



The housing market in Beijing and delays in sales: A fractional polynomial survival model



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ABSTRACT

This paper analyzes housing sales delay in Beijing, China. In the housing market, new properties sometimes experience delays before they are sold. Such delays reflect the preferences of buyers with regard to the characteristics of the housing. Therefore, it is important for managerial purposes to identify the causes of housing sales delays. It is concluded that delays are largely explained by the dwellings' characteristics and location. Policy implications of the research findings, particularly those related to means of shortening the delays, are discussed.

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1. Introduction

House sales are subject to delays due to market conditions and consumer preferences. Furthermore sale delays increase the cost of the dwelling due to, along with other costs, the interest accrued while the dwelling remains unsold. Therefore, the question of housing sales delays is of importance to realtors because of the uncertainty that it causes (Cunningham, 2006). The research focus of this paper is to examine the determinants of housing sales delays in a city market – Beijing, China – using a sample of homes sold and adopting an innovative survival model. Survival models in housing have been adopted by Pickles and Davies (1986), Lacour-Little and Malpezzi (2003), Cunningham (2006), Bulan et al. (2009), Groves (2009), Painter and Lee (2009), Feijten and Mulder (2010), Moriizumi and Naoi (in press), Ström (2010) and Kau et al. (2011) Kim and Min (2011), Barros et al. (2012), Zhang et al. (2012), Zeng et al. (2013) and Zhang et al. (2013). However, none of these authors analyze sales delay nor take into account the polynomial nature of the survival model.

The present research was motivated by the following issues. First, survival models have proven to be particularly suited to the modeling and analysis of duration events. Although the usefulness and reliability of survival modeling for predicting duration events has been recognized in several urban contexts (Bulan et al., 2009; Cunningham, 2006; Feijten and

Mulder, 2010; Kau et al., 2011; Lacour-Little and Malpezzi, 2003 and Ström, 2010), their application to housing has not attracted much research interest. Second, since, as mentioned above, housing sales delays are of great importance in housing management, it would be of value to ascertain which covariates best explain the delays in selling housing, since these covariates may be specific to the market analyzed. Third, it is important for policy purposes to investigate the factors that influence purchasers' home-buying decisions. Finally, in contrast to alternative survival models, a fractional polynomial is adopted in the present research to take into account the dynamic nature of data that spans over various years.

The paper makes two contributions to the relevant literature: first, by analyzing the determinants of home sales delays in the case of the Beijing housing market, an Asian city that has attracted little research so far; and second, by adopting a survival model with a fractional polynomial, which is a novelty in the survival model context. We are not aware of any research paper previously adopting survival models with a fractional polynomial in housing.

This paper is organized as follows. After the introduction, the contextual setting of the Beijing house market is presented, followed by the literature survey. Next the theoretical framework background is presented in Section 4, followed by the methodology in Section 5 and the hypotheses to be tested in Section 6. Section 7 deals with the study context, and Sections 8 and 9 display the empirical results. A discussion and the conclusions are presented in the final section.

2. The city of Beijing, China and its house market

Beijing, the capital of China, is one of the four municipalities directly under the administration of the Central Government and located in the

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northwest of the country. Nowadays, it is the hub of China's political and cultural life. The city covers an area of 16,410 km², with a current population of approximately 17.55 million. The nominal GDP was 1186.6 billion Yuan in 2009 (yuan/dollar in December 2009 = 6.8282).

The real estate market of Beijing has developed in the last decades since the Central Government launched its nationwide reform program with respect to housing and the land-use system. Prior to the initiation of the reforms in 1978, there was no real estate market in China, as trading in land and property was strictly prohibited. During the decade from 1978 to 1988, the Chinese real estate market was revitalized as the country took its first bold steps from a planned economy towards a market economy. Deng Xiaoping, the chief architect of the reform and opening-up policy from 1978, proposed that housing commercialization should be based on real estate reforms. With the surge of real estate enterprises after the deregulation and stimulus, the real estate industry underwent excessive growth, the number of real estate agencies increasing from 3140 in 1988 to 17,000 by 1992. To counter the subsequent overheating, the Central Government launched series of measures to intervene in the real estate market. In 1997, when the Asian financial crisis erupted, causing the strong downturn of its exports, China initiated a second wave of real estate reforms, i.e. ending subsidized housing (Alona and Bian, 2005), encouraging the development of real estate finance and implementing the public accumulation funds program. These radical measures led to renewed rapid growth during the following decade, the real estate industry contributing 4.75% to China's GDP in 2007, compared with the 2.20% registered in 1978. However, rising prosperity has brought potential bubbles as well as development. Today's burgeoning real estate prices have incurred the inhabitants' unanimous aversion to purchasing new homes and led to the Government's harsh intervention. This has taken the form of limiting investment to reduce speculation-type demand for real estate, increasing the supply of economically affordable housing, forcing 78 state-owned companies whose core business is not real estate to withdraw from the real estate market, and so on.

Beijing is among those Chinese cities that have experienced soaring housing prices, due to brisk demand derived from rapidly expanding urbanization resulting from rural migration and location advantages with regard to employment. In addition, when the city was chosen in 2001 to host the 29th Olympic Games, the real estate market of Beijing enjoyed another boom, as the number of dwellings being constructed and traded was enhanced in successive years (see Table 1). On the other hand, as a political center, Beijing is quite vulnerable to the Central Government's policy decisions. The frequent national macroeconomic controls introduced in recent times may obscure the short-term development of Beijing's real estate market in the future.

Table 1
Beijing housing characteristics during 1999–2008 (yuan/dollar in December 2009 = 6.8282).

Source: China Real Estate Statistics Yearbook 2001–2009.

Years	Price of dwellings (yuan/m ²)	Sold space of dwellings (thousand m ²)	Dwellings unoccupied on sale (thousand m ²)	Dwellings space newly completed (thousand m ²)
1999	4786.8	4847.1	–	9082.6
2000	4557.2	8982.2	–	10,136.6
2001	4716.0	11,275.0	6340.6	13,934.3
2002	4467.0	16,044.0	6340.6	19,261.7
2003	4456.0	17,711.0	8969.2	20,807.5
2004	4747.1	22,858.2	7238.5	23,439.5
2005	6162.1	28,236.5	7997.3	28,414.2
2006	7375.4	22,050.3	4941.2	21,933.2
2007	10,661.2	17,314.8	4117.7	18,539.5
2008	11,648.0	10,314.3	5227.2	13,993.0

Note: the dwellings include villas, high-end flats, economically affordable housing and ordinary apartments.

The real estate reforms have enabled more people to own their own homes and to enjoy more spacious housing than in the past. According to a survey conducted by the State Statistical Bureau in 2010, households that possess their own home account for 72.8% of the total. Moreover, the average dwelling space per capita for urban residents has increased from 6.7 square meters in 1978 to 21.56 square meters in 2008 (see Graph 2). Meanwhile, the total income per household has increased by 15.14% on average since 1978, reaching 27,678 Yuan per year, (US\$ 4053.484), but when real estate prices are considered in relation to earnings, it can be seen that the cost of purchasing a home is extremely high for the average Beijing inhabitant.

3. Duration models in housing

Duration models are applied in diverse research fields, with the aim of analyzing the duration of an effect. However, their use is rare in housing-related topics. For example, Lacour-Little and Malpezzi (2003) analyze the quality of mortgage loans in Alaska with the Cox proportional duration model, concluding that decreasing appraisal quality is associated with an increase in the mortgage default hazards rate. Cunningham (2006) analyzes the delay in the timing of land development in Seattle with an exponential, a Weibull and a Cox proportional survival model, concluding that uncertainty over the future prices reduces the hazard of current-period development, and at the same time raises land prices. Bulan et al. (2009) analyze the extent to which uncertainty delays investment in condominium development in Vancouver, Canada with a Weibull survival model. These authors conclude that builders delay development during times of greater idiosyncratic uncertainty in real estate prices and when the exposure to market risk is higher. Kau et al. (2011) analyze residential mortgage defaults and pre-payments, using a Cox survival model with frailty. They investigate whether mortgages originated in the same Metropolitan Statistical Area share any common factors. Feijten and Mulder (2010) analyze the timing of moving into long-stay housing based on postponed marriages and childbirth in the Netherlands with the Cox survival model. They conclude that the macro context explains the postponement decision. Ström (2010) analyzes the extent to which the housing-type decision is constrained by first births in Sweden. A Kaplan–Meier survival curve is used to analyze the time taken to move to a new dwelling after the first birth and piece-wise constant hazard survival models are used to analyze the dwelling choice. The author concludes that the size of the dwelling seems to be the most important housing-factor decision related to the first birth.

From this literature survey, it is noteworthy that the focus on a capital city and the analysis of sales duration and adoption of a sample selection survival model have not yet been used in urban research. Therefore, the present research innovates in this context.

4. Theoretical framework

The survival model estimated in this study is based on the theory of consumer behavior developed by Lancaster (1966) and the concept of hedonic prices (Rosen, 1974). The economic theory of consumer behavior assumes that a consumption decision faced by an individual aiming to maximize its utility, subject to budgetary restrictions, is taken on the basis of prices and income (Varian, 1987). This traditional framework, however, does not allow for circumstantial conditions and product characteristics which are known to play an important role in shaping housing demand, given the composite or differentiated nature of the services that comprise a housing market (Garcia and Raya, forthcoming). Therefore, the demand for houses is derived from the demand for the various goods and services offered by a house market (Feijten and Mulder, 2010), adopting the Lancaster approach.

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