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Hedging house price risk in the presence of lumpy transaction costs ☆

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Abstract

This paper presents a life-cycle model of housing demand with uncertain house prices and lumpy transaction costs. The paper extends the (S, s) methodology to a non-stationary discrete time framework with multivariate stochastic price processes. This allows the characterization of a self-hedging mechanism in an incomplete housing market: households use earlier accumulated housing wealth to hedge against future housing cost risk. As a result, the direction of the effect of price uncertainty on housing demand depends critically on households' future housing consumption plans. When price uncertainty increases, households consume (and thereby invest in) less housing if they plan to realize the housing wealth gain. However, they will instead take a larger housing position if they plan to move to a bigger home in a correlated housing market in the future.

JEL classification: C61; D81; R21

Keywords: Housing demand under price uncertainty; Hedge; Life cycle

1. Introduction

This paper examines the effects of house price uncertainty on housing demand in a life-cycle framework. The study is motivated by the following considerations. First, for most households in the United States, housing is not only an important consumption good, but also the dominant financial asset in their portfolio. Second, like other financial assets, housing has substantial price risk. For example, as shown by Glaeser and Gyourko (2006), the standard deviation of three-year real changes in the average American metropolitan area house prices is $26,354 (in 2000 dollars), about one fifth of the median price level. Yet, unlike the markets for other financial assets, the housing market is highly incomplete (Englund et al., 2002). In addition, housing transactions involve large lumpy transaction costs (Haurin and Gill, 2002), which make it costly for households to adjust their housing positions in response to price risk. This paper asks how households make home purchase decisions in the presence of lumpy transaction costs, and how house price uncertainty affects their home purchase decisions and welfare.

To answer these questions, the paper presents a life-cycle housing demand model with stochastic house prices and lumpy transaction costs. The model follows the traditional (S, s) framework in which at each point in time households choose whether to transact and how much to purchase if transacting. The traditional (S, s) rule, as applied to durable goods by Grossman and Laroque (1990), requires an assumption that the optimization problem can be reduced to a problem with a single state variable. Although this assumption is convenient and useful in many (S, s) applications, it rules out interesting cases like models with multiple stochastic price processes. For example, households could benefit by recognizing the positive correlation between sequential home purchases and increasing housing demand to self-hedge against house price risk. This paper extends the traditional (S, s) approach by considering a finite horizon discrete time framework and by modeling multivariate house price process. In particular, house prices are correlated both over time and across markets. This allows us to confirm the hedging intuition in an intertemporal setting and to

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model the important role of households' expected future housing consumption plans when explaining the effects of house price uncertainty on housing demand.

To illustrate the sort of hedging, suppose a young couple plans to purchase a condominium now and to move into a single family house later. In a volatile housing market, both the condominium price and the single family house price are uncertain. According to classical economic theory, uncertainty adds to the risk associated with future housing capital gains. It therefore discourages their investment in the condominium. Thus, the risk averse couple would either delay the condominium purchase or purchase a smaller condominium. This is referred to as the effect of housing wealth risk.[1] However, the empirical observation indicates that the average within-metropolitan-area correlation between condo condominium prices and single family house prices is 0.9195.[2] The positive correlation between the condominium price and the single family house price implies that the ability to hold a condominium now and sell it in the future to finance a single family house has positive economic value. This value is often referred to as a real hedge. Like a financial hedge that allows one to purchase a security whose return is positively correlated with the cost of other future desired assets, a real hedge provides high returns when the future price of the single family house is high, and vice versa. House price uncertainty increases the value of hedging. As a result, the young couple may find it optimal to make an earlier and bigger condominium purchase even when the condominium price is volatile.

To formalize this intuition, the model in this paper incorporates two features. First, housing is illiquid. When prices are volatile, the presence of lumpy transaction costs can lead to a higher housing risk premium than would be required otherwise. This risk premium may fall sharply, however, once the second feature of the model is introduced: the possibility of a positive correlation between the price process of an earlier home and the price process of a home that the household plans to purchase later. This allows households to use earlier accumulated housing to hedge against the risk associated with future housing costs. This self-hedging mechanism is particularly important in the housing markets, given that conventional financial instruments cannot help households to insure against future housing cost risk.[3]

The key implication of this model is that the net effect of house price uncertainty on housing demand depends on the strength of the hedging incentive. This, in turn, depends on households' future housing consumption plans. For households who plan to move up the housing ladder and move to a correlated housing market, the hedging effect dominates the housing wealth risk effect. As a result, price uncertainty increases their housing investment (and thereby consumption). For households who plan to move down the housing ladder or to move to an uncorrelated housing market, the incentive to hedge diminishes and hence price uncertainty suppresses housing demand. Thus, our model predicts that the direction and magnitude of the effects of house price uncertainty on housing demand change across households, depending on their inter-market mobility, and vary across the stages of the life cycle, depending on whether households plan to move up or down the housing ladder.

Turning to welfare implications, our numerical exercise shows that the magnitude of the welfare cost under house price uncertainty is reduced when households have stronger hedging incentives. Thus, while families in an incomplete housing market are not able to access formal insurance financial instruments to diversify or insure against the house price risk, they do rely on private informal coping mechanisms to smooth housing consumption over the life cycle. If this is the case, the social insurance instruments proposed by Case et al. (1993) may be less efficient than prior studies suggest, as such insurance would serve partly to crowd out the self-hedging mechanism taken by certain households.

In addition to these economic implications, the analysis in this paper carries a small methodological lesson. By extending the traditional (S, s) methodology into the discrete time framework with multiple state variables, the paper provides an explicit characterization of the hedging incentive. Such an approach may be valuable when modeling the financial decisions for households who face uncertainties on multiple economic conditions. Furthermore, the optimal home purchase decision rules derived in this paper have an additional advantage of enabling us to learn about complex home purchase dynamics and hence providing theoretically sound instruments for testing the model in a repeat home purchase market in the future work.

The remainder of the paper is structured as follows. Section 2 briefly reviews the literature. Section 3 describes a life-cycle model of housing demand and Section 4 drives the optimal home purchase decision rules. Section 5 carries out a number of comparative static exercises by simulating and solving the model numerically. Section 6 discusses the welfare costs imposed by house price uncertainty. Section 7 concludes.

2. Literature review

This paper relates to two strands of the literature on economic dynamics. First, the paper builds on recent literature showing that homeownership can provide a hedge against fluctuations in future rent payments. The notion that housing provides a hedge against

[1] Henderson and Ioannides (1983) discuss this type of risk by showing that house price uncertainty makes home ownership less attractive, since risk averse households may otherwise invest in a safe asset whose fixed return may offset the renter's negative externality. Davidoff (2006) shows that labor income uncertainty can amplify housing risk because of a positive covariance between labor income and house price.

[2] Author's calculation, based on data from the National Association of Realtors Existing-Home Sales Series (http://www.realtor.org/Research.nsf/Pages/EHSdata).

[3] Flavin and Yamashita (2002) find a low correlation between housing and other financial assets, which provides evidence that housing markets are highly incomplete.