Sunspots and self-fulfilling beliefs in the U.S. housing market ☆

Masanori Kashiwagi *

National Taiwan University, 21 Hsu-Chow Road, Taipei 10055, Taiwan

A B S T R A C T

This paper provides a rational expectations equilibrium framework to organize the following observations about the U.S. housing market from 1975 to 2007: (i) housing occupancy patterns were approximately constant, (ii) rents were stable, and (iii) house prices appreciated considerably in the late 1990s. I develop a model based on search and matching theory and close it by specifying a state of household confidence that is assumed to take one of two sunspot-driven values: normal or exuberant. The model generates a substantial increase in house prices and stable rents as the probability of the exuberant state increases, driven by self-fulfilling beliefs. I explore which aspects of the parameterization are important for generating a large appreciation in house prices in the model.

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1. Introduction

This paper explains the recent boom in U.S. house prices as a sunspot phenomenon in a rational expectations equilibrium framework. Among the total housing units, the shares of rented, owned and vacant units were approximately constant over time between 1975 and 2007. Rents were stable during the period. By contrast, house prices grew rapidly from the late 1990s until 2006. Applying ideas developed in search and matching theory, this paper presents a simple model that accounts for these facts.

In the search and matching model, the meeting of traders creates a surplus that must be divided between them. As Howitt and McAfee (1987) point out, this leads to a situation with fewer equations than unknowns. Consequently, the model displays indeterminacy of deterministic equilibria. Most of the literature resolves the indeterminacy by assuming Nash bargaining with a fixed bargaining weight. This paper, however, takes a different route. As suggested by Farmer (2012),

* Fax: +886 2 2351 1826.
  E-mail address: mkashiwagi@ntu.edu.tw.

I close the model by assuming that confidence selects an equilibrium.[1] Confidence, in my model, may take two values that I refer to as normal or exuberant.

Although the paper focuses on two of the deterministic equilibria, their set is much larger. There is a continuum of deterministic equilibria, each associated with a different division of the surplus between the buyer and the seller of a house. I choose to select just two of these underlying deterministic equilibria because I am interested in this paper in matching the data using a stylized model. I am motivated by the fact that there were small fluctuations in rents and housing occupancy patterns in the U.S. data, which suggests that most of the time the economy is in what I call a normal deterministic equilibrium.

I model a non-stationary increase in house prices that is triggered by increasing confidence among buyers and sellers that the economy is likely to move from the normal state to the exuberant state. In effect, I am modeling a non-stationary equilibrium as a sunspot in the sense of Cass and Shell (1983).

Sunspots work as a signal that coordinates actions and moves the economy by affecting the likelihood of the exuberant economy occurring. I treat the random arrival of news as a sunspot. While the economy is likely to be in a normal state most of the time, news may signal the possibility that an exuberant state is likely to occur. After receiving such news, people obtain incremental evidence about the likelihood that it is true. As news arrives randomly, it progressively drives the economy toward the exuberant state. Alternatively, households may receive a signal that the news was incorrect, which triggers a collapse back to the normal state. This randomization by sunspots creates multiple states that are associated with the likelihood of the exuberant state occurring. Note that in the sunspot equilibrium constructed in this paper, the economy does not jump instantaneously between the two underlying equilibria.

House prices increase as the economy moves closer to the exuberant state. Nevertheless, the exuberant state has not been observed in the data. To explain this fact, I argue that the economy experienced a crash before reaching it. This paper explains the recent housing market boom using a framework where news drives prices. I provide an equilibrium framework to support a non-fundamental account of the observed appreciation in U.S. house prices where a substantial house price appreciation is driven by self-fulfilling beliefs[2] as part of a rational expectations equilibrium.

As a robustness check, I investigate which aspects of the parameterization are important to generate a substantial house price appreciation. I find that the surplus sharing rates in the two deterministic equilibria and the extra utility from owning a house play key roles. I consider various alternative choices for normal and exuberant surplus sharing rates and study their quantitative implications.

In the model, self-fulfilling beliefs account for stability in rents and a large appreciation in house prices. Regarding housing occupancy patterns, I assume that there is a fixed housing supply and that housing occupancy patterns evolve according to exogenous shocks and an exogenous matching technology. These modeling assumptions imply constant quantities[3] independent of beliefs and they make the framework simple and tractable. To support the fixed housing supply assumption, I compare the benchmark model with a model with the free entry of housing units and argue that the version of the model with fixed housing supply can generate realistic price dynamics, while the model with free entry cannot.

It might be argued, as an alternative explanation, that the large appreciation in house prices was due to an increase in real income associated with economic growth. An increase in household income leads to more spending on housing services. To control for this explanation, I deflate nominal prices by nominal income. The proposed house price series still exhibits a surge from the late 1990s, and the rent series deflated in this way is still stable.[4]

Section 2 of this paper reviews the literature. Section 3 documents three observations regarding the U.S. housing market from 1975 to 2007. Section 4 presents a theoretical model and its analytical properties. Section 5 discusses quantitative results and shows that recent house price boom can be characterized as a rational expectations equilibrium. Section 6 conducts sensitivity analyses. Section 7 concludes the paper.

2. Related literature

The model in this paper is an extension of a line of work that applies ideas developed in the labor search literature (e.g. Mortensen and Pissarides, 1994) to the housing market. The pioneering work using this approach is Wheaton (1990), who studies the homeownership market and discusses comparative statics. Subsequent work in this area includes Williams (1995) and Krainer (2001).

Among recent studies on the quantitative implications of search models of the housing market, this paper's focus is related to Piazzesi and Schneider (2009), who use a search model to examine the influence of a small number of optimistic traders on house prices. The authors model the surge in house prices as a one-time shock to the beliefs of a small fraction of households and generate the transition of prices back to the original steady state. Burnside et al. (2011) present evidence

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[1] Hall (2005) is another example of a different approach from Nash bargaining with a fixed bargaining weight. He uses wage stickiness as an equilibrium selection mechanism to resolve the indeterminacy.

[2] In this paper, I use the terms sunspots and self-fulfilling beliefs (prophecies) interchangeably, as in Farmer and Guo (1994).

[3] Throughout this paper, by quantities I mean measures of renters, homeowners, vacant units, houses on the rental market, and houses on the ownership market relative to the number of households.

[4] In addition, Glaeser and Gyourko (2007) consider observable fundamentals, including amenities, income and interest rates, and argue that it is difficult to account for large house price volatility with these fundamentals.