

Research on Relative Saturation of Housing Market in Anhui Province

Ying Zhou^{1a}, Tingting Ju^b, Dongmei Wei^c

{^asusuxiangzhang@126.com, ^b1069042661@qq.com, ^c315691329@qq.com}

Anhui Xinhua University, Anhui Hefei ,230031

Abstract. Taking 16 cities in Anhui Province as the research object, the evaluation index system of relative saturation of housing market was constructed by expert interview method, and the weight of each index was determined by AHP. Based on the data of Anhui Province in 2020, the index values in the index system were counted, and the relative saturation of housing market in each city was finally calculated. By studying the relative saturation index, we can not only detect the development of each market, but also reflect whether the housing market in Anhui Province is polarized. The empirical results show that the housing market of 16 prefecture-level cities in Anhui Province, of which the relative saturation of 6 prefecture-level cities is higher than 1.5, and the relative saturation of 4 prefecture-level cities is lower than 0.9. The polarization is obvious.

Keywords: Anhui Province; Housing Marke;Relative Saturation ;Analytic Hierarchy Process

1 Introduction

Since 1980, China has started the reform of housing system, and housing has become a commodity, which has been included in the operation of market economy, laying the institutional foundation for the later development of real estate industry and housing market economy. After more than 40 years of development, China's housing market has made brilliant achievements. According to the data released by the National Bureau of Statistics in 2020, China's housing has developed from less than 7 square meters per capita housing construction area before the housing system reform to 39.8 square meters per capita housing construction area for urban residents ^[1]. China's housing market has a low starting point and rapid development. So far, what is the development prospect of China's housing market, whether the market has reached saturation, and whether the stock meets the demand? Many scholars have studied the problem of housing saturation.

In 2013, the China Index Research Institute published an article saying goodbye to the shortage and the housing market is far from saturated in the urban housing magazine, which judges the saturation of China's housing market by analyzing the housing stock and housing value. The results show that the overall shortage of housing stock in China has ended in 2010, but the stock structure is not very reasonable. Revitalizing the housing stock is an important

1 Ying Zhou (1987-)The lecturers of Anhui Xinhua University mainly focus on industrial economics and real estate.

task that China's housing market needs to face ^[2]. Liu Hongyu, Yang Fan and Xu Yuejin (2013) analyzed the problem of housing shortage through the ratio of housing units to households, and the results also showed that the absolute shortage of total amount has been solved, but there are still large regional differences in the degree of supply and demand balance ^[3]. In November 2020, Shanghai Yiju Real Estate Research Institute hosted a series of Yiju thematic studies, including a housing saturation study report, which judged the housing saturation of 40 cities in China by analyzing the urban per capita housing construction area. The research results show that the housing saturation of 9 cities is high, and the per capita housing level exceeds the level of the four countries in the stable period. The housing in other 31 cities has not reached saturation ^[1].

Through the research of various database documents, it is found that at present, scholars study the housing saturation through a single indicator, and the commonly used indicators are the per capita housing floor area and the ratio of households. The per capita housing floor area is the ratio of the total housing floor area to the total population, and the ratio of housing units is the ratio of the total number of housing units to the total number of households. Such indicators are called absolute indicators by scholars. The advantage of the absolute index is that it can reflect the overall average situation of the market. By comparing with the mature markets in developed countries, it can reflect the development stage of China's housing market.

However, it cannot be ignored that the absolute index of saturation has the following two defects: first, the absolute index only relates housing demand to population factors, ignoring the relationship between demand and other factors such as economy. Second, the absolute index reflects the overall average situation, ignoring the problem of uneven housing distribution in the market.

2 Propose concepts

In order to overcome the defect of absolute index, this paper constructs an evaluation index system of housing use demand and supply based on the influencing factors of housing use demand and housing supply. So as to avoid the defect of single population determining demand and stock determining supply; In order to overcome the second defect, this paper divides the study area into N regions, and studies the housing saturation of smaller units. Although it cannot completely overcome the problem of uneven housing distribution, it avoids the defect that the supply of the whole area is generally average.

Market saturation reflects the relationship between market supply and consumer demand. When supply equals or exceeds consumer demand, market saturation will occur. Relative saturation is equal to supply fraction and demand fraction.

The demand measured in the indicator system is the use demand, excluding the investment demand. If the supply score is greater than the demand score, it can be deduced theoretically that there is investment demand in this region. The index value can not only judge the saturation state of the housing market, but also determine whether there is a large investment demand in the housing market of each region through the distribution of supply resources in each region. If the demand for investment is too large, it will disrupt the market order,

promote the rise of house prices, aggravate the polarization of housing distribution, and require government intervention.

3 Construction of relative saturation index system of housing market

The concept of market saturation was first applied to retail market research. In the 1980s and 1990s, Tread Gold And Reynolds (1989); Guy(1994,1996); Benjamin(1996,1998); Lonston (1997, 1998) and other scholars have studied whether the retail market is saturated. The most famous research is Lord (2000) [4], who interviewed 66 American retail experts by mail to study whether the American retail market is saturated. The concept of market saturation is also applied to the market research of all walks of life in China. Guo Feifei and Ren Si [5] (2009) conducted a saturation evaluation study on the tourist souvenir market. Ren Meng and Chen Yuanxin [6] (2012) conducted an empirical study on the saturation of sports lottery retail market in Hubei Province. Guo Meng [7] (2017) studied the market saturation of shared bicycles. Xu Jian [8] (2019) analyzed the market saturation of gas stations. Li Yongjing and Jia Champions (2022) [9] studied the saturation and development trend of the life insurance market in Shandong Province.

The saturation indicators applicable to each industry are different, so it is necessary to build the relative saturation index system of housing. This paper uses the expert interview method to construct the housing saturation evaluation index system. In order to give consideration to both theory and practice, half of the eight experts interviewed are university economics professors and half are real estate enterprise executives. The author first visited the experts through Delphi method, and after synthesizing the opinions of the experts, drafted the indicator system and fed it back to the experts. The indicator system was revised repeatedly with the suggestions of the experts. The final indicator system was confirmed by the experts, and the differences between the experts were small. The indicator system is shown in table 1.

Table 1. Relative saturation evaluation index system of housing market

Relative saturation evaluation index system of housing market A	Demand B1	Population C1	Urban population D1 Urban population growth rate D2 Number of urban households D3
		Economy C2	GDP D4 Proportion of tertiary industry D5 Per capita disposable income D6 Number of industrial enterprises above designated size D7
			Athers C3
	Supply B2	Stock houses C4	Area of stock houses D10 Number of housing units in stock D11
		Vacant C5	Vacant room area D12 Vacancy rate D13
			Invest C6

4 Determination of index weight by analytic hierarchy process

4.1 Judgment matrix

Judgment matrix is $A=(a_{ij})$

$$a_{ij} = 1/a_{ji} \quad (1)$$

a_{ij} indicates the importance of the u_i element relative to the u_j element, $a_{ij}=1, 2, 3, \dots, 7$. $a_{ij}=1$ indicates that the importance of the u_i element relative to the u_j element is the same, $a_{ij}=3$ indicates that the u_i element is slightly imp ve to the u_j element, $a_{ij}=5$ indicates that the u_i element is relatively important relative to the u_j element, $a_{ij}=7$ indicates that the u_i element is obviously important relative to the u_j element, and so onc The judgment matrix of each level is shown in the following tables, and the consistency test results are located in the last row at the end of the table, λM is the maximum eigenvalue, and K is the eigenvector.

$$CI = \frac{\lambda_m - n}{n - 1} \quad (2)$$

$RI(3)=0.58, RI(4)=0.9, CR=CI/RI$. Consistency check is not required when n is $2^{[10]}$. The index judgment matrix of each layer is shown in Tables 2 to 9.

Table 2.B₁ index judgment matrix

B ₁	C ₁	C ₂	C ₃	K ₁
C ₁	1	2	4	0.5714
C ₂	1/2	1	2	0.2857
C ₃	1/4	1/2	1	0.1429
$\lambda_m=3$	CI=0	RI=0.58	CR=0<0.1	

Table 3.B₂ index judgment matrix

B ₂	C ₄	C ₅	C ₆	K ₂
C ₄	1	4	3	0.6250
C ₅	1/4	1	1/2	0.1365
C ₆	1/3	2	1	0.2385
$\lambda_m=3.018$	CI=0.009	RI=0.58	CR=0.016<0.1	

Table 4.C₁ index judgment matrix

C ₁	D ₁	D ₂	D ₃	K ₃
D ₁	1	3	4	0.6301
D ₂	1/3	1	1/2	0.1515
D ₃	1/4	2	1	0.2184
$\lambda_m=3.108$ CI=0.054 RI=0.58 CR=0.093<0.1				

Table 5.C₂ index judgment matrix

C ₂	D ₄	D ₅	D ₆	D ₇	K ₄
D ₄	1	2	1/2	4	0.2801
D ₅	1/2	1	1/5	3	0.1466
D ₆	2	5	1	4	0.4981
D ₇	1/4	1/3	1/4	1	0.0752
$\lambda_m=4.155$ CI=0.052RI=0.9 CR=0.058<0.1					

Table 6.C₃ index judgment matrix

C ₃	D ₈	D ₉	K ₅
D ₈	1	5	0.8333
D ₉	1/5	1	0.1667
$\lambda_m=2$ CI=0 RI=0 CR=0<0.1			

Table 7.C₄ index judgment matrix

C ₄	D ₁₀	D ₁₁	K ₆
D ₁₀	1	1/2	0.3333
D ₁₁	2	1	0.6667
$\lambda_m=2$ CI=0 RI=0 CR=0<0.1			

Table 8.C₅ index judgment matrix

C ₅	D ₁₂	D ₁₃	K ₇
D ₁₂	1	5	0.8333
D ₁₃	1/5	1	0.16687
$\lambda_m=2$	CI=0	RI=0	CR=0<0.1

Table 9.C₆ index judgment matrix

C ₆	D ₁₄	D ₁₅	K ₈
D ₁₄	1	3	0.7500
D ₁₅	1/3	1	0.2500
$\lambda_m=2$	CI=0	RI=0	CR=0<0.1

4.2 Comprehensive weight of demand index and supply index

The comprehensive weights of demand index and supply index are shown in Table 10 and Table 11. The demand index CR=0.08<0.1, the supply index CR=0<0.1, so the total sorting consistency test passed.

Table 10.Comprehensive weight of demand indicators

	C ₁	C ₂	C ₃	Weight W
	0.5714	0.2857	0.1429	
D ₁	0.6301	--	--	0.3601
D ₂	0.1515	--	--	0.0865
D ₃	0.2184	--	--	0.1248
D ₄	--	0.2801	--	0.0800
D ₅	--	0.1466	--	0.0419
D ₆	--	0.4981	--	0.1423
D ₇	--	0.0752	--	0.0215
D ₈	--	--	0.8333	0.1190
D ₉	--	--	0.1667	0.0238

Table 11. Comprehensive weight of supply indicators

	C ₄	C ₅	C ₆	Weight W
	0.6250	0.1365	0.2385	
D ₁₀	0.3333	--	--	0.2083

D ₁₁	0.6667	--	--	0.4167
D ₁₂	--	0.8333	--	0.1137
D ₁₃	--	0.1667	--	0.0227
D ₁₄	--	--	0.7500	0.1789
D ₁₅	--	--	0.2500	0.0596

5 Empirical analysis

5.1 Data processing and results

Relative saturation measures the relative situation between regions in the whole region, so the range method is selected for dimensionless quantitative processing of data. First, determine the maximum value X_{max} and minimum value X_{min} of each index value, and calculate the range $R=X_{max}-X_{min}$, then subtract X_{min} from the variable value X of the index and divide by the range R .

Multiply the dimensionless quantification result with the corresponding comprehensive weight of each index value to obtain the weighted index value. Data source: Anhui Statistical Yearbook.

6 Conclusion analysis

Cumulative weighted demand index value and supply index value can obtain the demand, supply scores and saturation level of 16 cities in Anhui Province, are shown in table 12.

Table 12. Demand, supply scores and saturation level of each city²

	hf	hb	bz	sz	bb	fy	hn	cz	la	ma	wh	xc	tl	cz	aq	hs
supply	0.94	0.10	0.36	0.40	0.29	0.48	0.15	0.38	0.44	0.14	0.33	0.24	0.12	0.09	0.36	0.13
demand	0.95	0.20	0.23	0.22	0.21	0.26	0.18	0.25	0.20	0.30	0.32	0.22	0.12	0.11	0.18	0.14
Sat-level	0.99	0.52	1.6	1.87	1.35	1.88	0.86	1.52	2.22	0.47	1.03	1.09	1.03	0.85	2.02	0.92
rank	11	15	5	4	7	3	13	6	1	16	9	8	10	14	2	12

The per capita housing floor area and ranking of cities in Anhui Province are shown in Table

² Each letter represents each city, hf:hefei, hb:huaibei, bz:bozhou, sz:suzhou, bb:bengbu, fy:fuyang, hn:huainan, cz:chuzhou, la:liuan, ma:maanshan, wh:wuhu, xc:xuancheng, tl:tongling, cz:chizhou, aq:anqing, hs:huangshan. similarly hereinafter.

13. Combined with relative saturation and absolute saturation indicators, the housing market can be analyzed more comprehensively. The average level of Anhui Province is 36.39 square meters.

Table 13. Per capita housing construction area of cities

cit	la	bb	sz	cz	xc	aq	fy	bz	hs	cz	wh	ma	hf	hb	tl	hn
y	47.77	47.38	42.58	41.94	39.95	38.91	38.56	38.07	37.99	37.62	35.70	34.72	29.45	27.41	26.98	25.90

Based on the above data, the following conclusions can be drawn:

Strong provincial capital with obvious characteristics.

In 2011, Anhui Province drastically changed its administrative divisions, abolished the prefecture-level Chaohu City, and merged Lujiang County into Hefei City. Since then, Anhui Province has launched the strategy of strengthening the provincial capital, and various resources have begun to tilt towards Hefei. Hefei has made rapid progress and achieved remarkable results, radiating and driving the overall economic development of Anhui Province. In 2022, Anhui's GDP will reach 4504.5 billion yuan, an increase of 3.5% over the previous year, ranking among the top ten provinces. From the perspective of calculation indicators, Hefei's leading position in the housing market is also unquestionable. Hefei's supply and demand scores are far higher than those of other cities, twice as many as the second city. Its population growth rate, total urban population, total number of households, GDP, proportion of tertiary industry, real estate price, urbanization rate, housing stock area, number of units, housing investment, housing new construction area and other 11 indicators all ranked first, accounting for 73% of the total indicators. Although the supply and demand of the housing market in Hefei are very strong, the housing market in Hefei is far from saturated in terms of the per capita housing construction area. There is still much room for demand.

Excessive supply in some markets.

There are two possibilities for the relative saturation of the housing market. First, if the saturation is large and the inventory is large, the market cannot digest the housing supply, which is the market oversupply. Second, if the saturation is large and the inventory is small, the market has digested the housing supply that exceeds the use demand. In this case, it can be speculated that there may be a large amount of investment demand in this market or that it has absorbed foreign use demand.

The relative saturation of housing market in Lu'an City and Anqing City is 2.22 and 2.02 respectively, ranking first in Anhui Province. The vacant housing area of the two prefecture-level cities is 711652 square meters and 701989 square meters respectively, which also ranks the first in Anhui Province and the first and second in the 16 prefecture-level cities. Xin'an Big Data Research Institute studied the inventory of real estate in Lu'an City in June 2022, and the results showed that the dominant inventory of new houses in Lu'an City was 20897 sets. Based on the average transaction of 722 sets from January to December, the liquidation period was 28.9 months. The Academy of Sciences believes that the reasonable period of the real estate inventory destocking cycle is about 6 to 18 months. From the

perspective of absolute saturation, the per capita housing construction area of Lu'an City is 47.77 square meters per person, ranking first in the province, and Anqing City is 38.91 square meters per person, ranking sixth in the province. Therefore, this is a typical oversupply of housing.

High housing demand in some markets.

The relative saturation of the housing market in Fuyang City is 1.88, ranking third in the province. By comparing and analyzing the original data of the indicators, it is found that the housing market in Fuyang City is very different from Lu'an City and Anqing City. It belongs to the second case analyzed above - high saturation and low inventory. Fuyang has three characteristics: first, its population base is large, and its urban population and household number are ranked second in the province; Second, the economy is backward. Its per capita GDP ranks the last, per capita disposable income ranks the second, and the urbanization level is also the lowest in the province; Third, the housing market is in great demand. Its housing vacancy area is 89669 square meters and the housing vacancy rate is 0.0118, both of which are the lowest in the province. Both the housing investment and the newly-started housing area rank second in the province, and these data indicate that the housing market demand in Fuyang is large.

Fuyang City is located in the northwest of Anhui Province, far from the provincial capital city, with relatively backward economy, and is not an ideal investment city. The high demand for housing in Fuyang City is mainly due to its large population base. The urban population of Fuyang City is 3.442 million, and the permanent resident population of the city is 8.2 million, ranking second in the province, second only to Hefei City. This is an important source and guarantee of housing demand in Fuyang.

Insufficient supply in some markets.

Compared with Table 11 and Table 12, it is not difficult to find that Huainan City, Huaibei City and Maanshan City are at the end of the table. From the perspective of per capita housing construction area, the per capita housing construction area is the lowest. Moreover, their relative saturation is lower than 1, which indicates that the market supply of Huainan, Huaibei and Maanshan is relatively low compared with the average supply level of the entire housing market in Anhui Province. Relative saturation is lower than 1, which will further cause the absolute saturation of the market to fall behind the overall level.

7 Conclusions

To sum up, the housing market in Anhui Province is relatively special in some parts, such as Lu'an City and Anqing City with obvious oversupply, Fuyang City with strong digestibility in the housing market, and Huainan City, Huaibei City and Maanshan City with insufficient housing supply. On the whole, the polarization of 16 cities in Anhui Province is obvious. The relative and absolute saturation of Suzhou, Chuzhou, Bozhou, Bengbu and Xuancheng are relatively high. Among them, Suzhou and Chuzhou have a greater degree; The relative saturation of Xuancheng City, Wuhu City, Tongling City, Hefei City and Mount Huangshan City is close to 1, indicating that the supply of these markets matches the current demand. In terms of absolute saturation, the per capita housing construction area in Xuancheng City and

Mount Huangshan City is higher than the average, but the per capita housing construction area in Wuhu City, Tongling City and Hefei City is lower than the average. Therefore, the supply level should be increased accordingly to increase the per capita housing construction area; Huainan City, Chizhou City, Huaibei City and Maanshan City have the lowest absolute saturation and relative saturation, and the total supply is insufficient. For these markets, we should vigorously strengthen the effective supply of housing, solve the problem of housing demand, and at the same time formulate the speculative behavior of the housing market by tax and other policies, promote the healthy and orderly development of the market, and alleviate the polarization of the housing market in Anhui Province.

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