

Housing and Liquidity, by He, Wright and Zhu

In *Housing and Liquidity*, Chao He (Hanqing Advanced Institute of Economics and Finance at Renmin University of China), Randall Wright (University of Wisconsin-Madison and NBER) and Yu Zhu (University of Wisconsin-Madison) study economies in which houses play multiple roles. They provide direct utility; they can yield capital gains or losses; and they are assets that can facilitate credit transactions via home equity loans. This third function, the collateral role of housing, implies that the equilibrium house price can bear a liquidity premium: people are willing to pay more than the fundamental value (equal to the discounted utility of living in the house forever) because home ownership provides security in the event one needs a loan. Since liquidity is at least partly endogenous, and depends on beliefs, even when fundamentals are deterministic and time invariant house prices can display complicated patterns in equilibrium, some of which resemble *bubbles*.

Intuitively, one might say housing has a certain *moneyness*, in the sense that it, like currency, ameliorates trading frictions. Yet houses are also different from money as one usually uses the term – e.g., on the supply side, in contrast to currency houses are produced by profit-maximizing agents; and on the demand side houses generate direct utility, while cash does not. Still, housing has a certain moneyness, or provides liquidity services. Given this, one might expect that house prices could potentially display some complicated equilibria, as in some models of fiat currency. Note also that this does not require households necessarily take out home equity loans all the time – they are willing to pay for the option to do so (a precautionary demand for liquidity). The authors endeavor to make these ideas precise and study their implications. In particular,

they construct a natural and simple model of the housing market, and show that once one takes into account liquidity, it is possible to generate some rather exotic equilibria, including cyclic, chaotic and stochastic price paths.

This seems interesting for several reasons. First, it is commonly heard that there can be bubbles in house prices, that this was the case in the US over the last decade, and that the bursting of the bubble led to all kinds of economic problems. Yet there seems a shortage of serious models of housing markets that yield bubble-like equilibria, especially if one does not want to abandon some of the fundamental assumptions of standard economic theory, like rationality, or at least rational expectations. This paper asks how far we can get without recourse to nonstandard assumptions, simply by including liquidity considerations. Also, the paper argues that home equity loans may be an interesting phenomena worth more attention in our study of housing markets, in general, and recent experience, in particular.

The authors document that since 2000 there was a tripling in the use of home equity loans. In less formal theory this has been recognized as interesting – e.g., Reinhart and Rogoff contend financial innovation allowed consumers “to turn their previously illiquid housing assets into ATM machines;” and Ferguson says this “allowed borrowers to treat their homes as cash machines,” reporting that between 1997 and 2006, US consumers withdrew an estimated \$9 trillion from home equity. The facts described in the paper can be summarized as follows: coinciding with the start of the house-price boom, there began a sizable increase in the real value of home equity loans, along with an increase in housing investment (construction); later prices drop fast, and investment falls, while home equity borrowing stays fairly high. The paper argues financial development led

to a bigger role for home equity in credit markets, this fueled an increase in housing demand, and that led to an increase in prices in the short run and quantity in the long run.

The paper then shows how to generate equilibria qualitatively, and to some extent quantitatively, consistent with experience. The authors also present a version of their model with money and banking, to study the interplay between housing and monetary policy. They find that inflation has a nonmonotonic effect: at low inflation rates, house prices and inflation move in the same direction; for medium inflation they move in opposite directions; and for high inflation they are independent. The authors also show their results are robust to using various ways to determine the terms of trade in the model, including strategic and axiomatic bargaining, as well as competitive price taking. And they show their predictions go through with exogenous credit limits, as assumed in many papers, as well as in the more interesting case where credit limits are endogenous.

Heuristically, suppose one believes that house prices tomorrow will be high. Then one can relax one's borrowing constraints in the future with less collateral, in terms of physical housing, and this reduces the current demand for houses. Thus, high prices tomorrow are consistent with low prices today. Then tomorrow, if one believes prices will be low the next day, it takes more physical housing to generate the same liquidity. Thus, low prices in the future are consistent with high current demand and hence high prices. Of course one has to take into account the service flow from housing as well as capital gains or losses, to determine the price, but this little example illustrates that houses, like any other asset that derives at least part of its worth from its liquidity, have a tendency

towards oscillations: high prices in one period are consistent with low prices next period, and vice versa, simply as a self-fulfilling prophecy. This is true despite the fact that there always exists a unique steady state. So prices *may* fluctuate, but need not.

This tendency is illustrated in its simplest form by a 2-cycle, where the price oscillates between ψ_1 and $\psi_2 > \psi_1$. Explicit examples are presented with 2-cycles and higher-order n-cycles. Some results from dynamical systems theory tell us that if one can find a 3-cycle, as the authors do, then there exist cycles of all orders, as well as chaotic dynamics where ψ_t evolves over time in such a way that $\psi_t \neq \psi_s$ for all $t \neq s$. So housing market equilibria can be quite complex, even in simple models. There are also equilibria where prices rise for several periods in a row, in classic bubble fashion, before collapsing. Such equilibria are constructed assuming not only rational expectations, but the limiting extreme of perfect foresight. However, in these equilibria the capital gain is bounded below the rate of time preference, counter to what we seem to see in some data. The authors address this by constructing stochastic (sunspot) equilibria, in which ψ_t varies randomly over time even though fundamentals are constant. In these equilibria the *expected* capital gain is bounded below the rate of time preference, but it is possible to have realizations in which realized capital gains exceed the rate of time preference for several periods in a row.

The above examples were constructed with a fixed stock of houses in the model. Once they introduce an endogenous supply of houses, the authors ask how well their model might account for the US housing market over the last decade. They consider two experiments. In the first, parameters are chosen so the model exhibits a classic indeterminacy: there are very many paths from

some initial conditions leading to the steady state. Suppose financial innovation is modeled as a one-time unexpected increase in the credit limit implied by a given value of home equity, D_1 . After a change in D_1 the authors select from the large set of equilibrium transition paths to the new steady state one that resembles the data. At least qualitatively, they find paths that "fit" reasonably well. In the second experiment, parameters are chosen so there is a unique path from initial conditions to steady state, and they calibrate a dynamic financial innovation by matching observed values of D_1 year by year. They ask how well this matches experience. The answer is that equilibrium again looks like the data qualitatively, but this 'fundamental' explanation accounts for only about 15% of actual price appreciation.

The point of the paper is not to provide a single explanation based on one idea, but to explore various ways in which dynamic economic theory can be brought to bear on the issues. One particularly relevant point is that, in the experiments with financial innovation, the representative household is actually *better off* after the innovation, even though the market displays a classic bubble pattern, with a price runup followed by collapse. It is true that this is only an example, but it calls into question the common suggestion that bubble-like outcomes are necessarily bad. Future work may try to take these models more seriously in a quantitative sense; this work has established that complicated dynamic patterns can emerge in simple, stationary, deterministic models of the housing markets, and some of these resemble experience in terms of the behavior of home equity loans, prices and construction.