MODELS OF HOUSEHOLD DYNAMICS AND RELOCATION

SEARCH AND MOBILITY IN A HOUSING MARKET WITH LIMITED SUPPLY

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Abstract

In this paper, a non-linear dynamic model is presented for a housing market in which various types of households and dwellings are distinguished. The model is based on a stock-flow framework, in which households have to cope with incomplete information when searching for dwellings. The model includes life-cycle patterns (social mobility, ageing) as well as stochastic dwelling preferences. Simulations are carried out with the model to investigate its properties (existence of stationary states, etc.) under various conditions of housing supply. Special attention is paid to vacancy rates, duration of residence, and length of vacancy chains.

1. Introduction

Housing markets in many European cities are characterized by strong government intervention in the form of price controls, subsidies, zoning, etc. This is one of the reasons why disequilibria are frequently observed on the urban housing market as a whole and its various submarkets; these disequilibria manifest themselves in queues of households waiting and searching for better dwellings on the one hand, and vacancies on the other. In order to be able to describe these phenomena, models of housing markets need to be developed which take these disequilibria into account explicitly. In the present paper some steps in that direction will be taken.

Housing market research during the last decade has been focussed on residential location models using discrete choice theory and random utility models as a point of departure [3]. This has given rise to a strong micro bias and also a demand side orientation. In the present paper an effort is made to study urban housing markets from a meso perspective. An integral picture of a dynamic market where households enter, change in size and finally disappear will be given. Housing supply is heterogeneous and families of different size and social class will have different preferences. The model accordingly describes the housing market “career” of a household during its life-cycle.

In the model vacancy chains are taken into account since each moving household leaves a vacant dwelling that may be occupied by another household in the next period. The usual way of dealing with vacancy chains is by means of
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Markov models [7]. Our model is not a standard Markov model, however, since it follows from the specification that the transition probabilities are not constant. These probabilities depend on the stock variables in the housing market, so that a non-linear dynamic system is obtained. Consequently, existence, uniqueness and stability of an equilibrium solution are no longer self evident [5].

The present model bears some resemblance to a dynamic stock-flow model developed by Weibull [12]. Like Weibull, we deal with the housing market as a system of interrelated submarkets that usually will be in a state of permanent disequilibrium (i.e., no Walrasian equilibrium will appear in a stationary state). The present model, however, gives a more detailed picture of the dynamics of the households. Arias and Cho [1] also deal with (a partially) regulated housing market, but do not deal explicitly with household dynamics. In the present model prices do not play an explicit role. The market is assumed to be fully regulated: dwellings are rented and rents are assumed to be fixed.

Section 2 of the paper is devoted to the presentation of a simple version of the model in which N types of dwellings are distinguished and households are assumed to be homogeneous. Existence, uniqueness and stability of the equilibrium solution will be discussed. In section 3 this model will be extended by relaxing the assumption of homogeneous households. Different sizes of households will be distinguished and life-cycle phenomena are taken into account. In this extended model households may move, either because they found a dwelling which is more attractive than the present one (their class being unchanged) or because they recently entered another class so that their preferences and possibilities have changed. Section 4 is devoted to an illustration by means of numerical simulation experiments. Section 5 contains some concluding remarks.

2. Basic Model

This section is devoted to the presentation of a simplified model in which there is only one type of household, while there exist N types of dwellings. All households have the same preference-ordering with respect to these types of dwellings. If they are not able to occupy a dwelling of the most preferred type, they will for some time accept a less preferred one and move from there to higher preferred types. As long as they do not occupy a dwelling of the most preferred type they continue to search.

Total population is assumed constant, but in each period some households disappear, while new ones are formed. Starting households initially do not occupy a dwelling; vacancies occur because of disappearing households. In the models that will be discussed in this paper, starting households include both newly formed households and immigrating ones. Similarly, disappearing households include terminating as well as outmigrating households.

2.1 Some definitions and identities

There are N types of dwellings. Type 1 is most preferred, type N is least preferred. The number of dwellings of each type is denoted as \( W_n \) \( (N=1,\ldots,N) \). The total number of dwellings is \( W \):

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W = \sum_{n=1}^{N} W_n > 0 \text{ for } n=1,\ldots,N
\]