

RESEARCH ON CHINA'S REAL ESTATE INVESTMENT VALUE BASED ON FACTOR ANALYSIS

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ABSTRACT

The real estate industry is one of the important pillars of China's national economy. It has long interacted with China's economic growth. This article first selects indicators closely related to economic growth, and uses factor analysis to find out the factors that have significant relevance to the real estate industry and analyze them, which shows that our real estate industry is suitable for the needs of economic growth and has a positive relationship with people's living standards. Secondly, a factor analysis of the development indicators of the real estate industry in each region shows that the areas currently suitable for real estate investment are those with rapid economic development and certain development bases, such as Jiangsu, Shandong, Guangdong, Zhejiang and Henan.

Keywords: *factor analysis; real estate investment; development analysis*

I. INTRODUCTION

China has the goal of fully building a well-off society in 2020, and the stable growth of the national economy is particularly important at this time. The real estate industry has long been one of the important pillars of the national economy, and its development trend also shows a great correlation with the development of the country's macro economy. Chen Shuyun and Fu Zhenqi's analysis of the relationship between urbanization, real estate investment and economic growth ^[1] shows that economic growth promotes real estate investment, and urbanization promotes real estate investment. Chen Xiangzhou and Yuan Yongfa showed that there is a long-term equilibrium relationship between real estate investment and economic growth in the regional difference ^[2] analysis of real estate investment impact on economic growth, and real estate investment plays a positive role in promoting economic growth. Real estate investment affects economic growth. There are significant regional differences in the impact, and economic growth in the east and central regions is significantly more dependent on real estate investment than in the western region. Real estate investment is suitable for the needs of current national policies, and the more obvious the tendency of national policies for real estate, the stronger the development strength of the real estate industry itself, and the higher the actual purchasing power of residents, the more suitable the real estate industry for investment.

The development of the real estate industry in different regions has obvious differences. Edelstein and Tsang (2007) ^[3] analyzed the impact of macro, regional, and local economic factors on the real estate market in San Francisco, Los Angeles, San Diego, and Sacramento, and concluded that local economic factors are more important than macro and regional economic factors. The real estate market has a greater impact. Huang Zhonghua, Wu Cifang, and Du Xuejun indicated that real estate investment and economic growth—national and regional level panel data analysis ^[4] show that real estate investment can cause economic growth at both national and regional levels, including real estate investment in the entire country, the east, and the west. There are also mutual feedback effects on economic growth; there are regional differences in the contribution and impact of real estate investment on economic growth, with the largest in the eastern region, followed by the central region, and the smallest in the western region. The impact of real estate investment on economic growth depends on the level of regional economic development. The above research shows that there are differences in the value of real estate investment in various regions, and each region has a large influence on the development of the real estate industry. The current empirical methods for real estate investment are mainly based on cointegration tests, error correction models, Granger causality tests, pulse function analysis and cluster analysis. There are many variables related to real estate investment value, but not all independent variables have good explanatory variables to the dependent variable. Excessive independent variables will have multicollinearity phenomenon. The current research

seldom considers variable selection. Through factor analysis, this article finds the factors that mainly affect the development of the real estate industry in each region, such as the demand for real estate in each region's economic growth, the investment status of real estate in each region, and the living standards of residents in each region, to find out that China is currently suitable for real estate development. That is, the top five areas for real estate investment are Jiangsu, Shandong, Guangdong, Zhejiang, and Henan.

II. EMPIRICAL ANALYSIS

In order to study the main trends and investment value of the real estate industry in China at present, this article first analyzes the development trend of China's real estate industry, clear the main direction of development, and then analyze the main indicators of the development of the real estate industry that is the investment value of real estate in various regions, choose the appropriate investment scope and goals.

Factor analysis is an effective multivariate statistical analysis method. It starts from the study of the dependencies within the correlation matrix and organizes the variables of intricate and complex relationships into the method of dimension reduction of a few integrated variables. There are many variables related to real estate investment value. However, not all variables are interpretive to predictive variables, and the correlation between variables also leads to predictive effects. It is necessary to find out the common constraints behind variables by factor analysis, that is, to find some common factors to describe multiple variables.

2.1 Analysis of the Development Trend of Commercial Housing in China

In order to study the main trends of China's real estate development, the article selected the consumer price index (x1) from April 2016 to April 2018, the cumulative growth rate of completed fixed asset investment (x2), and the cumulative growth rate of real estate development investment (x3), Cumulative growth rate of sales area of commercial housing (x4), cumulative growth rate of total retail sales of social consumer goods (x5), year-on-year growth rate of total value of imports and exports (x6), cumulative growth rate of per capita disposable income of residents (x7), The monthly data is analyzed by factors, and conclusions are drawn, clarifying the future development direction of the real estate industry.

Table 1-Testing by KMO and Bartlett

Sample a sufficient Kaiser-Meyer-Olkin metric.		0.55
Bartlett's sphericity test	Approximate Chi-square	86.89
	df	21.00
	Sig.	0.00

From Table 1, it can be seen that the KMO statistic = 0.55 > 0.5, the chi-square statistic of the sphere test = 86.89, and the unilateral p = 0.00 < 0.01, which is suitable for factor analysis.

Table 2- Sample variance contribution rate

Ingredients	Initial feature value			Extract square and load		
	total	% of variance	accumulation%	total	% of variance	accumulation%
1	3.34	47.69	47.69	3.34	47.69	47.69
2	1.26	17.95	65.64	1.26	17.95	65.64
3	1.12	15.94	81.58	1.12	15.94	81.58
4	0.48	6.91	88.49			
5	0.43	6.20	94.69			
6	0.28	3.93	98.62			
7	0.10	1.38	100.00			

Table 2 carries on factor analysis to 7 variables, chooses the factor that can bear the function of most of the variables, when the factor cumulative contribution rate of the factor reaches 80%, these factors can explain most of the factors by default, when select three factors in this article, the cumulative variance contribution rate reached 81.58%, so we chose three factors, namely f1, f2, and f3, respectively, and constructed a development trend component matrix.

Table 3 - Rotation component matrix of development trend

	Ingredients		
	1	2	3
x5	-0.92	-0.04	0.05
x3	0.84	-0.23	0.35
x6	0.6	-0.51	0.39
x4	0.02	0.9	0.08
x2	-0.49	0.67	-0.09
x1	-0.12	-0.17	-0.89
x7	0.11	-0.56	0.71

According to the factor analysis of the rotation component matrix, we can see:

$$f1 = -0.12 \cdot x1 - 0.49 \cdot x2 + 0.84 \cdot x3 + 0.02 \cdot x4 - 0.93 \cdot x5 + 0.60 \cdot x6 + 0.11 \cdot x7$$

$$f2 = -0.17 \cdot x1 + 0.67 \cdot x2 - 0.23 \cdot x3 + 0.90 \cdot x4 - 0.04 \cdot x5 - 0.51 \cdot x6 - 0.56 \cdot x7$$

$$f3 = -0.90 \cdot x1 - 0.09 \cdot x2 + 0.35 \cdot x3 + 0.10 \cdot x4 + 0.05 \cdot x5 + 0.39 \cdot x6 + 0.71 \cdot x7$$

There is positive correlation between the f1 and x3(real estate development),is positively correlated with the higher total value of x6 (import and export), and it is highly negatively correlated with the x5(retail sales of social consumer goods), indicating that the overall social investment and development has a positive impact on the real estate industry. Larger role in promoting, but at the same time the rapid development of other consumer goods will reduce the overall social investment in the real estate industry, sothat f1 is the overall social economic development of the real estate industry investment tendency factor, when the overall economic performance of the community is good. The investment in the real estate industry will increase, which will increase its profits. However, when the overall social economy reduces the proportion of investment in real estate, it will make people less optimistic about the real estate industry when the macro economy is better, which will hinder its development.

The f2 and x4(cumulative growth of the sales area of commercial housing) was positively correlated with the height, and it was positively correlated with x2(the cumulative growth of asset investment completion), indicating that in the development of the real estate industry, the completion of social fixed investment and the real asset is commercial housing. The growth of the area will promote the development of the industry. In a certain proportion of fixed investment, the steady increase in the area of commercial housing will undoubtedly indicate that the market affirms its industry. When the overall economic needs of the society develop, the real estate industry also adapts to the development of the macro economy. The trend has strengthened investors' confidence in the industry and will further promote the development of the industry. So believes that f2 is the self-development ability factor of the real estate industry under the overall economic level of society. The stronger the ability, the more worth investing.

The f3 and x1(consumer price indexes) are highly negatively correlated, but f3 and x7(the cumulative growth of the per capita disposable income of residents) are highly positively correlated. When the consumer price index increases rapidly, the actual purchasing power of residents declines, and the actual disposable income decreases. People will increase the proportion of spending on maintaining basic living standards. As a result, people's investment in finance will be reduced. Especially for products like real estate that require large amounts of capital for investment, the impact will be even greater and it will show a high degree of negative correlation. Therefore, when the per capita disposable income of residents increases, people will also have more funds to invest. When the per capita disposable income of residents increases to a certain extent, people will transfer financial investment funds with less stable income to preserve the value. On the value-added real assets investment, real estate investment is the first choice for many residents. Therefore, the development of the real estate industry is highly correlated with the residents' disposable income. So f3 can be regarded as

the real income level factor that residents have. The higher the actual income level, the more conducive to the development of the real estate industry.

2.2 Analysis of local development of commercial housing in China

Due to the historical issues in China that caused severe mismatches in economic strength between regions, the disparities in the actual income levels among residents in different regions have led to large differences in the value of real estate investments, and it is the real estate industry that eased in the second half of 2017. In the golden period, choose the average growth rate of commercial housing sales in various regions from June to October 2017 (y1), the growth rate of industrial added value in each region (y2), the growth rate of fixed asset investment in each region (y3), and the consumer price category in each region Index (y4), Construction area of commercial housing in each area (y5), Area of commercial housing completed in each area (y6) Construction area of commercial housing in each area (y7), completed area of commercial housing in each area (y8) to factor analyze. Further determine the actual investment value of China's real estate industry in various regions.

Table 4- KMO and Bartlett test of data for each region

Kaiser-Meyer-Olkin metric for sampling enough		0.69
Bartlett's sphericity test	Approximate Chi-square	241.33
	df	28.00
	Sig.	0.00

From Table 4, it can be seen that the KMO statistic is $0.69 > 0.05$, the sphere test chi-square statistic is 241.33, and the unilateral $p=0.00 < 0.01$, which is suitable for factor analysis.

Table 5- Variance contribution rate of each index

	Factor1	Factor2	Factor3	Factor4
SSloadings	3.63	1.43	0.73	0.64
ProportionVar	0.45	0.18	0.09	0.08
CumulativeVar	0.45	0.63	0.72	0.81

Table 5 performs factor analysis on the above eight variables and selects the factors that can carry most of the effects of the variables. When the factor cumulative contribution rate of the factor reaches 80%, the default factors can explain most of the factors. When choose four factors in this paper, the cumulative variance contribution rate reached 81%, so four factors were selected, namely F1, F2, F3, and F4.

Table 6- Rotational Component Matrix of Indicators for Each Region

	Factor 1	Factor 2	Factor 3	Factor 4
y1	-0.18	-0.11	-0.37	0.00
y2	0.11	0.66	0.61	-0.26
y3	0.00	0.98	0.14	0.00
y4	-0.13	0.00	-0.12	0.70
y5	0.95	0.00	0.10	0.00
y6	0.95	0.00	0.31	0.00
y7	0.95	0.00	0.00	-0.25
y8	0.93	0.00	0.29	-0.10

From the above rotation component matrix we can see:

$$F1 = -0.18*y1 + 0.11*y2 - 0.13*y4 + 0.95*y5 + 0.95*y6 + 0.95*y7 + 0.93*y8$$

$$F2 = -0.11*y1 + 0.66*y2 + 0.98*y3$$

$$F3 = -0.37*y1 + 0.61*y2 + 0.14*y3 - 0.12*y4 + 0.10*y5 + 0.31*y6 + 0.29*y8$$

$$F4 = -0.26*y2 + 0.70*y4 - 0.25*y7 - 0.10*y8$$

According to the rotation component matrix of the above factors, F1 scores higher in y5, y6, y7, and y8, and it is listed as an investment factor for commercial housing in each region. F2 scores higher in y2 and y3, and it is classified as the economy of each region. The growth rate factor, F3 scored higher in y1, y6, and it was listed as the actual investment situation of commercial housing in each region. F4 scored higher in y4, ranking it as a factor of human life.

Table 7- Regional scores on various factors

area	Factor 1	Factor 2	Factor 3	Factor 4	Total Score	area	Factor 1	Factor 2	Factor 3	Factor 4	Total Score
Beijing	-1.1	-0.04	0.26	0.01	-0.60	Henan	1.07	0.22	-0.07	-0.41	0.60
Tianjin	-0.8	-0.56	-0.9	0.9	-0.59	Hubei	0.24	0.27	0.56	0.04	0.26
Hebei	0.29	-0.2	-0.75	1.06	0.14	Hunan	0.47	0.28	0.33	0.28	0.39
Liaoning	0.26	-2.38	-0.24	-1.32	-0.54	Inner Mongolia	0.2	-0.14	-2.34	0.86	-0.10
Shanghai	-0.76	-0.36	1.88	-0.21	-0.32	Guangxi	-0.34	0.42	-0.26	0.38	-0.09
Jiangsu	2.33	-0.57	1.96	1.35	1.55	Chongqing	0.13	0.16	0.87	-0.56	0.15
Zhejiang	0.95	-0.17	1.35	0.76	0.72	Sichuan	0.92	0.35	-0.12	-1.09	0.48
Fujian	0.07	0.46	0.54	-0.05	0.20	Guizhou	-0.52	1.42	-1.16	-2.13	-0.32
Shandong	2.16	-0.04	-0.28	-0.04	1.18	Yunnan	-0.32	0.83	-0.14	-1.01	-0.12
Guangdong	1.96	0.57	-0.62	-0.42	1.12	Tibet	-1.8	1.13	1.45	-0.16	-0.62
Hainan	-0.61	0.25	0.11	1.99	-0.08	Shaanxi	-0.17	0.53	-0.03	0.36	0.05
Shanxi	-0.67	-0.18	0.07	-0.3	-0.44	Gansu	-0.61	-3.63	-0.99	-0.26	-1.29
Jilin	-0.72	-0.77	0.12	-0.26	-0.59	Qinghai	-1.14	-0.06	-0.26	0.69	-0.62
Heilongjiang	-0.67	0	-0.76	0.59	-0.40	Ningxia	-1.08	-0.34	0.56	-0.39	-0.66
Anhui	1.01	0.24	-0.12	-1.66	0.44	Xinjiang	-0.26	1.91	-1.18	0.98	0.24
Jiangxi	-0.47	0.41	0.16	0.04	-0.16						

Among the F1 investment factors for commercial housing, the top five are Jiangsu, Shandong, Zhejiang, Guangzhou, and Sichuan. Due to the rapid economic development, it is imperative to invest in housing estates. Tianjin, Shanghai, Qinghai, Ningxia, Beijing, Tianjin, and Shanghai are difficult to invest in real estate investment because of their near saturation. Qinghai and Ningxia are also not suitable for real estate investment because of geography and economic factors. Among the F2 (economic growth rate factors), Guizhou, Tibet, Xinjiang, and other places have fast speeds and are ranked high because of their small base, and Liaoning's impact as an old industrial base on emerging industries is slow.

Among the actual investment in the F3 (economy for commercial housing), Jiangsu, Zhejiang, and Shanghai have high rankings because of their strong economic strength and the need for rapid development. Tibet has a relatively high ranking due to its investment direction. Therefore, it ranks higher in Inner Mongolia, Xinjiang, and Guizhou. Other places are less suitable for investment in real estate due to geographical reasons. In the analysis of F4(human and living standards), Jiangsu, Hebei, Hainan and other places have higher rankings because of relatively rapid economic development and large changes in the price index, while Liaoning, Guizhou, and Sichuan have relatively small changes in the price index and are ranked lower. On the whole, Jiangsu, Shandong, Guangdong, Zhejiang, and Henan rank among the top five in terms of economic housing, humanities, and natural resources, which indicate that the economy is the driving force behind the development of the industry. Gansu, Qinghai, Ningxia, and Tibet also Ranked last for the same reason.

After ranking the total factor analysis, the top five were Jiangsu, Shandong, Guangdong, Zhejiang, and Henan. These regions are very suitable for China because of their rapid economic development, relatively rich capital, and high level of human life. Economic development, so the speed of economic development in the future will be relatively rapid, and because the development is not as perfect as the northern city of Guangshen and other large cities, so housing prices are not particularly high, suitable for financial investment and a larger appreciation of space, it is recommended that investors focus attention.

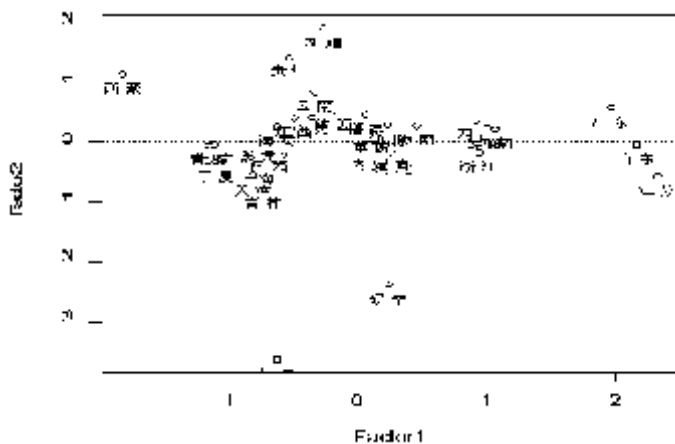


Diagram1. Factor Analysis of F1 and F2

As the F1 and F2 factor analysis charts show, under the condition that the economic development has been kept relatively stable, there are places that have the ability and conditions for the development of commercial housing to promote the rapid development of this real estate in the region.

III. CONCLUSIONS

3.1 The strong development momentum of China's real estate industry is closely related to people's lives

As one of the pillars of China's national economy, the real estate industry has a significant correlation with the national economy. Through the analysis of this paper, some relevant factors are used to infer its development trend, such as the development of the country's macroeconomic conditions and its preference for the real estate industry. The real estate industry's own development capacity and the current people's actual income level development conditions indicate the real estate industry. It is suitable for the needs of China's current economic development. China, as a country with a relatively high level of economic development and currently ushering in the goal of a well-to-do society as a whole in the year of 2020, has a relatively clear macroeconomic situation. It is also realizing the goal of transferring rural people to cities. It is also beneficial to the development of the real estate industry and is suitable as a Investment object. The real estate industry has always been one of the industries with strong development capabilities. In particular, in response to the current situation of depreciation of prices, investing in real estate is considered by many to be one of the effective ways to preserve and increase the value of assets. Therefore, the real estate industry conforms to the economy. The need for the

development of residential investment is an industry worth investing in. Of course, due to the long-term development of various technologies, scales, and capital accumulation, the real estate itself has now become one of the industries with strong competitiveness, which will give investors even more protection. However, although the real estate industry has a relatively high development space, it also needs to match the actual income level of the residents. Only when the actual income level of residents keeps pace with the development of the social economy will it play a catalytic role in the real estate industry. Real estate investment will be carried out. On the contrary, when the real purchasing power of residents is reduced due to depreciation of prices, etc., the real estate investment will have a low rate of return and hinder its development.

3.2 Unbalanced development in various regions of the real estate industry

From the analysis of the development of real estate in various regions of China, we can see that in the fast-growing regions, the demand for commercial housing is relatively large and has certain financial strength, so its rapid development is suitable for financial investment. It is difficult to highlight the value of slow-growing areas. Housing prices in high-saturated areas are insufficient for many investors, and they have limited room for appreciation and are not suitable for financial investment. The real estate investment in areas with rapid development and the real estate market is not particularly perfect is conducive to financial investment.

3.3 Choose a suitable area for real estate investment can get a higher return

Investment in the real estate industry is a very popular investment industry in China in recent years. Due to the needs of the country's macroeconomic policies, people's need for investment and financial management, and the internal perfect system and strong financial strength of the industry, it has a strong potential for development. Real estate investment is a necessary path for a family investment to mature and not only protects residents. The basic needs of life are also important tools for investment and financial management. The value of real estate investment between different regions shows great differences. Different choices mean the difference in capital preservation and value-added efficiency. Everyone should choose the right region to invest in considering their actual economic capacity. If the financial strength is sufficient, it may choose to develop a comparatively perfect city for investment. In particular, the limited capital strength must choose the development potential of the region and strive to obtain higher returns in the long term with appropriate price investment.

REFERENCE

- [1] Chen Shuyun, Fu Zhenqi. *Analysis of the relationship between urbanization, real estate investment and economic growth: Taking the time series data of Hubei Province from 1990 to 2009 as an example*[J]. *Economic System Reform*, 2012(02):30-35 .
- [2] Chen Xiangzhou, Yuan Yongfa. *Regional differences in real estate investment affecting economic growth: An empirical analysis based on provincial panel data* [J]. *Journal of Beijing Technology and Business University (Social Sciences Edition)*, 2013, 28(06): 117- 122.
- [3] Robert Edelstein and Desmond Tsang, *Dynamic Residential Housing Cycles Analysis*, *Journal of Real Estate Finance and Economics*, 2007, Vol.35, pp.295-313.
- [4] Huang Zhonghua, Wu Cifang, Du Xuejun. *Real Estate Investment and Economic Growth: Panel Data Analysis at National and Regional Levels* [J]. *Finance and Trade Economy*, 2008(08):56-60+72.
- [5] *National Bureau of Statistics*.
- [6] Wang Binhui. *Multivariate Statistical Analysis and R Language Modeling (Fourth Edition)* [M]. Jinan University Press. 2016: P175-P203.
- [7] Lu Qiang, Zhu Hong. *spss statistical analysis (5th edition)* [M]. Electronic Industry Press. 2015: P499-P519.
- [8] Du Li, et al. *The paradox of economics in China's real estate market and its analysis*[J]. *Capital University of Economics and Business*, 2002(1):14-16.
- [9] Li Yonghui, Chen Yongqiang, He Ling. *Analysis on Regional Differences of China's Real Estate Industry and Countermeasures*[J]; *Journal of Chengdu Administration College (Philosophy and Social Sciences)*; 2006-06.