Spatial Variation Analysis of Urban Land Price in Central Kunming City

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ABSTRACT: The purpose of this study is by taking the balance theory of western urban space structure for reference, to analyze the characteristics and influencing factors of spatial variation of land price in single center of provincial capital in China, the curve of spatial variation and the optimization of land use pattern. Methods of GIS, statistical and economic were employed with the actual transaction data of land price in Kunming from 2001-2013. The results indicate that land price decreases from city center to outskirt along with obvious spatial variability. The dominant factor of land price spatial variation is the distance from the city center, followed by CBD distribution, public utilities and natural conditions. In conclusion, the land price has played a role in spatial allocation of land resource after more than ten years reform of urban land use system. The urban land price spatial variation in single center of provincial capital in China is in accord with Alonso’s theory of space structural model basically.

KEYWORDS: Land-Price; Spatial variation; Distance apart from the city core; Kunming City

1 INTRODUCTION

Land is the foundation of human subsistence and development, furthermore, urban land is the indispensable basic element in all urban activities about production and operation. Urban land is adjusted by land-price (LP) to optimize the allocation of resources to the maximum. Therefore, LP spatial distribution basically reflects the situation and efficiency about the land utilization and also is the core power to promote the market of the urban land and real estate running regularly. Just because of this, all western scholars were inclined to start their research with LP spatial and studied the Optimum Allocation Model as well as Urban Spatial Structure Equilibrium of land utilization. J. H. Von Thunen say, agricultural area land rent is the decreasing function about the distance. In the 1960s, American economist Alonso, Mills and Muth all put Thunen’s “area land rent” in the equilibrium analysis about urban spatial structure. All of the research shows, the primary reason of causing the spatial declining on housing price, capital density and population density is exist of area land rent besides LP’s spatial declining tendency with the increasing of distance to CBD.

In China, it was a long time to implement urban land utilization without expenses and deadline; as a result, LP system didn’t have an effect on land utilization and resources allocation so that there was a common phenomenon about urban land with low efficiency ago. In 1990, Chinese government issued and implemented “Urban Land Transference with Expenses and Deadline Rule”, initiating urban land system marketing reformation, and from then on, LP system has been having an more and more obvious effect on urban land resources allocation and real estate development. It radically changed the structure and pattern of urban construction and urban spatial distribution in China. Therefore, using western urban spatial structure equilibrium theory for reference and also quantitatively studying Chinese urban land price spatial distribution characteristics and the influence factors together with LP’s adjusted function to urban land utilization may provides the references for government to deepen reformation, perfect urban construction and real estate management system and improve urban land efficient and sustainable utilization.

2 DATA AND ITS CHARACTERISTICS

This article will study the main urban area of Kunming including four areas whose names are Wuhua, Panlong, Guandu, Xishan, with 12
kilometers radius, 140 square kilometers and 2.5 million population, which is the provincial capital city of Yunnan province. The objects of study are LP spatial characteristics and influence factors about commercial zone, comprehensive zone, housing zone and industrial zone. All data come from land utilization exchange data from 2001 to 2013 provided by Kunming Bureau of Land and Resources. The case numbers is 875, including commercial: 172, comprehensive:95, housing : 389 and industrial: 219. (Figure I)

2.1 LP statistical characteristics

According to cases data analysis, the maximum LP is 8855.32 Yuan per square meter. The minimum is 24.29 Yuan per square meter and the average value is 1347.83 per square meter. Standard deviation is 1369.62. We took natural logarithm about data to find that the better distribution is normal distribution.

2.2 LP spatial characteristics

To analyze LP spatial characteristics, this study built Digital Land Price Model (DLPM), using Kriging technology. (Figure II)

![Figure I. all land exchange cases distribution map (2001-2013).](image1)

![Figure II. LP isopleths index line map.](image2)

Analyze from multi-sections according to LP isopleths index line map and we can conclude LP spatial variation characteristics as fallows:

A. LP spatial distribution maintains a little continuity. Seen from the LP isopleths index line map (Figure II), LP peak value zone mainly centralize at some areas near the second-circle road zone (note: according to the distance to urban center and the road around the city, we partition one city to the first-circle road zone, the second-circle road zone and so on).

B. LP spatial obviously has spatial variability.

C. Generally speaking, LP shows gradual decreasing tendency from urban center to outside in various directions.

D. The nearer the area to urban center, the larger is LP fluctuation margin, with LP gradually reducing from urban center to the outside.

E. LP variations are different for various uses of land.

3 MODEL AND POSITIVE ANALYSIS

Here, we use the Hedonic-Model which is generally used in making research on real estate price in the western. The concept is put forward firstly by Court (1939) and he used the pleasant philosophy of Utilitarianism for reference, estimating the consumers’ enjoyment from cars’ functions, in his viewpoint, which are the base of the estimation.

According to the distribution of the sample data and the comparison of different models, here we use logarithm function to set up price model, the basic model is:

\[
\ln P = \beta_0 + \sum_{i=1}^{n} \beta_i \ln(X_i) + \sum_{j=1}^{m} \beta_j X_j + \xi
\]

In the model: P is the revised land-price, namely, the unit LP on each land exchange case (Yuan/square meter); n is the number of influence factors on land-price; \(X_i\) is on-the-pot investigation variable; \(X_j\) is virtual variable ; \(\beta\) is the pending coefficient and \(\xi\) is stochastic variable.

According to “Urban Planning about Land Classification and Standard LP Renewal in Kunming” ① and consultation from some of the scholars and experts of the Bureau of land and resources, here we initially choose the primary factors which influence the LP spatial variation in Kunming.

See Page 37 to 61, project from Urban Planning about Land Classification and Standard LP Renewal in Kunming, the Bureau of Land and Resources of Kunming, November, 2012.
Table I. The influence factors and data about various land spatial characteristics models in Kunming.

<table>
<thead>
<tr>
<th>Code name</th>
<th>influence factors</th>
<th>Data source methods</th>
<th>Measure explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>X_1 DIST</td>
<td>Urban center influence degree</td>
<td>GIS measure</td>
<td>The straight distance between samples and urban center.</td>
</tr>
<tr>
<td>X_2 COMMER</td>
<td>Commercial prosperity degree</td>
<td>0-1 virtual variable</td>
<td>Referring to the “technology report” to ascertain the numbers of commercial centers’ grade, radius and according to the influence of different commercial centers’ radiate radius.</td>
</tr>
<tr>
<td>X_3 LENTH</td>
<td>The development degree of transportation</td>
<td>GIS measure</td>
<td>Referring to the “image picture” to ascertain road, grade, radiate radius, and to ascertain the total length of roads in different radius.</td>
</tr>
<tr>
<td>X_4 TRAFFIC</td>
<td>The transportation to outside</td>
<td>0-1 virtual variable</td>
<td>Referring to the “technology report” to ascertain the numbers of transportation to outside, grade, radiate radius, and according to the influence of different transportation around radius.</td>
</tr>
<tr>
<td>X_5 BUS</td>
<td>The density of bus stations</td>
<td>GIS measure</td>
<td>Referring to the “city map” and investigate the numbers of bus station, radiate radius and to ascertain the numbers of bus station 500m away from the samples.</td>
</tr>
<tr>
<td>X_6 HOSPTIL</td>
<td>Hospitals around</td>
<td>0-1 virtual variable</td>
<td>Referring to the “technology report” to ascertain the numbers of hospitals, grade, radiate radius, and according to the influence of different radiate radius of hospitals to ascertain what we need.</td>
</tr>
<tr>
<td>X_7 SCHOOL</td>
<td>Universities around</td>
<td>0-1 virtual variable</td>
<td>Referring to the investigation and “electric map” to ascertain the numbers of university, grade, radiate radius, and according to different radiate radius of universities to ascertain what we need.</td>
</tr>
<tr>
<td>X_8 MIDDLE</td>
<td>Junior schools and senior schools around</td>
<td>0-1 virtual variable</td>
<td>Referring to the investigation and “electric map” to ascertain the number of high school and junior high school, grade, radiate radius, and according to the different radiate radius to ascertain what we need.</td>
</tr>
<tr>
<td>X_9 DIST_DC</td>
<td>The distance to Dian chi</td>
<td>GIS measure</td>
<td>The straight distance between samples and Dian chi.</td>
</tr>
<tr>
<td>X_10 DIST_CH</td>
<td>The distance to Cui hu</td>
<td>GIS measure</td>
<td>The straight distance between samples and Cui hu.</td>
</tr>
<tr>
<td>X_11 ENVIRONMENT</td>
<td>The natural environment around</td>
<td>0-1 virtual variable</td>
<td>Referring to the “technology report” to ascertain the numbers of natural environment, grade, radiate radius, and according to different radiate radius of natural environment to ascertain what we need.</td>
</tr>
<tr>
<td>X_12 RIVER</td>
<td>The influence of rivers around</td>
<td>0-1 virtual variable</td>
<td>Referring to the “technology report” to ascertain the numbers of rivers, grade, radiate radius, and according to the influence of the area about 300m around railway to ascertain what we need.</td>
</tr>
<tr>
<td>X_13 RAILWAY</td>
<td>The influence of railways around</td>
<td>0-1 virtual variable</td>
<td>Referring to the “technology report” to ascertain the numbers of railway, grade, radiate radius, and according to the influence of the area around 300m around railway to ascertain what we need.</td>
</tr>
<tr>
<td>X_14 PLAN</td>
<td>Land exchange pattern</td>
<td>0-1 virtual variable</td>
<td>According to the original data about paid patterns attribute information to ascertain what we need.</td>
</tr>
</tbody>
</table>

Note: “Technology Report” is “the Technology Report about Land Classification and Standard LP Renewal in Kunming”.

4 CALCULATE AND RESULT ANALYSIS

4.1 Non-distinction utilization

By the least square method estimation, LP spatial influence factors analysis show that: through distinctiveness test about eight influence factors including the Distance to Urban Center (0.690), the distance to Dian pool(0.089), the distance to Green lake (0.206), River (0.196), commercial center (0.533), Hospital (0.151), Bus station and School (0.171), etc., we conclude that they are the mainly factors to influence LP spatial variation in Kunming. Characteristics price function:

\[
\ln P = 13.307 - 0.690 \ln \text{DIST} - 0.089 \ln \text{DISTDC} + 0.26 \ln \text{DISTCH} + 0.533 \text{COMMERCE} + 0.151 \text{HOSPITAL} + 0.050 \text{BUS} + 0.171 \text{SCHOOL} + 0.196 \text{RIVER}
\]

\((N=875, R^2 = 0.807, R^2 = 0.651, \text{after adjusting: } R^2 = 0.646, F=114.74, \text{Sig.}= .000)\)

4.2 Commercial utilization

LP spatial influence factors analysis show that: through distinctiveness test about five influence factors including the Distance to Urban Center, Commercial center, Hospital , Bus station and University, we conclude that they are the mainly factors to influence LP spatial variation in Kunming. Various factors regression coefficient are: The Distance to Urban Center (0.523), Commercial Service (0.376), Bus Station (0.176), Surrounding
According regression results, commercial utilization LP spatial characteristics model in Kunming can be concluded:

\[ \text{LNPRICE}=14.207-0.523\text{LnDIST}+0.376\text{COMMERCIAL}\]

\[ +0.301\text{HOSPITAL}-0.176\text{BUS}-0.202\text{SCHOOL} \]

\[ (N=172, R= 0.937, R =0.866,\text{after adjusting: } R =0.849, F=78.654, \text{Sig.}=0.000) \]

### 4.3 Housing utilization

LP spatial influence factors analysis show that show that: through distinctiveness test about nine influence factors including the Distance to Urban Center (0.741), Commercial Center (0.344), Surrounding Hospital (0.282), river (0.421), School (0.305), Railway (-0.176), Environment (0.371) and Land Exchange Patterns (0.116), etc. we conclude that they are the mainly factors to influence LP spatial variation in Kunming. Housing utilization LP spatial characteristics model can be concluded:

\[ \text{LNPRICE}=12.524-0.741\text{LNDIST}+0.344\text{COMMERCIAL} \]

\[ +0.282\text{HOSPITAL}-0.421\text{RIVER} \]

\[ +0.305\text{SCHOOL}+0.176\text{TRAFFIC}+0.371\text{ENVIRON}+0.116\text{PLAN} \]

\[ (N=389, R= 0.787, R =0.724,\text{after adjusting: } R =0.708, F=44. 873, \text{Sig.}=0.000) \]

### 5 CONCLUSION

To summarize above-mentioned regression analysis about various land spatial Characteristics price models, we can conclude that the most significant factors are the distance to urban center and commercial center, although the influence factors of various utilization LP spatial variation are different. According to the urban economic spatial structure theory, the urban center is the most intensive and prosperous region of tertiary industry such as commercial service as well as the employment offering center. Taking Kunming as an example, the long-period development only formed an single commercial center which is mainly distributed to Five areas of urban area: Jin ri, Xiao xi men, Qingnian Road, Baita Road, Huancheng and Nanpin Road, Zhengyi Road system having obvious commercial center space concentrated character (JinJie,2005,2007). Therefore, the primary influence factor on LP spatial variation is the distance to commercial center and it is identical to the western urban spatial structure equilibrium theory, indicating that the development of the provincial capital cities like Kunming have strong centrality in China. With the function of centrality, the convergence of CBD will force up the LP in the urban center which influences the land-price more greatly than other factors.

This research indicates that the various utilization LP spatial distribution of metropolitan city all gradually decline with the increasing of the distance to urban center in China, while the decreasing margin range exists spatial diversity and location distinction. It is basically identical to the expectation model in the western urban spatial equilibrium theory. As time goes by, the trend of LP with the decrease of distance decreases.

This positive analysis demonstrates that Chinese provincial capital cities like kunming applying to urban spatial structure equilibrium theory in western urban economics to some extent still are in the period of the single-centre city development. Therefore, it is significant for us to enhance the study of western urban spatial structure equilibrium theory, using its methods and models for references to research the spatial distribution as well as land optimum utilization about Chinese metropolitan city, so as to improve Chinese urban city planning & land planning theory and enhance the management level of Chinese urban construction & real estate development.

### REFERENCES


