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Thesis

The Impact of Public Land Leasing System on the Price Decision Mechanism in

Land Market and Real estate Market--- A Case Study of Shenzhen

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The Impact of Public Land Leasing System on the Price Decision Mechanism in Land Market and Housing Market--- A Case Study of Shenzhen

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Summary

Since the "reform and opening-up" policy issued in 1978, China has experienced great changes during the past three decades. Characterized by the rapid growth of GDP, the national economic development has changed from planned command economy to a decentralized market economy. As the experimental city, Shenzhen's development not only adopted the transformation of the economic development model but also brought about the rapid urbanization process. Under this condition, the municipality faced great pressure to finance the city construction if only depended on conventional ways. Therefore, the municipality, learned from Hong Kong, introduced the public land leasing system to capture the land value and thus to finance the construction of infrastructure and public facilities. Together with a series of relevant national reforms, the primary land market and real estate market have been reformed as market-driven system in Shenzhen.

Nevertheless, along with such improvement, the land price and newly-built commercial housing price have continuously been in an upward trend, which incurs great social criticism and friction. In this case, this research is both exploratory and explanatory to find out the influence of implementing public land leasing system as an important instrument of land value capture in China. In addition, it also highlighted the difference between the three market-oriented public land leasing modes. According to the context, it put forward the hypothesis that the public land leasing system would increase the land price and further the newly-built commercial housing price. Besides the verification, this paper also deeply explained the reasons and its meanings.

The methodologies used in the paper are single-case study and error correction model. For the case study, Shenzhen was chosen due to its well maintained database and representative experience of implementing public land leasing system. Comparison between closing land price and standard land price was the main quantitative way to analyze how the system affects the land price in primary land market. And the statistical model was used to tell the individual influence of the three different modes of public land leasing system on the housing price variation.

The date used was collected from the *Shenzhen statistical yearbook* and *Shenzhen real estate yearbook* with the triangulated information from real estate agencies. Interview with the experts from the Institute of Shenzhen Real Estate Research and developers provided the most of the qualitative information about the context.

The findings and results firstly showed that public land leasing system can manifest the market value of land and thus has been an effective way for the municipality to capture the land value and finance the provision of public service and urban development. While on the other hand, such a system improved the transparency of land transferring process and the efficiency of land resource allocation. However, it tended to raise the land price in primary land market either due to the strengthened

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competition or because of the manifest the cost of obtaining the land which has been hidden in the black market.

The findings from the VECM further verified that the increment of auction land price has greatest impact on the growth of newly-built commercial housing price while the raise of listing land price shows much weaker influence on the housing price variation. And there is no statistically significant evidence to support such influence of tendering land price in Shenzhen. However, when compared with the impact of annual selling area, the impact of land price is relatively weak. As a consequence, although land price resulted from public land leasing system indeed has impact on newly-built commercial housing price variation, it seems that the housing price is primarily determined by the supply and demand in the market.

Key words

Land price; newly-built commercial housing price; public land leasing system; Shenzhen; supply and demand

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It is exciting and also sorrows to find that almost everything has been done. It is difficult to image that the time flows so quickly and the study is nearly finished.

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Abbreviations

AHP: Housing Price of the Land Transferred through Auction

ALP: Price of the Land Transferred through Auction

BL: Operation Bus Line

CLP: Closing Land Price

FAR: Floor Area Ratio

FDI: Foreign Direct Investment

GDP: Gross Domestic Production

HPI: Housing price index

LHP: Housing Price of the Land Transferred through Listing

LIR: Loan Interest Rate

LLP: Price of the Land Transferred through Listing

LPI: Land price index

PD: Population Density

PE: Price to Earning Ratio

QE: Quantitative Easing Monetary Policy

SLP: Standard Land Price

SA: Selling housing area

THP: Housing Price of the Land Transferred through Tendering

TLP: Price of the Land Transferred through Tendering

VECM: Vector Error Correction Model

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Chapter 1: Introduction

This chapter demonstrates the overview of the whole thesis and the purposes to do this research. It shows what has happened in the real estate market and land market in China during the past few years and a case study of Shenzhen will be used to further analyze the impact of land price resulted from public land leasing on newly-built commercial housing price variation.

1.1 Background

Public land leasing system, which was introduced from Hong Kong in the 1980s (H.Perkins, 2009), has been a significant instrument for municipalities to capture the land value in China. The development of the system is accompanied by the economic reform, especially the reforms related to land resource allocation and housing allocation.

1.1.1 Land reform in China

Land market in China has experienced different development stages during the past decades. The first land auction happened in Shenzhen in 1987, which leaded the land reform of land marketization (Zhao & Cao, 2012). In 1988, the amendments to the Constitution legalized land transferring for the first time (People's daily online, 2006). However, there was no formal land market in most cities and allocation was still the dominant way until 1997 (Wang & Zhang, 2010). In 2002, the Ministry of Land and Resource issued the land order NO.11[1], which required all the commercial land use right were ought to be transferred through auction, tendering or listing. Land market gradually formed. And then in 2004, public land leasing system was officially required to be used for all profit-oriented land transfer and land market formed across the country (Kuang & Li, 2012).

Land market in China has five main characteristics. Firstly, the municipality owns the urban land and thus monopolizes primary land market. Secondly, only the urban land can be leased and the rural land can be leased only if it has been expropriated and been redeveloped as construction land[2] (Luo & Yin, 2013). Thirdly, each of the leasehold has a fixed lease term, which is legally defined according to its planned use. When the contract expires, the land will be taken back or the user can pay the premium to continually use the land. Fourthly, some specific use such as military use, religious use is still allocated without any payment. Fifthly, the land-transferring fee is a lump-sum payment and should be paid within 60 days after the conclusion of contract[3], which is always complained by the developers that they have to suffer from heavy financial pressure.

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[1] It is the regulation of *The Regulation of Transferring State-owned Land Use Right through Tendering, Auction and Listing* (2002)

[2] Resource is cited from the tenth plank of *Constitution of the People's Republic of China*.

[3] Resource is cited from the *Provisional regulations of the People's Republic of China on Urban Land Use and Transfer of Provisional Regulations*

Consequently, for the municipality, public land leasing is a favourable instrument for land value capture while the land transferring fee has become the most important revenue resource (Peterson, 2008). It is popularly called "land finance"[1]. The total local land-transferring fee was $0.65 trillion last year, which was 44.6% more than that in 2012[2]. Especially for Shenzhen, it has the highest year-on-year growth rate although the absolute value of its land transferring fee is not particularly high.

Table 1   The land-transferring fees of major cities in 2013 in China[3]

city	revenue($,billion)	Year-on-year growth rate (%)	city	revenue($,billion)	Year-on-year growth rate (%)
Beijing	294.19	128.18	Ningbo	118.53	53.8
Shanghai	365.24	181.18	Nanjing	128.04	212.5
Guangzhou	99.30	149.52	Suzhou	69.85	33.54
Shenzhen	75.45	330.88	Shenyang	77.18	−11.4
Tianjin	128.74	20.8	Wuhan	110.76	−23
Hangzhou	214.27	117	Ha'erbin	18.19	65.19

1.1.2 Housing system reform in China

Since 1978, the central government started the pilot reform of real estate market, such as commercialized public housing and provided housing rent subsidies. However, all the houses were still public constructed and most of them were allocated according to personal seniority during the period (Perkins, 2009). Until the end of 1991, the real estate market was initially formed accompanied by the sprung up the real estate companies in the following years (Chai, 2008). From 1994 to 1997, the central government began to regulate real estate market running through tight fiscal policy and monetary policy (Chai, 2008). In 1997, the Asian Financial Crisis resulted in the deflation of national economy, so was the real estate industry affected in China. And 1998 was the turning point when the government abolished the welfare housing distribution system and decided to introduce the market mechanism in housing distribution. (Unirule Institute of Economics, 2011). Since 2003, the growth of newly-built commercial housing price (Fig 1) has gradually been out of control and the short of housing supply became intensified. In this condition, the government began to regulate the housing market again through a series of more severe policies (Chai, 2008). However, contrary to the result of last regulation, the real estate enterprises still ushered in their gold decade due to the accelerating macroeconomic environment.

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[1] "Land finance" vividly describes the reality that the local finance heavily depends on the land transferring fees.

[2] The data is cited from the annual work report of the Ministry of Finance.
http://gks.mof.gov.cn/zhengfuxinxi/tongjishuju/201401/t20140123_1038541.html

[3] The data is collected from the local government work report and report from real estate agencies and the date is converted with the average exchange rate in 2013.

Figure 1 Variation of inflation-adjusted housing price in some major cities in China (State information center, 2007)

variation of housing price in major cities
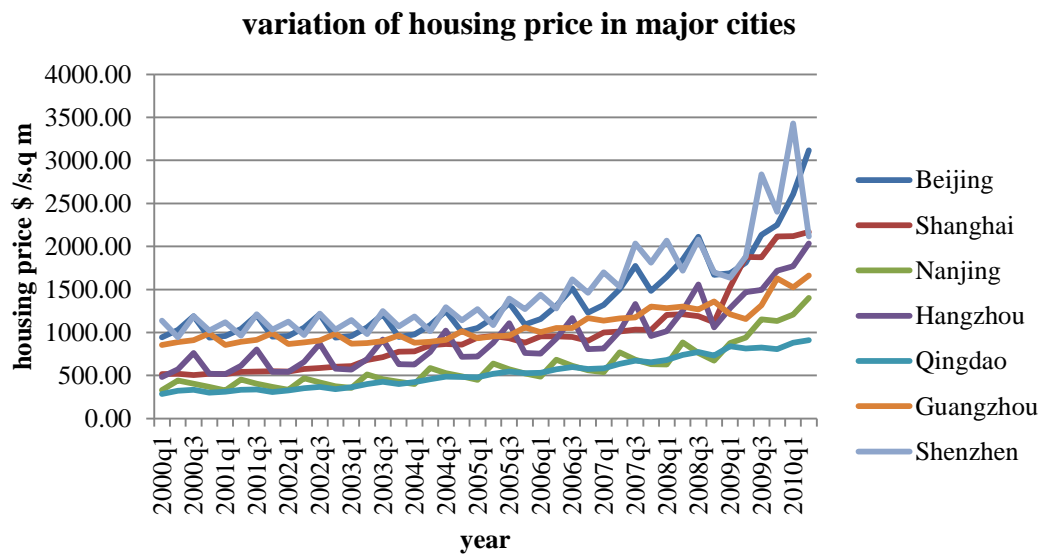
Resource: National Bureau of Statistic, 2011

The real estate market was characterized by more and more intensified relationship between supply and demand. The accelerated urbanization progress, urbanization rate ranging from 18% in 1978 to 53.73% in 2014 (Song, 2014), exacerbates the shortage of supply either for industry and commercial development or for housing construction in real estate market.

In addition, the traditional Chinese culture regards household ownership as not only the shelter for living but also the symbol of wealthy life (Lai, 2006). With such a deep-rooted perception, people are motivated to purchase a house and forms great potential housing demand as population grows. However, the housing supply is relatively inelastic in short-term and its change lags behind the change in demand in the long-term (Yan, 2006). According to the classical western economy, such imbalance of supply and demand could directly determine the housing price in the market.

1.1.3 Introduction of Shenzhen

Shenzhen, being the first Special Economic Zone in China since the "reform and opening-up" policy, has developed rapidly due to great political support from the central government. In 2013, its GDP was \$234.13[1] billion raising 10.5% than the year before, which ranked fourth among all the cities. Besides, it is also the significant gateway of foreign exchange due to its favourable geographical position in China. In this condition, it became attractive showing strong agglomeration effect. Until 2012, the permanent population is 10.5474 million, most of which are immigrants

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[1] The average foreign exchange rate was 6.1932 in 2013.

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(Shenzhen municipality , 2013). And there are 192 enterprises of the Fortune Global 500 have located in Shenzhen until May 2013. Nevertheless, such agglomeration effect imposes great pressure for land availability and housing construction.

On the other hand, Shenzhen is innovative and is always the pioneer or experimental city of reforms. Being a separate planning city, Shenzhen enjoys more free right to make policies corresponding to local interest and development needs. Fiscal decentralization not only reduces the administrative cost during the approval process but also motivates the municipality to maximum the revenue they can gain within their administrative power, among which the land related payment, taxation and fees accounts for large part.

In brief, its economic development and free political environment provides both the possibility and necessity to start the land system reform followed by the national housing allocation reform.

Land market reform in Shenzhen

From 1982 to 1986, land transfer with payment was officially approved but only through allocation. Since 1987, the first land auction happened in Shenzhen and then public land leasing system was introduced which included auction and listing as the new ways to transfer the land. Until 1994, the municipality abolished administrative allocation. Subsequently, it further required that all profit-oriented land should be transferred through public land leasing system in 1998, which was 6 years earlier than the same national policy. In 2001, the municipality announced that land price should be measured by market price instead of negotiation price. And in the next year, another mode, called listing, was introduced by the Ministry of Land Resource and Shenzhen municipality included in its public land leasing system. (Ye & Shi, 2007) On December 20 2013, the first community-owned industrial land auction happened. It was regarded as a meaningful trial to terminate the dual land system but also implies the shortage of land in the city (Zhang, 2013).

Housing market in Shenzhen

Since 1984, real estate industry formed and numerous companies established. After the national policy of abolishing the welfare housing distribution system in 1998, the real estate industry in Shenzhen ushered in its golden decade. Along with its marketization process, the industry began to boom and some local real estate companies developed rapidly. In 2002, the market development reached a peak and gradually restored the rational development due to the rounds of national macroeconomic regulation and control. Developer also changed their development strategies from resource dependence to marketing strategies. During this period, they concerned more about brand value, land management, quality of products and property management instead of only bidding for the land. Between 2005 and 2007, the lag effect of macro regulation policies was amplified and the housing price experienced a great drop just after its second flourish. The real estate investment

variation and the housing price variation described the development stages while the reveres trend indicated the lag market response (Fig 2).

Figure 2   The development of Shenzhen's real estate industry in its golden decade (Yin & Xie, 2013)

Development of Shenzhen's real estate industry
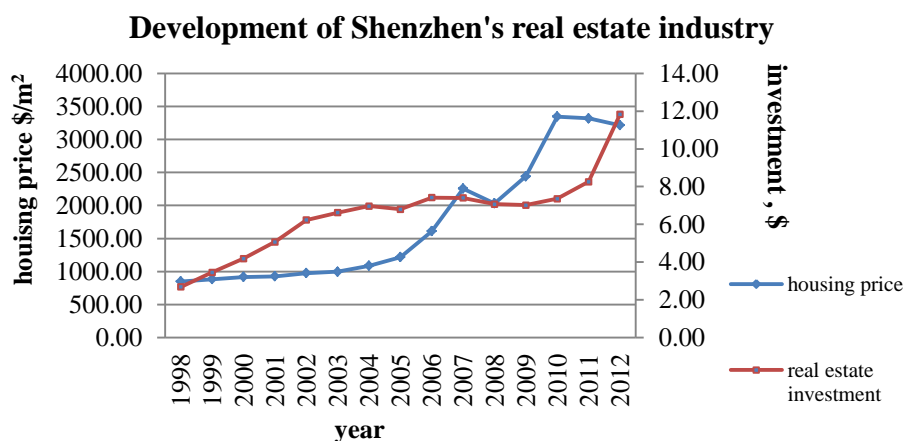
1.2 Problem Statement

During the last three decades, the country experienced rapid economic growth and fast urbanization process, which imposes great pressure on land availability either for city development or for housing construction. Especially in recent years, land becomes scarcer after numerous years' intensive development. While on the other hand, the land market and real estate formed and gradually developed mature, which is good for efficient land allocation and housing allocation. Accompanied those changes, the land price and housing price have increased sharply since 1990s (Fig 3), which has incurred great social criticism.

Developers always complain the higher land price resulted from public land leasing system, which together with other land related taxations and fees accounts for remarkable part of housing construction cost. Since they should responsible for their own profit and loss in the market economy, they prefer to transfer such cost to consumers. To the contrary, the municipality would attribute the land price increment to the raising derived land demand resulted from growing housing demand. People have no other choice except to suffer from the out of reach housing price and the heavy debt.

Therefore, it is meaningful to explore the influence of implementing the public land leasing system as an important instrument to capture the land value on the land market and real estate market.

Figure 3   Variation trend of LPI and HPI at national level (based on the price of 2000)

changing trend of national LPI and HPI
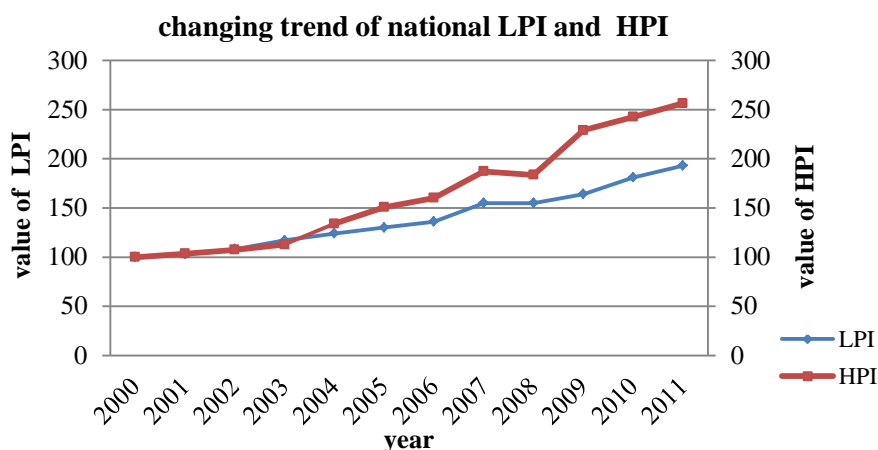
Resource: from the website of National Bureau of Statistics of China and website of China Land Price Information Dynamic Publish Platform, 2012

Case of Shenzhen

Shenzhen has been struggle with land shortage for long time. Its relatively small administrative area was difficult to provide enough land for its intensive city development and in effect the land was exhausted quickly. Dating back to 1992, it had completed the nationalization of community owned land in its four main administrative districts. However, before long, its development again faced shortage of available construction land. Therefore, Shenzhen nationalized the 260 km^2 collective-owned land which was in the suburbs, after which Shenzhen became the first city terminate the dual land use system[1] across the whole country (Liu, 2014).

Conditions are even worse for residential land. There is always less land planned for residual use than for industrial or commercial use. During the 11th five-year planning period, Shenzhen supplied 5.62 km^2 of land for newly-added commercial housing, especially in past three years, no more than three plots of residential land, as a whole, were annually transferred (Yu, 2014). Nevertheless, the housing demand still increases. The municipality announced its goal of ensuring everyone has the housing right in the 12th five-year planning period (2011-2015), which required provision of 3 million units of commercial houses and the total construction area was up to 270 million km^2.

In brief, the lack of land availability remarkably influences the demand and supply either in primary land market or in newly-built commercial housing market. This paper would like to explore what the impact of such condition on land price variation and housing price variation in market mechanism.

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[1] The urban area and rural area are applied different land use system according to the different land use related limitations. For example, only the urban land can be transferred while the rural land should be used only within its community.

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1.3 Research Objectives

Based on what have been discussed above, this paper has two objectives:

a. To explore the impact of public land leasing on land price in primary land market in Shenzhen.

b. To explain the the role of land price in primary land market play in the increase of newly-built commercial housing price in Shenzhen.

1.4 Provisional Research Question

The main question is:

In what way dose the land price resulted from public land leasing system drive up the newly-built commercial housing price during the golden time (2000-2010) of real estate industry in Shenzhen and how can this be explained?

The specific sub-questions are:

a. How does the public land leasing system influence the land price in primary land market in Shenzhen ?
b. What is the role that land price in primary land market play in the increase of newly-built commercial housing price in the Shenzhen?

1.5 Significance of the Study

It is really an old topic and there is already a mountain of papers discussing this problem. However, this paper is different from others because it highlights other three main points. Except for the analysing the impact of land price variation on housing price variation, it paid attention to the effect of implementing public land leasing system as an important instrument of land value capture on primary land market. Additionally, it explored the different individual influence of the three market-oriented public land leasing modes on land market operation and housing price variation. Lastly, it tries to explore whether the land price variation caused by public land leasing system is necessary and sufficient condition or not for the newly-built commercial housing price variation.

Another improvement of the study is that the analysis respects and in accordance with the normal market economic principle. According to the micro economics, the relation of supply and demand is the dominant power of price decision mechanism (Mankiw, 2011). The study takes good advantage of this relation to explain the linkage between primary land market and newly-built commercial housing market rather than regard them as "isolated islands". Consequently, it avoids the bias of only concerning either side and the discussion will be more in-depth and sophisticated.

1.6 Scope and Limitations

This study concentrates on explaining the impact of land price resulted from public land leasing system on newly-built commercial housing price. Under the Chinese background, this paper uses an econometric model to test whether such influence exists and how it works through a case study of Shenzhen. Obviously, the pricing

system is quite comprehensive in market mechanism. To stress the key point and simplify the process, this paper primarily controls the economic fundamental factors' influence when quantitatively analysing the impact of land price variation. Furthermore, this paper only explores the impact of land price variation on housing price variation though they would be mutually affected. Last but not least, it need to mention at the beginning that the housing price discussed in the paper is the price of newly-built commercial housing while the land price is the land transferring fee in primary land market.

The study is limited to the applicability of its findings and conclusions because all assumptions and conclusions are generated based on the information of Shenzhen. Characterized by immobility, land use and land market operation are more or less rooted in its local context, so does real estate market. Although the city's experience is relatively representative and valuable compared with other cities, it is still one-sided to describe the situation of the whole country due to the heterogeneity of the markets. In this way, the outcome of this research is inevitable to be narrowly focused and limited used. Further analysis is also lacking in time and deeper information. However, what has been studied in the paper is able to, to some extent, show whether the land price caused by public land leasing should be to blame for the skyrocketed housing price.

1.7 Thesis structure

The paper is structured as follows: next sector reviews the related articles about both economic principles used and the introduction of market operation and then point out the hypothesis. The third part describes the data and expresses the procedure of establishing the econometric model and relevant statistical tests. The fourth part analyses the findings and results collected from the field work and answers the questions of this research. The last part is our conclusion and recommendation.

Chapter 2: Literature Review

Introduction

Public land leasing system, which is not so popular now in European countries (Booth, 2012), is quite an appreciated method that used to transfer the land use right in primary land market in China. This chapter starts with the introduction of land value capture and public land leasing system in China. The remaining part discusses the pricing mechanism both in land market and real estate market. Finally, it analyses the relationship between land price variation and housing price variation.

2.1 Land value capture and public land leasing

2.1.1 Introduction of land value capture

Land value capture refers to the fact that the government shares the land value increment, which is resulted from their directly or indirectly actions, sometimes it even includes those called "unearned income" (Smolka, 2013). It is originally created to raise funds to get itself out of budget deficit, especially in developing countries, where the municipalities have more obligations to provide public service but less power to raise financial revenue. (Gregory & Hong, 2012).

To further speaking, land value capture has long been regard as an important instrument to internalize the positive externalities generated by the public investment in public facilities or infrastructures. The Canadian government is the pioneer to practice this concept. It sold the development rights for 48-mile wide corridor along the railway to capture the increment of land value due to improved transportation and further to partly financed the construction of the railway with the revenue (George Hazel Consultancy Ltd, 2013). While in Hong Kong, the rapid urban development and increasing population density imposed great pressure on its natural resource. Suffered from such problems, the government began to pin the hope on the use land value capture through public land leasing to realize the political purposes including raising funds for providing public service and public housing, managing urban growth and promoting industrial development (Hong, 2003).

However, land value capture is not the panacea for the society. It also has some distorted effect. One such example is land tax. Land tax has long been labelled as a justified instrument since it does not create deadweight loss as other kinds of tax do because the tax base is relative fixed (William & Riel, 2005). However, when the heavy tax cannot be transferred to the lessees or consumers, it discourages the land owner to invest in land thus they may underuse land even leave the land unused (Fred, 2005). In addition, Anderson (2012) argues that the lessee would not like to optimally invest in the land with capital or time than he would do if he owns the land. Because the lessee only gain a finite return with a fixed time leasehold and all the value left will forgone when the lease expires.

Increment of land value capture

According to Gregory & Hong (2012) and rent theory, land value increment, which is the fundament for land value capture, can be determined by four dimensions: the economic embody in land ownership, the investment of private sector, the investment of government and the natural increases (Fig 4).

Figure 4 Diagram of the segmentation of land value (Smolka, 2013; Gregory & Hong, 2012)
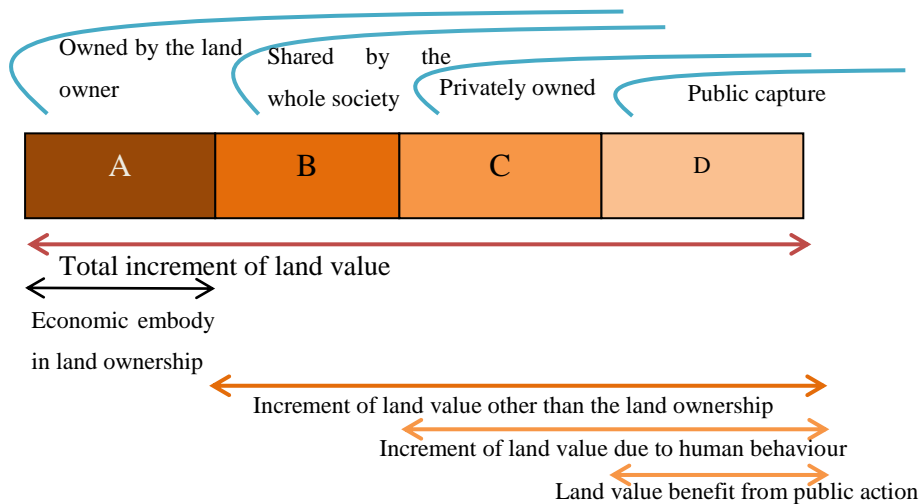
According to the famous Marx's theory of rent, land rent is divided into three categories: absolute rent, differential rent and monopoly rent (Marx, 1959). Marx (1959) asserted that "landed property itself [rather than more organic mechanisms of capital] has created rent". In other words, the land ownership is the economical formation to manifest the land value (Marx, 1959). In this way, the land owner is inherent to own the residual value of land just because he has the title to the land.. Since the land ownership is just the right to refuse others to use his land for free rather than create the increment of land value itself (Ge, 2010), the land owner can share such part of land value increment only through land leasing.

George (1912) demonstrated that the land value increment should be accrued to society as a whole instead of the individual land owners. Social progress and economic development can increase social welfare, so is people's income increased. Additionally, the central government will loose the credit policy so that people are easier to get loan from the bank. The more income on the one hand enables people invest more in the land and on the other hand it can raise land demand, either of which could increase the land value (Rajan & Ramcharan, 2012). Therefore, social development is able to result in great leverage in land development and thus contribute to the growth of land price.

According to Gregory & Hong (2012), "the value related to the original productivity of the land paid for by the owner and the increment in value generated by private land improvements should remain in private hands". In fact, depriving such profit from the land owner likely discourages them to make further investment in land, which could cause inefficiency in the land market.

Another reason supporting government's right to share the increment of land value is its investment in public service. Because of the rapid social progress, the local governments in most cities have faced the challenge to provide public service requiring either higher quality or larger quantity to meet the growing demand (Gregory & Hong, 2012). And the most serious problem is money. Even in Central and Eastern Europe, the governments have to find alternative ways to increase their revenue to cover such cost. Especially, the recent economic crisis makes the situation even worse (Medda, 2011). In this way, the government is possible to share the increment of land value resulted from its investment to improve its fiscal capacity (Medda, 2011).

In the next section, the paper will discuss public land leasing, which is the dominant land value capture instrument in China and its effect on land value.

2.2 public land leasing system

General discussion of public land leasing

Public land leasing system is developed based on the rent theory. Rent is a time-honoured economical concept and its definition has been progressively developed during the long time. In the era of agriculture, rent refers to the surplus value of agricultural land which was mainly decided either by the accessibility to the city centre or the fertility of land (Richard, 1903). After coming into the industrial era, rent was explained as the remaining profits of production. In this way, the accessibility dominates the land value since transport cost accounts for most of the production cost (Alonso, 1964). The rise of ecology provides another point of view as the ecologists regard the land value is determined by the competition of potential users (Alonso, 1964). Alonso also highlighted the significant influence of size of the site on land value since reduction of land price with smaller size in the outskirt can compensate the higher transport cost and vice versa (Alonso, 1964). However, no matter what the rent concerned in different time period, rent reflects the land value and the land owner can free to own such value because his has the title to the land. As Marx (1959) pointed that rent was normal economic phenomenon and owning the rent was the economic formation of land ownership.

Public land leasing system means that the government can lease the state-owned land to developers for a fixed period. The rational of public land leasing is that the government can get revenue from the land and realize its political goals through the control of land use (Anderson, 2012). For instance, the Sweden municipality encourages the provision of affordable housing through public leasehold (Anderson, 2012). While in Hong Kong, besides the same goal as the Sweden municipality has, the government also aims to manage urban growth, promote specific industries and capture land value (Hong, 2003).

Public land leasing system is beneficial for the municipalities, especially in the country where majority of the land is state-owned (Peterson, 2008). First of all, as the land owner, the government dominates the process so that it monopolizes the right to

enjoy the increment of public land value. In this case, the government can capture the land value in the lease term through the way of premium, ground rent or annual rent while still holds the opportunity of further land development through retaining the land ownership (Anderson, 2012). Secondly, public land leasing faces far less public resistance than property tax faces. Public land leasing is a bilateral agreement and each project has its own targeted group. Therefore, it will not affect the interest of a third party. On the contrary, property tax is a general instrument and always applies to a wide group of people. It also has the problem of double taxation and high administrative cost which is relatively disorder and comprehensive (Yue & Wang, 2004). Comparatively speaking, public land leasing does not put heavy financial burden on the whole society and can, to some extent, avoid people to "vote with their feet". Lastly, public land leasing is much easier to implement. As a way to capture land value, public land leasing can combine wider public purposes and private objectives under various forms like public private partnership, joint ventures or urban development funds(Medda, 2011).

However, there are still some problems of public land leasing. Obviously, the most important one is corruption. Since the leasehold is a bilateral agreement which lacks of monitoring, it provides opportunities to make an agreement under the table for special interest of both parts, especially in some democratic countries, where the government heavily depends on public vote (Gregory & Hong, 2012) , which is called "money election". Another problem is whether the public land leasing efficiently capture the increment of land value while takes justice into account (Fainstein, 2012). In general, land rent is fixed in the contract while the land value increases over the time thereby its variation lags behind the social development and changes. Last but not least is how to deal with the land when the lease hold expires. In principle, the government can reclaim the leasehold and redevelop the land at the termination but there is the risk of overlapping investment or waste of existing development outcomes. Therefore, in most cases, the leasehold will be renewed (Anderson, 2012).

Public land leasing in China

Public land leasing system was originated in the 1980s in Shenzhen, which was mainly motivated by the financial factors. Most important of all, it was introduced by Shenzhen municipality to finance the construction of infrastructure and public facilities. Along with development of public land leasing, the central government's share of land transferring fee ranged from 60% at the beginning to 0 in 1994, when the tax sharing reform happened (Zhao & Cao, 2012). During such a process, public land leasing was regarded as a significant element of national fiscal decentralization, which reallocates the share of revenue generated from kinds of taxation.

Besides, the financial deficit was also caused by the limited way for Chinese municipalities to gain effective revenue. They have less flexibility to generate revenue. Firstly, the taxation system is unified across the country and the municipality is not allowed to create new taxes or fees (Zhao & Cao, 2012). Secondly, the financial

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market is regulated by the central government and the municipality cannot raise money through issuing government bonds. Lastly, the municipality only can borrowing from the state-owned banks with the collateral of land (Peterson, 2008), but it is just an interim method and the municipality has to repay them through selling the land use right (Perkins, 2009).

Restricted by above conditions, the municipality prefer the public land leasing system as the dominant way to gain revenue and finance the provision of public service.

Political support: bundle of rights
Property right

Dating back to 1960, Coase for the first time to state that "if trade in an externality is possible and there are no transaction cost, bargaining will lead to be an efficient outcome regardless of the initial allocation of property rights" (Coase, 1960). In other words, when there is transaction cost, the clear initial definition of property could play significant role in economic efficiency (Guo, 2006). During its development, Demetz (1967) listed three important criteria for efficiency of property right: universality, exclusivity and transferability. It defined that the property should be exclusively owned by someone and the property can be transferred to higher utilization efficiency (Demsetz, 1967). In fact, private property rights guarantee the owner the exclusive right to use, develop, consume, sell, mortgage, transfer and exchange possessions with other entities (Bentham, 1978) cited in (Ingram & Hong, 2009).

Another important development about the concept of property right was the introduction of the concept of "bundle of rights". It indicates that the ownership can be separated into bundle of individual rights while the owner owns them at all (United States Court of Appeals, 2007). It also indicates the rules related to specify, proscribe and authorize auctions from the point of view of land owner (Klein & Robinson, 2011).

Introduction of the system

In China, public land leasing means the local governments lease the land use right to the developers with a fixed lease term and the developers are obligate to pay for the right (council, 2006). The tenancy term is determined according to the type of land use---- residential land is 70 years; industrial land is 50 years; land for education, science, culture, sports or medical treatment is 50 years; land for business, travel or recreation is 40 years; land for other use is 50 years (council, 2006).

Public land leasing in China is different from that in other countries due to the following characteristics. Firstly, the licensor is and only is the local government. The primary land market is an imperfect competition market because of the government's monopolization (Wang & Zhang, 2010). Secondly, only the state-owned land use right can be transferred. The lessee is lawfully to possess, use, profit from the land (council, 2006).Thirdly, the use of community-owned land is strictly restricted that rural land cannot be leased except being expropriated (council, 2006). Fourthly, since the tax-division system reform in 1994 which reallocate the division of local financial

revenue between central government and local government, the revenue generated from public land leasing is totally owned by the local government. Since then, the local government relies more and more on land related revenue (Yue, et al., 2009).

There are four legal ways to lease the public land in China and they are auction, tendering, listing and negotiation.

Negotiation is the dominant mode of land transfer in China. In 2003, the Municipality of Land and Resource promulgated the *Rules of Agreement Transfer of State-owned Land Use Right* to regulate the agreement-based transfer of land use right. According to this rules, negotiation means the government transfer a certain years' land use right through negotiation with developers. The developers should pay for it according to relevant regulation. The land transferring fee should not be lower than the sum of land use fee, compensation for expropriation and land-related taxation. Or if the city has standard land price system, the land transferring fee should not be lower than 70% of the standard land price at its corresponding level (Ministry of Land and Resource, 2007).

Auction, started in 1987 in Shenzhen, is the process that local government publishes the auction notice and the bidders bid for the land in the specified place at specified time. Land is owned by the top quota. In order to control the skyrocketed housing price, this rule is further explained into two ways: one is to bid for the area of affordable housing with a ceiling of land price and the other is bid for land price with a ceiling of housing price. Furthermore, the bidder needs to pay a deposit which is no less than the amount regulated in the auction notice when he applies for the auction. Another rule is that the auction can proceed unless there are more than three bidders (Ministry of Land and Resource, 2007).

Tendering means the local government publishes the tender notice and invites potential bidders, including citizens, organizations or enterprises. It has to meet two requirements to execute the bidding operation. One is that the bidder needs to pay bid bond except for the essential documents and the other one is that there should more than three bidders in the tendering process. The determination based on the standard listed in the bidding documents (Ministry of Land and Resource, 2007).

Listing means the local government publishes the listing notice at first and publicly announces the trading conditions of the parcel which is prepared to be transferred at specified place. The bidders can offer their bid price and the government will update the listed price within the prescribed time. The final result will be determined at the termination according to the listed price. The rule of "highest bidder" is also applicable once there are more than two bidders. In the condition that there are several bidders offering the same quoted price, the one who submits the quotation earlier is the competitive one. If there is only one bidder, he can get the leasehold as long as his quoted price is higher than the starting price (Ministry of Land and Resource, 2007).

The influence of implementing public land leasing

Compared with the previous way, which transferred the land by allocation or negotiation, the way of auction, tendering and listing has several advantages both for the primary land market running and government finance conditions.

The most remarkable breakthrough is the improved fairness and transparency. Marker-oriented modes of public land leasing system are for the first time to introduce the competitive mechanism in land transaction (Zhang, 2011). Since then, land market formally formed and brought about some changes in the land transferring process. The pro-announcement of information enables the developers with relatively abundant time to do field survey, financial budget and make their final decisions. Furthermore, such a system liberalizes the primary land market and allows more developers to join in the land transferring process. Unified threshold weakens the influence of government's preference when choosing the transferee and enables the developers can compete in relative fair environment (Chen & Song, 2010; Li & Shang, 2010). Rather than select the developers from a relatively small samples, it contributes to improve the successful matches between buyers and sellers. Above two improvements make it easier to make effective deals in primary land market.

Another significant improvement is to make land traction be cost-effective. On the one hand, the market-oriented modes of public land leasing system could lower the cost both for the government and developers. As for the government, such a system simplifies and opens the land transferring process so that it reduces the kinds of administrative cost. Additionally, rather than to spend a lot of time, energy and money to find an appropriate transferee, municipality can save the searching cost because the bidders are more active and more appropriate after the screening (Chen & Song, 2010). As for the developers, the simple process reduces their administration related cost and trade cost while the less opportunities of rent seeking reduces their corruption cost (Ma, 2008). Additionally, it to large extent excludes the influence of human intervention including less corruption and more favourable market order so that it improves the allocation efficiency of land resource (Chen & Song, 2010).

On the other hand, the market-oriented modes of public land leasing system also manifest the real land value. Compared with negotiation, which could artificially lower the land price in order to meet the private interest, auction, tendering and listing can reflect the market value of the land through market competition (Yan, 2006). In addition, most developers measure the land value and its deserved maximum cost not only depends on its productive ability but also highlight its appreciation potential in the future (Xu, 2011). In this case, land is regarded as a kind of asset rather than only means of production and the bidding price shows the asset value of land in primary land market. Lastly, as the land transferring fee also can be calculated as the discount value of future earnings that is generated within its leasehold, the land price resulted from the auction, tendering and listing reflects both the current land use value and future land use value (Wang, 2009). In brief, the bidding price in primary land market

manifests the real market value of land use right as well as the developers' evaluated value of the land with its planned use.

The third advantage is the market competitive mechanism helps to improve the land use efficiency. The threshold of auction, tendering and listing guarantees the enterprise qualification of those interesting in obtaining the land. The measurement of such qualification includes the enterprises' business experience, cash flow, financial condition and business certification or license, which is designed to ensure the complete development of the land to be transferred. In addition, the land is always transferred with some official planning conditions or regulations which are made by the experts in order to guide the land development. Another relevant and crucial factor is the competitive mechanism actually reflects the principle of "survival of the fittest", through which the market will automatically choose the most appropriate developers for each plot of land to be transferred. That explains why the large companies with more comprehensive business capability can always outcompete to obtain the plot with large-scale and complex development regulation. Those companies have better ability, experience and resource to develop the land and generate benefit either to them or to the society.

Continues with above discussion, improvement of land use efficiency is also attributed to the developers' motivation to cover the land obtaining cost and pursue the profit. Developers are responsible for their own profit and loss so that they will utilize the land more efficiently than land transferred by agreement. The developers who can obtain the land through agreement with the municipality tends to be government-related enterprises, such as state-owned enterprises, and the outdated management mechanism and the bureaucratic style make it impossible for them to efficiently use the land.

With its development, there are also some drawbacks gradually appear. Complied with the principle of "high price results", some overly optimistic developers may obtain the land with quite high price and later may find that either the price is far beyond their affordability or the price exceeds the real value of the land. Those unexpected results would affect the land development process and even some developers will give up the leasehold and return the land. Such phenomenon weakens the land use efficiency while add the administrative cost (Wang, 2009). In addition, the bidding ways are special methods to maximize the sellers' profit in the condition of supply falls short of demand. It actually indicates the shortage of land supply in the land market, which is caused either by physical limitation or by artificial monopoly, and thus the land price is inevitable to be driven up (Dong, 2013).

Additionally, the municipality lacks effective supervision during the land transferring process, which results in corruption and abuse of land transferring fee. Even in the market mechanism, those developers who have close relationship with the municipality could have access to the information in private. And then they can have more chance and means to obtain the land with twin-contracts, which actually the land

price is much lower due to the unfair competition (Wang, 2009). While the municipality can help the targeted bidders to evade other competitors through the way of setting specific threshold conditions or planning condition for certain plot of land (Wang & Zhang, 2010). Even in the auction process, there is still opportunity of corruption by the way of signaling activity. Corruption happens mainly because the municipality can monopolize the entry deterrence during the preparation period that is before the start of auction (Cai, et al., 2009). Besides, motivated by existing evaluation system which crucially highlights local GDP, the municipality prefers to use the land transferring fee to invest in vanity projects than to invest in public facilities and infrastructure (Wang & Zhang, 2010;Wang, 2009).

Lastly, officials tend to be short-sighted due to their tenure system. Since the land transferring fee is lump-sum, the municipality is inclined to intensively transfer large amount of land within their term to gain more revenue (Dong, 2013). In reality, such government performance overdrafts the land related revenue in future tenure. The intensive land transferring and unlimited sprawl of the city distorts the normal supply and demand relationship in primary land market. While in this condition, the land price is difficult to reflect the real market price (Wang, 2009).

In brief, the public land leasing system to some extent contributed to the increment of land price in primary land market and further growth of the newly-built commercial housing price. Its advantages of competition mechanism and transparent, which exposes the shadow price and reflects the real marker value of land, results in that the land price is much higher than that generated by negotiation (Yue, 2005). Nevertheless, the disadvantages like corruption, emphasis of the decisive effect of highest bidding price and lack of effective supervision, contributes to the further increment of land price and false prosperity in real estate market (Li & Wu, 2010).

Different impact of auction, tendering and listing on land market and real estate market

Actually, there is still less literature to explore the difference between auction, tendering and listing, let alone the relevant discussion about their individual effect.

A recent research demonstrates that listing is the one most preferred among the three public land leasing modes (Li & Ma, 2009). Listing is discussed good for both the municipality and developers. As for the municipality, listing is a way of English auction that ensures high revenue. Additionally, no limited number of bidders for listing could avoid the situation that the auction fails for lack of enough bidders. It also reduces the risk of social criticism of the municipality to overheat the land market through public land leasing system. Price resulted from listing is relatively lower than that caused by auction since the bidders are rational during the bidding process. Finally, the more simple land transferring process of listing can reduce the transaction cost.

While for the developers, listing allows longer term for land transferring, during which period they can collect the bidding information about other competitors. In this way, they tend to be more rational when making final decision (Li & Ma, 2009).

Nevertheless, Li & Ma (2009) also argues that there are more opportunities of corruption during tendering and listing because the municipality have greater influence on the determination of final results during the process, for example they can set more tendering conditions to select target bidders.

Wang (2005) points out some other characteristics of each mode. Auction largely improves the transparency and land allocation efficiency so that in provides fairer and more open competition than the other two. Tendering is better at exposing relevant information and reducing the agent cost but it also more possible to incur corruption because the bidders are easier to form collusion in order to lower the tendering price. Listing is the one that is deepest marketization and the most rational way.

As for their impact on land price variation, Wang (2005) demonstrates that land price resulted from auction is much higher than that resulted from the other two modes. And the price of the land transferred through tendering is more close to the land price set by the municipality.

2.3 Pricing mechanism in land market and real estate market

2.3.1 Introduction of supply and demand

According to the classic western economy, price is primarily determined by the supply and demand in the market. The two functions codetermine the quantity of good that should be produced and the price at which it is accepted by both the producers and consumers. Fig 6 describes the supply and demand in market economy and explicit description is in annex 1.

Demand curve shows the relationship between market price and quantity demanded of the good. Each point on the demand curve means that the price at which the consumers are willing and able to pay for the corresponding quantity of good. If ceteris paribus, the price and demand of the good vary in reverse. In other words, increasing commodity price discourages the consumers to purchase the quantity of good he would consume since the limitation of his budget. Corresponding to the individual behaviour, market demand is the sum of individual demand and shows similar function (Mankiw, 2011).

Supply curve shows the relationship between market price and the quantity supplied of certain good. Each point on the supply curve means that the amount of good the producers are willing and able to provide at certain price. If ceteris paribus, the quantities supplied and price is positively related. The increasing price of good means more profit for the suppliers so that they are motivated to produce more good to supply. Similar as the market demand, market supply is the sum of all the supplies of producers and also works as individual supply behaviour (Mankiw, 2011).

There are many factors can affect the demand and supply of commodities, such as income, price of related goods, preference, input prices, technology and expectations. In the following part, it discusses how these factors work in land market and real estate market in order to describe the land pricing mechanism and housing pricing mechanism.

Figure 5   The equilibrium of supply and demand (Mankiw, 2011)
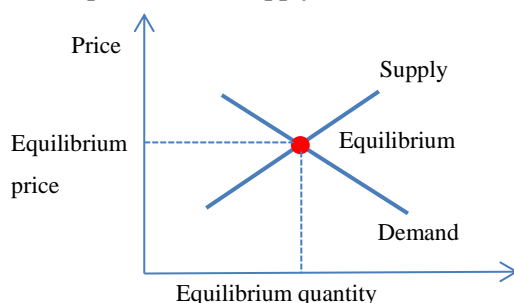
2.3.2 Pricing mechanism in land market and real estate market

Based on above discussion, this part highlights those elements that have significant influence on land price variation and housing price variation in the market.

Economic development

Rapid economic development provides well economic environment and stimulation for the market boom. The rapid development of urbanization and industrialization leads to intensive demand of construction land in cities through directly or indirectly ways. Urban construction and economic development increases the demand for urban construction land for companies, commercials and business (Zhang, et al., 2004). While population growth in urban areas resulted from natural growth or migration requires more residential land for living (Tan, et al., 2003).

Besides, people's welfare also benefits from the economic development. Restricted by the less developed financial market, purchasing a house becomes rather a way of investment than only holding a shelter for living. The flourish of housing market in the past few years strongly convinces people that investment in real estate market is profitable (Zhou, 2005). Therefore, basic living needs, investment and even speculation imposes great pressure on housing demand, which is further transferred into intensive land demand.

Excessive demand tends to be converted into higher land price and housing price in the two market. Song and Gao (2007) find that the real estate development and macro-economic development are reciprocal causation according to the result of Granger Causality Test. Fu (2007) also testifies that economic development (personal GDP used in the paper) is correlated with housing price. Leung & Yui (2003) point out that the continued economic prosperity is the main reason that drives up the housing price in Japan, Korea, Hong Kong and Singapore. Similar results are also verified in OECD countries (Englund & Ioannides, 1997).

Foreign direct investment (FDI)

There is almost no theory explains the relationship between FDI and housing price variation but quite a lot of empirical studies regarding FDI as an important factor affecting the housing price. Jiang, Chen and Isaac (1998) believe that the FDI contribute to the prosperity in the real estate market during the stringent period. Kuang (2013) points out that the impact of FDI depends on where it to go. If the FDI goes into housing construction, it could increase the housing supply. In this case, it helps to decrease the housing price. However, it could have opposite effect once it is invested or even speculated in the real estate market. Such behaviour increases housing demand and thus pushes up the housing price. It is also supported by Radelet and Sachs (1998). Their study argue the East Asian financial crisis flow of FDI to some extent result in the fluctuation of housing price and further the bubble in real estate industry.

Speculation

In land market, speculation, which means that the land owner hold the land with an optimistic expectation of land price, is a typical representative of expectation that influences the land supply (Gaffney, 1994). The land owner always does not invest in land but just wait for price to be pushed up to gain profit.

Land speculation is easy to be induced in imperfect market. In reality, the market, contrary to the hypothesis of the neoclassical economy, is imperfect because of information asymmetry, heterogeneous, high costs, access conditions and financing policy (Triantafyllopoulos, 2010). According to Triantafyllopoulos (2010), the benefit of the government policy that stimulated the regional development with generous subsidies or easy credit system could be easily capitalized into higher land value. It is viewed as speculative opportunities by speculators. In this way, the land price would be raised to speculative levels and the developers have to pay higher for land, just as what has happened in the tourism sector in Greece (Triantafyllopoulos, 2010).

In real estate market, speculators eager to gain huge profit by the way of taking good advantage of leverage (Xu & Ren, 2006). As Waston (2013) referred that "potential purchasers will just bid more aggressively than otherwise".

> *Speculative investors have driven the market and they've made profits because demand*

> *Outstrips supply...speculative investment has definitely been the driving force (behind housing market growth) in many areas[1].(Hickman, et al., 2007)*

The flourish of real estate market has contributed to the emergence of speculative investors and in turn enlarges the housing market. Hickman et al. (2007) pointed out two main speculative markets: city center and low value regeneration areas. The comprehensive regeneration program that would bring about huge value-add development potential, which makes the low value areas particularly attractive to

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[1]It is an interview of an officer of House Builer' Federation used in the paper.

speculation (Hickman, et al., 2007). In this way, the real estate tends to be artificial prosperous.

Nevertheless, the boundary between investment and speculation is quite ambiguous so that it is difficult to quantify such element.

Loan interest rate

Loan interest and credit condition are significant factors in determining the demand in land market and housing market because the loan interest directly determines the purchasers' actual payoffs (Waston, 2013). The lower loan interest can improve the affordability both of the developers and citizens due to the save of interest payment (Waston, 2013). Therefore, lower loan interest rate would increase both the housing demand and housing price in real estate market (Yu & Chen, 2009). Furthermore, the real estate market development has more close relationship with the economic system. On the one hand, the increasing housing price contributes to the rise of total amount of credit because the value of collateral is also increased. While on the other hand, the raising credit can in turn stimulate the housing price to shoot up further (Yu & Chen, 2009).

Expectation

People's decision to purchase housing or land mainly depends on expectation of future housing price or land price variation which will affect the housing demand and land demand both in today and in future (Waston, 2013). If one believes in the upward trend of housing price, he prefers to buy the house now than to buy it in the future, vice versa. As for the developers, they always gain the huge gap of land price through the way of hoarding land. They expect that the land price and housing price will continuous go up in the prosperous market and just waiting for the increment of land value (Li & Wu, 2010).

Expectation of income variation in the future is another significant factor that can affect current purchasing decision (Waston, 2013). Expected income either the physical income or the mortgage provided is stable or even will increase will reduce his risk of future budget (Mankiw, 2011). In this way, people are more willing to purchase a house than those with less optimistic income expectation.

In brief, such expectation largely affects the potential land demand and housing demand in both markets.

Investment in infrastructure (location)

According to the Neoclassical theory, land value decreases with less accessibility to city center (Alonso, 1964). In other words, the land value is fundamentally affected by its location. Medda (2011) further explains this theory that the land value is determined not only by the accessibility to the city center but also by the access to public infrastructure (schools, hospitals, transport station, piped water) and natural amenities. The externalities of infrastructure on land value can be produced even before its construction. Knaap (2001) asserts that the plan to invest in light rail has positive effect on land value which is proximity to the planned station even before it i

available to use (Knaap, et al., 2001). Another similar research is taken by McDonald (1995) shows that the new transit facilities can increase the residential land value within one-half mile of the station site and the land market responded to those changes so actively even before the transit facilities are there.

In modern society, transport cost is affected not only by the distance but also by the transportation development level. Government investment in primary infrastructure, especially the transport infrastructure, which aims to extend the connection to remote areas or new area, could increase land supply (Bertaud, 2010). It is because that such investment brings more underused or unused land which out of connection due to the poor infrastructure into the existing land market. As in Mumbai, the dispersion system of the planned trans-harbour bridge improved the intercity accessibility between downtown and Pune. In this way, there would be more land could be supplied on the other side of the bay though it has a limitation of maximum amount (Bertaud, 2010).

As for real estate market, where to live partly determines the living cost. When people making their decision, they will combine their location cost, which includes both the transport cost, opportunities cost like commuting time spent, and housing payment together, to choose an optimal location (Quigley, 1976). According to the urban economic, both the amount of housing demanded and the housing price will decrease as the distance from the city center increases (O'sullivan, 2003). It is also widely supported that the better public transport accessibility contributes to the increase of housing price. According to Nie, et al. (2010), the average increment of housing price is up to 19.5% within 700 m radius around the subway station. Another similar research result demonstrates that the railway system could significantly affect the housing price, especially in those areas which are far away from the city center (Hao & Chen, 2007).

However, every coin has two sides. The better accessibility to transport facilities can also has negative impact on land values such as higher possibility to suffer from noise, pollution, unsightliness, chaos environment and crimes (Medda, 2011). In addition, it is difficult to measure how much the increment of land value will be offset by those negative externalities.

Plot ratio

Chinese municipality uses plot ratio instead of FAR to regulate building density. The plot ratio is the ratio of total construction area and site area. In other words, plot ratio directly determines the land utilization rate (Zou, 1994). The impact of plot ratio on land price follows the principle of diminishing returns. If other conditions unchanged, the land price will first increase then decrease with plot ratio rises, which is mainly affected by the variation of profit margins (Dan & You, 2003).

The plot ratio has stronger effect on land price in larger cities than that in small cities since the land market develops more perfectly in larger cities (Zhang, et al., 2005). Within the same city, the city center is always crowed with more population who have higher ability to pay and is equipped with better accessibility together with better public service. Therefore land development there is more profitable and thus causes

strong competition in land acquisition. In this condition, the influence of plot ratio gradually decreases from the center to the outside (Dan & You, 2003).

Development of stock market

As the two main "capital pools" attracting large amount of investment, both stock market and real estate market can reflect the macro-economic situation. According to Hong and Gao (2007), the relationship between the two markets changes with different attributes of housing. When the housing is regarded as consumer goods, the prosperity in stock market could increase the housing consumption through both direct and indirect ways. The boom in stock market adds personal wealth and improves people's affordability. Its implication of good prospects of economic development further convince people's optimistic expectation of future budget but pessimistic expectation of raising housing price (Wang, 2008). Above concepts will affect the current decision of purchasing housing and tends to form potential housing demand.

When the property is regarded as investment goods, there are both crowding-out effect and substitution effect between stock market and real estate market. The increasing stock price is always followed with higher risk so that the risk neutral investors will transform their capital to some lower risk investments, such as real estate market. Additionally, investors prefer the investment with higher rate of return. Especially when the capital is fixed, they always have to choose only one as the main investment. Hong and Gao (2007) argue that there are strong substitution effect between stock market and real estate market in China and most of the investment goes into the real estate market. Hu, et al. (2009) also finds out that the dynamic changes of stock market and real estate market are positive correlated. They are both influenced by the government intervention, such as interest rate and supply of money.

The debate about the interaction of land market and housing market in China

From the economic point of view, land and housing is more or less represents complementary relationship (Lian, et al., 2007). Especially in recent years, both the astonishing upward trend of housing price and land price incur heated argument about which one is more to blame.

Land price variation results in newly-built commercial housing price variation

The upward trend of land price variation after implementing the public land leasing system traps the land price in the criticism of pushing up the newly-built commercial housing price. It is mainly because that the cost of obtaining the land accounts for a remarkable part of total housing construction cost (Liu & Liu, 2003). Yan (2006) also points out that real estate industry is such an industry of increasing costs that the higher land price would increase the construction cost.

Newly-built commercial housing price variation leads to land price variation

The land price tends to be derived price because the physical supply of land is inelastic while the economic supply is limited to both the physical supply and

technological level in China. Furthermore, the governmental monopolization further aggravates the supply-demand imbalance. In this condition, the land price is mainly determined by the land demand which is the same as the demand of land product (Liu & Liu, 2003).

Interaction between the two markets

Yan (2006) expresses more dynamic process showing how the housing price determines land price in short term while they were mutually influenced in the long term. In the short term, the real estate industry has long construction period that results in relatively inelastic housing supply. In this condition, housing price is determined by housing demand which is also an important reference for the developers to revise their expected ability to pay. From such point of view, the housing demand indirectly determines the land demand and thus the land price. While in the long term, the supply-demand in both of land market and housing market are relatively elastic so that the supply and demand in the two markets can automatically adjust to achieve new equilibrium.

In conclusion, it seems that land price determinism approaches the question mainly from the view of supply side while the housing price determinism tends to analyse the problem from the view of demand side.

2.4 Conceptual framework

2.4.1 Meaning of concepts

Public land leasing system

In China, public land leasing means the local government transfers the land use right to the developers with a fixed tenancy term and the developers are obligate to pay for it (council, 2006). The leasehold is classified according to the type of land use----residential land is 70 years; industrial land is 50 years; land for education, science, culture, sports or medical treatment is 50 years; land for business, travel or recreation is 40 years; land for other use is 50 years(council, 2006).

There are four legal ways of public land leasing in China: negotiation, auction, tendering and listing. The former one is more or less the administrative method while the later three are market-oriented ways.

Primary land market

China divides the land market into two different levels: primary land market and secondary land market. In primary land market, the municipality on behalf of the state transfers the state-owned land use right through public land leasing system. It reflects the longitudinal trading activities between governments and land users or developers. Primary land market is monopolized by the municipality in China (Xie & Deng, 1996).

Newly-built commercial housing market

The commercial housing market is always divided into two sub-markets: newly-built commercial housing market and secondary commercial housing market. Newly-built housing market is where developers sell or lease the newly built houses. In other

words, these houses are first in transaction in new housing market (Fu, 2000). It reflects the relationship between developers and consumers.

Land price

Land price used in this research refers to the land transferring fee in primary land market in China. This paper introduces two land price systems: closing land price and standard land price. The closing land price is the final knock down price during the land transferring process. The standard land price, which is evaluated by experts, is the officially published average price for different land use type in certain homogeneous region.

Newly-built commercial housing price

As pointed in chapter 1.6, housing price discussed in this study means the newly-built commercial housing price in the real estate market. Other types of housing, such as secondary commercial housing, affordable housing is beyond the scope of this study.

Brief introduction

This study concerns the impact of land price affected by public land leasing system on housing price variation. Yan (2006), Xu (2011) and Wei (2012) acknowledge that the market-oriented approaches improve the transparency in land transferring process. Land transfer through competitiveness could reflect the market price and more effectively capture the increment of land value. However, the market mechanism is also criticized to incur the rapid growth of land price mainly due to the competition.

On the contrary, Li & Ma (2009), Xu (2011), Shi (2011) and Kuang & Li (2012) find that public land leasing system has little impact on land price variation and housing price variation. Land price could be pushed up due to corruption or "cartel" while the housing price is mainly determined by the strong demand in China. In the market economy, supply-demand mechanism is the fundamental inducement of price variation.

Based on all of these debates, this paper tends to put forward the hypothesis that the land price resulted from public land leasing system can drive up the newly-built commercial housing price in China.

2.4.2 Conceptual framework

The following diagram synoptically expresses the conceptual framework of the topic

Figure 6   The conceptual framework of the thesis
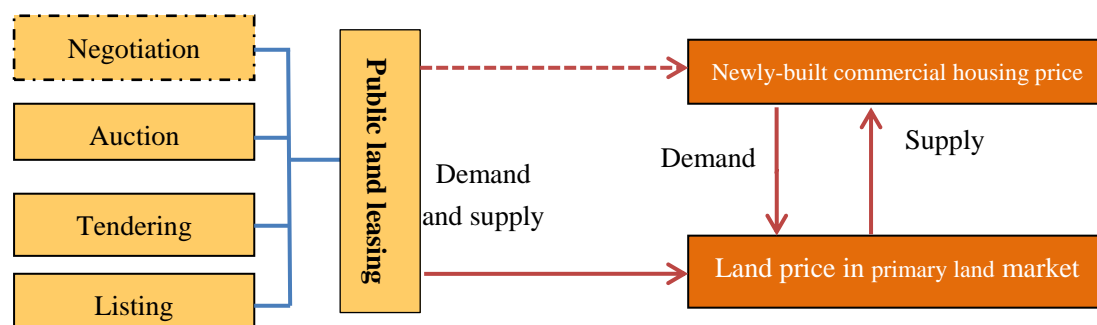
Chapter 3: Research Design and Methods

This chapter describes the research methodologies that are used to approach the research question and sub-questions. During the discussion, it clearly shows the research process and advanced alternatives for data processing problem.

3.1 Introduction

This research tried to explore one of the most controversial situations in China and explain it through both the qualitative and quantitative ways. The boom of real estate industry in recent decade is a national phenomenon and it should be attributed to the continuous macroeconomic development. Following the market prosperity, the land price and newly-built commercial housing price has been increasing sharply, which brings about great social friction. In this way, it is interesting to find how such incredible changes happen.

However, since the end of last year when the real estate development gradually slows down, both the governments and developers began to recognize that housing is a kind of commodities characterized by regional qualities (Tencent's property, 2014). Actually, the immovability of land and housing makes them to be regional heterogeneity so that it is more meaningful and insightful to analyse the phenomenon at local level instead of at national level.

In this condition, case study has been chosen as the research strategy in this thesis. A single-case study could connect the phenomenon in the study with its local context, which helps to understand and analyse market operation and pricing system both in land market and real estate market. In this paper, it analysed the pricing system in land market and real estate market in Shenzhen and explained the influencing mechanism between them.

As for the data analysis method, an econometric model was used to test that to what extent the land price variation affect the newly-built commercial housing price variation. With the analysis of quantitative data, the research further explained what role the land price play in the increase of housing price.

This paper also concerned a land value capture instrument applied in the whole country. The instrument was closely related to the operation in primary land market and has been in long criticism of being the "chief plotter" of economic bubble either in the land market or in real estate market.

3.2 Revised Research Questions

The literature showed that quite a lot of literatures have discussed the influential factors in pricing mechanism. In addition, it also introduced the theoretical basis of the disputation that which one was the dominant between housing price variation and land price variation. Nevertheless, this research narrowed its focus on only one side of the comprehensive relationship that supported the significant role that land price variation played in housing price variation.

The main question of this research is:

In what way does the land price resulted from public land leasing system drive up the newly-built commercial housing price during the golden time (2000-2010) of real estate industry in Shenzhen and how can this be explained?

The specific sub-questions are:

c. How does the public land leasing system influence the land price in primary land market in Shenzhen and what are the difference between the public land leasing modes?

d. What is the role that land price in primary land market play in the increasement of newly-built commercial housing price in the Shenzhen?

3.3 Operalization: Variables and Indicators

According to the theoretical framework in chapter 2, the following table represented the operationalization of the conceptual framework in chapter 2. The table showed the variables, indicators used to answer the research questions. Additionally, the table included the data resources, collective methods and triangulations.

Table 2 Operationalization and methodology

Dimensions	Variables	Indicators	Units	Type	Data analysis method	Date source	Triangulation
Land price	Closing land price1	State land ownership	N/A	quality	Description	Legal documents analysis	local government working report; interview
		Urbanization rate (population density)	person /sq.km	quantity	Modelling	the Real Estate Statistics Yearbook of Shenzhen	Monitoring data from estate agencies; interview
		Auction price	$/m^2				
		Tendering price	$/m^2				
		Listing price	$/m^2				
		Consumer Price Index[2]	%	quantity	Data analysis	Web of National Statistics Bureau	News, report; interview
		Expectation(land price in previous period)	$/m^2	quantity	Modelling	the Real Estate Statistics Yearbook of Shenzhen	Monitoring data from estate agencies; interview
		Loan interest rate	%			People's bank of China	News, report; interview
	Standard land price	Plot ratio	N/A	quantity	Comparison	Web of urban planning land and resource commission of Shenzhen municipality	Monitoring data from estate agencies; interview

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[1] All the three different types of land price are the land price of per unit floorage.

[2] This index is used to exclude the inflation effect from the price.

Dimensions	Variables	Indicators	Units	Type	Data analysis method	Date source	Triangulation
	Standard land price	Cost for primary land consolidation	$/m^2	quantity	Comparison	Web of urban planning land and resource commission of Shenzhen municipality	Monitoring data from estate agencies; interview
		Valuation date	N/A				
		Land level	N/A				
Housing price	Newly-built housing price	Housing price in each statistics period	$/m^2	quantity	Modelling	Web of urban planning land and resource commission of Shenzhen municipality	Monitoring data from estate agencies; interview
	Expectation	Housing price in previous period	$/m^2			Web of urban planning land and resource commission of Shenzhen municipality	Monitoring data from estate agencies; interview
	Loan interest rate	N/A	%			People's bank of China	News, report; interview
	Economic development	GDP	$			the Real Estate Statistics Yearbook of Shenzhen	reports; interview
	FDI	N/A	$				
	Accessibility	Number of operation bus line	N/A				
	Investment alternatives	Price to Earning ratio	N/A				
	Urbanization rate	Population density	person /sq.km				

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3.4 Data Collection Methods

The following research analysis depended on both the primary data and secondary data. Obviously, it would face the challenge to guarantee the authenticity of data collected, especially that of secondary data, and further the validity of this research. In this case, interview and working report of real estate agencies were used as a way of triangulation to check the validity and authenticity of the data collected from the governmental statistics yearbook.

In the terms of closing land price, the most significant indicators were land price of different public land leasing modes. First of all, it was worth to mention that data of land transferred with agreement was available neither by open publication nor by the record of real estate agencies. Such record has still been the internal data of the government. Therefore, negotiation price was not included in the following analysis. The data of another three types of land price was collected from the the *Shenzhen statistical yearbook* and *Shenzhen real estate yearbook* from the online yearbook database of China National Knowledge Infrastructure. CPI was referred to the National Statistics Bureau through online search and the urbanization rate was provided on the municipality websites. The triangulation is the data record from the real estate agencies and interview of expert or professors.

The other part of land price was the standard land price. Standard land price is the average land price in certain homogenous region and is evaluated by professional assessments based on a series of indicators, including different land use types, different current land use situation, land grading, and the evaluation date (Ministry of Land and Resource, 2001). And the result should be approved by the municipalities. In this way, all the indicators listed in the operationalization table have impact on standard land price and all of them are taken into account when evaluators evaluate the standard land price. In effect, the standard land price was provided on the website of Urban Planning Land and Resource Commission of Shenzhen Municipality. However, standard land price is not annual statistical record, which is quite different from closing land price. Generally speaking, it is updated every five years or more. The triangulation of these data was the evaluated land price published in the working report of real estate agencies through online search and the interview of experts or professors.

The legal precondition of land use right transfer was consulted to the *Provisional regulations of the People's Republic of China on urban land use and transfer of provisional regulations*, *Law of Land Management*, *Property Law* and some municipal regulations. At the same time, the different laws were not only the important reference but also the triangulation themselves. Interview of experts and developers was also another way of triangulation.

As far as the housing price to be concerned, there were 8 main variables needed to be quantified. Except for the loan interest rate, which was cited from the online statistics

reports from the web of People's Bank of China, all the data of remaining indicators were collected from the *Shenzhen Statistical Yearbook of* from the yearbook database of China National Knowledge Infrastructure. Record and working reports from real estate agencies and interview of experts were referenced as ways of triangulation.

In order to ensure that all samples were comparable, all the variables were regarded as control variables except the land price resulted from public land leasing system. CPI was used in the data editing process to eliminate the effect of inflation.

Last but not least, interview was done through the following steps. Once accept the confirmation of being willing to be interviewed from the interviewee, we phoned the interviewee to simply introduce the research background, purposes and expected response. After that, the interview template was sent to the interviewee and the draft response from the interviewee was also sent back through email. Finally, we phoned the interviewee again to get more information about some specific question or reconfirm the vague response.

3.5 Sample Size and Selection

The research area was the whole administrative area of Shenzhen, which was divided into 6 administrative districts (Graph 1). The land price and housing price used in the following analysis were the average price of each district. It was committed that all the districts were relatively comparable not only due to the effect of control variables but also because the unified urban organizational system in the city. Other indicators including GDP, FDI and population density were also selected at district level, except for PE and annual bus line which were published only at city level.

Graph 1 The administrative districts in Shenzhen (Mind Over Mandarin, 2014)

In terms of time frame, the paper concerned the data during the period between 2000 and 2010. It was firstly because that such time span basically matched the golden decade of real estate development. More significantly, it ensured the data availability. There was a lag between obtaining the land and selling the property due to the

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construction period. Generally speaking, the construction and preparation for selling would cost more than 2 years and most of the land obtained after 2010 are still under construction or preparation. In this way, the one to one corresponding data of housing price and land price are only available before 2010.

In brief, there were totally 86 plots of land in the research samples.

As for qualitative data, the information about the land ownership and bundle of rights was collected both at the national level and local level. National policies and relevant laws were the important reference to clarify the political background of land ownership. It highlighted the local regulations that directly influenced implementation of public land leasing system in Shenzhen.

Lastly, interview was mainly used as a way of triangulation and explanation. It not only was used to check the data validity but also contributed to deeply understand the context and outcomes of modelling. In other words, it helps to better interpret the result of modelling. The target interviewees have been experts or professors which were chosen according to the following standards:

- One should long engage in real estate related research or work, which at least more than five years. It was important to ensure that the interviewees were familiar with the operation either in primary land market or in real estate market. Additionally, they have enough experience to create their own judgement and analysis of the land market development and real estate development in Shenzhen.

- One is appropriated to live or work in Shenzhen, or at least have done some case studies of Shenzhen. It is to ensure that they are familiar with the local context and understand its impact on the real estate development.

- Another important factor is that the interviewee has the willingness and time to be interviewed. It avoids the resistance and is possible to have a deep talk to gain abundant of information.

3.6 Validity and reliability

"Validity is an integrated evaluative judgment of the degree to which empirical evidence and theoretical rationales support the adequacy and appropriateness of interpretations and actions based on test scores or other modes of assessment" (Messick, 1990). In brief, it concerns whether the outcomes are true and certain (Guion, 2002). In this case study, the variables and indicators were chosen referring to the literature review, which ensured that all the variables and indicators were meaningful for analysis. And all the secondary data obtained from the statistics yearbook was triangulated with the information provided from the real estate agencies interview. Furthermore, the same local context including economic, political environment or cultural tradition guarantees the research samples were comparable. The research time frame was the period when the macro economy kept going up with

a grow rate around 8% and it also almost coincided with the golden decade of real estate industry development. Therefore, the housing market was in a well development context, which excluded the possible adverse impact of uncertain macro environment. However, such research concerning with the phenomenon in only one city was limited to its external validity, which meant that the outcome was difficult to be generalized. It was because that the micro context, such as the supply and demand relationship, was quite disparate among different cities, which made the housing market and land market be less comparable.

Reliability refers to the degree of consistency between two types of measuring systems of the same thing, which evaluates how reliable an instrument would impact the strength of research results (Black, 1994). For this research, reliability was guaranteed by the explicit definition of the concepts and scope used in the paper. It avoided misunderstanding or confusion about the explanation as much as possible. Additionally, as an econometric model was used, the deduction and calculation process was transparent and clearly listed. Another aspect was that the real estate agencies chosen to be the triangulation had good domestic reputation and their working reports were widely used by different organizations as a reference.

3.7 Data Analysis Methods

Based on the main question and sub questions of this paper, the main strategy used was case study and the main data analysis methods were comparison and modelling.

Case study was used to reveal the relationships of a phenomenon in its context. Because neither the land market nor the real estate market in different cities, especially in China where there are hundreds of cities, are completely comparable.

The heterogeneity of land market and real estate market is caused by both the physical and political factors. In terms of physical attributes, immovability of land diversifies the land market and real estate market in disparate regions. The impossibility of barter trade further strengthens the regional segmentation. As for political restrictions, municipalities in China are empowered with right to make specific regulations themselves based on their local economic, political conditions or their development purposes. Thereby the market development is rooted in its local context. In addition, different cities also characterized by different urban attractiveness, agglomeration effect, urbanization process and market operations. Case study was effective to clarify the empirical discussion of such phenomenon.

Comparison between closing land price and standard land price was used to test what the impact of public land leasing system on land price in primary land market. During such an analysing process, a statistical method called paired samples T test was used to test whether there were difference between closing land price system and standard land price system. Additionally, based on the interview and local context, it explained how the public land leasing system affected the land price.

Modelling is effective to describe the relationship between variables. An econometric model (error correction model) was used to statistically test whether the land price resulted from public land leasing had impact on the growth of housing price and if so, to what extent the housing price was driven up by the land price.

Paired samples T-test

A t-test is a statistical method used to test whether the two sets of data are significantly different from each other. Among all the kinds of t-test, paired samples-test is used to determine whether there is significant difference between the mean values of two sets of data. The data should be measured on the each same unit in the sample while the t-test is calculated based on the difference between the two values (the statistical glossary, 2014). The null hypothesis is written as H_o:

$H_{o:}$ there is no difference between the two sets of values for the same sample.

$H_{1:}$ there is significant difference between the two sets of values for the same sample

If the result of t-test rejects H_o, it indicates that the data support H_1

The hypothesis of this paper was written as follows:

H_o: there was no significant difference between closing land price and standard land price for the samples collected in Shenzhen from 2000 to 2010.

H_1: there was significant difference between closing land price and standard land price for the samples collected in Shenzhen from 2000 to 2010.

Vector Error Correction Model (VECM)

Vector error correction model is a statistical model that combines the function of vector auto-regression (VAR) model and error correction model (ECM). It is used to solve the endogeneity problem of the model.

VAR was deigned to deal with the non-stationary time series data which has been tested to be cointegrated. The dependent variable is explained by the association of its own lags and lags of other independent variables (Asteriou & Hall, 2011). While, Error correction model (ECM) shows the dynamic behaviour of the relationship between two variables. Its most important function is to estimate the speed at which the independent variable returns to its long-run equilibrium once the dependent variable changes with a unit. In this way, it can simultaneously test the short-term and long-term effect of independent variables on dependent variable (Davidson, et al., 1978).

The original formulation of VECM starts by the VAR model, which contains the lags of dependent variables and independent variables (Gao, 2006). And the following explicitly deduced the model (Gao, 2006).

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Let's started with a general, simple VAR model describing the relationship between two variables:

(1)

$$y_t = c_0 + \sum_{i=1}^{p-1} \Gamma_i y_{t-p} + \Phi * x_{t-1} + \mu_t$$

Where y means the dependent variable and is k-dimension column vector; x means the independent variable and is k-dimension column vector; c_0 denotes a constant and μ is the error term and is also the k-dimension column vector. The lower-case t denotes the time frame since all the variables are time series. p denotes the lag intervals for endogenous.

The current value of the endogenous independent variable[1] is not included in the model in order to exclude the possibility of contemporaneous correlation between them (Gao, 2006).

Next, the lag one time formulation was written as follows:

(2)

$$y_{t-1} = c_1 + \sum_1^{p-1} \Gamma_{i-1} y_{t-1-p} + \Phi * x_{t-2} + \mu_{t-1}$$

Then, by deducting formula (1) from formula (1), the first difference form of variables:

$$\Delta y_t = \beta_0 + \Phi * \Delta x_{t-1} + \sum_1^{p-1} \Gamma_i \Delta y_{t-1} + ECM_{t-1} + \varepsilon_t \qquad (3)$$

While $\beta_0 = (c_0 - c_1)$ and it still means a constant variable;

$ECM_{t-1} = u_{t-1} = y_{2t} - \beta y_{1t}$; $\varepsilon_t = \mu_t - \mu_{t-1}$. It is the "error correction" which denotes the gap between the observed value and the predicted value at one point. Once the equilibrium value of y exceeds its average value, the "error correction" function would drive the y heading toward the equilibrium in long run term (Cottrell, 1996). Formula (4) completely described the characteristics of error correction model, which showed that the current variation of dependent variable was affected by three parts: current variation of independent variables, the deviation from the equilibrium in previous period and the random error (Wooldridge, 2007). The coefficient of first difference of independent variable (β_1) denotes its long-run impact while that of ECM shows the short-term effect on on dependent variable. This approach easily distinguishes between the long-run and short-run functions at the same time (Mehra, 1991).

According to the main question and sub-questions of this study, three formulas were deducted to test individual influence of land price caused by the three public land leasing modes on housing price variation. The dependent variable was the newly-built commercial housing price while the independent variables were auction land price,

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[1] Endogenous means that the dependent variable is in turn able to affect the variation of the independent variable.

tendering land price, listing land price and other control variables. It was ensured that housing price and land price of each plot were one-to-one correspondence. Additionally, since the land price and housing price are in effect mutually effected based on the literature review, land price is regarded as the endogenous independent variable. Besides, the first-lagged value of dependent variable and endogenous independent variable is chosen.

Formula 1   The three equations of VECM

$$\Delta AHP_t = \beta_0 + \beta_1 * \Delta AHP_{t-1} + \beta_2 * \Delta ALP_{t-1} + \beta_3 * ECM_{t-1} + \beta_4 * \Delta Lir + \beta_5 * \Delta GDP + \beta_6 * \Delta FDI + \beta_7 * \Delta BL + \beta_8 * \Delta PE + \beta_9 * \Delta PD + u_t$$

(5)

$$\Delta THP_t = \beta_0 + \beta_1 * \Delta THP_{t-1} + \beta_2 * \Delta TLP_{t-1} + \beta_3 * ECM_{t-1} + \beta_4 * \Delta Lir + \beta_5 * \Delta GDP + \beta_6 * \Delta FDI + \beta_7 * \Delta BL + \beta_8 * \Delta PE + \beta_9 * \Delta PD + u_t$$

(6)

$$\Delta LHP_t = \beta_0 + \beta_1 * \Delta LHP_{t-1} + \beta_2 * \Delta LLP_{t-1} + \beta_3 * ECM_{t-1} + \beta_4 * \Delta Lir + \beta_5 * \Delta GDP + \beta_6 * \Delta FDI + \beta_7 * \Delta BL + \beta_8 * \Delta PE + \beta_9 * \Delta PD + u_t$$

(7)

ΔAHP_t: current value of annual variation of housing price whose land is gained through auction

ΔTHP_t: current value of annual variation of housing price whose land is gained through tendering

ΔLHP_t: current value of annual variation of housing price whose land is gained through listing

ΔAHP_{t-1} : value of annual variation of auction land price in each district in last period

ΔTHP_{t-1} : value of annual variation of tendering land price in each district in last period

ΔLHP_{t-1} : value of annual variation of listing land price in each district in last period

ΔALP_{t-1} : value of annual variation of auction land price in each district in last period

ΔTLP_{t-1} : value of annual variation of tendering land price in each district in last period

ΔLLP_{t-1} : value of annual variation of listing land price in each district in last period

ΔLir :   annual variation of loan interest rate

ΔGDP: annual variation of Gross Domestic Product in each district

ΔFDI :   annual variation of foreign direct investment in each district

ΔBL :   annual variation of operation bus lines

ΔPE :   annual variation of price earning ratio

ΔPD :   annual variation of population density in each district

β_1 measures the impact of housing price in the last period on the current housing price variation. Through this way, it excludes the its own tendency change from the housing price.

β_2 denotes the long term impact of land price of the disparate public land leasing modes on the variation of housing price. Each coefficient measured that to what extent did the different types of land price change one unit lead to the variation of newly-built commercial housing price in the long run.

β_3 measures the long term impact of land price variation on housing price variation. Because it reflected the speed at which the housing price returned to the equilibrium in every period. In this way, it should negative correlated to the ΔHP_t according to its function, otherwise the model was spurious regression.

$\beta_4 \sim \beta_9$ showes the short-term impacts of all control variables.

It is need to mention that each coefficient could test simultaneously whether one independent variable was positive or negative correlated to the independent variable and its influence.

However, before operating the regression, there are some basic assumptions for ECM:

- Linearity: the relationship between dependent variable and independent variables should be linear.
- Normality: the value of the variables should be normally to make sure that the error is also normally distributed.
- Homoscedasticity: error spreads consistently between the variables and the change of error is isolated from the variation of independent variables.
- Independence: errors between the observations are not correlated.
- Multi-collinearity: independent variable should be uncorrelated.
- Stationary: the value of the indicators does not change over time.
- Cointegration relationship between variables: there is a long-term or equilibrium relationship that is kept through short-term adjustment between variables. (Wooldridge, 2007)

In order to avoid the spurious regression, corresponding tests, which were listed as follows, of above assumptions were done firstly.

- Linearity: Scatter plots or residual plot
- Normality: Q-Q plots or histogram
- Homoscedasticity: residual plot, Glejser test, White test or Goldfield-Quandt test

- Independence: residual plot, Durbin-Watson (DW) test, Breusch-Godfrey (BG) test
- Multi-collinearity: the variance inflation factor(VIF) test, the correlation coefficient matrix R of independent variables, etc..
- Stationary: unit root test including DF (Dickey-Fuller) test and Augmented Dickey-Fulle (ADF) test.
- Cointegration relationship between variables: Engle-Granger test, Johansen test or Cointegration regression Durbin-Watson (CRDW) test
  (Wooldridge, 2007)

Last but not least, the error correction model was estimated through a two-step procedure. The first step was to use a consistent estimation procedure and calculate the residual values. Next, ECM was assigned the value of lag 1 residual value generated in step 1 and equation (4) was estimated by the method of Ordinary Least Squares (OLS) (Mehra, 1991).

3.8 Limitations

The study was limited to the study scope and explaining ability of the model. As what has been discussed above, the case study in this paper was really narrow focused. The relationship between land price variation and newly-built commercial housing price variation in one city lacked the universality when applied across the country.

Another limitation was the explaining ability of the econometric model. Each econometric model has its own applicable scope and conditions. The model used only dealt with time series data and thus variables like plot ratio and accessibility, the value of which did not change over time, was not included in ECM. This caused the problem of lacking enough control variables. Generally speaking, housing price of single property was affected by various factors except for land price and such impact should be included in the model as much as possible. In order to solve above problem, average land price and housing price of 6 administrative districts were used instead of using the price of each plot. In this way, it could neglect the influence of cross-section variables[1].

More practical limitation was the availability of data and other information. Land price in China was still not completely transparent and the relevant data was rarely published. If it was, the published time was quite short. Therefore, it was difficult to collect the data for a long period. And the research was inevitable to be selection bias and thus the outcome drawn from the study was limited used.

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[1] Cross-section variable is that the value of the variable only varies with location and is not affected by time.

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Chapter 4: Research Findings

This chapter describes and interprets the data of the variables collected through the field work and concludes the findings. And it further tries to explore the connection between the findings and land value capture. Based on the data mining process, this chapter answers the main and sub questions listed in chapter 3.

4.1 The impact of public land leasing system on the primary land market

4.1.1 Further introduction of public land leasing system

During the process of implementing public land leasing system, the government is the most active facilitator and provides great political support to facilitate such land transferring methods. The following expresses the most relevant central and local policies together with their impact on the operation of primary land market.

Evolution of National policies about regulating the public land leasing system

During the past decades, the public land leasing system was gradually clarified and improved under the guidance of series of the central policies.

Dating back to 1990, *Interim Regulation of the People's Republic of China Concerning the Assignment and Transfer of the Right to the Use of the State-owned Land in the Urban Areas* was firstly clarified that state-owned land use right could be transferred through negotiation, tendering and auction while the municipalities were responsible to design the specific land transferring procedure.

In 1994, *Urban Real Estate Administration Law of the People's Republic of China* firstly highlighted that the land for commercial, travel, entertainment and luxury housing should be transferred through auction or tendering if possible. However, the concept of "if possible" was quite ambiguous in the law.

In 1998, *Implementation Regulation for PRC Law of Land Administration* further clarified that the local land administrative department rather than the municipality took charge of the land transferring process.

In 1999, *Regulation about Further Promotion of Transferring the State-owned Land Use Right through Auction or Tendering* clarified the applicable conditions for auction or tendering when transfer the land for commercial, travel, entertainment and luxury housing, which was an significant improvement than that in the regulation issued in 1994.

In 2002, *Notice of the Ministry of Land and Resources on Issuing the Rules on the Assignment of State-owned Land Use Right by Bidding, Auction and Quotation (for Trial Implementation)* firstly introduced listing as another way of land transferring mode. Additionally, it further demonstrated what kind of land was ought to be transferred through auction or tendering and unified the land transferring procedure. In 2004, *Notice of Continuous Promoting the Supervision of Transferring the Profit-oriented Land Use Right through Auction, Tendering or Listing* required that

the local land administrative departments should published the relevant information about land transferring on the web of "land china" in order to improve the information transparency. In addition, it was the first time to compulsively require that all profit-oriented land use right be transferred through auction, tendering or listing.

Obviously, public land leasing system has been gradually improved to be more systemic, transparent and stringent through the central government's guidance. It helps to regulate the land market operation and enhances the role that public land leasing system play in the land market development.

Policies about regulating the public land leasing system in Shenzhen

Shenzhen started the land marketization and always has been the pioneer in the land reform process. Reviewing the land reform in Shenzhen, the municipality prioritized to introduce, promote and perfect the public land leasing system.

In the 1980s, the Shenzhen municipality faced great fiscal stress. It lacks enough financial budgets to support the urban construction. In 1985, the municipality borrowed $ 0.221 billion from the bank and the annual interest was about $ 1.7 million (Shenzhen Special Zone Daily, 2006). Such severe fiscal situation pushed the municipality to learn from Hong Kong's experience and thus introduced the public land leasing, which began with the first land auction in 1987.

However, such a system did not work well in the following years due to the impact of invisible land market. Some powerful companies, especially those state-owned companies, hoarded quite a lot of land which was obtained through allocation or negotiation in previous years. They sold the land to real estate developers with much lower price than it would be if it was transferred through public land leasing system. Therefore in 2001, the municipality issued *Administrative Rules of Shenzhen Municipality on Land Transaction Market* to regulate the land market. According to the rule, Shenzhen municipality set up the land market and required that all profit-oriented land use right should be openly transferred in the land market. Through this way, the municipality further strengthened the role of public land leasing system as the market-oriented way to allocate the land resource.

Although the visible land market to large extent contributed to the redevelop the stock land, Shenzhen municipality still encountered the problem of lacking available land for urban construction in the following years. In order to solve the problem, the municipality decided to include the industrial land use right transfer into public land leasing system. At the end of 2005, the first public transaction of industrial land was transferred through listing with the premium rate of 360%. Since then, the public land leasing system has been an effective and important way for municipality to encourage the developers to intensively utilize the land resource.

Bundle of rights

The adoption of conception of bundle of rights makes it possible to separate the land use right from land ownership, which is the foundation of implementing public land leasing system in China. As a socialist state, the national Constitution stipulates that all the productive resource are obligate to owned by whole people, so does land. More specifically, all land in the urban areas are owned by the state while the land in rural and suburban areas are owned by the community, except those lawfully stipulated that owned by the state (council, 2006). According to the *Land Management Law*, bundle of rights are listed and its impact on public land leasing is expressed (Fig 12).

The land–related right system is listed as follows.

Figure 7 List of land-related right system (Wang & Li, 2007)
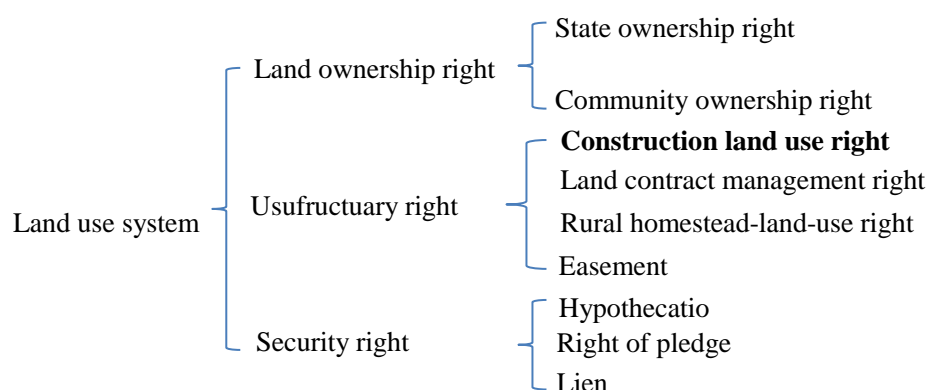
The state-owned construction land use right is the one that being transferred in public land leasing system while community-owned construction land use right only can be used within the community and without transaction. One way to the other, the emergence of such land use right to some extent can be regarded as the induced institutional response to the problem of more severe land scarcity and of the black market. Tenure security not only helps to manifest the shadow land price but also motivate the land users to make long term investment in land development (Deininger & Feder, 2001).

Components of land transferring fee

When transferring the land, the municipality firstly sets the floor price. Therefore, it is essential to describe how the municipality determines the floor price before going to analyse the impact of public land leasing system. According to our interview, the municipality in general sets the floor price in accordance with the following procedure[1].

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[1] Annex 1 provides another floor price determination system, which is more perfect and theoretical.

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Figure 8 Flow diagram of determining the floor price (*editing according to the interview*)[1]
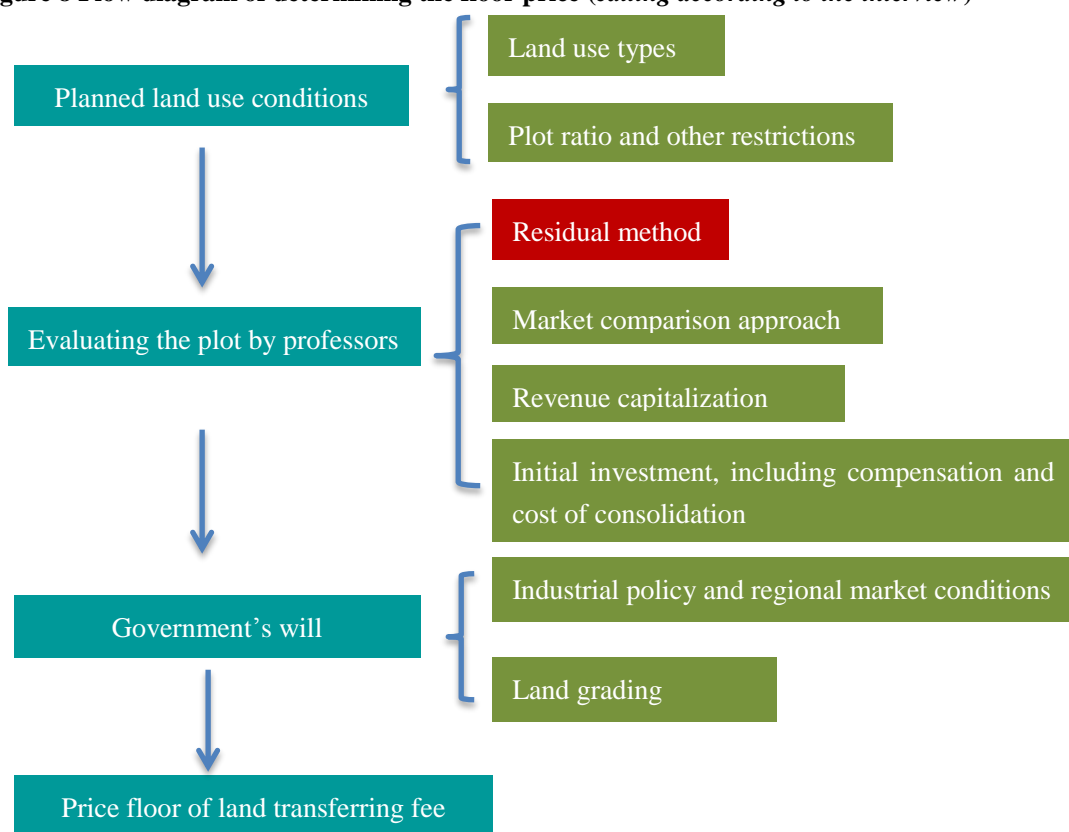
The "government's will" in the flow diagram is an influential part which could have critical impact on the determination of floor land price. Generally speaking, the floor price tends to be lower once the plot is to be transferred in the industry supported by the government. Such industries include new energy industry, high-tech industry, eco-friendly industry and so on. Even in the same industry, the developers could face difference floor land price due to the different land use purpose. For example, the Ministry of Land Resource recently issued the government document requiring the local government to support the land supply for endowment real estate, according to which those non-profit ones could be exempted from paying the land transferring fee (National Business Daily, 2014).

However, in 2006, Shenzhen municipality issued an official document to abolish the concessional terms to land. Especially, it underlined that none real estate project can continuously enjoy the reduction or exemption of land price at all, except for some special cases. It implies that there is less government intervention while the land market for such land use right transaction is more perfect. Therefore, it seems that the transferring process of residual land use right is more fair and just.

Except for the subjective preference, the expert from the institute of Shenzhen real estate study indicates that the Urban Planning Land and Resource Commission of

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[1] The method marked in red is the one used in Shenzhen.

Shenzhen Municipality utilizes the residual method to calculate the floor price for the plot of land to be transferred. Through such method, the floor land price is generally calculated as deducting the construction cost, taxation and fees from housing price. Since there is no property on the plot of land, the housing price used in the calculation always refers to the housing price in surrounding area.

In this case, the rapid urbanization and well developed economy boom the real estate market and then would result in the increment of land price. While on the other hand, the raising land price could further drive up the newly-built commercial housing price because the cost to obtain a plot of land account for quite a large part of total housing construction cost. In Shenzhen, the mutually strengthening effect cause the land price and newly-built commercial housing price increase in turns.

4.1.2 The influence of public land leasing system and land value capture
Public land leasing and improved transparency
Emphasizing the information disclosure is a crucial part of public land leasing system and improves the transparency of land market operation. Such improvements involve the land transferring process, information inquiry and supervision.

According to a research comparing the land transfer system between mainland and Hong Kong, the land transferring process in Shenzhen is listed as fig 9. During the land transferring process, the Urban Planning Land and Resource Commission of Shenzhen Municipality publishes the basic information of the plot of land to be transferred, such as its location, area, plot ratio and additional planning conditions. It allows the developers to make rational expectation of the land use limitation, land value and the potential of profit.

Additionally, the department also has established well maintained referral information system. On the website of Urban Planning Land and Resource Commission of Shenzhen Municipality, there are annual land supply planning and the relevant information relevant to land value variation including the focus of urban development and city spatial layout. Additionally, the website has good records of the detailed information of each plot of land that has been transferred and there is search link on the home page. Through this way, anyone can find the information about any plot of land and thus supervise the land development process. Besides, it also publishes the email address and toll-free number of Bureau of Land Management in all administrative districts. The citizens can on line consult and supervise the land transferring process and land development process and even report the illegal activities.

Interesting evidence was the reality happened in the period between 2001 and 2005. During the five years, the total amount of revenue generated from the land transferring in the visible land market was up to $ 3.14 billion but there was none related corruption cases happened in the same period (Shenzhen Special Zone Daily, 2006). The officials explained that, except for the publicity of land transferring information, the land transferring process was under the supervision of Discipline

Inspection Department, social media and the public, which guaranteed the fairness and justice.

Actually, the respondents from the developers in our interview appreciated the public land leasing system in that it improved the information transparency and allowed more bidders to join in the land transferring process. In addition, they acknowledged that the land market in Shenzhen has developed relatively well, which was more close to the perfect market. It seems that the market mechanism works effectively and there is less corruption in land market operation in Shenzhen.

However, the department does not publish the floor price for the plot of land before land transfer. It still provides opportunities of corruption because the one who can have access to such information would be more competitive during the competition.

Figure 9 Process of land transfer in Shenzhen (Lin, 2012)

Government announcement of pre-declaration land

Application from developers

Government working plan, developing priority

Annual land supply plan

Approved by higher-tier government

Establishing land bank

Determining the specific planning conditions for each plot

Choosing the plots for recent land transferring

Public land leasing

Auction, tendering, listing

Developers obtain the land

Public land leasing system and greater efficiency

Public land leasing system effectively increases land transferring efficiency depends on its two main features: information transparency and competitive mechanism.

As the interviewed representatives from the developers demonstrated that the public land leasing system standardized the threshold conditions and thus it included more eligible bidders in the land transferring process. In this case, it reduced the administrative cost and improved the possibility of the appropriate matching between the municipality and developers which made the land transferring process more

efficient for both parties. In other words, the market mechanism would automatically allocate the land resource to the most appropriate developer with lower cost.

With the development of visible land market, the public land leasing system enhanced the municipality's ability to regulate the land market operation. According to the market demand and urban development strategy, the municipality can adjust the amount of land supplied and additional planning conditions through land supply planning. In this case, the municipality can guide the future land development and avoid the phenomenon of hoarding or underuse the land as much as possible.

On the other hand, the inclusive of market mechanism prompts the developers to improve the land utilization efficiency. Because the developers' profit depends on the residual of land production deducting the total construction cost. The higher cost to obtain the plot of land would motivate the developers to intensively and efficiently utilize the land and maximize the land value. Besides to make the land development be more cost-effective, one respondent of developers also appreciated that public land leasing system provided fair and justice competition so that they can pay more attention to improve the production design and production function to follow the urban development strategy.

Public land leasing system as an instrument of land value capture

Since it was introduced, public land leasing system has been serving for the municipality to capture the land value to finance the urban construction and the provision of public services in Shenzhen. From 1987 when the first land auction happened to 1991, the revenue generated from land transfer primarily supported the industrialization reform. While from 1992, the municipality began and finally completed the nationalization of all land within its administrative area and the great amount of land related revenue in turn finance the urbanization process. Until 2012 when the municipality was trapped in severe shortage of urban construction land, the municipality highlighted the redevelopment of stock urban construction land. Since then, public land leasing system was equipped with the function to ensure the sustainable development and was going to be enriched with more new modes (Liu, 2012).

Among its functions, the investment, which is financed by land transferring fee, in the improvement of public services and the increment of land value are mutually affected through public land leasing system. Since the land transferring fee is lump sum payment, local government can capture both the current land use value as well as the future land use value within its tenancy term. In this way, the government gains quite considerable amount of revenue which improves its fiscal condition and its ability to provide and improve the public service in the city. In 2009, the land transferring fee in Shenzhen was up to $ 2.2 billion while the expenditure on public service was about $ 0.86 billion, accounting for nearly 40% of the total revenue (Southen Urban Daily, 2010).

In turn, the government also benefits from their investment through public land leasing system. In urban area, the land value is increased mainly due to the improved public facilities and infrastructure, which are invested by the local government. Remarkable evidence is the large amount investment in Qianhai region has resulted in the land price to be doubled from 2006 to 2012 (Hu, 2012). Qianhai is a small region in Shenzhen and its development is mainly through the way of reclaiming from the sea. The government planned to invest in total about $ 49.1 billion in ten years to develop it as a new modern development zone in Shenzhen. And in 2014, the land price per floor area resulted from public land leasing has exceeded the surrounding housing price per square. The respondents from developers in the interview also mention that the municipality's investment in Qianhai convinces them with optimistic expectation of the appreciation potential in that area. And the both the land price and housing price has increased sharply in recent years.

Additionally, the inclusive of market mechanism in public land leasing system on the one hand reduces the possibility of corruption as well as speculation and thus manifests the developers' shadow cost to obtain the land (Zhou, 2006). It other words, the land price in visible land market reflects the real market value of land. While on the other hand, the competitive mechanism during the land transferring process further includes the potential value of the land with its planned use in to its bidding price. In this way, the land price resulted from public land leasing system is much higher than it would be if it is transferred in invisible land market. From 2001 to 2005, there was in total 4.723 million m^2 of land transferred through public land leasing system and the amount of revenue generated was up to $ 1.89 million (Shenzhen Special Zone Daily, 2006). It not only collected enough funding for urban construction but also helped preserve and increase the land value in the rapid urbanization process.

However, the expert of the institute of Shenzhen real estate study points out that the proportion of revenue generated from public land leasing in fiscal revenue has gradually declined in recent years. The main reason is that the municipality pays more attention to redevelop the stock urban construction land through urban renewal in order to solve the problem of land availability. During such process, the land is mainly transferred through negotiation instead of auction, tendering and listing. Consequently, the function of public land leasing system to capture the land value may be weakened in the future.

Drawbacks of public land leasing system

It seems that public land leasing system has contributed to forming a fair, justice and visible land market but at the same time there are still some opportunities for unfair competition. For example, the developers will form an alliance to cool the competition and thus prevent the price to get bid up during the land transferring process. In such an alliance, the crucial member can obtain the targeted plot of land with much lower price while other members can get reward or the commitment of

help once they need in other land transferring cases from him. Another example is the developers who have close relationship with the municipality can directly obtain the plot of land at the cost of taking responsible for the primarily land development which should have been the municipality's obligation. In this case, the municipality shields the targeted developers through the way like setting special threshold conditions and the land transferring process is just to go through the motions. Such phenomena not only happen in Shenzhen but also are common across the country.

Additionally, public land leasing system as an important instrument for the municipality to capture the land value has been criticized to contribute to raising the land price in primary land market and further pushes up the newly-built commercial housing price. The following part is gonging to analyse the reality in Shenzhen through quantitatively methods.

4.1.3 Quantitatively analysis of the influence of public land leasing system on land price

Based on above introduction of public land leasing system in Shenzhen, this part analyses how the system influences the land price in primary land market through quantitatively methods. The comparison between the standard land price and closing land price is used to test the effect of public land leasing system on closing land price variation.

● **Standard land price**

Standard land price is an important measurement for the government to manage and monitor the land market operation. First of all, it is the main reference for the government to make urban development plan, land use plan and the industrial layout. The standard land price map describes the distribution of the land with different value and indicates the disparate regional development potential at more micro level within the city. With such a price system, the municipality can revise their development purposes and plan the city's blueprint not only to promote the city development but also to maximize the land use value and land use efficiency.

Furthermore, it is the benchmark when the government determines the floor price of land transferring fee, land rent, taxation and other land related fees, especially for those kinds of land transferred without market. For example, it is regulated that the price of the land transferred through negotiation should not be less than 70% of the standard land price of the plot in Shenzhen (Shenzhen city planning and land resources committee, 2014). In brief, standard land price clarifies and simplifies the process and measurement to evaluate the land price when dealing with the financial settlement of the plot (Xu, 2008).

● **The comparison between standard land price and closing land price**

All core information of each plot in the research samples is grouped in accordance with the administrative districts and is edited into six tables (table 3). According to those tables, this part compares the closing land price and standard land price of each plot and the difference between the two land price systems as groups. Through those

two ways, it tries to find out whether the closing land price has been artificially high. In the end, the comparison between the closing land price and the starting land price set by the government of some plots is the further evidence supporting the preliminary results.

Comparison of each plot

At the very beginning, it is need to mention that the standard land price is less time sensitive. As mentioned in Chapter 3, it is not an annual record and the price used in our study was evaluated in 2006. However, it edited the data and calculated the annual standard land price according to the normal evaluation methods.

As expected, most of the land transferred in our sample has positive price difference, which implies that the land has been transferred with much higher price than its evaluated value during the research period in Shenzhen. Therefore, it is possible to believe that the land transferring system have contributed to heating the primary land market. According to above discussion, the higher final transaction land price on the one hand indicates the land function and the increasing intense in supply shortage are gradually be recognized, while one the other hand it is unable to reject the possibility that the land price is bubbled or artificial high.

However, there are still samples with negative price difference. One meaningful reason referred from our interview explains that the leasehold would be appended some land holding conditions, for example, the government would require the real estate companies to develop the land including a certain percentage of social affordable housing or the construction of commercial facilities and infrastructure. In this case the land would be transferred with lower price but the cost to complete the additional land conditions in effect increases the construction cost for the real estate company and euphemistically raises the real land price. The lower land transferring fee is just superficial and its advantage is offset.

Another possible reason is because of the regional development gap. Most of the deals with negative price difference were occurred in Bao'an district and Longgang district in the first few years. At that time, those two districts were still sub urban area which developed relative slowly. Therefore, the land was less attractive to developers and thus the situation of supply exceeding the demand in the land market lowers the land price. No matter what the reasons are, those cases are not the mainstream and the developers in general have to bear higher land price in primary land market.

It is also interesting to find that the amount of land transferred is equal neither on the spatial dimension nor on the time dimension. Among the 6 administrative districts, Bao'an district and Longgang district are relatively abundant of land supply while the remaining districts face the opposite situation. The former two districts almost have land transferring cases in every year but the samples in the other four districts are distinuous.

There two main reasons to explain such phenomenon. Firstly, the four main districts (Luohu, Futian, Nanshan and Yantian) are the urban central areas and their physical land is smaller than that of Longgang district and Bao'an district which locate relatively in suburb. Secondly, the four main districts are the earliest ones that were zoned as the Special Economic Zone so that they experienced longer and more intensive development process. In this way, the land supply was more abundant in previous years but dropped quickly over time. Statistically speaking, the samples in the two large districts could reflect the price variation better due to the advantages of large samples.

As for the time dimension, only Bao'an and Longgang districts has almost annual land supply while most of the land was transferred before 2006 in the four main districts. It indicates that the development speed and development level is quite different from one to another among the 6 administrative districts.

All discussed above implies the fact that Shenzhen is in serious shortage of land supply and further such evidence is the annual residential land supply variation during our research period (Fig 10). Land supply for residence gradually drops since 2004, which further confirms that land becomes more and more scarce in recent years in Shenzhen. In this condition, the seller is the dominant in the market and the price is primarily affected by the demand intensity. And when the strong demand overweigh the supply in the market, the price of commodities is inevitable to be driven up.

Figure 10   Annual residential land supply in Shenzhen in the research period (Huang, 2010)

annual residential land supply in Shenzhen

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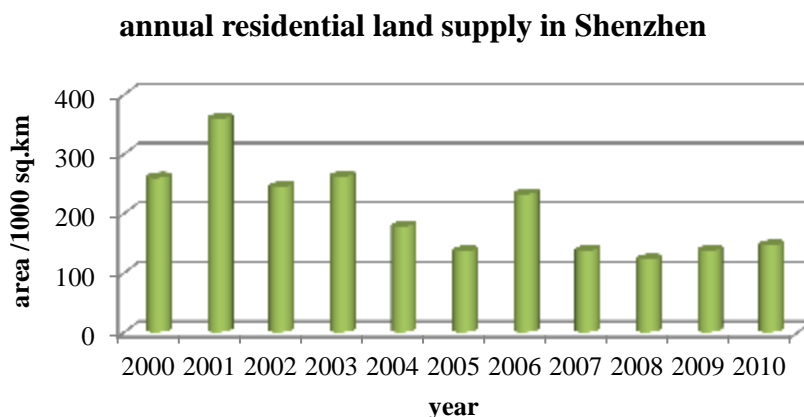
Table 3　The closing land price, standard land price and price difference of 6 administrative districts in Shenzhen[123]

Longgang district

Time	Closing land price ($)[4]	Standard land price($)[5]	Price difference($)[6]	Mode	premium rate[7]	Time	Closing land price ($)	Standard land price($)	Price difference($)	Mode	premium rate
2001	36.61	67.67	(31.06)	Tendering	—	2006	220.27	155.69	64.58	Tendering	—
	30.45	56.19	(25.75)	Auction	0.7		307.96	162.17	145.78	Tendering	
	80.58	100.48	(19.89)	Tendering	—		260.14	67.76	192.38	Tendering	
2002	58.43	62.59	(4.16)	Auction			189.69	86.96	102.73	Listing	2.42
2003	276.63	148.42	128.20	Auction	—	2007	149.54	114.02	35.52	Listing	0
2004	158.21	106.37	51.85	Listing	0		393.55	91.14	302.41	Listing	0.73
	1574.13	74.98	1499.15	Listing	0		223.31	85.52	137.79	Listing	0.6
	208.16	122.63	85.54	Auction	0.6	2008	151.61	78.82	72.79	Listing	—
2005	258.03	140.50	117.53	Listing		2009	655.83	168.99	486.84	Listing	2.02
	252.11	140.72	111.39	Auction	—	2010	817.45	136.25	681.20	Auction	0.575
	59.61	133.52	(73.91)	Listing			708.15	136.25	571.90	Listing	0.573
	362.38	136.62	225.76	Auction			786.63	104.61	682.01	Listing	—

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[1] All original data is collected from the *Shenzhen statistical yearbook, Shenzhen real estate yearbook*, real estate agencies.

[2] The data edited in the same line describes the information of the same plot in the same year.

[3] All land price listed in the six tables are inflation-adjusted and are converted into U.S. dollar. The exchange rate used is the annual average exchange rate recorded by the *People' Bank of China.* For example, the price in 2001 is converted with the rate average doll-yuan exchange rate in 2001.

[4] Closing land price is the final transaction land price in primary land market.

[5] Stand land price shows the average land price of small homogeneous area and are the market price evaluated by experts. It describes the market price of land in the normal conditions.

[6] Price difference describes the gap between closing land price and standard land price of the same plot at the same time. Price difference = Closing land price – standard land price. In this way, positive number means the closing land price exceeds the standard land price of the plot.

[7] In this column, "—" means there is no record of this value while "0" means the final land price of the plot is the same as its starting price.

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Bao'an district[1]

Time	Closing land price ($)	Standard land price($)	Price difference($)	Mode	premium rate	Time	Closing land price ($)	Standard land price($)	Price difference($)	Mode	premium rate
2000	91.45	78.83	12.62	Auction	—	2005	276.12	137.51	138.61	Auction	—
	112.83	58.81	54.02	Tendering			230.54	99.64	130.89	Auction	
2001	77.09	106.17	(29.08)	Tendering			314.92	92.56	222.36	Auction	
2002	174.20	103.94	70.26	Auction	—	2006	257.87	103.63	154.25	Tendering	—
	135.02	112.42	22.60	Auction			403.74	132.95	270.80	Tendering	
	105.96	145.02	(39.05)	Auction			232.98	142.28	90.70	Tendering	
	142.22	103.38	38.84	Tendering			545.06	127.20	417.86	Tendering	
2003	206.56	108.33	98.23	Auction	—		772.07	134.74	637.32	Auction	
	659.57	77.94	581.63	Auction			323.93	107.94	215.99	Auction	
	107.77	81.66	26.10	Auction	0	2007	822.64	134.81	687.83	Listing	0.5
	115.40	144.31	(28.90)	Auction	—		682.12	179.53	502.59	Tendering	—
	187.77	78.82	108.95	Auction		2008	333.68	196.76	136.93	Listing	—
	205.96	127.15	78.80	Auction			458.29	136.14	322.15	Listing	
2004	192.94	117.14	75.80	Auction	—	2009	208.06	187.14	20.91	Listing	0
	217.35	102.22	115.13	Auction			825.04	223.60	601.44	Listing	0.45
	1026.31	79.54	946.77	Auction			1106.00	178.07	927.93	Auction	0.22
	154.75	116.41	38.34	Auction							
	277.07	148.21	128.87	Auction							

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[1] The missing years in the following five tables mean that there was no land transferred in that administrative district in that year.

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Luohu districts

Time	Closing land price ($)	Standard land price($)	Price difference($)	Mode	premium rate
2004	354.63	224.64	129.99	listing	0.903
	138.00	230.86	(92.86)	listing	0
2006	483.68	252.01	231.67	auction	—

Futian district

Time	Closing land price ($)	Standard land price($)	Price difference($)	Mode	premium rate
2000	403.00	269.46	133.54	Tendering	—
	286.06	201.54	84.52	Auction	
2003	327.78	225.38	102.39	Listing	0.607
2004	232.17	253.54	(21.37)	Listing	—
	879.08	255.09	623.99	Auction	
2005	282.82	270.25	12.57	Listing	—
2006	401.39	416.79	(15.39)	Listing	0.05
2009	577.50	395.50	182.01	Listing	0.65

Nanshan district

Time	Closing land price ($)	Standard land price($)	Price difference($)	Mode	premium rate
2000	285.21	89.74	195.48	Tendering	—
	228.20	123.45	104.74	Tendering	
2001	325.39	138.09	187.31	Tendering	—
	364.92	127.95	236.97	Auction	
2002	296.52	134.30	162.22	Auction	—
	316.55	185.25	131.29	Auction	
2004	96.23	162.19	(65.96)	Listing	0
	201.43	158.36	43.08	Listing	0
2005	269.22	213.68	55.54	listing	—
2006	116.07	247.66	(131.59)	Tendering	0

Yantian district

Time	Closing land price ($)	Standard land price($)	Price difference($)	Mode	premium rate
2000	413.99	78.66	335.33	Auction	—
	117.06	154.32	(37.27)	Tendering	
	219.86	77.52	142.34	Tendering	
2001	192.22	99.41	92.81	Tendering	—
	233.48	87.58	145.90	Tendering	
2002	251.36	103.85	147.51	Tendering	—
2003	271.25	158.82	112.44	Listing	—

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Comparison between groups

As mentioned in chapter 3, paired samples T test as a statistical method is used to check whether there is significant difference between average value of closing land price and of standard land price. The result from the SPSS is showed in following tables.

The original hypothesis of the test is that there is no significant difference between the average levels of the two land price systems.

Table 4   The results of paired sample T test

	clp	slp	clp-slp[1]
Mean	406.6536	195.9729	210.68067
Std. Deviation	321.73163	86.26588	334.2188
Std. Error Mean	33.91349	9.09322	35.22976
T	—	—	5.98
Sig. (2-tailed)	—	—	0.000
N	90	90	—
df	—	—	89

Note: clp means the closing land price while the slp means the standard land price

The second line in table 4 shows the mean of closing land price and of standard land price, respectively. Obviously, the mean of closing land price is much higher than that of standard land price, which indicates that the closing land price is generally higher than standard land price.

The significant value of results of paired sample test is 0.000 which means the result rejects the hypothesis. In other words, it is proved that there is significant difference between the mean of closing land price and of standard land price as groups. Although such a result cannot tell how the difference represents but based on what have been discussed above, it could further confirm the assumption that closing land price has been much increased through public land leasing system.

Comparison between closing land price and starting price (Premium rate)

Additionally, the impact of public land system on land price could be further verified with the premium rate of land price. Such a rate measures how much the closing land price exceeds the starting land price set by the government. Land transferred with high premium rate indicates that the final transaction price is much higher than the starting price set by the government at the beginning. Although the data in table 3 is not complete[2], the existing data of premium rate could to some extent reflect the great

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[1] The data in this column shows the statistical results of the paired difference between closing land price and standard land price.

[2] The lack of data is caused by the incomplete record provided by the municipality.

impact of public land leasing system on heating the land market and pushing up the land price.

In some cases of our samples, the final land price is two times more than the starting price. Those developers who would like to pay quite a lot to obtain the land may be motivated by the strong competition among the bidders, favourable location or the good appreciation prospects. As the senior manager of China Merchants Property Development co.ltd says that the market oriented modes of public land transferring system improves the transparency of land transfer but at the same time it also allowed more participants to join in the land transferring process. In this way, it is inevitable to incur strong competition among the bidders, especially when competing for the plot locates in the four main districts in Shenzhen. In addition, land transfer follows the principle of "high price results" while the municipality does not set the ceiling price for the plot, which actually further frees the increasing limit of land price. In brief, those qualitative analyses verify the hypothesis that the public land leasing system is able to raise the land price.

Aggregated analysis

Finally, we aggregated the information collected in a more comprehensive format, based on which it is going to analyse the difference between the three public land leasing modes.

It is interesting to find firstly that each mode is popular in different time. Tendering was used since the very beginning but has gradually gone out of service recently. While the modes of listing was produced a bit later until in 2003, it becomes the most frequently used method in land transferring in recent years. While, auction is the most frequently used in the whole research period. The government may have preference of the modes used to transfer the land in primary land market, but it is more possible to find out the particular impact of each public land leasing mode.

The first disparity is that the public land leasing modes differently affects the developers' rationality when they bidding and making decisions. Since the competitive environment is quite different from one to another, it is possible to affect the land price decision in difference cases. Land transferred by listing allows the appliers to quote again and again within the fixed time, during which period they can collect relevant information, do the field survey and make financial budget. Also the competition information is more open and transparent in this procedure because the updated bidding price is listed in certain official place so that everyone can know the competition about the land timely. In this condition, the developers are more rational and could make a deliberate decision.

On the opposite, auction is a one –time deal and the bidders always have to compete strongly on the spot to obtain the land. Actually, the bidders tend to be irrational in the warm and competitive atmosphere on the spot. While tendering is relatively a medium way to bid for the land because the bidders can integrate various aspects of influential factors into account to make the bidding document but they only have one chance to

quote. Consequently, land price resulted from listing is better to reflect the market condition at that time while that from auction is possible to be bubble price. Therefore, land transferred by listing could to larger extent reveal the reality in primary land market.

Another difference is the different potential of corruption during the land transferring process. Compared with auction, listing and tendering are more easily influenced by the government intervention because the government has greater power to impact the ultimately results in the process. While the final results of auction is largely generated in accordance with the principle of "high price results". Therefore, auction is the one with least opportunities for corruption while the bidders are also less motivated to offer a bribe in such relative open and fair competition.

Last but not least, the price difference caused by the three modes is also quite different. Based on table 5, auction always caused the largest price difference and it tends to lead to greater fluctuation of price difference. Relatively speaking, modes of tendering and listing generate more moderate results at average level. Therefore, it further confirms that bidders tend to be more irrational in auction than in the other two modes. That explains why the mode of listing is preferred by the local government in recently years while the other two becomes less popular in Shenzhen.

Table 5   The aggregated information of the research samples[1]

Year	modes	price difference($)		Year	modes	price difference($)	
		lowest	highest			lowest	highest
2000	Auction	12.62	335.33	2006	Auction	215.99	637.32
	Tendering	(39.45)	198.45		Tendering	(131.59)	417.86
	Listing	—	—		Listing	(15.39)	102.73
2001	Auction	(25.75)	187.31	2007	Auction	—	—
	Tendering	(31.06)	236.97		Tendering	502.59[2]	
	Listing	—	—		Listing	35.52	687.83
2002	Auction	(39.05)	162.22	2008	Auction	—	—
	Tendering	38.84	145.90		Tendering	—	—
	Listing	—	—		Listing	72.79	322.15
2003	Auction	(28.90)	581.36	2009	Auction	927.93	
	Tendering	—	—		Tendering	—	—
	Listing	102.39	122.44		Listing	20.91	601.44
2004	Auction	(38.34)	623.99	2010	Auction	681.20	
	Tendering	—	—		Tendering	—	—
	Listing	(92.86)	1499.13		Listing	571.90	682.01
2005	Auction	111.39	225.76				
	Tendering	—	—				
	Listing	(73.91)	117.53				

[1] The data aggregated in the table based on the collection in our samples. The symbol "—" in the table means there was no land transferred through the public land leasing modes in the whole city in that year.

[2] The merged cell in the table means there was only one plot transferred by the public land leasing modes in the whole city in that year.

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4.2 The results of VECM and its explanation

Referring to annex 3 and 4, the three equations are revised in order to ensure the regression could pass all the hypothesis tests before running the regression. And the revised equations are written follows:

Formula 2   The final equations of the VECM

$$\Delta AHP_t = \beta_0 + \beta_1 * \Delta ALP_t + \beta_2 * ECM_{t-1} + \beta_3 * \Delta Int + \beta_4 * \Delta GDP + \beta_5 * \Delta FDI + \beta_6 * \Delta BL + \beta_7 * \Delta PE + \beta_8 * \Delta PD + u_t$$
(1)

$$\Delta THP_t = \beta_0 + \beta_1 * \Delta TLP_t + \beta_2 * ECM_{t-1} + \beta_3 * \Delta Int + \beta_4 * \Delta GDP + \beta_5 * \Delta FDI + \beta_6 * \Delta BL + \beta_7 * \Delta PE + \beta_8 * \Delta PD + u_t$$
(2)

$$\Delta LHP_t = \beta_0 + \beta_1 * \Delta LLP_t + \beta_2 * ECM_{t-1} + \beta_3 * \Delta Int + \beta_4 * \Delta GDP + \beta_5 * \Delta FDI + \beta_6 * \Delta BL + \beta_7 * \Delta PE + \beta_8 * \Delta PD + u_t$$
(3)

With the help of Eviews 6.0, we gain the regression outcome of each equation. The following tables express the regression coefficients of each variable in each equation and the statistical characteristics of each equation.

The first parts of the table shows the coefficient and its statistical characteristics of each variable used in the equation. And the second part lists the statistical characteristics of the regression model itself, among which the most important factor is R-square showing the ability of the independent variables in the model to explain the variation of dependent variable. In other word, R-square expresses that to what extent does the sample matches the reality. In our study, equation (1) can reflect the variation of the land price resulted from auction with around 84.8% confidence, equation (2) can reflect the real condition of land transferred by tendering with almost 71.8% confidence and equation (3) can match the reality of land price resulted from listing with about 74.5% confidence.

The results of R-square indicate that the three models on average have good approach ability and reflect the reality. However, it is still worth to mention at the very beginning that the housing pricing mechanism is complicated in Shenzhen and the price is affected by other factors, for example the influence of macro-control policies, which are not included in the model. Almost all the macro-control policies aimed to curb excessive demand through the way of Hukou system or credit squeeze, which directly reduced peoples' affordability. While neither the central government nor the municipality would imposes pressure on primary land market operation to control the unaffordable newly-built commercial housing price. Therefore, the primary land market and newly-built commercial housing market have been differently influenced by the policies and the corresponding price variation is a bit different from one to the other. Also, other control variables' responses to external changes are also possible to be different and are not totally converted into the housing price variation. Finally, it may also be caused by the data quality. In this way, the regression results are possible to be abnormal or not completely consist with the current situation.

Table 6 the outcome of the three statistical models[1]

	Auction	Tendering	listing
C	19200.16	-374.363.872	-2876.762
	[13290.8]	[3008.19]	[8033.87]
D(AHP(-1))[2]	0.096*	—	—
	[0.067]		
D(THP(-1))	—	0.145	—
		[0.086]	
D(LHP(-1))	—	—	0.094*
			[-0.1157]
D(ALP(-1))	1.138**		
	[0.746]		
D(TLP(-1))	—	-0.196	—
		[0.445]	
D(LLP(-1))	—	—	0.397*
			[0.883]
ECM	-0.474***	-1.153***	-0.935***
	[0.123]	[0.168]	[0.169]
D(FDI)	0.013	-0.004	0.031
	[0.022]	[0.01]	[0.025]
D(SA)	-10.905***	-7.581***	-15.859***
	[7.638]	[3.666]	[8.686]
D(PE)	-10.53	1.198	69.325
	[39.61]	[18.87]	[46.173]
D(LIR)	-232.723	-129.964	899.276
	[1043.44]	[494.077]	[1327.56]
D(PD)	0.031	-0.059	0.117
	[0.131]	[-0.063]	[0.157]
Number of Observations[3]	35	23	28
Number of Districts	6	6	6
Number of Years	11	11	11
R-squared	0.848	0.718	0.745
Adjusted R^2	0.821	0.668	0.7
F-statistic	31.45	14.342	16.458
Akaike AIC	19.877	18.369	20.20
Schwarz SC	20.209	18.70	20.53
Mean dependent var	-25.997	-597.097	266.684
Note: ***$p<0.01$, **$p<0.05$, *$p<0.1$; robust standard errors in square bracket			

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[1] The kind of data used is panel data.

[2] D(x) means the first different order of the variable. The value of D(x) = value of X in the last period – current value of X.

[3] The flowing indicators describe the statistical characteristics of the three models.

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Key Variables：

Δ AHP (-1)（Auction housing price），Δ THP (-1) (Tendering housing price),

Δ LHP (-1) (Listing housing price)

In table 6, the coefficients of first-lagged auction housing price and first-lagged tendering housing price are significantly different from zero. It means that one unit increment of auction housing price in last period can rise up the current auction housing price by 0.096 units, which is similar as the current listing housing price variation caused by the price variation in last period. While, the coefficient of tendering housing price is not statistically significant so that it is no evidence to conclude whether the current listing housing price variation is affected by the price variation in last period.

It vividly describes the continuous prosperity in real estate industrial. During the research period, the average newly-built commercial housing price in Shenzhen increased from $ 677.34 per square meter in 2000 to $ 3938.7 per square meter in 2010, which has increased more than five times (Huang, 2010).

In such a booming market, the expectation plays an important role in converting the potential demand into effective effect demand. Generally speaking, people less hesitates to purchase a commodity with increasing price in order to avoid the risk of paying more if purchase it in the future. Especially when purchasing the housing, a bit increment of housing price is able to impose great pressure on people's affordability and financial budget. In this case, when facing the phenomenon that the housing price keeps growing, citizens in Shenzhen expect the housing price will still go up in the future and thus eager to purchase the housing as soon as possible. Therefore, the higher housing price in the last period stimulates more potential demand at present,

As for the developers, the continuous rising housing price convinces them with optimistic expectation of real estate development and their profit in the future. Therefore, they are motivated to create the false impression of intensive housing supply and thus raise the housing price for more profit. During the interview, the respondents from the developers also commit that the last decade was the golden time for the real estate development and the housing price has been increasing sharply. The newly-built commercial housing price to income ratio is up to 10 and the out of reach housing price becomes the main reason for the young talents to leave Shenzhen.

In brief, because of the incentive to avoid the risk of suffering from heavier financial burden, the higher housing price in last period makes the citizens more eager to purchase the housing. And influenced by the cultural tradition, citizens prefer to buy newly-built housing than to buy the second hand housing. Therefore, the great released demand in turn raises the newly-built commercial housing price.

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△ALP (-1)（Auction land price），△TLP (-1) (Tendering land price)，△LLP (-1) (Listing land price)

According to the outcome, two of the coefficients of the three different types of first-lagged land price are significantly different from zero and have the expected signs. If the price of the land that is transferred by auction increases by 1 percentage in the last period, the corresponding housing price will be passively increased by 1.138 percentages. And the same increase of listing land price in the last period will result in the housing price to rise by 0.397 percentages. While for tendering, the coefficient of the land price is also not statistically significant.

Before going further, it needs to underline why the models exclude the current value of land price. According to our literature review, the land market operation and real estate operation are closely related through public land leasing system. Especially in Shenzhen, the residual method used to calculate the floor price for the land transfer lead to the fact that the housing price variation can in turn affect the land price variation. Statistically speaking, the land price in the model is the endogenous variable. In order to avoid the mutual effect between the current value of land price variation and housing price variation, the VECM model only includes the first-lagged value of land price.

However, there are some subtle variance among the impact of the price resulted from the disparate public land leasing modes on the newly-built commercial housing price variation. The impact of auction land price is much stronger than that of the price resulted from the tendering. While such influence of listing land price is not as evident as that of the other two.

There are several reasons to explain why the three public land leasing modes show varying degree of influence on housing price variation. Firstly, it may be caused by the different sample sizes, which could statistically influence the outcome. Statistically speaking, the larger is the sample size, the more accurate is the outcome. And in the research samples, there are more plots of land transferred through auction than listing, which is a bit more than that of tendering. Additionally, the data used in the model are panel data, which tracks the varying value of certain variable both cross section and over time. However, as for time dimension, there was no land transferred through tendering in many years while there was annual record of land transferred through auction. While on the cross section, the land transferred in each districts equals neither in the quantity nor in the frequency of utilization of each mode. As a consequence, it may result in difference outcomes of each formula. Especially for the regression of tendering, the smaller and quite discrete sample sizes of the plots primarily weaken its influence.

Furthermore, the cardinal number of land price resulted from different land transferring modes is different because each of them is used intensively in different micro periods. Auction is the one used for longest time and most frequently. Since 2003, listing becomes popular in public land leasing system while tendering began to

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"quite the stage of land transferring" at the same time because there was almost no land transferred through such way since then. Therefore, the land price of each model to some extent actually reflects the land price level in its utilization time period. In other words, variation of auction land price records the whole development process of the booming land market, the variation of tendering land price mainly reflects the land price in the first few years and that of listing land price highlights the price level more recently. In Shenzhen, where the land market has been prosperous, it makes sense that the average land price resulted from auction is higher than that resulted from listing or tendering.

Additionally, the municipality also has recognized that auction tends to push up the bidding price during the land transferring process. Facing the great social criticism of the astonishing housing price was caused by the municipality's preference to use auction to transfer the land, in 2006, the municipality again intensively chose tendering, which had been suspended for three years, to transfer the land with the purpose to cool the hot real estate market. One research also showed that the ratio of land price resulted from auction, tendering and negotiation was up to 11.6:3:1 (Qin, 2006). All above proves that the auction land price has been able to greatly impact the newly-built commercial housing price.

During its implementation, public land leasing system contributes to the rapid urban development but at the same time it becomes more and more criticized to worse the overheated real estate market. Actually, such situation in Shenzhen is partly due to its geographical limitation. Shenzhen, together with Beijing, Shanghai and Guangzhou is listed as the first tiers cities[1] in China but it is the smallest cites of all that its administrative area is only one fifth of that of Beijing, one third of that of Shanghai, but they have similar population scale. Therefore, urban development is firstly limited to its geographical area, which is the main incentive for the land price to go up.

In addition, land resource is distributed regionally uneven. The central urban area is smaller but it takes on more comprehensive functions and is also more attractive. As a consequence, the central urban area faces greater pressure of land availability. While in the satellite town, the land supply and demand is less intensive. Such uneven supply and demand relationships would cause different growth of land price and thus of newly-built commercial housing price in different region. Reviewing the past decades, the housing price in urban central area was the first to grow and keeps at a high growth rate while the housing price in satellite town began to rise with a rising increasing rate until 2005 (Huang, 2010).

The government's inaction makes the situation even worse. On the one hand, the more market-driven modes of land transferring, which means more transparent and open, allows more bidders to join in the land transferring process. It is inevitable to

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[1] China has an urban hierarchy system. The first-tire cities means the cities have significant political and economic status in the country and have strong positive externalities on other cities. It evaluates the cities' comprehensive competitive power.

intensify the competition, especially the competition for the land in central urban area where the land has higher development and value-added potential. On the other hand, the bidding follows the principle of "high price results" but without ceiling price. Therefore, the land price could be pushed up without any restriction.

In sum, the results of the VECM relatively well describe the reality in Shenzhen. According to the outcome, the land price resulted from the public land leasing system has contributed to the growth of newly-built commercial housing price. And comparing the three modes, auction shows the greatest impact on housing price variation while that of listing is much weaker. Particularly, there is no statistical evidence to conclude such effect of land price resulted from tendering.

Variable: ECM (Error correction)

Error correction describes the speed at which the value of independent variable returns to its long-term equilibrium under the affection of dependent variables. In equation(1), error correction measures that the value of independent variable have to change 0.474 percentage in reverse in order to return to the average level while in equation (2) and (3) the amount is 1.153 percent and 0.935 percent, respectively.

In our case, the coefficients of error correction in the three equations also reflect the deviation of newly-built commercial housing price resulted from the auction, tendering and listing. Obviously, the results clarifies that the newly-built commercial housing price with the land transferred through tendering has the greatest deviation while that with the land transferred by auction has the minimum deviation. Such findings consist with the discussion in 4.1, which argue that the three modes influence the newly-built commercial housing price variation in quite different ways and tendering is more probable to raise the newly-built commercial housing price. As for tendering, it has more opportunities to disorder the normal market price determination mechanism and the land price would be more artificial determined.

However, it is still worth to mention the possibility that such results could be resulted from their popularity in different time period. The records of auction land price and the corresponding housing price is more complete than the other two, which covers the whole study period. In this way, the continuity of data ensures the auction land price and corresponding housing price variation show convergent variation with that of the market development which is characterized by the steady upward trend. To the contrary, tendering has been used more randomly during the decade and the data in the research sample is quite discontinuous. Therefore, the housing price variation caused by tendering seems more fluctuated. Finally, the housing price variation resulted from listing land price variation is just a continuum between the two modes.

Explanation of Control variables

According to the literature review, several other measurable factors which could also significantly influence the variation of newly-built commercial housing price are included in the model as control variables. In this case, the coefficient of the land

price could reflect its own impact excluding the interference of other factors. The following part explains the outcomes of those control variables.

Variable: FDI (Foreign direct investment)

All coefficients are not significantly different from zero and thus it seems that there is no significant evidence to determine the influence of FDI on housing price variation according to the research samples. However, it is still worth to analyse a bit about its influence because it becomes an important factor in real estate market operation in Shenzhen.

As a showcase of China's opening up, Shenzhen provides good political and industrial environment and has attracted more and more foreign investment. Among the various choices, foreign capital prefers to invest in real estate not only because the low market access threshold but also the temptation of high yield rate in China. Generally speaking, there are three main ways to invest in real estate with foreign capital: individually invest in housing; directly invest in real estate industry including set up real estate enterprises or acquiring the stock of domestic famous real estate enterprises and through foreign debt

According to the statistical data of the Ministry of Commerce, real estate industry has become the the second largest industry that is invested by foreign capital, following the communication equipment and electronic equipment industry. And in Shenzhen, the foreign capital also has significant impact on the real estate market. There are more than 100 foreign-owned real estate enterprises in the city, and the aggregated foreign capital that has been invested in real estate industry in 2013 accounts for 7.28% of the total disbursement of foreign capital in that year. In 2007, the Tax Bureau launched an extensive tax audit activity and the taxation that be recovered was up to $59.39 million, which indicated that those foreign capital had generated huge output value and profit. What's more, the foreign investment has begun to expand to whole industrial chain, except for setting up the real estate companies, other related business such as the foreign capital invested real estate consulting, also gradually develops. Famous real estate consulting, such as DTZ Debenham Tie Leung and Savills, has set up their branch office in Shenzhen.

All in all, although it is supported by VECM to report that FDI has contributed to the newly-built commercial housing price, above discussion has exposed its ability to influence the housing price variation. It may be seen in the near future.

Variable: SA (Annual selling area)

The coefficients in the three equations are significantly from zero and have expected signs. The one percentage increase in housing supply can lead to the about 10.905 percent of decrement in newly-built commercial housing price in equation (1), 7.581 percent of drop in equation (2), and 15.859 percent of drop in equation (3). It seems that the housing supply has the strongest influence when the land is transferred by listing.

As mentioned in Chapter 2, supply and demand relationship is the most important economic principle of price determination mechanism, so is for the pricing mechanism in real estate market. Reviewing the newly-built commercial housing demand and supply in the past decade in Shenzhen, annual completed area of commodity units has been obviously falling short of annual selling area. It, therefore, it confirms the fact that the real estate market lacks of enough housing supply in Shenzhen, which could manifest as increasing newly-built commercial housing price.

Figure 11   Annual demand and supply of commodity units in Shenzhen's housing market (Yin & Xie, 2013)
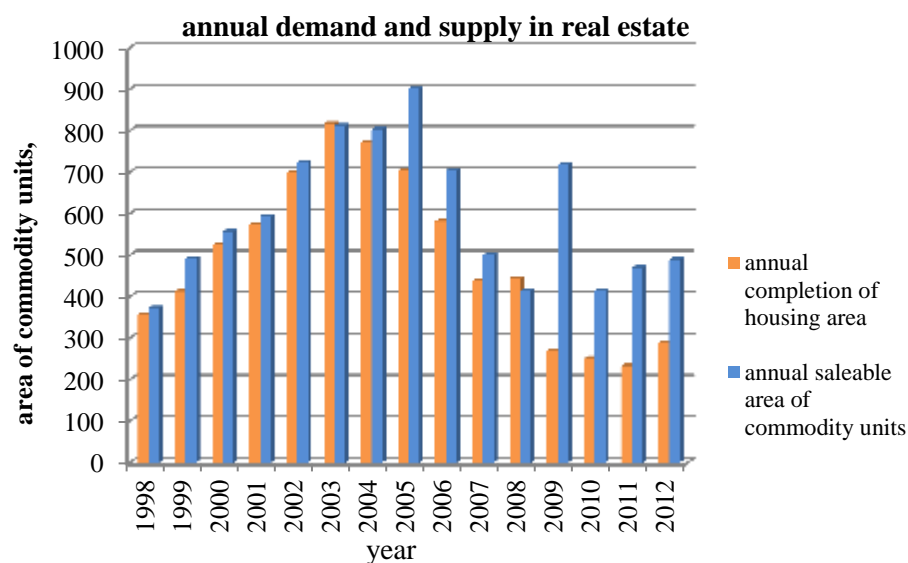
First of all, land availability should take part responsible for the shortage of housing supply. Physically speaking, Shenzhen is a small city and the administrative area is only about 2000 km^2, half of which are available construction land. The annual land transferred through auction, tendering and listing is about 2 km^2 in recent years and current urban construction area has been up to 1000 km^2. Faced with the contraction between future development and lack of available urban construction land, the municipality has to redevelop the stock urban construction land. In this way, urban renewal becomes the main resource of urban construction land. However, since the city is relatively new city with short term of modernizing development, it is quite difficult to find large amount of plots to be reconstructed. Otherwise, the urban renewal will be less cost-effective. Additionally, there are many large factories occupying the heart of the city. The difficult communication and high compensation make it difficult to carry out urban renewal projects. In conclusion, lacking urban construction land to large extent affects the housing supply in Shenzhen.

Secondly, the variation of supply always a bit lags behind the variation of demand in real estate market. The estimation of projects to be developed relies on existing housing demand and appropriate increasing rate, which is not so accurate to calculate. And then the housing will be sold in the real estate market after a long procedure

including obtaining the land, construction and preparation for sale. It at least costs one year for the company to get the certificate of forward-sale. While on the other hand, the demand varies quickly, especially in prosperous market. It is common to find that the estimated amount of housing needed is less than that is actually needed. During the golden decade of real estate industry, housing demand was in a "blowout" type of explosive growth across the whole country, so did it happened in Shenzhen. People were trapped in the predication that the housing price would infinitely go up so that people regard investing in property as a best way to gain added value.

The governments' monopolization makes the situation even worse. The amount of land that can be transferred in a year is determined by the government and is showed in the form of annual land supply plan. Although the government can guide the land market development and the urban development layout through land supply plan, such administrative instruct is rather rigid and cannot follow the market changes. Furthermore, except for the consideration of housing demand in real estate market, the government also takes into account many other considerations, such as political support for some special industries, the construction of social affordable housing, or even the government performance. All these restrictions are probably to be converted into higher newly-built commercial housing price.

In conclusion, the outcome of VECM supports that the housing supply plays a significant role in newly-built commercial housing price variation. Enough housing supply can effectively decrease the housing price, especially when the land is transferred through listing. Nevertheless, it is a pity to find that the newly-built commercial housing supply is in serious shortage and thus the housing price is driven up.

Variable: PE (Price to Earning ratio)

We use "price to earning ratio", which is the ratio of stock price and its earnings, to describe the operation in stock market. The coefficients in all the three equations are also statistically insignificant.

It may because that the stock market is still under the strict regulation and supervision of the government. For example, on the midnight on 29 May 2007, the China Security Regulatory Commission issued a statement that the stamp tax was to be increased from 1‰ to 3‰ from the next day and the stock index plunged 300 points the next day. Additionally, the stock market in China lacks the appropriate delisting mechanism. Numerous companies are eager to raise money through initial public offerings (IPO) while most of them will gloss over their financial condition. It is published that the financial condition of IPO companies are much worse in three years after they have successfully be listed in the stock market. And most of them will be out of the stock market once they have successfully financed. In this case, overmuch IPOs cause huge loss of ordinary shareholders and distort the normal function of stock market.

Consequently, since neither the real estate market nor the stock market is completely marketization in Shenzhen, the market mechanism still does not work well to inter-relate the two market function as the literature review has concluded.

Variable: LIR (Loan interest rate)

All coefficients of loan interest rate are statistically insignificant, which means that the loan interest rate does not show important impact on the newly-built commercial housing price variation in the research samples.

Theoretically speaking, higher loan interest can directly reduce both the developers' and citizen' affordability thereby helps reduce the land demand and housing demand. In this case, it may curb the housing price rises. In China, loan interest rate has been in effect a frequently used financial instrument for the central government to regulate the real estate market operation during the golden development period (table 7)

Table 7   The variation of loan interest rate in the recent decade (department, 2010)

Date	Variation (%)	Date	Variation (%)
3. 2002	−0.54	20. 07. 2007	+0.27
10. 2004	+0.36	22. 08. 2007	+0.27
28. 4. 2006	+0.27	15. 09. 2007	+0.27
19. 08. 2006	+0.27	20. 12. 2007	+0.27
18. 03. 2007	+0.27	9. 2008	−1.08
19. 05. 2007	+0.18		

The abnormal outcome of VECM may because the loan interest rate adjustment was too small to show its impact on housing price variation. Besides, it also could due to attributes of the data. The value of loan interest rate only varies over time but keeps the same for different administrative districts. However, the housing price is quite different both at time dimension and at spatial dimension. Therefore, the loan interest rate lacks the ability to express the spatial features of housing price.

Variable：PD (Population density)

Similar result as above two factors is also happened to population density that all coefficients are not statistically significant.

According to the literature review, population significantly and directly influences the demand in real estate market. Shenzhen is the most complete immigrant city in China and its inclusive, creative and vibrant cultural environment, free political environment and rapid economic development attracts quite large amount of immigrants. Roughly estimating, the population increases by about 1 million per year, most of which have potential willingness to purchase properties in Shenzhen. Figure 11 describes the variation of population density in each administrative district in Shenzhen in recent decade.

Figure 12   Variation of population density in Shenzhen in recent decade (Huang, 2010)
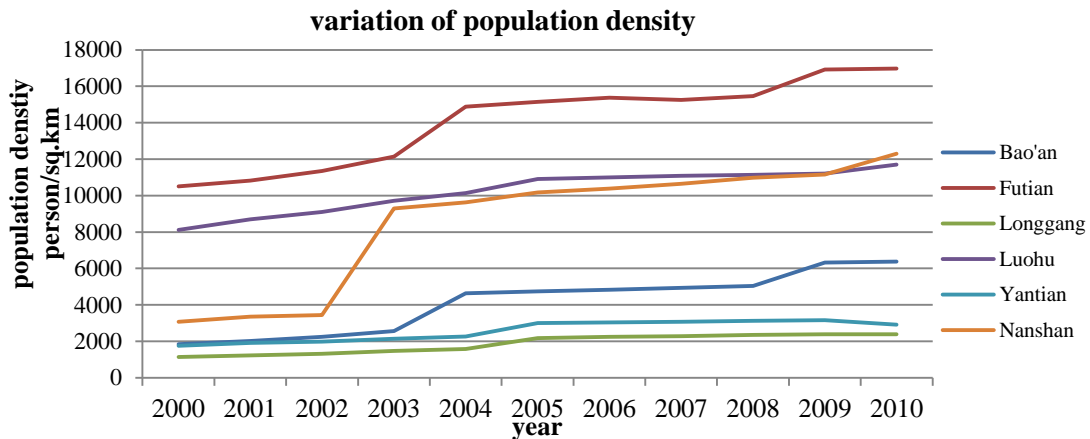
There two reasons may explain the abnormal results of VECM. Firstly, it is because of the Hukou system[1]. Shenzhen implements dual register system between urban area and rural area before its complete urbanization. With hukou system, only the citizens with urban hukou can purchase a house in Shenzhen while in reality most of the immigrants cannot meet such requirements. Additionally, the series of macro-control policies, which was designed to curb the skyrocketed newly-built commercial housing price through credit squeeze or restrictions on the number of properties that one household can own, to large extent restrain large part of citizens who would purchase a house to improve living standard. Consequently, the combined effect of above policies may inhibit the potential demand be converted into effective demand.

4.3 Conclusion

Firstly, public land leasing system is an effective instrument for the Shenzhen municipality to capture the land value and thus to finance the public service and urban construction. The marketization reform improved the transparency and efficiency of the land transferring process but it also has been proved to contribute to the growth of land price in primary land market. And among the three market-oriented modes, auction is effective in improving the efficiency but tends to bid up the land price; tendering provides more opportunities of corruption but the price is more rational and listing is more or less the compromise with more rational transferring process but also results in higher land price.

According to the outcome of VECM, the land price resulted from auction and tendering shows their impact on the newly-built commercial housing price while that of tendering is not supported by the model. It is interesting to find that the selling housing area has quite strong impact on newly-built commercial housing price variation. Comparing speaking, the influence from the land price is weak.

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[1]According to where the person is born and his family relationship, he is registered as rural resident or urban resident. In reality, unless a person is registered as urban residents, which is quite difficult in more developed cities that he has no right to public service, and even no right to purchase a house (Perkins, 2009).

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Chapter 5: Conclusion and recommendation

This part is designed to make final conclusion of the main content of this paper, including the original intention, research context, conclusive answers for main questions and sub questions, some problems encountered in research process need to be further discussed as well as the recommendation for future study or readers.

5.1 Why is Shenzhen

Public land leasing system was first introduced in Shenzhen and during the following decades, the municipality led the relevant reform and improvement. Therefore, it has experienced a relative long time development and there is abundant of information and experience about how it works, its attributes, characteristics, advantages and disadvantages. With such information, it is easier to deeply understand the system and to analyse its influence on both primary land market operation and real estate market operation.

Additionally, Shenzhen is one of the most modernized cities in China and was the first city to quit the dual land use system and to realize the complete urbanization. Both the experts and developers in the interview acknowledge that the land market and real estate market in Shenzhen are relative mature and are similar as perfect market, which provides good context to analyse the market operation.

Lastly, Shenzhen municipality's publicity of relevant information makes it easier to collect the data and other necessary information for the research.

5.2 The function of public land leasing system and land value capture

Since the first leasehold of state-owned land use right was auctioned in 1987, the public land leasing system has been implemented for more than 25 years in Shenzhen, during which period, the government continuous to improve the system to be adapted to the changing reality.

According to the segmentation of land value increment mentioned in chapter 2, Shenzhen municipality effectively captures the land value increment primarily depends on its ownership of state-owned land. Besides, it also share the land value increment resulted from its investment in public service and social progress.

During the process, public land leasing system has been an effective instrument for the Shenzhen municipality to capture the land value since it was introduced in 1987. During its improvement and development, it financed the industrialization process at the beginning and then it greatly supported the nationalization and urbanization in the city. Since 2012, although its function to capture the land value has been weakened, it is still regarded as an important way to gain revenue to promote the urban sustainable development.

The introduction of market mechanism and competitive mechanism into land market makes the land transferring process more justice, transparent. Publicity of relevant information and the standardized threshold not only simplify the administrative procedure both for the government and bidders but also improve the possibility of

successful matching between government (seller) and bidder (buyers). Consequently, land transferring process becomes more efficient.

As for how the public land leasing system influence the land market operation and land price variation, the findings in the research consist with that mentioned in literature review.

Firstly, marketization manifests the value of land as a kind of asset. The floor land price set by the municipality has taken into account various aspects of land use, including the compensation of expropriation, the cost of land consolidation and other political considerations. While, the bidding price shows the developers' maximum willingness to pay, which is determined according to the planed land use condition and the appreciation potential. Furthermore, developers are also motivated to sufficiently utilize the land resource to maximize the land use value and gain more profit. In brief, such a system improves the land utilization efficiency.

However, public land leasing system to some extent raises the land price. On the one hand, it manifests the shadow cost of developers in the visible land market so that the price is higher than that would be if it is sold in the black market. On the other hand, it is raised by the shortage of land supply in Shenzhen. Available land in Shenzhen is limited to its physical area and the intensive consumption of land resource caused by the rapid urban development.

As for the individual influence of the three public land leasing modes, similar results as Li and Ma (2009) are found auction tends to have greater impact on raising the land price than the other two. While listing is more or less a compromise and it seems to be used more frequently in recent years. But different from the literature, tendering was used less and randomly in Shenzhen although it seems to make the land transferring process more rational and lead to more moderate results

5.3 The role of land price plays in the newly-built commercial housing price variation

According to the outcome of VECM, this paper proved that the land price would raise the housing price. One percent of increment of auction land price in the last period can raise the current newly-built commercial housing price by 1.138 percent while the same increment of listing land price in last period would cause the current price variation by 0.196 percent. Such results partly support the arguments that land price raises the newly-built commercial housing price discussed in chapter 2.

Actually, both the respondents from the institute of Shenzhen real estate study and developers in the interview acknowledge that the cost of obtaining the plot of land accounts for around 35% to 40% of the total cost. Since the developers are responsible for their own loss and profit, such cost is converted into higher housing price and thus is transferred to the consumer. Except for the direct effect, the land price also indirectly affects the housing price variation through limited land supply. The increasing land price in effect reflects the fact of lacking available land and thus it results in the shortage of housing supply in Shenzhen. As the outcome from the

VECM proves that the selling area has remarkable impact on the newly-built commercial housing price variation.

However, different from those criticism of land price resulted from public land leasing system, the statistically results in the research only confirms such impact of land price through auction and listing. And there is no statistically significant evidence to indicate that tendering land price can also increase the newly-built commercial housing price.

5.4 The relationship between public land leasing system and newly-built commercial housing price variation

Reviewing what has happened during our research period in Shenzhen, the public land leasing system especially the three market-oriented ways has increased the land price in primary land market and such function is transmitted into real estate market through financial ways. Both the comparison between closing land price and standard land price and the interviews confirm such reality while the VECM statistically supports such influence only of auction and listing.

Nevertheless, except for above findings that are in accordance with the most literature argued in chapter 2, there are another two important factors have great impact on the newly-built commercial housing price variation in the study.

One is the newly-built commercial housing price, which has been neglected in related research. Because the VECM considers the endogenous problem, it is found that the newly-built commercial housing price indicates self-enhancement effect in the research samples that It is statistically proved that the price of the housing with the land transferred through auction and listing in the last period can increase the current housing price but that of tendering is not statistically significant.

The other one is the housing supply. It is not only statistically supported by the VECM but also shows quite strong influence on the newly-built commercial housing price variation, which is 7 to 15 times more than that of land price resulted from public land leasing system. Comparatively speaking, it seems that the newly-built commercial housing price is primarily determined by the supply and demand in the market.

5.5 Discussion and recommendation

This research devotes great effort to explore and explain the influence of implementing the public land leasing system on newly-built commercial housing price. The findings are meaningful. Either the land price or the newly-built commercial housing price is chiefly determined by the supply and demand in the market. However, the political system and law empower the municipality the right to intervene the market, which in effect has remarkable effect on market operation. Along with the economic development and the political reform, the government gradually acknowledges the improved efficiency and function of the market and thus weakens its intervention. Therefore, the research should take the government intervention into account when approaching the market operation with the case study of Chinese cities.

Furthermore, it verifies that the increase of land price can drive up the newly-built commercial housing price but the opposite is not studied. Generally speaking, the growth of newly-built commercial housing price can be affected by various factors besides the raising land price. Therefore, it is difficult to prove that the increment of housing price is completely caused by the growth of land price. Rather than to verify whether the housing price is absolutely driven up by the increment of land price, it is more meaningful to find out to what extent does the land price variation impact the newly-built commercial housing price variation in this study. However, similar studies should pay attention to such asymmetric influential logic between land price variation and newly-built commercial housing price variation.

Anyhow, there are still some points can be further discussed and some recommendation for similar researches.

First of all, the analysis is limited to the data availability. The sample size is limited to the reality that there were fewer and fewer plots of land could be transferred with time flowing. It is not difficult to find that there was no land transferred in some years in certain districts in Shenzhen, which restricts the function of statistical models. Additionally, the data of land is still not completely known to the public in China and it is quite difficult to collect all land related information. That is why there are a lot missing data of premium rate in Chapter 4. In this way, the limitation of data availability weakens the evidence so that restricts our analysis to go deeply. For further similar research, it is recommended to make sure the data availability at first.

Secondly, the methods used in the paper still can be extended. Since the theme of the paper is to explore and explain how the public land leasing system influence the land price determination and newly-built commercial housing price determination. We use comparisons and qualitative analysis to describe the influence of the system on land price determination and VECM to analyse the individual difference as well as the deviation of housing price from its average level caused by auction, tendering and listing. The findings already can answer the main questions and tell the story behind the data. Nevertheless, there is still one recommendation to perfect the analysis. For other similar study, comparing the price variation before 1998 and after 1998 is suggested. Since in 1998, the both the housing reform and land reform began in Shenzhen, difference of price variation in the two period with the cut-off point in 1998 can more clearly tell the "with and without" impact of implementing the public land leasing system.

Last but not least, the relationship between land market and housing market is actually more complex than what have been discussed. Rather than a one-way process, primary land market and real estate market are mutually affected. This paper paid most of the attention to the influence of land market on housing market without considering the other way around. We recommend other similar could be interested in the reverse relationship and its function and complement the discussion about the relationship between the two markets.

Reference

Alonso, W., 1964. The economics of urban land: introduction and review. In: *Location and land use: toward a general theory of land rent.* Cambridge: Harvard university press, pp. 1-17.

Anderson, J. E., 2012. Collecting land value through public land leasing. In: I. G. & Y. Hong, eds. *Value capture and land policies.* Cambridge: Lincoln Institute of Land Policy, pp. 123-148.

Asteriou, D. & Hall, S. G., 2011. *Vector Autoregressive (VAR) Models and Causality Tests.* Second ed. London: Palgrave MacMillan.

Bentham, J., 1978. Principles of the civil code. In: C. B. Macpherson, ed. *Reprinted partially in Property:Mainstream and critical positions.* Oxford: Basil Blackwell, pp. 40-57.

Bertaud, A., 2010. How government acton affects both land supply and consumption. In: *Land markets, government interventions, and housing affordability.* Washington: Global Economy and Development, pp. 18-21.

Black, T. R., 1994. Data quality. In: *Evaluating Social Science Reasearch: Introduction.* New Delhi: SAGE Publications Ltd, pp. 60-85.

Booth, P. A., 2012. The unearend increment: Property and the capture of betterment value in Britain and France. In: I. G. & Y. Hong, eds. *Value Capture and Land Policeis.* Cambridge: Lincoln Institution of Land Policy, pp. 74-96.

Cai, H., Henderson, J. & Zhang, Q., 2009. *China' Land Market Auction: Evidence of Corruption,* Cambridge: National Bural of Economic Reearch .

Chai, Q., 2008. *The development history and the reform of housing sysytem in China.* [Online] Available at: http://theory.people.com.cn/GB/49154/49155/8108609.html[Accessed 8 5 2014].

Chen, X. & Song, H., 2010. The impact of auction,tendering and listing on sustable use of land resource. *Nature Resouce Economics of China*, 7, pp. 34-36.

Coase, R., 1960. The problem of social cost. *Journal of Law and Economics*, 3, pp. 1-44.

Cottrell, A., 1996. The error correction model. *Journal of Economic Methodology*, 3, pp. 138-144.

council, t. s., 2006. *Provisional regulations of the People's Republic of China on urban land use and transfer of provisional regulations.* [Online] Available at: http://www.mlr.gov.cn/tdzt/zdxc/fzxcr/124_2007/tdgl/200712/t20071207_66588 1.htm[Accessed 23 4 2014].

Dan, S. & You, J., 2003. The Af fection regularity of Ratio of Building Area to. *Journal of Chang 'an U niversity (So cial Science Edition)*, 5(1), pp. 52-58.

Davidson, J. E., Hendry, D. F., Srba, F. & Yeo, S., 1978. Econometric modelling of the aggregate time-series relationship between consumers' expenditure and income in the United Kingdom. *The Economic Journal*, 88(352), pp. 661-692.

Deininger, K. & Feder, G., 2001. Land institutions and land market. In: *Handbook of Agricultural economics.* Amsterdam: Elsevier B.V, pp. 288-331.

Demsetz, H., 1967. Towards a theory of property rights. *American Economic Review*, 57(2), pp. 347-359.

Yifei Shi----The Impact of Public Land Leasing System on the Price Decision Mechanism in Land Market and Housing Market--- A Case Study of Shenzhen

department, M. p., 2010. *The table of loan interest rate adjustment.* [Online]
    Available   at:
    http://www.pbc.gov.cn/publish/zhengcehuobisi/629/2012/201207061820547581
    17206/201207061820547581172 06_.html
    [Accessed 1 9 2014].

Dong, J., 2013. The Analysis of Chinese Land Institution of Real Estate Development.
    China Real Estate, 1, pp. 30-46.

Englund & Ioannides, 1997. House Price Dynamics: An International Empirical
    Perspective. *Journal ofHousingEconomics*, 6(2), pp. 119-136.

Fainstein, S. S., 2012. Land value capture and justice. In: G.Ingram & Y. Hong, eds.
    Value capture and land policies. Cambridge: Lincoln Institute of Land Policy, pp.
    21-40.

Fred, E. F., 2005. Geo-Rent: A Plea to Public Economists. *Econ Journal Watch*, 1 2,
    pp. 106-132.

Fu, M., 2007. The co-integration analysis of real estate investment and
    macro-financial data. *Productivity Research*, 4, pp. 94-96.

Fu, S., 2000. Develop and regulate the secondary housing market. *Manage World*, 2,
    pp. 1-15.

Gaffney, M., 1994. Land as a distinctive factor of production. In: T. N., ed. *Land and
    Taxation.* London: Shepheard-Walwyn, pp. 39-102.

Gao, T., 2006. Vector Aotugression and Vector Error Correction Model. In:
    Econometric analysis method and modeling. Beijing: Tsinghua University Press,
    pp. 267-297.

George Hazel Consultancy Ltd, 2013. *Land Value Capture Discussion Paper,*
    Edinburgh: George Hazel Consultancy Ltd.

George, H., 1912. Progress and poverty: An inquiry into the cause of industrial
    depression s and of increase of want wiht increase of wealth. In: *The remedy.*
    Garden city: Doubleday, p. 27.

Ge, Y., 2010. Research on Marx's theory of land ownership and rent. *Jingji Sixiang
    Ping Lun*, 2, pp. 95-106.

Gregory, K. & Hong, Y., 2012. Land Value Capture: types and outcomes.. In: K.
    Gregory & Y. Hong, eds. *Land Value and Land Policies.* Cambridge: Lincoln
    Institute of Land Policy, pp. 3-18.

Guion, L. A., 2002. *Triangulation: Establishing the validity of qualitative studies,*
    Florida: University of Florida.

Guo, Y., 2006. Neoinstitutional Economics. In: *Property right & Transaction cost.*
    Shanghai: Lixin Accounting Publihing House Co., Ttd., pp. 100-183.

H.Perkins, W., 2009. China's land system: past,present and future. In: G. K.Ingram &
    Y. Hong, eds. *Property Rights and Land Policy .* New Hampshire: Puritan Press
    Inc, pp. 70-95.

Hao, Q. & Chen, j., 2007. The geographical difference of the relationship between
    access to CBD, transport accessibility and housing price in Shanghai. *World
    Economic Papers*, 1, pp. 1-11.

Hickman, P. et al., 2007. Making sense of mobility and housing demand. In:
    Understanding housing demand: learning from rising market in Yorkshire and

the Humber. Chartered Institute of Housing: Chartered Institute of Housing, pp. 61-67.

Hong, t. & Gao, B., 2007. The analysis of relationshi between stock price and housing price in China between 2001-2006. *Price: Theory & Practice*, 1, pp. 64-65.

Hong, Y., 2003. Policy dilemma of capturing land value under the Hong Kong public land leasing system. In: B. Bourassa & Y. Hong, eds. *Leasing public land: Policy debates and international experience.* s.l.:Cambridge, pp. 151-176.

Huang, t., 2010. *Shenzhen Real Estate yearbook,* Shenzhen: Publishing House of Shenzhen Press Group.

Hu, T., 2012. *Real estate companies are eager to obtain the land in Qianhai area.* [Online]   Available   at: http://money.163.com/12/1107/01/8FM02SOF00253B0H_all.html [Accessed 3 9 2014].

Hu, Z., Liu, Y. & Dai, Y., 2009. Research on the dynamic relationship of China's house price and stock price based on the MTV model. *Statistics & Information Forum*, 24(6), pp. 77-82.

Ingram, G. K. & Hong, Y., 2009. Examinng land policies from a property rights perspective. In: *Property rights and land policies.* New Hampshire: Puritan Press Inc, pp. 3-22.

Jiang, D., Chen, J. J. & Isaac, D., 1998. The Effect of Foreign Investment on the Real Estate Industry in China. *Urban Studies*, 35(11), pp. 2101-2110.

Klein, D. B. & Robinson, J., 2011. Property: A Bundle of Rights? Prologue to the Property Symposium. *Econ Journal Watch*, 8(3), pp. 193-204.

Knaap, G. J., Ding, C. & Hopkins, L. D., 2001. Do Plans Matter?The Effects of Light Rail Plans on. *Journal of Planning Eduaction and Research*, 21(1), pp. 32-39.

Kuang, W., 2013. FDI and housing price. *Theory and Management of Economy*, 2, pp. 51-58.

Kuang, W. & Li, T., 2012. The Relationship between Land Price and Housing Price. *Journal of Financial Research*, 8, pp. 56-69.

Lai, J., 2006. The consuming attitudes and investment demand of increasing housing price. *Development Research*, 11, pp. 57-59.

Leung, C. & Yui, K., 2003. Economic Growth and IncreasingHouse Price. *Pacific Economic Review*, 8, pp. 183-190.

Lian, Z., Tang, Z., Lu, R. & Xu, W., 2007. The relationship between land price and housing price----A case study of Hubei province. *Modern Agricultural Science and Technology*, 5, pp. 104-105.

Li, G. & Shang, M., 2010. The advantages and problems of public land leasing system. *Science & Technology Information*, 26, pp. 212-214.

Lin, Q., 2012. The comparative analysis of land transfer system between Hong Kong and Shenzhen. *China Land Sciences*, 26(12) 12, pp. 22-26.

Li, S. & Ma, X., 2009. The analysis of the influence of public land leasing on real estate market. *Reform fo Economic System*, 2, pp. 144-148.

Liu, L. & Liu, H., 2003. Economic Analysis of the Relationship between Land Price and Housing Price. *the Journal of Quantitative & Technical Research*, 7, pp. 27-30.

Liu, W., 2014. *Shenzhen handles the illegal construction problems left over from the past.* [Online] Available at: http://ilonggang.sznews.com/lgnews/content/2014-02/10/content_9078847.htm [Accessed 9 5 2014].

Liu, Y. & Pan, J., 2007. *The design of evaluaction methods of standard land price based on the information system.* [Online]
Available at: http://www.mlr.gov.cn/xxh/fasj/201003/t20100306_709766.htm [Accessed 24 7 2014].

Liu, Z., 2012. *The new land reform in Shenzhen.* [Online]
Available at: http://house.china.com.cn/topic/2012shenzhentugai/ [Accessed 2 9 2014].

Li, Z. & Wu, s., 2010. The improvement and adjustment of public land leasing system. *China Real Estate Finance*, 6, pp. 7-10.

Luo, H. & Yin, C., 2013. The analysis of increment allocation mechanism of expropriation system. *People's Tribune*, 9, pp. 143-145.

Mankiw, N., 2011. The market force of supply and demand. In: J. Sabatino, ed. *Principles of Microeconomics.* Boston: Cengage Learning, pp. 65-88.

Markiw, N., 2011. The cost of Production. In: J. Sabatino, ed. *Principle of Micoreconomics.* Boston: Cengage Learning, pp. 259-278.

Marx, K., 1959. Absolute Ground-Rent. In: *Capital.* New York: International Punlishers, pp. 512-527.

Ma, X., 2008. The Study on Market Performance of Bid Invitation, Auction and Listing system in Urban Land Transfer. *Urban Studies*, 15(6), pp. 119-123.

McDonald, J. F., 1995. The effect of anticipated transportation improvement on residential land values. *Regional Science and Urban Economics*, 25(3), pp. 261-278.

Medda, F., 2011. Land Vlaue Finance: Resource for Public Transport. In: R. Sietchiping, ed. *Innovative land and property taxation.* Nairobi: United Nations Human Settlements Program, pp. 42-52.

Medda, F. R., 2011. *Land value capture as a funding resource for urban investment,* Wrocław: Ernst & Young Poland.

Mehra, Y. P., 1991. An Error-Correction Model of U.S. M2 Demand. *FRB Richmond Economic Review*, 77(3), pp. 3-12.

Messick, S., 1990. *Validity of test interpretataion and use,* New Jersey: Eduaction Testing Service Princeton.

Mind Over Mandarin, 2014. *Shenzhen, Guangdong Province,South China.* [Online]
Available at: http://www.mindovermandarin.com/about-shenzhen/ [Accessed 24 8 2014].

Ministry of Land and Resource, 2001. *Regulation for Evaluation on Urban Land (GB/T18508-2001),* Beijing: s.n.

Ministry of Land and Resource, 2007. *Provisions on the Assignment of State-owned Construction Land Use Right through Auction, Tendering and Listing ,* Beijing: Ministry of Land and Resource.

Nason, G. P., 2006. Stationary and non-stationary time series. In: H. M. C. S. G. C. ed. *Statistics in Volcanology.* London: Special Publications of IAVCEI, pp. 129-142.

Yifei Shi----The Impact of Public Land Leasing System on the Price Decision Mechanism in Land Market and Housing Market--- A Case Study of Shenzhen

National Business Daily, 2014. *The Ministry of Land Resource strict the scope of endowment real estate and issue series of policies supporting its decelopment.* [Online] Available at: http://fangchan.21cbh.com/2014/4-25/5MMDA1NzFfMTE0ODM5MA.html [Accessed 16 6 2014].

Nie, C., Wen, H. & Fan, X., 2010. The spatial and temporal effect on property value increment with the development of urban rapid rial transit: an empirical research. *Geographical Research*, 29(5), pp. 801-810.

O'sullivan, A., 2003. Why are the housing different?. In: X. Su, J. Chang & Y. Zhu, eds. *Urban Economics.* Beijing: CITIC Publishing House, pp. 343-382.

People's daily online, 2006. *The land reform in China.* [Online] Available at: http://cpc.people.com.cn/GB/64156/64157/4512167.html [Accessed 9 5 2014].

Perkins, D. H., 2009. China's Land System : Past, Present, and Future. In: G. K. Ingram & Y. Hong, eds. *Property rights and land policies.* New Hampshire: Puritan Press Inc., pp. 70-95.

Peterson, G. E., 2008. *Unlocking land values to finance urban infrastructure.* Washington DC: The World Bank.

Qian, Z. & Zou, W., 2008. The Study on the Relationship Between High Housing Prices. *Journal of Economics Research*, 5, pp. 55-62.

Qin, R., 2006. *Shenzhen municipality find ways to cool the housing price.* [Online] Available at: http://www.szhome.com/new/focus/2006/8/260818-1.html [Accessed 4 9 2014].

Quigley, J. M., 1976. Housing Demand in the Short Run: An Analysis. In: *Explorations in Economic Research.* National Bureau of Economic Research: Cambridge, pp. 76-102.

Rajan, R. & Ramcharan, R., 2012. *The Anatomy of a Credit Crisis: The Boom and Bust in Farm Land Prices in the United states in the 1920s,* s.l.: Unpublished.

Richard, M., 1903. *Priciples of city land values.* New York: The Record and Guide.

Shenzhen city planning and land resources committee, 2014. *The Regulation about the land transferred through negotiation.* [Online] Available at: http://www.szpl.gov.cn/xxgk/zcfg/fgk/tdl/201308/t20130813_94352.html [Accessed 17 8 2014].

Shenzhen municipality , 2013. *The overview of Shenzhen.* [Online] Available at: http://www.sz.gov.cn/cn/zjsz/szgl/201311/t20131122_2252502.htm [Accessed 9 5 2014].

Shenzhen Special Zone Daily, 2006. *The twenty years developemnt of land management in Shenzhen.* [Online] Available at: http://www.szpl.gov.cn/xxgk/ztzl/sztdgl20n/200908/t20090826_49085_2.htm [Accessed 2 9 2014].

Shi, E., 2011. *The research of public land leasing and its market impact.* Beijing: Tsinghua University.

Smolka, M. O., 2013. *Implementing value capture in Latin America: Policies and tools for urban development,* Cambridge: Lincoln Institute of Land Policy.

Yifei Shi----The Impact of Public Land Leasing System on the Price Decision Mechanism in Land Market and Housing Market--- A Case Study of Shenzhen

Song, B. & Gao, B., 2007. A Causality Test for Housing and Land Prices: 1998-2006. *Moder Economic Science*, 29(1), pp. 72-77.

Song, L., 2014. *The housing price in China will not show a trend of decline.* [Online]
Available at: http://finance.chinanews.com/house/2014/05-16/6180865.shtml
[Accessed 28 7 2014].

Southen Urban Daily, 2010. *Shenzhen's land transferring fee was up to 2.2billion in 2009.* [Online]
Available at: http://money.163.com/10/0723/08/6C8VPM16002534NU.html
[Accessed 17 8 2014].

State information center, 2007. *The advanced query of real estate transaction.* [Online]
Available at: http://www.realestate.cei.gov.cn/search/index.aspx?xx=jy
[Accessed 22 8 2014].

Tan, M., Li, X. & Lv, C., 2003. The analysis of driving force of urban expansion. *Economic Geography*, 23(5), pp. 635-639.

Tencent's property, 2014. *The regional characteristics of housing begin to be recognized by the policy.* [Online] Available at: http://huizhou.house.qq.com/a/20140502/015408.htm
[Accessed 18 5 2014].

the statistical glossary, 2014. *Paired sample t-test.* [Online] Available at: http://www.stats.gla.ac.uk/glossary/?q=node/355[Accessed 1 7 2014].

Triantafyllopoulos, N., 2010. Land speculation and property market (in)efficiency. *Discussion Paper Series*, 16(10), pp. 223-252.

Unirule Institute of Economics, 2011. *The Research of Establishing Housing Security System in China,* Beijing: Beijing Tianze Economic.

United States Court of Appeals, 2007. *UNITED STATES of America, Plaintiff-Appellee,v. David Emory FLEET,Defendant-Appellant,* s.l.: s.n.

Wang, C. & Li, J., 2007. *Real Right Law of the People.* Beijing: Higher Eduaction Press.

Wang, D. & Zhang, H., 2010. Defects of urban-land-supply system of China and relevant proposals for rectifying. *Journal of Qingdao University of Science and Technology（Social Sciences)*, 4 26, pp. 1-5.

Wang, D. & Zhang, H., 2010. Defects of urban-land-supply system of China and revelant proposals for rectifying. *Journal of Qingdao University of Social and Technology(social science)*, 4 26, pp. 1-5.

Wang, M., 2009. *Study of defects and improved measures on the land grant system in China.* Lanzhou: Lanzhou University.

Wang, W., 2008. The analysis the relationship between houing price and stock price. *Market Modernization*, 7, pp. 343-344.

Wang, Y., 2005. *Studies on Urban Remising-land Intitution and Running Mechanism.* Shanghai: East China Normal Univerity.

Waston, E., 2013. *A closer look at some of the supply and demand factors influencing residential property markets,* Wellington: Reserve Bank of New Zealand.

Wei, G., 2012. The impact of land transfer system on hoursing price:a theorical model and some inferences. *Prices Monthly*, 12, pp. 22-25.

Yifei Shi----The Impact of Public Land Leasing System on the Price Decision Mechanism in Land Market and Housing Market--- A Case Study of Shenzhen

William, J. M. & Riel, C., 2005. *Land Value Taxation: An Applied Analysis.* Farnham: Ashgate Publishing.

Wooldridge, J. M., 2007. The regression analysis of time series data. In: J. Fei, ed. *Introductory Econometrics: A modern approach.* Beijing: The Renmin University of China Press.

Xie, W. & Deng, W., 1996. Urban Land Economics. In: *Urban Economics.* Beijing: Tsinghua university press co., LTD, pp. 223-281.

Xu, M., 2011. The relationship between land price and housing price based on the financial shock and demand. *Financial Industry*, 10, pp. 30-34.

Xu, M. & Ren, H., 2006. Analysis on some speculation behaviour in Chinese real estate market. *Journal of Shanxi Finance and Economics University*, 28(4), pp. 87-92.

Xu, R., 2008. *What is the standard land price?.* [Online] Available at: http://www.mlr.gov.cn/tdzt/zhgl/jyxc/yjjy/200806/t20080601_674950.htm [Accessed 18 6 2014].

Yan, J., 2006. Land Price and Housing Price in China:. *the Journal of Quantitative & Technical Research*, 1, pp. 17-26.

Ye, T. & Shi, P., 2007. Impact of Land Policy Reform on Land Use Efficiency and economic benefit in China: a perspective from Shenzhen Special Econimic Zone. *Journal of Natural Resource*, 22(3), pp. 434-444.

Yin, Y. & Xie, Z., 2013. *Shenzhen statistics yearbook,* Shenzhen: Shenzhen bureau of statistics.

Yue, G., Teng, L. & Wang, C., 2009. On Local Governments' Land Selling Revenue in China. *China Opening Herald*, 3, pp. 47-52.

Yue, S. & Wang, H., 2004. The analysis of the current situation and problems of existing property tax. *Journal of Tax College of YangZhou University*, 9(3), pp. 8-15.

Yue, X., 2005. Houing price, land price and public land leasing system. *China Land*, 1, pp. 16-17.

Yu, H. & Chen, D., 2009. The Research of interrelationship between land price, interest rate and housing price. *Journal of Economic Review*, 4, pp. 41-49.

Yu, X. & Yang, J., 2008. The research of the gap between the disparity of regional housing price and dispatiry of regional personal income. *Seeker*, 5, pp. 34-35.

Yu, Y., 2014. *Shenzhen's land market is in doldrums; Newly-added residential land is in shortage.* [Online] Available at: http://szhome.oeeee.com/html/201403/08/55487.html[Accessed 12 5 2014].

Zhang, A., 2013. *The first "rural land" being transferred in land market in Shenzhen provides realistic reference for new land reform in China.* [Online] Available at: http://news.xinhuanet.com/fortune/2013-12/20/c_125893817.htm [Accessed 9 5 2014].

Zhang, B., Su, D. & Huang, X., 2005. he Mechanism and Demonstration Research on the. *Area Reasearch and Development*, 24(5), pp. 105-109.

Zhang, X., Mount, T. D. & N.Boivert, R., 2004. Industrialization, urbanization and land use in China. *Journal of Chinese Economic and Business Studies*, 2(3), pp. 207-224.

Zhang, Y., 2011. The discussion of public land leaing system according to the housing welfare property. *Co-operative Economy & Science*, 12, pp. 96-97.

Zhao, Z. J. & Cao, C., 2012. *Land Transfer Fees for Urban Infrastructure Development in China,* Arizona: Lincoln Institute of Land Policy.

Zhou, J., 2005. The empirical study of real estate speculation and price fluctuation. *Contemporary Finance & Economics*, 4, pp. 19-24.

Zhou, J., 2006. *High Land Price and Public Land Leasing System.* [Online] Available at:http://www.landvalue.com.cn/TheContent.aspx?ContentID=9830&Menu_ID= 32[Accessed 2 9 2014].

Zou, D., 1994. The study of plot ratio. 1, pp. 19-23.

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Annex
Annex 1
The general theory of the relationship between land market and housing market

According to the classical western economy, price is determined by the supply and demand in the market, so do the land price and housing price. The Four Quadrants Model is appreciated because it clarifies the price decision mechanism and the mutually affected relationship between land price and housing price in market condition as follows (Qian & Zou, 2008)

The assumption of this model is that both the land market and housing market are free markets. E_H and E_L are the original equilibrium of housing market and land market while E_{H1} and E_{L1} are the new equilibrium through market adjustments.

Scenario 1, how does the variation of housing demand influence land market (Fig 13).

Assuming that neither the housing supply nor the land supply is changed, growth of housing demand (in quadrant Ⅰ) causes both higher housing price and greater land demand (in quadrant Ⅳ) because land demand is derived demand. Therefore, the short of supply in land market will push up the land price (in quadrant Ⅲ). Then higher land price also contributes to higher housing price since cost of land is a remarkable part of housing construction cost (in quadrant Ⅱ). Finally, the two markets arrive at new equilibrium with both higher land price and housing price.

Figure 13 The relationship between changing housing demand and housing price as well as land price(Qian & Zou, 2008)

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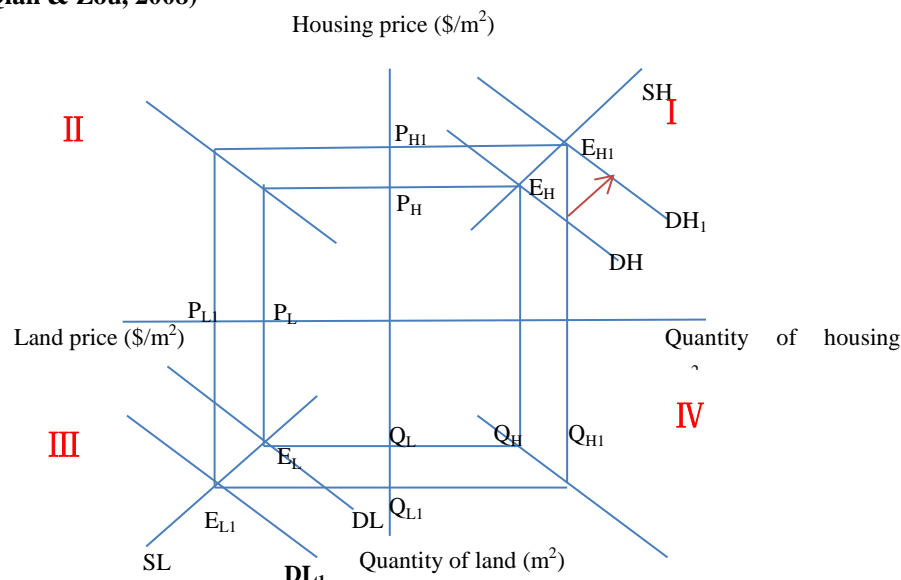
Scenario 2, how does the change of housing supply affect the two markets (Fig 14)

Assuming that both the housing demand and land supply are fixed, the decline of housing supply leads to higher housing price and reduction of housing demand (in quadrant Ⅰ). Subsequently, land demand is passively dropped (in quadrant Ⅳ) thus land price decreases (in quadrant Ⅲ). Finally, the two markets arrive at new equilibrium with lower land price and higher housing price (in quadrant Ⅱ).

Figure 14   The relationship between changing housing supply and housing price as well as land price (Qian & Zou, 2008)
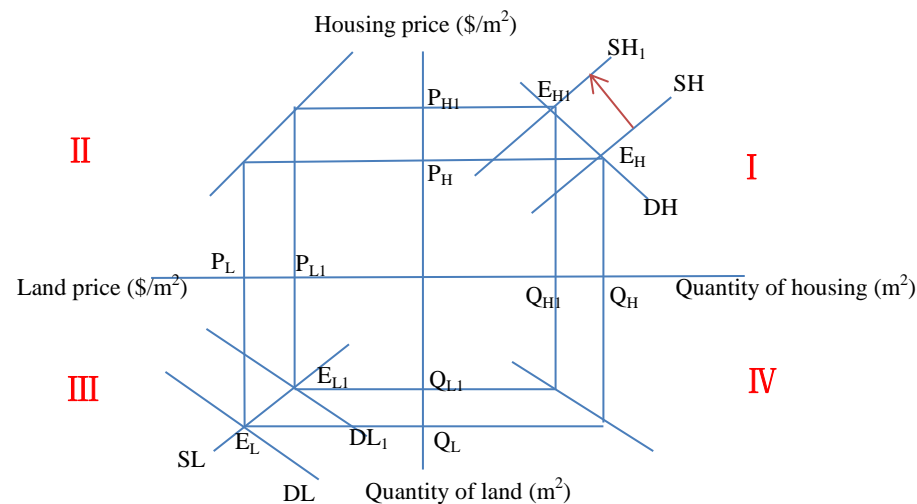
Scenario 3, how does the changing land demand impact the two markets (Fig 15)

The assumption is that land supply and housing demand are fixed. The rise of land demand intensifies the imbalance of land supply and demand, and then results in higher land price (in quadrant Ⅲ). The upward trend is transformed to housing market where the housing price increases (in quadrant Ⅱ). After that, higher housing price squeezes out some housing demand (in quadrant Ⅰ).Finally, the two markets arrive at new equilibrium E_{H1} and E_{L1} and it implies that the lack of land demand will indirectly lead to higher housing demand (in quadrant Ⅳ).

Figure 15   The relationship between changing land demand and housing price as well as land price (Qian & Zou, 2008)

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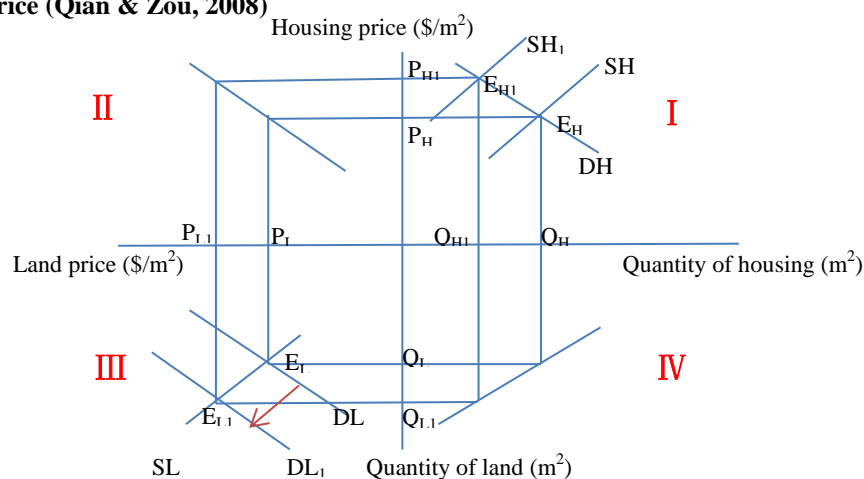
Scenario 4, how does the changing land supply influence the two markets (Fig 16)

The assumption is that the markets have fixed housing demand and land demand. Decreasing land supply pushes up land price (in quadrant Ⅲ), so does it affect the housing price though through indirectly ways (in quadrant Ⅱ). As a consequence, the higher housing price will reduce the housing demand (in quadrant Ⅰ).Finally, the two markets arrive at new equilibrium E_{H1} and E_{L1}. This scenario indicates that the tightening of land supply leads to declining housing demand (in quadrant Ⅳ).

Figure 16 The relationship between changing land supply and housing price as well as land price (Qian & Zou, 2008)
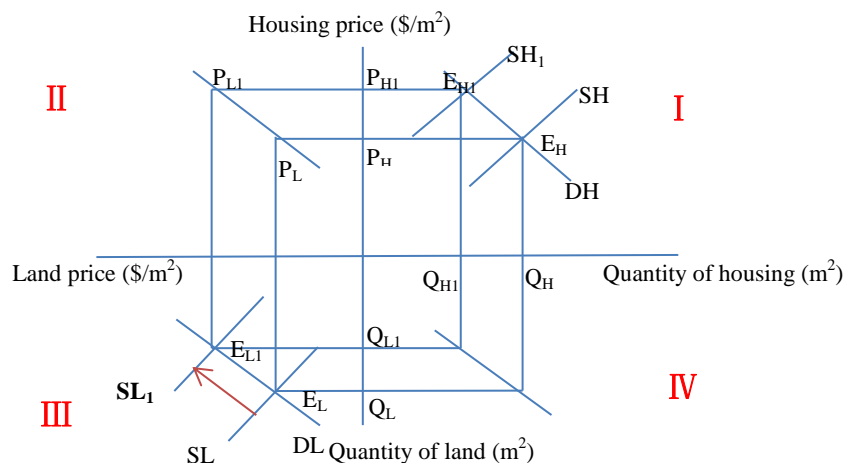
Such situation is only analysed one round and in the next round the opposite will occur. The four figures vividly describe the pricing mechanism in the market and the transmission mechanism of the influence through supply and demand between land market and real estate market. Although those results are generated depends on the competitive market condition, it is still helpful to analyse Shenzhen's housing price variation since its relatively mature development market economy. And this classic microeconomic theory is regarded as key guideline in the following discussion.

Annex 2:

The calculation process of standard land price in Shenzhen

The evaluation of standard land price is guided by the principle of combining the function of evaluated land price and land grading[1]. The evaluation of land price should be based on the result of land grading while the land grading could be retested by standard land price in the way that the difference of standard land price should reflect the difference between land grades.

In Shenzhen, the municipality combine the calculation methods in the Regulation for Evaluation on Urban Land and local market needs, creates a model to evaluate the standard land price based on the land price of trading samples. The evaluating process is listed as follows:

Figure 17 Process of evaluating the standard land price (Liu & Pan, 2007)
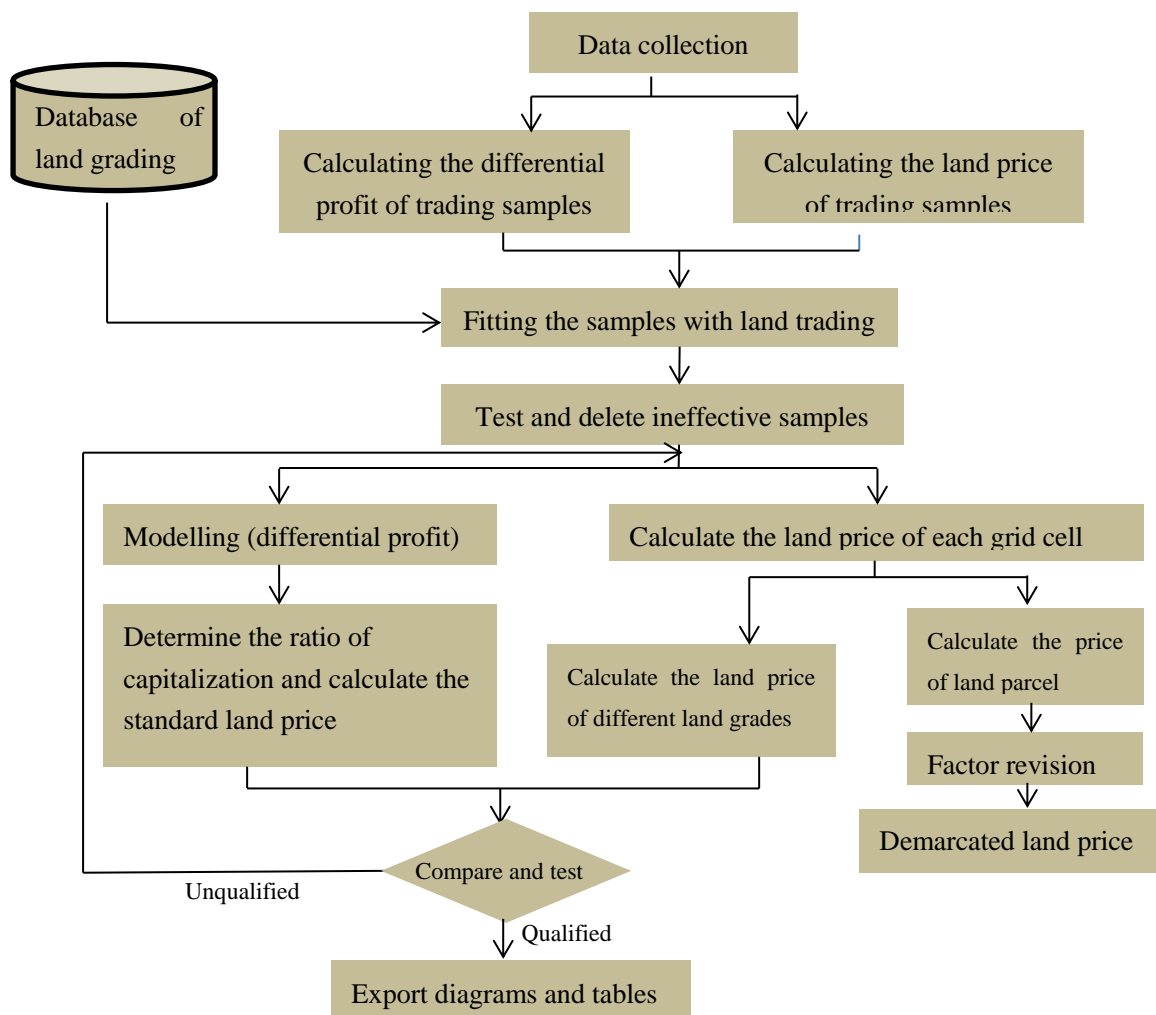
Such a method is applied in the area where the land market develops relative well because it needs a large amount of trading samples. Generally speaking, the amount

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[1] In China, land is graded according to *the Principle of Land Grading and Classification*.

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of samples should be no less than four times of the number of factors used in the model.

Differential profit method is used to capitalize the revenue gained in the future. In such a process, it regards the profit generated by the land within the tenancy term as the land rent paid by the enterprises. Nevertheless, the data used in this method is difficult to reflect the real variation of profit generated by land because of the authenticity of data provided by the enterprises. Therefore, in practice, differential profit method is rather a way to test the outcome of modelling than to directly calculate the standard land price.

The main method used to calculate the standard land price is establishing a model[1] based on the land trading samples. The first significant step is to calculate the score of land grading for each trading sample. The calculation refers to the total value of all the land grading related influential factors. And next is to establish a model to describe the relationship between land price of trading samples and the score of land grades. Thirdly, the area to be assessed is evenly and automatically divided into 50 x 50 or 100 x 100 grid cells and each cell is regarded as an evaluation unit. Then put the data of samples in the model to get the regression coefficient. Lastly, calculate the average total score of units covering the land in the same grade and modelling it to gain the standard land price for the land in this grade. Besides, a minimum and maximum price is also chosen from the value of these cells as the floor price and ceiling price for the land in this grade.

Finally, when finishes the calculation of all the cells, the result will be mapped through GIS.

It is also need to mention that demarcated land price is the evaluated price for each plot. It is based on the regional standard land price. The main difference between standard land price and demarcated land price is the measuring scale. Standard land price is the average price for certain homogenous region while the demarcated land price is the specific land price for each plot. They are both important reference when the municipality determines the price floor for land transferring fee.

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[1] There several types of model can be used. In the case of Shenzhen, the exponential regression model is chosen to describe the relationship between score of land grades and standard land price.

$$Y = A \times (1 + r)^{x}$$

Y: land price per square meter of each sample

X: score of land grade

r: coefficient of land price difference

A: regression coefficient

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Annex 3
Stationary and unit root testing

In real life, many kinds of economic or financial data are time series which exhibits trending or non-stationary over time. Such examples include income, price of commodities, GDP and so on. Non-stationary data would lead to some econometric problems. First of all, non-stationary variables are easier to show similar variation trend, which would have a high R^2 in the regression, even if they are completely unrelated. It would mislead our judgement about the real relationship between the variables. As for the regression procedure, the general t-test is not available for non-stationary data since the standard assumptions are not valid (Wooldridge, 2007).

In this way, one, in general, cannot use the model designed for stationary series with non-stationary series as it runs the high risk of generating completely misleading outcomes. It is quite essential to make sure that the data series are stationary before running the regression.

> "Loosely speaking a stationary process is one whose statistical properties do not change over time. More formally, a strictly stationary stochastic process is one where given *t1*, . . ., *tℓ* the joint statistical distribution of *Xt1*, . . ., *Xtℓ* is the same as the joint statistical distribution of *Xt1+τ*, . . ., *Xtℓ+τ* for all ℓ and τ." (Nason, 2006).

In other words, the stationary requires that the statistic characteristics of data series do not change over time. Otherwise, it is difficult distinguish the impact of trending variation from that of the independent variable. Additionally, any discussion of the relationship exceeds the sampling period is meaningless.

After a long-term development, there are already several ways to test the stationary of time series. And this study adopts the adjusted unit root test, which is also called ADF test since the test was first done by Dickey and Fuller in the 1970s.

The procedure of ADF test is as follows (Wooldridge, 2007):

The test regression is

$$y_t = \beta * y_{t-1} + u_t \tag{1}$$

The hypothesis is:

H_0: $\beta = 1$, which means that the time series is non-stationary

H_1: $\beta \neq 1$, which means that the time series is stationary

In practice, another regression is used to simplify the calculation:

Subtracting y_{t-1} on the both sides of (1), we get:

$$y_t - y_{t-1} = \beta * y_{t-1} - y_{t-1} + u_t \tag{2}$$

$$\Delta y_t = (\beta - 1)\, y_{t-1} + u_t \tag{3}$$

$$\Delta y_t = \rho y_{t-1} + u_t \tag{4}$$

$$\Delta y_t = \rho y_{t-1} + \sum_{i=1}^{p} \alpha_i\, \Delta y_{t-i} + u_t \tag{5}$$

In this case, the hypothesis is:

H_0: $\rho = 0$, which means that the time series is non-stationary

H_1: $\rho \neq 0$, which means that the time series is stationary

The formula (5) directly regress by OLS and the significance of ρ is based on τ ratio that was designed by Dickey and Fuller.

However, there is a problem to regress formula (5) that is how to determine the optimal lags of the dependent variables. In practice, there are two main ways to solve this problem: use the frequency of the data to decide or use information criteria.

Annex 4
Testing the hypothesis about the model

In this part, all the premises referred in chapter 3 will be tested and the results are listed before running the regression of the model. The original equations are written as follows:

$$\Delta AHP_t = \beta_0 + \beta_1 * \Delta AHP_{t-1} + \beta_2 * \Delta ALP_{t-1} + \beta_3 * ECM_{t-1} + \beta_4 * \Delta Lir + \beta_5 * \Delta GDP + \beta_6 * \Delta FDI + \beta_7 * \Delta BL + \beta_8 * \Delta PE + \beta_9 * \Delta PD + u_t \quad (1)$$

$$\Delta THP_t = \beta_0 + \beta_1 * \Delta THP_{t-1} + \beta_2 * \Delta TLP_{t-1} + \beta_3 * ECM_{t-1} + \beta_4 * \Delta Lir + \beta_5 * \Delta GDP + \beta_6 * \Delta FDI + \beta_7 * \Delta BL + \beta_8 * \Delta PE + \beta_9 * \Delta PD + u_t \quad (2)$$

$$\Delta LHP_t = \beta_0 + \beta_1 * \Delta LHP_{t-1} + \beta_2 * \Delta LLP_{t-1} + \beta_3 * ECM_{t-1} + \beta_4 * \Delta Lir + \beta_5 * \Delta GDP + \beta_6 * \Delta FDI + \beta_7 * \Delta BL + \beta_8 * \Delta PE + \beta_9 * \Delta PD + u_t \quad (3)$$

All those equations are likely to be revised after testing all the presupposed hypothese in order to avoid spurious regression and generate unbiased outcomes.

1. Multicollinearity test

As mentioned in chapter 3, the model is estimated into two steps: start with the regression of level variables and then regress using the first order difference variables. Therefore, the variables used should firstly exclude the correlation between level variables and the remaining variables and and then that between first order difference variable[1].

Multicollinearity means that some variable are originally related to each other without other impacts and it can result in invalid the general regressive methods as well as incorrect results. There are many reasons that can cause multicollinearity, such as jointly affected by seasonal trend or other economic trend.

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[1]The regression is divided into two steps. Firstly, we regress the original data and gain the residual value and then we regress the ECM equation where the data are all in the form of first order difference. Therefore, we test the correlation between the original data and the first order difference data, respectively.

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The correlation result of **equation (1)** is:

Table 8 Correlation of level variables in equation 1[1]

	ALP	BL	FDI	GDP	LIR	SA	PE	PD
ALP	1	0.04579	0.21071	0.21636	-0.16552	0.22131	-0.06446	-0.10364
BL	0.04579	1	-0.00132	0.55008	0.07906	-0.07850	0.08313	0.24451
FDI	0.21071	-0.00132	1	0.52544	-0.03369	0.40836	-0.07760	0.06409
GDP	0.21636	0.55008	0.52544	1	0.2144	0.5979	-0.0163	0.3588
LIR	-0.16552	0.07906	-0.03369	0.2144	1	-0.0605	0.3108	0.0960
SA	0.22131	-0.07850	0.40836	0.5979	-0.0605	1	-0.19027	0.19212
PE	-0.06446	0.08313	-0.07760	-0.0163	0.3108	-0.19027	1	-0.0569
PD	-0.10364	0.24451	0.06409	0.3588	0.0960	0.19212	-0.0569	1

Table 9 Correlation of 1th order difference variables in equation1

	D(ALP)	D(BL)	D(FDI)	D(GDP)	D(INT)	D(SA)	D(PE)	D(PD)
D(ALP)	1	0.11988	-0.19718	-0.12009	-0.14361	-0.05804	0.00046	0.12883
D(BL)	0.11988	1	-0.12118	0.12061	-0.25591	-0.24782	0.37648	-0.00060
D(FDI)	-0.19718	-0.12118	1	-0.21738	-0.09946	-0.08188	-0.00071	0.00082
D(GDP)	-0.12009	0.12061	-0.21738	1	0.3046	-0.0111	0.0944	0.1639
D(INT)	-0.14361	-0.25591	-0.09946	0.3046	1	-0.1240	0.1427	-0.0914
D(SA)	-0.05804	-0.24782	-0.08188	-0.0111	-0.1240	1	-0.33052	-0.05191
D(PE)	0.00046	0.37648	-0.00071	0.0944	0.1427	-0.33052	1	-0.0366
D(PD)	0.12883	-0.00060	0.00082	0.1639	-0.0914	-0.05191	-0.0366	1

There is no high correlation between all the first order difference variables, but high correlation between some level variables. In this way, some correlated variables should be deleted in order to avoid the spurious regression in the first step regression. Table 3 and 4 shows the result of multicollinearity test of adjusted association of variables, which has excludedsuch impact.

Table 10 Correlation of level variables after revision in equation 1

	ALP	FDI	SA	PE	INT
ALP	1	0.210714	0.221306	–0.064456	–0.165522
FDI	0.210714	1	0.408355	–0.077595	–0.033694
SA	0.221306	0.408355	1	–0.190266	–0.060522
PE	–0.064456	–0.077595	–0.19027	1	0.310819
INT	–0.165522	–0.033694	–0.06052	0.310819	1

Table 11 Correlation of 1th order difference variables after revision in equation 1

	D(ALP)	D(FDI)	D(INT)	D(SA)	D(PE)
D(ALP)	1	-0.197176	-0.14361	-0.058041	0.00046
D(FDI)	-0.197176	1	-0.09946	-0.08188	-0.000708
D(INT)	-0.143612	-0.099456	1	-0.123998	0.142665
D(SA)	-0.058041	-0.08188	-0.124	1	-0.330517
D(PE)	0.00046	-0.000708	0.142665	-0.330517	1

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[1] Generally speaking, the model only accepts the variables that the correlation coefficients are less than 0.5 in order to avoid spurious regression.

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The correlation result of **equation (2)** is:

Table 12 Correlation of level variables in equation 2

	TLP	BL	FDI	GDP	INT	SA	PE	PD
TLP	1	-0.23329	-0.00062	-0.01997	0.14980	0.05238	0.31259	-0.23529
BL	-0.23329	1	-0.00132	0.55008	0.07906	-0.07850	0.08313	0.24451
FDI	-0.00062	-0.00132	1	0.52544	-0.03369	0.40836	-0.07760	0.06409
GDP	-0.01997	0.55008	0.52544	1	0.2144	0.5979	-0.0163	0.3588
INT	0.14980	0.07906	-0.03369	0.2144	1	-0.0605	0.3108	0.0960
SA	0.05238	-0.07850	0.40836	0.5979	-0.0605	1	-0.19027	0.19212
PE	0.31259	0.08313	-0.07760	-0.0163	0.3108	-0.19027	1	-0.0569
PD	-0.23529	0.24451	0.06409	0.3588	0.0960	0.19212	-0.0569	1

Table 13 Correlation of 1th order difference variables in equation 2

	D(TLP)	D(BL)	D(FDI)	D(GDP)	D(INT)	D(SA)	D(PE)	D(PD)
D(TLP)	1	0.08530	-0.21282	0.16397	0.18404	-0.12777	0.23046	0.02624
D(BL)	0.08530	1	-0.12118	0.12061	-0.25591	-0.24782	0.37648	-0.00060
D(FDI)	-0.21282	-0.12118	1	-0.21738	-0.09946	-0.08188	-0.00071	0.00082
D(GDP)	0.16397	0.12061	-0.21738	1	0.3046	-0.0111	0.0944	0.1639
D(INT)	0.18404	-0.25591	-0.09946	0.3046	1	-0.1240	0.1427	-0.0914
D(SA)	-0.12777	-0.24782	-0.08188	-0.0111	-0.1240	1	-0.33052	-0.05191
D(PE)	0.23046	0.37648	-0.00071	0.0944	0.1427	-0.33052	1	-0.0366
D(PD)	0.02624	-0.00060	0.00082	0.1639	-0.0914	-0.05191	-0.0366	1

Similar as equation (1), there is also high correlation between some pairs of level variables but no correlation between the first order difference variables that marked red. We also need to delete some of them to ensure the accuracy of estimation. Table 13 and 14 show the correlations of adjusted association of level variables and first order difference variables excluding the multicollinearity.

Table 14 Correlation of original data after revision in equation 2

	TLP	FDI	PE	SA	INT
TLP	1	-0.000617	0.312591	0.052383	0.149802
FDI	-0.000617	1	-0.0776	0.408355	-0.033694
PE	0.312591	-0.077595	1	-0.190266	0.310819
SA	0.052383	0.408355	-0.19027	1	-0.060522
INT	0.149802	-0.033694	0.310819	-0.060522	1

Table 15 Correlation of 1th order difference data after revision in equation 2

	D(TLP)	D(FDI)	D(INT)	D(SA)	D(PE)
D(TLP)	1	-0.212824	0.184041	-0.127765	0.230461
D(FDI)	-0.212824	1	-0.09946	-0.08188	-0.000708
D(INT)	0.184041	-0.099456	1	-0.123998	0.142665
D(SA)	-0.127765	-0.08188	-0.124	1	-0.330517
D(PE)	0.230461	-0.000708	0.142665	-0.330517	1

The correlation result of **equation (3)** is:

Table 16 Correlation result of level data in equation 3

	LLP	BL	FDI	GDP	INT	SA	PE	PD
LLP	1	0.20017	0.11598	0.36834	0.05995	0.28987	0.13813	0.22957
BL	0.20017	1	-0.00132	0.55008	0.07906	-0.07850	0.08313	0.24451
FDI	0.11598	-0.00132	1	0.52544	-0.03369	0.40836	-0.07760	0.06409
GDP	0.36834	0.55008	0.52544	1	0.2144	0.5979	-0.0163	0.3588
INT	0.05995	0.07906	-0.03369	0.2144	1	-0.0605	0.3108	0.0960
SA	0.28987	-0.07850	0.40836	0.5979	-0.0605	1	-0.19027	0.19212
PE	0.13813	0.08313	-0.07760	-0.0163	0.3108	-0.19027	1	-0.0569
PD	0.22957	0.24451	0.06409	0.3588	0.0960	0.19212	-0.0569	1

Table 17 Correlation results of 1th order difference data in equation 3

	D(LLP)	D(BL)	D(FDI)	D(GDP)	D(INT)	D(SA)	D(PE)	D(PD)
D(LLP)	1	0.03663	-0.00051	-0.03100	-0.13393	0.17986	0.34182	-0.08445
D(BL)	0.03663	1	-0.12118	0.12061	-0.25591	-0.24782	0.37648	-0.00060
D(FDI)	-0.00051	-0.12118	1	-0.21738	-0.09946	-0.08188	-0.00071	0.00082
D(GDP)	-0.03100	0.12061	-0.21738	1	0.3046	-0.0111	0.0944	0.1639
D(INT)	-0.13393	-0.25591	-0.09946	0.3046	1	-0.1240	0.1427	-0.0914
D(SA)	0.17986	-0.24782	-0.08188	-0.0111	-0.1240	1	-0.33052	-0.05191
D(PE)	0.34182	0.37648	-0.00071	0.0944	0.1427	-0.33052	1	-0.0366
D(PD)	-0.08445	-0.00060	0.00082	0.1639	-0.0914	-0.05191	-0.0366	1

It generates the similar results as former discussion. There is still correlation between level variables but no correlation between first order variables. Therefore, it is essential to delete some correlated variables to avoid biased estimation. Table 17 and 12 show the correlation coefficients of adjusted association of variables, which avoids the multicollinearity.

Table 18 Correlation results of level data after revision in equation 3

	LLP	FDI	SA	PE	PD
LLP	1	0.115979	0.289874	0.138132	0.229568
FDI	0.115979	1	0.408355	-0.077595	0.064089
SA	0.289874	0.408355	1	-0.190266	0.192118
PE	0.138132	-0.077595	-0.19027	1	-0.056859
PD	0.229568	0.064089	0.192118	-0.056859	1

Table 19 Correlation results of 1th order difference data after revision in equation 3

	D(LLP)	D(FDI)	D(SA)	D(PE)	D(PD)
D(LLP)	1	-0.000512	0.179863	0.341822	-0.084453
D(FDI)	-0.000512	1	-0.08188	-0.000708	0.000819
D(SA)	0.179863	-0.08188	1	-0.330517	-0.051911
D(PE)	0.341822	-0.000708	-0.33052	1	-0.036615
D(PD)	-0.084453	0.000819	-0.05191	-0.036615	1

2. Heteroscedasticity test

Heteroscedasticity test is to test whether the model meet the requirement of being homoscedasticity. In order to ensure the regression coefficients could perform statistically, classical linear regression assumes that the random errors, which include the impact of many other unobservable independent variables, should be the same among all samples. In other words, those unobservable factors should have same influence on dependent variable when their own value changes.

Generally speaking, heteroscedasticity is difficult to avoid when deals with panel data. And with Eview 6.0, the test result of heterosecdasticity is reported only after the regression. Therefore, we will use the algorithm which could revise the outcome resulted from heteroscedasticity to calculate the regressive coefficients to ensure the model can generate unbiased estimation of parameters no matter there is problem of heteroscedasticity or not.

Stationary test

Time series data used in the regression model must be stationary, which means that the inner characteristics of the data do not change over time. As mentioned in annex 3, stationary is tested through unit root test. And the following tables show the results of stationary test of each time series variable except the deleted one--- BL and GDP.

Table 20 Unit root test results of AHP

	Assumes common unit root process		Assumes individual unit root process	
	Levin, Lin & Chu t*	Prob.	ADF – Fisher chi-square	Prob.
level variable	-2.40881	0.0080	11.5382	0.0211
1th order[1]	-5.67341	0.0000	26.2668	0.0002

Table 21 Unit root test results of ALP

	Assumes common unit root process		Assumes individual unit root process	
	Levin, Lin & Chu t*	Prob.	ADF - Fisher Chi-square	Prob.
level variable	-0.16242	0.4355	9.09833	0.1681
1th order	-3.48947	0.0002	29.9875	0.0002

Table 22 Unit root test results of THP

	Assumes common unit root process		Assumes individual unit root process	
	Levin, Lin & Chu t*	Prob.	ADF - Fisher Chi-square	Prob.
level variable	-3.56875	0.0002	11.1801	0.0830
1th order	-5.06589	0.0000	20.2264	0.0095

Table 23 Unit root test results of TLP

	Assumes common unit root process		Assumes individual unit root process	
	Levin, Lin & Chu t*	Prob.	ADF - Fisher Chi-square	Prob.
level variable	-7.60228	0.0000	20.7316	0.0020
1th order	0.0020	0.0000	19.4822	0.0125

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[1] This means first order difference variables and the same in the following tables.

Table 24 Unit root test results of LHP

	Assumes common unit root process		Assumes individual unit root process	
	Levin, Lin & Chu t*	Prob.	ADF - Fisher Chi-square	Prob.
level variable	-3.72001	0.0001	18.3392	0.0188
1th order	-5.23434	0.0000	41.4373	0.0000

Table 25 Unit root test results of LLP

	Assumes common unit root process		Assumes individual unit root process	
	Levin, Lin & Chu t*	Prob.	ADF - Fisher Chi-square	Prob.
level variable	1.16657	0.8783	10.7494	0.2163
1th order	-0.64256	0.2603	18.3628	0.0491

Table 26 Unit root test results of PE

	Assumes common unit root process		Assumes individual unit root process	
	Levin, Lin & Chu t*	Prob.	ADF - Fisher Chi-square	Prob.
level variable	-3.93052	0.0000	20.7846	0.0536
1th order	-4.88005	0.0000	-2.13833	0.0162

Table 27 Unit root test results of FDI

	Assumes common unit root process		Assumes individual unit root process	
	Levin, Lin & Chu t*	Prob.	ADF - Fisher Chi-square	Prob.
level variable	-0.58140	0.2805	18.1004	0.1127
1th order	-2.37230	0.0088	19.5158	0.0768

Table 28 Unit root test results of LIR

	Assumes common unit root process		Assumes individual unit root process	
	Levin, Lin & Chu t*	Prob.	ADF - Fisher Chi-square	Prob.
level variable	-4.63002	0.0000	17.4417	0.1337
1th order	-6.49434	0.0000	32.1116	0.0013

Table 29 Unit root test results of PD

	Assumes common unit root process		Assumes individual unit root process	
	Levin, Lin & Chu t*	Prob.	ADF - Fisher Chi-square	Prob.
level variable	-2.58943	0.0048	7.00991	0.8570
1th order	-2.02029	0.0217	12.1381	0.4347

Table 30 Unit root test results of SA

	Assumes common unit root process		Assumes individual unit root process	
	Levin, Lin & Chu t*	Prob.	ADF - Fisher Chi-square	Prob.
level variable	0.28036	0.6104	6.31181	0.8996
1th order	-3.27063	0.0005	22.2760	0.0345

According to those statistical results, it is proved that all 1th order difference variables are stationary while among the level variables ALP, FDI and SA are non-stationary.

4. Cointegration

Cointegration between variables is the essential precondition of VECM. Cointegration means that there is long-term equilibrium relationship between dependent variable and independent variables and the regression will make sense in real life under such a condition.

The whole process to find out appropriate equations is a continuous process of tries and errors. The three final equations are chosen after hundreds of tries of different association of variables. In order to simplify the testing process, our study only lists the results of cointegration test of the final association of variables for each equation to show its accuracy, respectively.

Table 31 Kao Residual Cointegration test results of equation 1 and 2

	T value	Prob
Equation 1	-2.8003	0.0026
Equation 2	-1.2366	0.1081
Equation 3	-4.435269	0.0000
Null Hypothesis	No cointegration	
Number of Observations	66	
Number of cross sections	6	

Both of the test results of the association of variables in equation 1 and equation 2 show cointegration relationships. Therefore, the model is empowered with statistical research significance and can generate unbiased estimated coefficients.

5. Conclusion

According to the results of all essential hypotheses testing, the three original regressive equations have been revised in order to ensure that they are statistical feasible. During the testing process, we tried different association of variables for each equation and tested the accuracy of the results. It is really a continuous process of trial and error. And finally, we choose the most explainable outcome of each equation and will explain the practical significance of each variable in chapter 4.

The revised equations are written as follows:

$$\Delta AHP_t = \beta_0 + \beta_1 * \Delta AHP_{t-1} + \beta_2 * \Delta ALP_{t-1} + \beta_3 * ECM_{t-1} + \beta_4 * \Delta Lir + \beta_5 * \Delta GDP + \beta_6 * \Delta FDI + \beta_7 * \Delta BL + \beta_8 * \Delta PE + \beta_9 * \Delta PD + u_t$$

$$\Delta THP_t = \beta_0 + \beta_1 * \Delta THP_{t-1} + \beta_2 * \Delta TLP_{t-1} + \beta_3 * ECM_{t-1} + \beta_4 * \Delta Lir + \beta_5 * \Delta GDP + \beta_6 * \Delta FDI + \beta_7 * \Delta BL + \beta_8 * \Delta PE + \beta_9 * \Delta PD + u_t$$

$$\Delta LHP_t = \beta_0 + \beta_1 * \Delta LHP_{t-1} + \beta_2 * \Delta LLP_{t-1} + \beta_3 * ECM_{t-1} + \beta_4 * \Delta Lir + \beta_5 * \Delta GDP + \beta_6 * \Delta FDI + \beta_7 * \Delta BL + \beta_8 * \Delta PE + \beta_9 * \Delta PD + u_t$$

Annex 5
Interview template
Questionnaire for professors and experts interviews

Introduction:

The following interview will serve the purpose of collecting information for my graduation thesis in the Urban Management and Development that is hold by the institute of urban management (IHS) in Erasmus University Rotterdam. My study is to test whether the land price resulted from public land leasing drive up the housing price in Shenzhen. And the following questions center on the relationship between newly-built commercial housing price and land price in primary land market. Your answers are really significant for the study and will be included in the paper as a research outcome. All the content of interview will not be published. And if you want to be anonymous, please let me know. Thanks for your attention and time.

Questionnaire

Topic 1	Land price in primary land market
Q1	In your opinion, why did the government adopt the market-oriented modes (auction, tendering and listing) of public land leasing?
Q2	Do you think there is any difference between the market-oriented modes (auction, tendering and listing) of public land leasing and the original way of transferring in an agreement?
Q3	Are there any advantages or disadvantages of the market-oriented modes (auction, tendering and listing) of public land leasing? If so, could you explain it in details?
Q4	Do you think the public land leasing system has any impact on the variation of land price? If so, how does it influence the land price?
Q5	In your opinion, are there any events, such as reform or specific regulation, that have significant impact on land market during the period from 2000 to 2010?

Topic 2	Newly-built commercial housing price in real estate market
Q1	Have you observed the changes of housing price from 2000 to 2010? How has it changed in the decade?
Q2	In your opinion, is the housing price still acceptable? Do you think that most people can afford the housing in Shenzhen compared with their income?
Q3	In your opinion, is the housing price affected by the variation of land price?
Q4	Does the change of land price influence the housing price? If so, and

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		is such an impact significant for the variation of housing price?
Q5		Are there any other factors that you think might also affect the newly-built housing price?
Q6		In your opinion, are there any events, such as reform or specific regulation, have significant impact on in real estate industry during the period from 2000 to 2010? According to your experience, are there one or more factors which have quite significant impact on housing price?

Lists of interviewees

No.	Position	Work unit	Date
1	Analyst	Shanghai ShenYi investment Co	02-07-2014
2	Senior Manager	WorldUnion	05-07-2014
3	Planner	Institutie of Shenzhen real estate study	12-07-2014
4	Senior Manager	China Merchants Property Development Co	15-07-2014
5	Reearcher	China Index Academy	16-07-2914