers

- Introduces sticky-prices via retailers.
- A continuum of retailers turn homogeneous output of entrepreneurs into differentiated goods.
- These differentiated goods combine to form a final good via a CES function.
- Thus, the retailers set markups, and yield a phillips curve.

Central Bank

- The central bank makes lump sum transfers of money to the real sector to implement a Taylor-type interest rate rule.
- $R_t = (R_{t-1})^{r_R}(\pi_{t-1}^{1+r_\pi}(Y_{t-1}/Y)^{r_Y}\bar{rr})^{1-r_R}e_{R,t}$
  where $\bar{rr}$ & Y are steady state real rate and output respectively.
- So the central bank reacts to past inflation and output, and allows for interest rate inertia.

Equilibrium

The eqm is an allocation $\{h_t, h'_t, L_t, L'_t, Y_t, c_t, c'_t, b_t, b'_t\}_{t=0}^{\infty}$ together with the seq of values $\{w'_t, R_t, P_t, P^*_t, X_t, \lambda_t, q_t\}_{t=0}^{\infty}$ satifyings the FOCs for optimization of the patient HHs, entrepreneurs, retailers, and central bank, and the market clearing conditions for labour ($L_t = L'_t$), real estate ($h_t + h'_t = H$), goods ($c_t + c'_t = Y_t$), and loans ($b_t + b'_t = 0$), given $\{h_{t-1}, R_{t-1}, b_{t-1}, P_{t-1}\}$ and the seq of monetary shocks $\{e_{R,t}\}$, together with the relevant transversality conditions.
Model is log-linearized around the steady-state and the resulting system of 9 eqns is solved using Harold Uhlig's Toolkit (Method of Unobserved Components). Some parameters are calibrated, some are estimated as the Taylor rule, and the rest are estimated by minimizing the distance of the IRFs in the VAR (R, π, q, Y).

The Transmission Mechanism of Monetary Policy

- Consider an interest rate increase. With sticky prices, monetary actions affect the real rate, and its increase works by discouraging current consumption and hence output.
- The effect is reinforced by the fall in housing prices, which leads to lower borrowing & lower entrepreneurial housing investment (Collateral)
- Debt deflation plays a role too: as obligations are not indexed, deflation raises the cost of debt service, further depressing entrepreneurial consumption and investment (Nominal Debt).
- Both of these together increase the effect of a one std dev (0.29% at quarterly interest rate) monetary policy shock from reducing output by 3.33% to 4.42%.

The Full Model

- To analyze policy, first the model is extended to include impatient HHs (which face borrowing constraints), and physical capital is added to entrepreurs production function.
- Collateral Effect: Changes in house prices (modeled as a shock to parameter j) now, due to the collateral value of housing, cause changes in output.
- Nominal Debt Effect: Allows matching the delayed response of output to an inflation shock. The increase in prices reduces the desired supply of goods at a given price level; at the same time it transfers wealth from the lenders to toward the borrowers, who, ceteris paribus, have a higher propensity to consume. These work in opposite directions, with the first effect later dominanting, giving a hump-shaped effect that eventually returns to the initial steady state.

Policy Implications

- Should the central bank react to house prices? Qualitatively yes, but the amount and improvement are both negligible.
- Does debt indexation reduce economic volatility? Actually it generall worsens it, as nominal debt contract improve central banks tradeoffs to supply shocks, and amplify effects of monetary policy changes.

Conclusion

- Collateral effects allow the model to match the positive response of real spending to a housing price shock.
- Nominal debt allows the model to accurately replicate the sluggish dynamics of real spending to an inflation suprise.