Hot Housing: A Study of Bidding Strategies in the Dutch Urban Residential Market

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Abstract. Agent-based models have been used successfully to study local and national housing markets. We consider the residential property market for a prototypical city in the Netherlands. The Dutch housing market is in boom, and various bidding strategies and outcomes are reported in the media. In this paper we examine three classes of bidding strategies, situated within the norms and legal framework of the Dutch market. Preliminary results indicate buyer strategies that open with an initial bid above the list price are the most direct route to a winning bid.

1   Introduction and Background

The prices of houses on the residential real estate market has implications for the economy of a city, region and country. At the time of writing, the Netherlands has witnessed increasing property prices for five years, and forecasts expect prices to continue rising [10], especially in the major cities. Whereas a decade ago, a buyer could secure a house with a bid below the list price, often without competition, today buyers engage in fierce bidding wars for a property.

Agent-based models (ABM) are a common tool for studying micro-to-macro effects [2]. Models for the housing market use various methodologies. These include models derived from asset pricing theory, trade theory, hedonic price theory, prospect theory, and the business cycle [4]. However the application of ABM to the housing market is surprisingly uncommon. Some notable ABMs are Magliocca et al. [9], Gilbert et al. [5], Filatova et al. [3], and Ge et al. [4].

Historically in the USA, bidding wars occurred in only around 4% of house purchases. Models therefore treated the list price of a property as a ceiling price. By 2005, bidding wars occurred in more than 30% of USA housing transactions [6]. We assume that other markets where demand has been increasing – such as Amsterdam – are likely to see a similar increasing percentage of bidding wars.

This paper thus studies bidding strategies in the context of the norms and legal framework of the Dutch property market. We develop a ABM of the residential market in a prototypical Dutch city, building on the formulation of previous ABMs. Our emphasis is on the strategy that a potential buyer can practice. We consider three classes of strategies, with deliberately over-bidding, under-bidding, or list-price bidding as the opening bid. Preliminary results from the simulation,

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implemented in NetLogo [11], indicate that buyer strategies that open with an initial bid above the list price are the most direct route to a winning bid.

2   Agent-Based Model

High-level design. Following Han et al. [6], the ABM is formulated as a sequential bidding model: a seller selects and deals with one bidder at a time.[3] Following Horowitz [8], we assume that in a bidding war, the seller of a property might not be able to – or necessarily wish to – assemble all bids that could be made before accepting one, and therefore the seller may accept a bid by a certain deadline. We assume that buyers bid for houses without knowledge about the other bidders. This reflects the sealed bid model common in the Dutch market. We allow buyers to enter an ongoing negotiation for a property, provided the negotiation has not yet reached a successful outcome.

Agents. The design and variables of the agents take their precedent from Gilbert's early ABM study of the UK housing market [5]. We model the city as a grid of roads and houses, as shown in Fig. 1; this kind of urban topography is quite common in modern Dutch cities. There is one class of agent, 'owners'; each agent represents a household. The agent can be currently occupying a dwelling, or be currently in temporary housing. Those agents currently occupying a dwelling might be looking for a new property; those currently (temporarily) homeless are certainly looking for a property. Agents have a fixed income; incomes and initial capital are set according to Dutch census data, and initial house prices are derived from the Dutch statistical bureau [1].
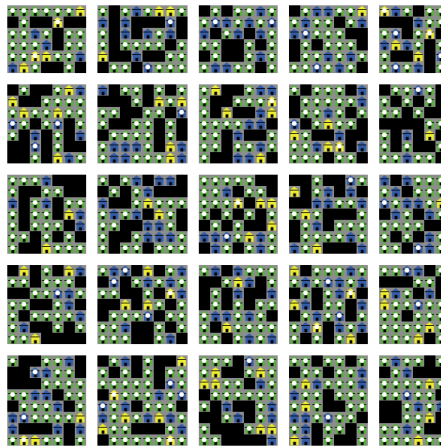

Fig. 1. City visualisation. Colour denotes house status; white denotes owner-occupier.

Processes. Each cycle of the ABM represents one month: two weeks for the owners to set their houses for sale and buyers to assess which house to bid on (if any), and two weeks for one negotiation cycle on each property under offer. The flow of the model is as follows:

 – Annually, new potential owners arrive in the city and some leave the city.
 – Agents that live in a house that is either above or below their income level set their house for sale and look for a new house. Other agents might decide to move with a random probability.

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[3] Indeed, under Dutch law, a seller cannot simultaneously negotiate with two bidders, although she may break off and return to negotiation with any bidder.

- Agents without a house get priority in entering a negotiation with a seller. After that, remaining agents can join negotiations.
- In the first negotiation cycle after a property comes onto the market, a list price and initial offers are made by the seller and the bidders respectively.
- The seller accepts the highest bid within a price gap to her requested price. We model non-fiscal bidding factors by allowing the seller to accept a non-highest bid with a small probability.
- If an agreement is reached, the seller moves out and the buyer moves in. If no agreement is reached on this negotiation cycle, the seller and bidders revise their bids; bidders either bid higher or drop out from the negotation. If however the negotiation has taken too long (too many cycles), then the negotiation will be aborted although the house remains on the market.
- A winning agent without sufficient capital to make the purchase obtains a mortgage. We assume a fixed mortgage rate and loans up to 100%, in line with the Dutch norm. Agents require minimal capital levels to buy or sell, e.g., for taxes that must be paid.
- Agents can own more than one property, although occupy only one at a time. To avoid property accumulation, any second house owned by an agent must be for sale: i.e., an agent can buy before she sells, but then must sell the other property. We allow agents to have negative capital while their second house is on the market.

Bidding strategies. While there is interest in seller strategies for pricing a property and selecting which bid to accept, our focus so far is on the buyer strategies. The motivation for considering three classes of strategies, with deliberately over-bidding, under-bidding, or list-price bidding as the opening bid, come from Han and Strange [7], who find the list price has an important anchoring effect.

3   Preliminary Results

We explore three hypotheses, based on 25 runs of the ABM for a simulated period of 100 years. This period is deliberately long for exploratory purposes; we ignore all longer-term factors such as employment.

H1: Initial over-bidding on the list price results in a higher success rate. The mean success rate of over-bidding is 55% versus 47% for no specific strategy (and 42% for under-bidding).

H2: Initial overbidding on the list price results in a shorter negotiation cycle. The mean number of negotiation cycles is 6.60 with over-bidding and 6.71 with no specific strategy.

H3: Under-bidding on the list price has more success when the amount of competitors for the same house is low. We analyse the correlation between the success rate and the number of competing buyers in the negotiation. Pearson's correlation test reports a correlation of -0.23.

4   Future Directions

This work brings to the ABMUS workshop an agent-based study of a contemporary phenomenon: bidding wars for residential property in a heated housing market. We focus on the norms and legal framework current in the Netherlands. Preliminary results indicate that buyer strategies that open with an initial bid above the list price are the most direct route to a winning bid, and support hypotheses linking under-bidding and the number of bidders and over-bidding and the length of the negotiation cycle.

Besides re-considering the simplifications of the housing market made, our work in progress is first, to study a wider range of seller and buyer strategies. Second, to study variants of the bidding process, including non-sequential bidding and different auction mechanisms. Third, to consider when multiple buyers can negotiate on multiple properties simultaneously. Lastly, to model demographic differences between buyers and longer-term economic factors.

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