



A real option-based valuation model for privately-owned public rental housing projects in China



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A B S T R A C T

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Chinese governments' great efforts in promoting the private sector's provision of public rental housing (PRH) have little effects, and the main reason is lack of proper provision mode and relevant valuation model. This knowledge gap is filled in by proposing a privately-owned PRH provision mode and a real option-based valuation model. In the proposed provision mode, the private sector primarily refers to private real estate developers, who will have ownership and decision rights of PRH projects. Then, the embedded real option at decision making stage is identified, and corresponding option premium (OP) is assessed by the Black–Scholes model modified with value leakage. Adding OP and conventional net present value (NPV) together, the expanded net present value (ENPV) is obtained as the investment value of a privately-owned PRH project. Finally, the proposed provision mode and valuation model are both exemplified in a PRH project, which has a negative NPV indicator but a positive ENPV indicator. Through the sensitive analysis, increasing the average rent of PRH buildings is found to be the most effective measure to enhance the ENPV indicator. Therefore, the proposed PRH provision mode is a feasible way to accelerate the private sector's provision of PRH in China, and the proposed valuation model can value a privately-owned PRH project objectively and comprehensively.

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Introduction

In China, public rental housing (PRH) made its debut in then-Premier Wen Jiabao's Report on the Work of the Government in March 2009. Afterward, PRH has been repeatedly declared as the development emphasis and future mainstream of China's reconstructed affordable housing system in many official documents like the National Twelfth Five-Year Plan, which planned to build or renovate 36 million suites of affordable houses nationwide from 2011 through 2015, placing great emphasis on PRH. To implement such ambitious plans, many local governments formulated aspiring targets in developing PRH, too. For example, Beijing municipal government promised to build as much affordable houses as accounting for 60% of all types of houses from 2011 through 2015, while PRH would take up 60% of all types of affordable houses. Henan provincial government even proclaimed to merge Cheap Rental Housing (CRH) into PRH and cover the indemnified targets of

Economical and Comfortable Housing (ECH) by PRH since 2014, aiming at housing 20% of urban population in the whole province with PRH, while CRH and ECH have been two cores of traditional affordable housing system in a long history.

To achieve above-mentioned grandiose targets of PRH development, China's governments at all levels have tried various ways to develop PRH projects. One popular way is local governments' direct provision through establishing specific state-owned organizations. For example, Chongqing municipal government established Chongqing Public Rental Housing Authority, who is responsible for raising funds and entrusting large-scale state-owned enterprise to construct local PRH projects (Yang, 2011). Another popular way is adopting the private sector (mainly private real estate developers) as agents of PRH projects, which has been applied in a few of cities (e.g. Nanjing city and Hangzhou city). In the agent system, all the costs of PRH projects are borne by local governments, and agent companies will obtain some additional agent fees and profits, which are 1%–2% and 3% of the total cost of the entrusted PRH project separately (Li, Wu, Cui, Xiao, & Yang, 2011). Due to the great efforts of governments at all levels, China's PRH projects have made rapid progress nationwide, but

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resulted in many negative effects meanwhile, including high construction costs, local government's financial deficit and supply inefficiency of PRH projects.

In order to eliminate those aforementioned negative effects and exert the advantages of the private sector, like abundant funds and efficient mechanism, Chinese central government has released many incentive policies in areas of land supply, financial subsidies, rights transfer and tax relief. Besides, some local governments like Fujian provincial government and Jinan municipal government have also laid down diverse incentive policies, such as subsidizing bank loan interests, reducing or canceling local taxations, supplying free lands. However, very few of China's private sector are found to be active in the provision of PRH (Zhong, 2013), while the main reason is lacking a stable profit model under current PRH provision modes (Zhang & Xie, 2011), or saying the disability of conventional net present value (NPV) method in dealing with great uncertainty in PRH project (Zhong, 2013). Therefore, the provision mode and corresponding valuation model of PRH projects in China should be innovated to attract the private sector effectively. In this paper, a privately-owned provision mode of PRH projects will be created, where the private sector has full ownership and flexible decision rights of the projects, complying with all regulations and enjoying all incentive policies related to PRH simultaneously. Then, utilizing real options theory, real options of this new model at decision making stage will be identified. Furthermore, a real option-based valuation model for this new model will be proposed, followed by a case study of one prospective PRH project in Nanjing city.

Literature review

Due to various objectives like obtaining the private sector's finance and expertise, allocating risks, improving service quality and lowering life-cycle cost (Abdul-Aziz & Kassim, 2011), the private sector has been adopted broadly to promote the provision of PRH (that is, public housing, social housing, and affordable housing). For example, the Irish government and many other European governments have reduced the role of social housing in recent years, while increased the role of the private rented sector with the aid of housing allowances (Norris & Coates, 2010). American public housing has similar experience in its 75 years history, which gradually shifted from sole public efforts to promoting mixed-finance partnerships between the public, private, and non-profit sectors (Vale & Freemark, 2012). In addition, Public-private partnership (PPP) is found to be the most prominent urban housing policy that has emerged in the last decade in India (Sengupta, 2006). Now, various public agencies in Malaysia are developing houses using the PPP approach (Abdul-Aziz & Kassim, 2011). Nigeria has also introduced PPP to improve the accessibility of low-income earners to housing, because it is affirmed that participation of the private sector has potential to improve housing delivery there (Adegun & Taiwo, 2011).

As regards real option, it is an extension of financial option to non-financial assets, which gives the decision maker the right but not obligation to take a decision at one or more points in the future (Chen, 2007). Just as Merton (1998) claimed, the future is uncertain and in an uncertain environment, having the flexibility to decide what to do after some of that uncertainty is resolved definitely has value, option valuation theory (OVT) provides the means for assessing the added value of flexibility. Therefore, OVT has been utilized in a variety of real estate development decision, from planning to operations and from operations to abandonment (Hui, Ng, & Lo, 2011). Some studies apply OVT to predict land prices (Grovenstein, Kau, & Munneke, 2011; Shen & Pretorius, 2013), and some scholars utilize OVT to value certain types of real estate development, such as recreational facilities (Leung & Hui, 2002),

public housing upgrading (Ho, Hui, & Ibrahim, 2009), office construction (Fu & Jennen, 2009) and farm (Stokes, 2012).

From above literature review, it is clear that the private sector has been worldwide adopted in the provision of PRH, and it has really done well in numerous circumstances. These international experiences may provide reference for promoting the private sector's provision of PRH in China. At the same time, as an efficient valuation model, OVT has been broadly applied in decision making of different types of real estate development. However, the application of OVT in valuing privately-owned PRH projects at decision making stage is rarely found so far. This knowledge gap will be filled in by constructing a valuation model for privately-owned PRH projects at decision making stage in this paper, based on the identification of imbedded options in such projects.

Proposed mode of privately-owned PRH projects

Characters of the proposed mode

In general, the private sector involves for-profit private sector and non-profit one. Because of special housing history and national conditions, non-profit housing organizations have been stifled in a long time and thus almost disappear in China's housing provision system (Wang, 2012b). In contrast, China's private real estate developers have developed and grew in the booming commodity housing market since 1980s. But, continuous macro-control in recent years has depressed the profit and even living space of private real estate developers. Therefore, combining the ambitious construction plans of PRH projects, many private real estate developers express a keen interest in PRH projects (Zhang & Xie, 2011). So, the private sector in this paper principally refers to for-profit private real estate developers. As for the tenants, they should be indemnified targets of PRH and their criteria are determined by local governments. In general, the qualified tenants of PRH projects in China cover urban lower middle income households with housing difficulties, newly employed university graduates and migrant workers (Wang, 2012a).

To put the idea of privately-owned PRH projects into practice, a project financing mode titled BOO (Build-Own-Operate) is employed, and the proposed mode is shown in Fig. 1. Although BOO isn't very common, compared with the direct provision system of local governments and the agent system, in current construction modes of Chinese PRH projects, it may be the new trend in the future. One important reason is that the focus of local governments with regard to PRH is satisfying inhabitation rights of citizens but not the ownership of PRH projects. For example, the UK governments have been making great efforts to strengthen PRP (private registered providers of social housing) to become significant providers of new housing for rent in recent years, while PRP are generally considered as private entities receiving public funding. Another important reason is that many Chinese local governments are increasingly worrying about the operation of growing PRH projects, and they are certainly willing to share the operation task with qualified private real estate developers. The last important reason is that most of private real estate developers need the full ownership of PRH projects to make decisions independently and flexibly.

In Fig. 1, it is evident that the private real estate developer is responsible for the life-cycle management of the PRH project, including its fund-raising, construction, possession, operation and final disposal. All those rights and obligations should be clearly stated in a formal concession contract between the private real estate developer and local governments, who also play several roles, including "enabler" by providing the enabling environment for the private real estate developer to step in Sengupta (2005),

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