RESEARCH ON LAND PRICING IN CHINA
FROM THE PERSPECTIVE OF MODERN FINANCE

基于现代金融学视角的土地定价问题研究

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摘　要

　　"劳动是财富之父,土地是财富之母。"土地是人类社会最原始的生活资料来源;土地是人类社会最原始的生产资料来源;土地为人类社会各行各业的建立与发展提供场所与基地;土地为人类一切劳动产品提供物质基础;土地是国民经济的基础性产业——农业不可替代的生产资料。由于中国特殊的历史传统和国情,土地是中国社会稳定、民族自强自立的基础。土地制度是人类社会最基础、最根本性的制度。市场是解决经济问题的最佳工具,利用土地市场可以优化资源的配置、提高资源的使用效率。由于中国城市和农村不同土地制度的影响,我国土地市场的发展存在着体制性障碍,因此研究土地定价问题就变得极为重要。

　　本书立足国情,基于资产定价理论、实物期权理论和期权博弈理论,探讨利用房价和房租对土地定价的实物期权方法;研究了三种随机性冲击,即房价、房租、经济冲击对土地价格的影响;并分析了在当前中国的土地制度下,土地价格形成的博弈过程;探索研究土地经营权流转市场的市场经济规律。力求在制度层面、工程层面、技术层面为中国土地定价机制的健康发展提供有益的探索。试图用现代金融学的理论方法理解中国土地市场的经济行为,为以技术手段克服制度的缺陷、为中国的现代化进程提供有益的理论探索,为制定合理而灵活的农民土地征用价格标准提供合理的经济学依据。全书包含九个章节,概要如下。

　　第一章,绪论。对本书的核心内容进行了概括,内容具体包括选题背景和核心问题的提出;研究的目的、意义和创新点;讨论对象的界定和分析方

法的介绍；最后，阐述了本书的结构安排。

第二章，当代中国土地制度的演进与定价方法述评。本章首先梳理了土地定价问题的理论脉络、历史脉络和方法脉络。农民的土地应是包括份额所有权、使用权和发展权的有机体系。所有权是产权，土地使用权也是一种产权。其次回顾当代中国土地制度的演进，获得了中国当代农民土地权利发展的一个清晰的理论坐标。最后评述了现有土地定价方法。边际农业价值法、实物期权定价法、时间空间模型定价法等所谓科学土地定价方法都有其适用范围和局限性。本章为整个研究提供了历史依据和经济理论基础。

第三章，实物期权定价方法源流考。本章系统而深入地评述了实物期权定价方法体系。实物期权定价方法来源于不确定性的处理和应对。不确定性的类型决定了实物期权定价方法的适用范围。实物期权定价方法的经济金融学理论基础是：套利均衡原理，市场完全性和有效性假设，风险中性定价原理。由于实物期权具有的特性，实物期权发展为一个丰富的类别。在经典实物期权方法的基础上，复合期权理论、期权博弈理论、模糊实物期权以及不完全信息下的实物期权方法正在得到理论界积极的探索和研究。最后，本章介绍了期权与实物期权的数学模型及求解方法。本章为整个研究提供了数理方法论基础。

第四章，房价与土地价格：一个实物期权分析框架。土地的价值可以分为固定收益部分和期权价值部分。本章视期权价值是房产价格的驱动的单因素美式期权，推导得到了土地价格的解析表达式，并进行了静态比较分析，在不同的市场参数结构下，给出了土地价格和期权价格的值及其比率。

第五章，房价、房租与土地价格：一个双因素欧式实物期权分析框架。本章把土地视为受房价和房租两个随机因素影响的实物期权，并得到了基于房屋价格和房租价格表示的土地价格。分析表明，土地价值的增长率和房屋价格的增长率近似成比例；土地价格的波动率一定超过房屋价格的波动率；土地价格的波动率一定超过房租价格的波动率；并给出了土地价格的增长率超过房屋价格增长率的一个解释，讨论了房租价格对地价的影响。

第六章，地价可以看成是房屋价格驱动的期权，这种定价较科学地反映了

土地的价值,当前的房地产调控对房价有较大的冲击,此时地价会有怎样的反映,本章利用带跳扩散过程的美式期权来分析这种冲击对地价的影响。

第七章,结合数理金融学的最新研究进展,把几何布朗运动、带便利收益的几何布朗运动、分数维的几何布朗运动、分数维带跳的几何布朗运动作为土地收益流的基本假设,并推导了各种形式下土地择优期权的解析表达式,可以为土地的择优期权定价提供理论指导。农地所包含的实物期权价值,在使用权无法流通的地方是成长期权的价值;在使用权实现流通的地方是复合期权的价值。农地的发展权定价可理解为成长期权、转换期权、价值成长期权和转换期权结合的复合期权。

第八章,二维随机条件下土地租赁经营的投资博弈模型。本章利用实物期权博弈框架,分析了二维随机条件下土地租赁经营的投资博弈模型,考察了二维随机条件下投资密度和投资成本对投资者决策的影响。当投资密度和初始投资成本比率不对称时,都会对各投资阈值产生影响;较大的投资密度和投资成本比率都能提高投资阈值,影响投资者的投资决策;交叉占优时两投资者都有机会成为领先投资者;相对于投资成本比率的影响,租赁经营密度对投资者的投资阈值影响更大。

第九章,总结与展望。本章首先结合相关的理论基础、研究成果及实践经验对本书研究结论进行系统的解释和探讨,以全面认识农民土地的份额所有权、使用权和发展权对土地定价的影响机理。在此基础上,总结本书的理论贡献和实践启示;结合中国国情,针对土地的定价问题、土地市场的建立、农民权益保护提出了相关的政策建议。最后,讨论了研究局限和后续研究的方向。

本书的主要研究结论如下:

第一,本书基于全国平均的数据,证实了土地开发的价值即房产的价值是地价构成的最主要部分。资本化地租方法不应被用于中国未来的土地转让活动。应用期权方法,能有效地反应市场的灵活性价值,完善土地定价的科学方法,确保农民在土地征用过程中获得合理的收益。

第二,在中国这个二元化的土地市场上,政府的垄断和规制加上土地资

源天然的稀缺性加重了社会福利的双重损失,限制了土地的发展权价值实现。为了提高土地资源配置效率,应利用市场这一解决经济问题的最佳工具,逐步建立统一的土地市场,实现土地资源的最优配置,提高国民福利。

第三,土地价格是土地市场的核心,但是这个核心依赖于具体的制度环境。当下的中国产生了浮躁的脱离国情的极端主张,比如主张土地的完全私有化和土地市场的完全自由化。由于中国特有的历史传统和土地资源的独有特质,坚持当下的土地制度是必要的。

本研究使我们对土地定价有了更系统、更深入的理解。在现有研究的基础上,本书的创新点主要体现在:

第一,本研究建立了由土地价格、房价、房租构成的全新的实物期权分析框架。本书基于农户对土地的份额所有权、使用权和发展权,基于无套利方法视土地价格为一个期权,进行了期权定价分析。分析利用了宏观整体的土地价格指数和住房价格指数,分析认为农户对土地的发展权应该得到价值体现,全国平均的数据证实了土地开发的价值即房产的价值是地价构成的最主要部分。资本化地租方法不应被用于中国未来的土地转让活动。中国的土地价格具有鲜明的期权特征,应用实物期权方法进行土地定价是科学、合理的。

第二,本研究通过结合数理金融学的最新研究进展,将几何布朗运动、带便利收益的几何布朗运动、分数维的几何布朗运动、分数维带跳的几何布朗运动作为土地收益流的基本假设,并推导了各种形式下土地择优期权的解析表达式,可以为土地的择优期权定价提供理论指导。

第三,本研究利用期权博弈工具,分析农业专业组织的竞争规律,建立了二维随机条件下土地租赁经营的投资博弈模型。研究了二维随机条件下投资密度和投资成本对投资者决策的影响。

本研究努力为实现征地补偿合理化、同地同价奠定理论基础,以扭转我国征地补偿标准偏低的现象;本研究为以产权制度为依托、以实际产权交易关系为依据,建立中国城市和农村统一的地价体系,提供理论支持。本书亦为研究土地经营权流转市场的市场经济规律提供有益的探索。

Abstract

"Labor is the father of the wealth, the land is the mother of the wealth." The land is the primary source to mankind. The land is the primary of production to mankind. The land provides arena and base for mankind to establish and develop. The land supply material basis for all product of labor. The land is irreplaceable for national economy fundamentality domain, agriculture.

As a result of specific historical tradition and national conditions of china, the land is foundation for social stability and nation support and independent. Land system is the most fundamental system to human society.

Market is the best tool to deal with economic issue. Taking advantage of the land market can optimize resource allocation; promote availability efficiency of scarce resources. Due to affect of dual level land market of china, the market of urban and rural exist institutional barrier, so the research of land pricing as the centre of the land market is of an extreme importance.

Based on the national conditions of china, using assets pricing theory, real option theory, and option game theory, land pricing method of real options, which driring by house prices and the rents is probed. Three stochastic shocks: house prices, the rents, and economic shocks impact on

land prices is discussed in this research. Under current land institution of china, especially the viewing angle of food security the game process of land prices forming is explored. Market economic law of land use rights is seeking for. It is a beneficial exploration to healthy development of land pricing mechanisms on regime, engineering technology lay.

Using modern finance theoretical method to understand the economic behavior of Chinese land market is attempt. It is helpful to technology put up with the defect of regime. This book offer beneficial theoretical exploration for china modernization process and give economics basis for establish the reasonable and flexible standard price of the requisition.

This book contains introduction and text, which is divided into nine chapters.

Chapter 1: introduction. The main content of this book has been summarized in this chapter. Specific include the research background of this book, raise of problem, the purpose of the study, significance of the study, innovation point of the study, definition of the object of study. Then the research method is introduced. Finally, the structure of the research is stated.

Chapter 2: the evolution of land system in contemporary China and review of land pricing methods. This chapter combs the theoretical context, historical context and methods vein of land pricing issues. Farmers' land rights, including share ownership, right to use and right of development ought to be an organism. As the ownership is a property right, the right to use is also a property right. Review the evolution of land system in contemporary China obtains a clear theoretical coordinates of contemporary Chinese farmers' land right to development. Finally, the existing land pricing method, such as the marginal agricultural value method, real option pricing

method and time space pricing model is remarked. What is called scientific land pricing method has its applicable scope and limitations. This chapter provides a basis in history and economic theory for the entire study.

Chapter 3: investigate origin and development of real options pricing method. System of real option pricing method is reviewed extensively and deeply in this chapter. Real option pricing method is derived from the uncertainty of the processing. The type of uncertainty determine the applicability of real option pricing method. Economics and finance theory which is real option pricing method based on are: arbitrage equilibrium principle, market completeness and validity of assumptions, the risk neutral pricing theory. Due to the nature of real options development of real option is a rich category based on the classic method of real options. Compound option theory, option game theory, the fuzzy real option, under the incomplete information of real options is being actively explore and study in the theoretical cycle. In the end, this chapter presents the mathematical model and solving method of option and real option. This chapter provides the mathematical methodology basis for study of the whole.

Chapter 4: house prices and land prices: a real option framework. The value of land can be divided into fixed income and option value. The option of land value is regard as an American option of single factor derived by the house prices. The analytical expression of the land prices is derived and the comparative static analysis has been carried on. Under different market structure parameters land prices, the value of the option prices and its ratio is given.

Chapter 5, house prices, the rents and land prices: a real option framework of tow-factor European. This chapter considers land prices and the rents as two random factors of a real option. Furthermore, land prices

based on the house prices and the rents is represented. The analysis result indicates that the growth rate of land value and the growth rate of house prices approximately is in proportion; land prices volatility must be more than that of house prices; land prices volatility must be more than that of the rent. And give one explanation for the land prices growth rate larger than house prices growth rate. How the growth rate of land prices affect house prices growth rate is discussed.

Chapter 6, land values may be regarded as an option driven by house prices. This method reflects the value of the land scientifically. The current real estate regulation has a big impact on house prices. American options driven by jump diffusion process is used to analyze the effect of the impact of land values.

Chapter 7, combined with the latest developments of mathematical finance, the geometric Brownian motion, the geometric Brownian motion with convenience yield, the fractal dimension geometric Brownian motion, fractal dimension geometric and Brownian motion with jumps, as basic assumption, are deduced analytic expression of preferred options under various forms in this chapter, which can provide theoretical guidance for pricing land preferential option. Farmland value contained by real option can be regard as the value of growth option if right of land use is difficult to traded. When the right of land using is marketized, the value is regard as the compound options. The value of land development can be understood as a compound option combined of a growth options and conversion options.

Chapter 8: land lease business investment game model under the condition of two-dimensional random. This chapter using the real option game framework, analysis investment density and cost effect on the decision-making of investors. Two-dimensional random conditions is investigated. When

the ratio of investment density and the initial investment cost is asymmetric, it will affect the investment threshold. The ratio of investment density and the initial investment cost is larger will improve the threshold value of investment. That is affecting investors' investment decisions. With cross dominant two investors have the opportunity to become a leading investors. Relative to the influence of investment cost ratio leasing management density of impact on the investor's investment threshold is greater.

Chapter 9: research conclusion and expectation. In this chapter, first of all, combined with relevant theoretical basis, research results and practical experience the author make a systematic explanation to this book research conclusion. With a comprehensive understanding of the influence mechanism of land pricing between farmers' land ownership; farmers' land use rights and farmers' right of land development. On this basis, summarized in this book, the theory contribution and practice implications: combined with China's national conditions, in view of the land pricing problem, the establishment of the land market, protection of the rights and interests of farmers puts forward relevant policy suggestions. Finally research limitations and the direction of further research are discussed.

Themajor research conclusions of this book are as follows:

First, in this book, based on the national average data, the value of land development, that is, the value of the real estate is the main part of land prices formation is confirmed in this study. Land rent capitalization method should not be used for China's land transfer activities in the future. Through using the method of options can obtain an effective response to the value of market flexibility which improves the scientific method of land pricing and ensure that farmers get reasonable profit in the process of land requisition.

Second, due to the duality of land market in China, ceiling price theory, both the monophony and seller's monopoly theory are at work at the same time. Characteristics of the primary market presents that the market is demand monopoly. Characteristics of the secondary market presents that the market is supply monopoly. Government monopoly, regulation combined and the natural scarcity of land resources, all decreased loss of social welfare doubly. In order to improve the efficiency of land allocation of resources, the market that is the best tool to solve economic problems should be used. A unified land market should be established step-by-step to achieve the optimal allocation of land resources and improve national welfare.

Third, land prices is the centre of the land market. But the core depends on the specific institutional environment. The situation of present China produced a blundering from extreme positions, such as, full privatization of the land, full liberalization of land market. Due to China's unique historical tradition and unique characteristics of land resources, stick to the current land system is necessary.

This research leads us to more and more in-depth understanding about land pricing system. On the basis of existing research, the innovation point of this book is mainly embodied in as follows:

First, this study established a new real options analysis framework of the land prices, house prices, and the rents. Based on the part of farmers on the land ownership, use rights and the right to development, based on no-arbitrage approach, regard land prices as an option. The option pricing is analysis using the macro analysis of land prices and house prices index as a whole in this book. Analysis indicates that farmers on the value of land development rights should be embodied. National average data confirmed the value of land development is the value of the property is the main part

of land prices formation.

Land rents capitalization method should not be used for the future of land transfer activities in China. Land prices in China have distinct option characteristics. Land prices by real option method is scientific and reasonable.

Second, in this study, combined with the latest developments of mathematical finance, the geometric Brownian motion, the geometric Brownian motion with convenience yield, the fractal dimension geometric Brownian motion, fractal dimension geometric and Brownian motion with jumps, as basic assumption, are deduced analytic expression of preferred options under various forms, which can provide theoretical guidance for pricing land preferential option.

Third, the option game tools are used to analysis the competition laws of agricultural professional organization, especially, how investment density and cost effect on the decision-making of investors in this study. Then a land lease business investment game model under the condition of two-dimensional random is established.

The effort of achieve land requisition compensation rationalization, the same price to the same land, reverse under-owned standard price of the requisition is strive for.

This research provide theoretical support for the city and countryside unification land market price system construction which on the land property rights system as the core, according to property relations of actual transaction process, constructing which give full play to guidance and regulation of the market. This research is a beneficial exploration to study economics laws of Chinese land market.

目　录