Analysis of Influential Factors of House Prices in Shenzhen

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Abstract. The change of house prices in Shenzhen can reflect the trend of house price changes in China, to a certain extent. This text chose the Factor Analysis Method to Specific analyze influential factors. This text put F1 as a variable, which included Total Floor Space of Residential Buildings Sold, Permanent Population, Total Floor Space under Construction of Commodity Housing, Investment in Real Estate Development, Gross Domestic Product, Local Budgetary Revenue and Expenditure. Through analyzing the data, this text deduced that Longgang, Baoan and Nanshan districts had above average values on F1. This text put F2 as a variable, which included Per Capital Disposable Income of Permanent Households and Growth Rate of Real Estate Investment, etc. Through analyzing the data, this text deduced that Nanshan, Luohu, Futian districts had above average values on F2. This text can conclude that Nanshan, Baoan and Futian Districts had a great influence on house prices in Shenzhen.

Keywords: House prices; influential factors; factor analysis.

1. Introduction

For over twenty years, China's house prices have been fluctuating upwards. Since 2005, house prices have increased significantly, with the growth rate of house prices in first-tier cities exceeding the growth rate of per capita disposable income of permanent households. In 2008 and 2016, first-tier cities saw a surge in house prices, with increases of as little as 40 per cent and as much as 70 per cent or more [1]. In 2021, home prices in China's first-tier cities show a trend, which is accelerated rise. In the month of May 2021, there was a year-on-year rise in 62 cities out of 70 large and medium-sized cities in China [2]. At the end of 2021, house price in China was hit by the epidemic, which lead to house price rises declining and house price rises slowing. Although there were occasional fluctuations in house prices, China's house prices were still generally showing an upward trend.

House prices in China are highly volatile, and the reasons and situations for the changes is complex. Comparing with other regions, Shenzhen has a high degree of economic development. So, to a certain extent, the change in house prices in Shenzhen can reflect the trend of house price changes in China. Housing prices in Shenzhen grew continuously from 2007 to 2017, and Shenzhen's housing prices quadrupled in ten years. At the end of 2016, the Central Economic Work Conference proposed to implement 'houses are used to live in, not to be used for speculation' for the first time, which aim was to regulate the market order. Chinese government introduced a series of policies so that government could regulate housing prices in China. House price in China growth slowed down because China's economy shocked by the epidemic in 2020 so many cities experienced varying degrees of house price reductions. Today, in order to cushion the impact of the epidemic, Shenzhen adopts relaxation of purchase restrictions, and government decides to abolish the requirements of time limit for settlement and personal income tax and social insurance of Shenzhen permanent resident. Government decides that people who are not Shenzhen residents to purchase house just need to pay social insurance for 3 years, rather than 5 years. The Government in Shenzhen has also taken a number of measures to promote the demand of residents for buying houses, which lead to Shenzhen real state market favorable frequently, but the fact is that the householder increasing sales with lower prices. Some property prices have fallen sharply, while others have unchanged. In order to adapt the complex and changing market environment and housing and home ownership demand, this text is fully analyzing the influencing factors of housing prices in Shenzhen and to provide advice and references for the government to enact relevant policies.

2. Literature Overview

Because the real estate industry chain is long which can lead to the development of many industries, real estate has an irreplaceable position in the development of the national economy. There is no doubt that the study of housing price changes in China is very significant.

Qiang & Wang & Lei explored the impacts of four types of factors which were settlement attributes, location conditions, transport features and supporting facilities, on the spatial differentiation of house prices in main urban areas [3]. Sun & Gu argued that expect abstract factors such as population structure, some more concrete factors such as the transport stations around the houses are also important factors affecting house prices. From the properties of the houses themselves and from a spatial perspective, Sun & Gu analyzed the impact of multivariate factors on house prices [4]. Cui and his partners further study the regularity of spatial differentiation of domestic urban house prices from a micro perspective and provide a strategy for the rational spatial allocation of amenities in the living area [5]. Zhang & Li argued that the introduction of the housing purchase restriction policy played a certain role in suppressing the rise of real estate prices in the short term, but its effect gradually weakened over time. There is a spillover effect of the housing purchase restriction policy, and the changes in house prices in the core cities which adopted purchase restriction policy will trigger the fluctuation of house prices in other cities [6]. Liang & Luo analyzed and concluded that the impact of urbanisation has significant spatial and temporal heterogeneity on the evolution of regional house prices. The level of urbanisation in the central region plays a significantly higher role in house prices than in the eastern and western regions [7]. Mentioned literature studies have analyzed the changes in house prices in terms of transport conditions, spatial distribution, and home buying policies.

In order to supply the influencing factors of house prices and to provide theoretical references to the government, this text analyzes the changes of house prices in Shenzhen in terms of the level of economic development, the relationship between supply and demand, and the government's policies on the basis of the previous studies.

3. Indicator System

After a comprehensive examination and review, this text selected eight indicators in terms of the level of economic development, the relationship between supply and demand, and the government's policies. The indicators were X1: Total Floor Space of Residential Buildings Sold (10000 sq. m), X2: Permanent Population (10000 persons), X3 Per Capital Disposable Income of Permanent Households (yuan), X4: Total Floor Space under Construction of Commodity Housing (10 000 sq. m), X5: Investment in Real Estate development (10000 yuan), X6: Gross Domestic Product (10000 yuan), X7: Local Budgetary Revenue and Expenditure (10000 yuan), X8: Growth Rate of Real Estate Investment(%) [8-9]. the statistics for the indicators in this text come from “Shenzhen Statistical Yearbook” and Statistical bulletins of the districts and CELdata. Missing data in this text were filled in by replacing the missing values in SPSS.

By calculating and observing the correlation coefficient matrix, this text argues that most of these correlation coefficient values are greater than 0.3, so most of the variables are strongly correlated with each other and these variables are suitable for factor analysis [9-11].

3.1. Descriptive statistical analyzes

This text analyses the above data using SPSS for descriptive statistics in Table 1.

Table 1. Descriptive Statistics.

Variable symbol	Variable name	N	Minimum	Maximum	Mean	Std. Deviation
X1		12	3.15	505.02	84.17	136.34
X2		12	7.28	1766.18	294.36	485.98
X3		12	50260.00	95729.04	71943.51	13292.59
X4		12	146.09	10950.04	1825.01	2954.83
X5		12	21.74	3413.28	568.88	925.81
X6		12	948756.00	3248071	03.00	54134517.33 88631614.18
X7		12	702781.00	22106449.00	4164486.17	5823468.68
X8		12	-25.10	83.00	7.13	29.59

3.2. Conducting standardization

This text uses SPSS to standardize the data in Table 1, in order to eliminate the influence of the dimension. The standardized variables are recorded as ZX1 to ZX 8. This step makes the data comparable to each other and more scientifically rigorous values will be obtained.

4. Factor Analysis of House Price Influencing Factors

In this text, the factor analysis method is selected to study the influencing factors of house prices in Shenzhen. First of all, this text selected the indicators affecting Shenzhen's house prices, and then the data are processed by using SPSS to calculate the variance contribution rate of each public factor Fj. Finally, the following formula is applied to calculate the comprehensive score of the factors.

$$F = \frac{\lambda 1F1 + \lambda 2F2 + \cdots + \lambda mFm}{\lambda 1 + \lambda 2 + \cdots \lambda m} = \sum_{i=1}^{m} wiFi \tag{1}$$

4.1. KMO (Kaiser-Meyer-Olkin) test

KMO statistic is used to test whether the bias correlation between variables is small enough and it is a relative index of simple correlation and bias correlation, the closer the numerical of KMO is to 1 means that the variables are more suitable for factor analysis. As shown in Table 2, in this text, the KMO is 0.8>0.7 and it is closer to 1, so the selected variables in this text pass the test and are suitable for factor analysis.

Table 2. KMO and Bartlett's Test.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.800
Bartlett's Test of Sphericity	Approx. Chi-Square	189.635
	df	28
	Sig.	.000

4.2. Extracting and constructing factor variables

This text has a principle which is only takes factors with variance greater than 1 (or eigenvalue greater than 1), because the contribution of factors with variance less than 1 may be small. As shown in Table 3, the eigenvalue of variance from component 1 to component 2 is greater than 1, which satisfies the above principle. In addition, the number of principal components selected is determined by the cumulative variance contribution of the factors. It is generally considered that a cumulative variance contribution of 80 per cent is required to meet the requirement. According to the results of the total variance interpretation, it can be seen that the cumulative variance contribution rate of the first 2 principal components reaches 88.292%>80%, which meets the requirements.

As shown in Table 3, the contribution rate of the first factor is 74.271%, and the contribution rate of the second factor is 14.021%, which indicates that the first two factors are significantly representative. So, the first two factors are selected as variable indicators in this text, and these two factors are recorded as F1 and F2.

Table 3. Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.942	74.271	74.271	5.942	74.271	74.271	5.941	74.266	74.266
2	1.122	14.021	88.292	1.122	14.021	88.292	1.122	14.026	88.292
3	.897	11.209	99.501						
4	.021	.258	99.759						
5	.012	.153	99.912						
6	.004	.047	99.959						
7	.003	.032	99.991						
8	.001	.009	100.000						

Extraction Method: Principal Component Analysis.

4.3. Factorial rotation

As shown in Table 4, the factor loading matrix is orthogonalised to obtain the rotated factor loading matrix after extracting the principal component. The six indicators, i.e., X1, X2, X4, X5, X6, X7, have higher loading on the first factor F1, indicating that F1 can better reflect these six indicators. X3 and X8 have higher loading on the second factor F2 which can indicate that F2 reflects these two indicators well.

Table 4. Rotated Component Matrixa

	Component	
	1	2
ZX1	.993	-.024
ZX2	.991	-.048
ZX3	.067	.770
ZX4	.998	-.009
ZX5	.997	-.033
ZX6	.988	.123
ZX7	.999	.024
ZX8	.056	-.714

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 3 iterations.

4.4. Calculating factor scores

This text using SPSS to calculate factor scores. If the F1 and F2 values are positive, it means that the region has a higher development level than average level of development on the indicators which were included in F1 and F2 and vice versa. The larger the composite score calculated by calculating the factor scores, the stronger the influence of the region on house prices. The larger the composite score calculated, the stronger the influence of the region on house prices. After calculating the factor scores, this text draws a number of conclusions.

As shown in Table 5, Longgang, Baoan and Nanshan districts have positive F1 values, and their indicators are higher. These three districts invest more in real estate, the reason is that these three districts have a higher level of economic development, higher per capita income, and a larger resident population. So, the five indicators included in F1 have a greater impact on the house prices in these three districts.

Nanshan, Luohu, and Futian districts have larger F2 values than average which means that house prices in these districts are more affected by per capita disposable income and government policies.

Nanshan, Baoan and Futian districts have high total scores which suggest that the indicators in these three districts have a great impact on house prices in Shenzhen.

Table 5. Factor score

area	F1 Score	F1 Rank	F2 Score	F2 Rank	Total score	Total Rank
Total	3.082	1	0.003	6	2.593	1
Futian	-0.270	6	1.141	2	-0.046	4
Luohu	-0.401	9	0.742	3	-0.220	7
Yantian	-0.542	10	0.595	5	-0.361	8
Nanshan	0.026	3	1.623	1	0.279	2
Baoan	0.089	2	-0.651	9	-0.029	3
Longgang	0.0249	4	-0.655	10	-0.0830	5
Longhua	-0.135	5	-0.079	7	-0.126	6
Pingshan	-0.391	8	-1.940	12	-0.638	12
Guangming	-0.298	7	-0.987	11	-0.407	10
Dapeng	-0.603	12	-0.417	8	-0.573	11
ShenshanSpecial Cooperation Zone	-0.582	11	0.623	4	-0.391	9

5. Conclusions and Advice

The changes of house prices in Shenzhen can reflect China's house price changes to a certain extent. This text examines the changes in Shenzhen's house prices by analyzing eight factors. The results show that Nanshan, Luohu, and Futian are more affected by per capita disposable income and government policies. The indicators in Nanshan, Baoan and Futian districts have a great impact on house prices in Shenzhen. The house prices in different districts of Shenzhen are affected by different indicators to different degrees so this text puts forward targeted advice to the regional governments of Shenzhen based on the factor scores of each region obtained through the analysis:

Nanshan District, Baoan District and Longgang District have a higher level of economic development, with a larger resident population and higher per capita disposable income, so these three districts have a greater tendency for house prices to rise. Nanshan District, Baoan District and Longgang District should adopt policies of reducing house prices. Shenzhen’s government should strengthen the regulation of real estate and implement the concept of ‘houses are used to live in, not to be used for speculation’. The reason why many people cannot afford to buy a house is that many house buyers think that buying houses is a speculation and some people hoard houses, all of which have led to high property prices. The government in Shenzhen should tighten the restrictions on the qualifications and conditions of house buyers. The government in Shenzhen also should increase the restrictions on those who already own a house. Shenzhen’s government should expand the supply of low-cost housing and regulate house prices, and this policy is to change from the demand side. To a certain extent, increasing the supply of low-cost housing can suppress the demand of who want to buy a home. If maintain this policy in the long term, it will lead to a downward trend in house prices and home prices will tend to stable. Shenzhen’s government should change the concept of social residents in buying houses and promote the stability of house prices. In China, most people in the community regard buying a home as a rigid demand and would rather take out a high loan to buy a home. Shenzhen’s government should try its best to publicize the scientific view of home buying and increase the level of residents' understanding of the property market conditions through various means, so as to change the situation that house prices continue to rise.

House prices in Nanshan, Luohu and Futian districts are greatly influenced by per capita disposable income and government policies and have a great influence on the overall house prices in Shenzhen. Shenzhen’s government should apply taxation and other means of redistribution of income to achieve a reasonable distribution of income. House prices in Nanshan, Luohu and Futian districts are greatly influenced government policies and these three areas also have a greatly impact on the overall house prices in Shenzhen, so the government's policies and regulatory instruments play an important role on house prices. Shenzhen’s government should make fully use of fiscal and tax policies to narrow the gap between the rich and the poor, so that houses are no longer bought only by a few high-income people, which can fulfill the wonderful wish of housing for everyone.

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