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Explosive rents: The real estate market dynamics in exuberance☆

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ABSTRACT

The interaction of the trading behavior of market participants in the housing and rental markets can result in a boom and bust in both markets. In this paper, we model real estate equilibrium with a focus on a short-run view and study the explosiveness in the rental market by analyzing the impact of housing market exuberance on rents. We then demonstrate the situation in which explosive behavior may appear in the rental market. The explosiveness in rents is tested based on samples from January 1991 to February 2015 in the U.S. housing market. Our results confirm the appearance of explosive rents during housing bubbles in five urban areas where explosive prices are also found, while no evidence of explosive rent can be found in the U.S. S&P/Case–Shiller Home Price Index-Composite 10.

1. Introduction

Rent, as one of the key factors associated with the fundamental value of housing prices (Mikhed & Zemčík, 2009; Beracha & Johnson 2012), plays an important role in the real estate market equilibrium. Zheng, Hu, and Wang (2015) investigated the rental differentials between paired observations in Beijing to determine the value of good locations in terms of school districts. Moreover, housing rent has been commonly used to measure housing fundamentals when estimating bubbles in the housing market (Phillips & Yu, 2011; Fabozzi & Xiao, 2016), much like the usage of dividends in measuring stock price fundamentals for equity bubble detection (Wu, 1997; Phillips, Wu, & Yu, 2011). The related literature includes real estate bubble modeling and fundamental analysis. Investigating real estate rational bubbles in Korea and Japan, Kim and Suh (1993) find the existence of bubbles between 1974 and 1989. Stevenson (2008) proposes an approach in modeling housing market fundamentals based on population, income, housing stock index, and interest rates.[1] Escobari and Jafarinejad (2016) tested the timeline of real estate investment trust by employing Generalized Supremum Augmented Dickey–Fuller (GSADF) proposed by Phillips, Shi, and Yu (2015).

However, one important issue that has not been sufficiently discussed in the literature is that rents should not be equally treated like dividends. Although rents and dividends are very similar in that they are the cash flows generated from asset ownership, they should be considered in different ways. There is a significant difference between the two types of cash flows: a stock dividend is determined by the company's board while rent is determined by the supply and demand in the rental market. There is an extensive literature on the rental market behavior. For example, Chau and Wong (2015) studied rent dynamics in the Hong Kong office market and found that high-end office rents adjust faster than that of low-end offices when information asymmetry exists. Crosby, Devaney, and Nanda (2016) studied the key factors that result in rental value depreciation based on samples from UK office and industrial assets. Finding that urban rents have risen faster than urban wages, Glaeser, Kolko, and Saiz (2001) explained this as "the demand for living in cities has risen beyond rising wages". In this work, we focus

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[1] Similar studies include those of Muellbauer and Murphy (1997) and Levin and Wright (1997).

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on residential properties and study the explosive behavior of a rent series. In particular, we demonstrate one important factor driving the increasing demand in the rental market by showing how housing prices and rents interact and jointly determine the equilibrium in the real estate market.

To study the connection between housing prices and rents, DiPasquale and Wheaton (1992) developed a four-quadrant framework (DW framework) that separates the real estate market into the asset market and the space market. Based on the DW framework, rents are determined by the supply and demand in the space market, and prices are determined by the valuation process in the asset market. On the other hand, prices can affect the construction cost and implicitly move the supply of houses in the space market and result in new rent equilibriums. Much research on real estate finance is based on the DW framework or from a similar long-term view of the real estate market. For example, Lieser and Groh (2014) studied the impact of economic growth, rapid urbanization, as well as compelling demographics on real estate investments based on a worldwide data sample covering 47 countries. Dieci and Westerhoff (2016) proposed a model that can generate endogenous boom-bust housing market dynamics based on historical information of overvaluation and over building. However, some short-term behaviors in prices and rents and their interactions have not been carefully discussed in the literature, especially when housing bubbles exist.

Our paper differs in two ways from previous research on the market behavior in the real estate market. First, based on the rent determination model we develop in this paper, we show the conditions under which explosive rents may appear. To the best of our knowledge, this is the first work that studies the existence of explosive rents and its origination. Second, unlike the DW framework, we discuss the connection between housing prices and rents by considering the interaction between the housing and rental markets, and we study the explicit impacts of price movements on the behavior of rents. Moreover, we empirically study the behavior in the real estate market by considering characteristics of the rental market and its connections to the housing market. Based on U.S. aggregate data and city-level data, we test the explosiveness of a well-known real estate price index, and a rent index in order to verify the existence of explosive rents in our urban areas samples in the U.S.

The paper is organized as following. In Section 2 we discuss our demand and supply model for the rental market, and the techniques of testing for explosive behavior. After describing in Section 3 the data for our empirical study, we report and analyze the estimation and test results in Section 4. Section 5 summarizes our findings.

2. The model

In this section, we discuss the methodology employed to estimate the timelines of asset bubbles, the characteristics of rental markets, and the effects of rental markets on the investigation of real estate bubbles.

2.1. Rental market equilibrium

To discuss the equilibrium of rent, we consider the interaction between the housing market and the rental market. DiPasquale and Wheaton (1992) suggested the following mechanism in the real estate market. In equilibrium, the demand for space, say d, matches the supply of space, s. Suppose that the demand for space is a function of rent and some other conditions regarding the local economy. We then have

$$d_t(R, Economy) = s_t \tag{1}$$

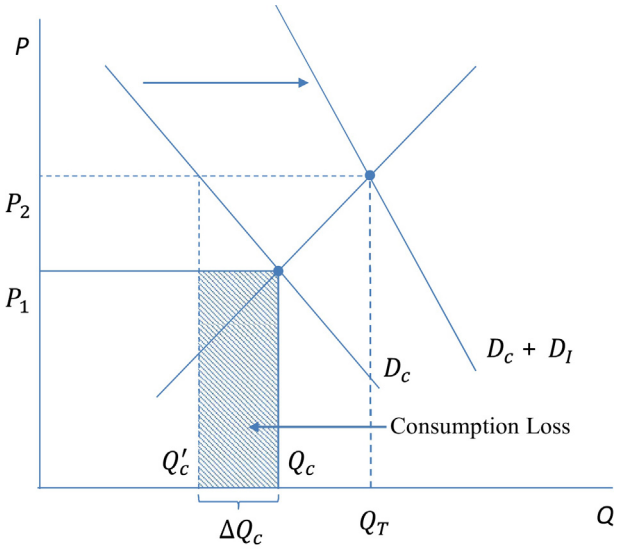

Fig. 1. Housing price equilibrium under different levels of demand. The shaded area is the consumption loss caused by the increasing investment transactions in the real estate market. Especially in the bubble period, the rapid growth of housing prices will lead to a depreciation of consumption-based purchasing activities, represented by $\Delta Q_c = Q_c - Q_c'$. This portion of consumption demand will have to be satisfied in the rental market.

where R is the rent. Then, given the determined rent in the space market, an appropriate price level, P, is determined in the asset market. Let i_t be the capitalization rate at time t, the price can be estimated by

$$P_t = \frac{R_t}{i_t} \tag{2}$$

where i_t is related to interest rate, property tax, income tax, depreciation rate, and the risk premium.

Assume the risk premium is equal to the expected capital gain by holding the property. Based on the equilibrium housing price, the asset market will also determine the level of construction of new properties. Considering that the cost of construction will increase under a higher level of building activity, we can obtain the optimal level of construction. That is, the maximum profit occurs when the price is equal to the construction cost, say *CCosts*, which is a function of the construction level C. Hence, we get

$$P_t = CCosts_t = f(C_t) \tag{3}$$

Returning to the space market, new construction will serve as additional real estate space. In long-term equilibrium, the depreciation of space is equal to new constructions, hence, the stock of space is stable ($\Delta s = 0$) and can be represented by

$$S_t = \frac{C_t}{k} \tag{4}$$

where $\Delta s_t = C_t - k s_t$.

Finally, the determined space supply interacts with the demand of space and determines the rent based on Eq. (1). This is the DW model that demonstrates the equilibrium in the real estate market under a long-term view in the absence of bubble conditions. In our work, we want to further investigate the scenario of real estate equilibrium from a short-term view, especially in the presence of housing bubbles.

Fig. 1 demonstrates the equilibrium in the housing market under different levels of demand. In no-bubble period, the purchasing demand for houses is mainly contributed by the consumption demand, D_c, and the equilibrium price is P_1. Suppose the housing price increases because of additional investment activities, D_I, then the total market demand would increase to $D_c + D_I$. As shown

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