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Motivated sellers and predation in the housing market

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ABSTRACT

We develop an equilibrium search model of the housing market where sellers may become distressed as they are unable to sell. A unique steady state equilibrium exists where distressed sellers attempt liquidation sales by accepting prices that are substantially below fundamental values. During periods where a large number of sellers are forced to liquidate customers exhibit 'predation': they hold off purchasing and strategically slow down the speed of trade, which in turn causes more sellers to become distressed. The model naturally suggests several proxies of liquidity. Interestingly, the average time on the market (TOM), one of the most frequently used statistics in the literature, does a poor job within the context of liquidation sales and predation. Specifically we show that TOM falls during periods of predatory buying, which, if interpreted on face value, indicates that the market becomes more liquid with predation. We propose an alternative proxy – the profit loss in fire sales – which appears to be a more robust measure of liquidity than TOM.

1. Introduction

Selling a house involves a long and non-trivial search process where the home seller faces a trade-off between the price and the time to sale. With sufficient time and no pressure to sell immediately, a seller can afford to wait to receive a price commensurate with the market value. However, due to factors such as bankruptcy, job loss, foreclosure, relocation, divorce etc. some sellers become 'distressed' and attempt to quickly sell and exit the market.

The presence of distressed sellers seems to affect buyers' purchasing behavior as well. During the recent housing crisis, for instance, where presumably a large number of sellers became distressed, buyers exhibited what can be termed as 'predation'. Despite falling prices customers were reluctant to purchase — appearing to be strategically delaying purchasing in an effort to obtain even better deals.

Based on these observations we develop an equilibrium search model of the housing market with two distinctive features. First, buyers' willingness to pay is private information and more importantly, second, sellers may become distressed, or 'motivated' in real estate parlance, as they wait to sell. We show that in equilibrium, financially distressed sellers accept prices substantially below fundamental values and consequently sell faster than regular sellers (liquidation sales). The more painful the shock, the lower the sale price and the quicker the sale.

Moreover, during periods where many sellers encounter financial distress (e.g. a crisis or recession) the following occur. First, the number of liquidation sales rises. Second, all sellers, regular and distressed, drop their prices. And most importantly, third, buyers exhibit predation: they become more selective and hold off purchasing despite the abundance of distressed sales and lower prices. By doing so, customers strategically slow down the speed of trade causing more sellers to become distressed, which in turn, exerts more pressure on sellers forcing them for further price cuts, and so on. From buyers' point of view such behavior is optimal as it allows them to acquire better houses at lower prices, but from sellers' point of view it is the worst possible outcome. Indeed, for distressed sellers liquidity disappears when it is most needed.

The model naturally suggests several proxies measuring liquidity from different angles. Curiously, though, the expected time on the market (TOM) – one of the most frequently used and referenced statistics in the literature – does a poor job in this context. We show that TOM falls during periods of predatory buying, which, if interpreted on face value, indicates that the market becomes more liquid with predation. We propose an alternative proxy, the profit loss in liquidation sales, which appears to be a more robust measure than TOM.

Finally, the model provides simple and intuitive answers to two puzzles raised by Merlo and Ortalo-Magné (2004). Based on a unique data set of individual residential property transactions in England, the authors document that about 2/3 of sellers do not change the listing price at all, while remaining sellers revise the listing price at least once (typically once). The fact that some sellers revise the listing price while others do not and that price revisions are infrequent and sizable are in stark contrast to the predictions of most existing theories in the housing market. In addition, based on the same data set the authors document a negative correlation between the sale price and the duration of the sale — the longer the time on the market, the lower the

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sale price. This fact, again, is inconsistent with most of the existing theoretical models.

According to our model some sellers revise the listing price while others do not, simply because some sellers become distressed while others do not. The revision occurs only once (when the shock hits) and it can be sizable if the shock is severe. The negative correlation is also easy to explain. Properties sold soon after the listing date are most likely 'regular sales'. Sellers of such properties are unlikely to become distressed within a short period of time. Sales taking place long after the listing date are most likely 'distressed', because the longer a seller waits, the more likely he is to become distressed. Since distressed sales occur at lower prices, the aforementioned negative correlation follows.

When constructing the model what we had in mind was the housing market, however the model is applicable in other settings characterized by (i) search frictions, (ii) informational asymmetry between buyers and sellers and (iii) the prospect of becoming distressed. As an example, consider the over the counter (OTC) markets; in particular markets for mortgage-backed securities, bank loans and derivatives among others. These markets share all three of the aforementioned characteristics. Indeed, search is a fundamental feature in many OTC markets, just as it is in the housing market, as it is difficult to identify a counterparty with whom there are likely gains from trade. Similarly informational asymmetry between buyers and sellers is a prevalent feature of the OTC markets as buyers' valuations are private information and it is not uncommon at all for parties to simply walk away without trading. Finally, traders may become financially distressed due to, for instance, pressing debt obligations, nearing margin calls, hedging motives or being caught in a "short squeeze". The model, therefore, is potentially applicable in this setting as well and anecdotal evidence suggests that the main results of the paper (fire sales and predation) indeed hold true in the OTC markets.[1]

This paper belongs to a literature that studies the housing market using search theory, e.g. see Yavas and Yang (1995), Krainer (2001), Wheaton (1990) and Albrecht et al. (2007), among others. The paper by Albrecht et al. is perhaps the closest to our model in terms of motivation and setup; however, it is based on complete information while ours is based on incomplete information. This difference is crucial because incomplete information is key in obtaining the predation result.

The paper proceeds as follows. In the next section we lay out the model. Section 3 presents the predation result, Section 4 discusses prices, Section 5 discusses liquidity and Section 6 concludes.

2. Model

Time is continuous and infinite. The economy consists of a continuum of risk neutral buyers and sellers. Each seller is endowed with a house and each buyer seeks to purchase one. Buyers and sellers differ in terms of their intrinsic preferences towards ownership of a house, which creates the incentive to trade. For simplicity, we assume that the utility to the seller from keeping the house is zero. Buyers on the other hand receive periodic dividends (housing services) starting at the period after the purchase of the house and continuing forever. Following the asset pricing interpretation, we assume that the value of a house is captured by the discounted sum of the future dividends.

Sellers' personal circumstances may change for the worse if they are unable to sell for too long a period. All sellers enter the market in regular circumstances, though, eventually as they are unable to sell they might be hit by an idiosyncratic shock and become motivated or distressed. The adverse shock arrives at an exogenous Poisson rate $\mu>0$ and may be associated with difficulties, financial or otherwise, forcing sellers into early liquidation. Regular and distressed sellers differ in terms of their time preferences. Buyers and regular sellers discount future utility by $(1+\delta)^{-1}>0$, whereas distressed sellers are more impatient and discount the future by $(1+\overline{\delta})^{-1}<(1+\delta)^{-1}$, which means that $\overline{\delta}>\delta$. Sellers do not exit the market until they sell and a distressed seller remains distressed. The parameters of interest are the frequency of the shock, μ, and the severity of the shock, $\overline{\delta}$.

Transactions are bilateral and involve a non-trivial search process. At any point in time buyers and sellers meet each other at a constant Poisson rate $\alpha>0$.[2] Upon inspecting the house, a buyer realizes his own valuation of the house $v\in[0,1]$, which is a random draw from the unit interval via c.d.f. $F(v)$. Buyers are identical in the sense that their valuations are generated by the same random process, however they may differ in their valuations for any particular house. This specification captures the notion that different buyers have different tastes and preferences and, therefore, will have different reservation prices. The realization of $v\in[0,1]$ is match specific, so when buyers search they in fact search for a high v. We assume that v is time invariant; so, once a buyer finds and purchases a house with a sufficiently high v then he continues to enjoy the same v forever. We impose log-concavity on the survival function, which is a crucial technical assumption to obtain several key results in the paper.[3]

Assumption 1. The density function $f(v)$ is strictly positive, whereas the survival function $S=1-F$ is log-concave, that is

$$f^2(v)+f'(v)S(v)>0, \forall v.$$

The realization of v is unobservable to the seller. The seller only knows the c.d.f. F generating v, so, he advertises a *list price l*, trading off the probability of sale with revenue. The *sale price* $p(l)$, depends on the list price but may involve a non-trivial renegotiation process (more on this later). If agents agree to trade at price p then the seller receives payoff p; the buyer receives dividends v starting at the beginning of the next period and continuing forever; both agents leave the search market and are replaced by a buyer and a regular seller. The replacement assumption is standard in the literature; it is needed to maintain stationarity. Agents who do not trade receive a period payoff of zero and continue to the next round to play the same game.

2.1. Sale price

In the housing market, transactions rarely occur at the list price; the sale price typically involves a hard bargain between the buyer and the seller. We are not particularly interested in how agents interact with each other as they negotiate, so we treat the renegotiation mechanism (be it Nash bargaining, strategic bargaining or even some esoteric price formation procedure) as a black box; however, we specify some mild properties that the resulting sale price ought to satisfy. As long as the renegotiation mechanism satisfies these properties our results go through. More formally, let $G\langle l,\alpha\rangle$ denote an extensive form game that induces some expected sale price $p(l)$: $[0,1]\rightarrow[0,1]$ for any given list price l and contact frequency α.

Assumption 2. The sale price $p(l)$: $[0,1]\rightarrow[0,1]$ is an increasing and differentiable function of l.

[1] For an application of search theory in OTC markets see Duffie et al. (2005) for predation in financial markets see Attari et al. (2005), Brunnermeier and Pedersen (2005) or Carlin et al. (2007), Ozcan et al. (2012) among others.

[2] What we have in mind is a Mortensen–Pissarides style random matching function where arrival rates are functions of the market tightness (buyer–seller ratio). Typically, one assumes different measures of buyers and sellers so that arrival rates for buyers and sellers may vary. However, to avoid excessive parameterization, we simply assume equal measures, which means that agents meet each other with the same rate α.

[3] Log-concavity of the survival function is equivalent to the ratio of the density to the survival being monotone increasing and many well known distributions including Uniform, Normal, Exponential, χ^2 satisfy this property. See Bagnoli and Bergstrom (2005) for more details.