ISSN 2616-5902 Vol. 6, Issue 3: 229-235, DOI: 10.25236/AJBM.2024.060328

Housing Price Bubbles in China: An Investigation of Six Cities

Liao Chenguang

Ulink College of China Optics Valley, Wuhan, China

Abstract: *Since the reform and opening up, China developed rapidly in almost all aspects, especially in economy. China's economy is characterized by a heaven reliance on the real estate sector. However, a contentious concern that the growth of Chinese housing marketing will lead to an enormous housing bubble has garnered significant attention, and people are keen for an objective evaluation of the housing market. This research paper aims investigate further in this field. In this research, we selected some typical cities across China, including 1st tier super cities, 2nd tier developed cities, and some still developing smaller cities. In every chosen city, we collected data of four categories, namely the median income level, the average price level of houses, and the average rent level. These data allowed us the so how high the housing price actually is when compared to people's income and to the rental price. Afterwards, we also estimated the inflation rate as well as the housing purchasing price and rental price for the next 10 years. We were able to use the DCF model to examine whether the houses are overvalued or not in the cities we selected. We concluded that bubbles do exist in major cities in China, but the situation is more optimistic in smaller cities.*

Keywords: *real estate, bubble, housing price to income ratio, housing price to rent ratio, DCF model*

1. Introduction

In the past 20 years, the real estate industry, together with other industries, has witnessed significant growth during the china's development. For instance, in 2005, average housing price in Shanghai was 6698 yuan. The price level rose to 14,290 yuan in 2010, to 21,501 yuan in 2015, and to 36,741 yuan in 2020. The ascending trend of housing price appears not only in Shanghai or only in first tier major cities but also in a wide range of second tier and third tier cities and even smaller cities. In the past 20 years, the housing industries certainly not only become the strategy industry of China within just 20 years, but it has also driven the development in all other industries in China, including popular industries such like IT technology in third sector and Production industries in second sector.

However, some risk and potential dangers are lurking behind in this development. For example, the collapse of the capital chain in Evergrande Group in 2023, uncompleted residential flats in Zhengzhou and many other cities, and a consistent decreasing in people's willingness to buy house have all indicated the unsustainability of the real estate industry. Although the government continuous provides more new policies to encourage individuals purchasing more, the total demand in housing market still keeps declining. Majorities concern about that whether the potential bubbles in housing market would burst in recent future. Some people even suggest that if China's policy makers don't attach importance to this problem, our housing market will be destroyed just like Japan [1].

This paper aims to better understand the housing price in China, and we employ various indicators to see whether there are bubbles in housing market with six cities of different tiers.

2. Methodology

2.1 Cities used in research

China's cities have long been classified into different tiers based on their population size and economic and political influence. According to YICAI, a state-owned news media specializes in finance and economics, China cities can be divided into six categories, Tier-one, Tier-two, Tier-three, Tier-four, Tier-five [2]. We choose six typical sample cities, including a first-tier city, Shanghai and Shenzhen, two of the most economically developed and vibrant cities in China; a new first-tier city, Nanjing, capital of

ISSN 2616-5902 Vol. 6, Issue 3: 229-235, DOI: 10.25236/AJBM.2024.060328

Jiangsu Province in the eastern and more developed part of China; a second-tier city, Jinan, capital of Shandong Province; a third-tier city, Lanzhou, capital of Gansu Province and a link between less developed western part of China and the rest of the country; and finally, a very small city called Luzhou, in Sichuan Province. These cities are in different regions and are of different development level. Together, they afford necessary examples for our analyses.

2.2 Data collection

Most information we used in this research is from creditable government resources. For example, the average housing price level is excerpted from creprice. cn [3], a credible website offers statistics of average listed price across all major real estate agents in different cities, and the numbers are also checked with Local bureau of statistics to make sure they are accurate representation of the actual housing price, the median income level found in the data bank of the State statistics bureau, and inflation rate is based on World Bank data. However, for data or figures that cannot be found on official websites, we used reports from media outlets that are typically considered reliable, such as CCTV, People's Daily etc.

2.3 Indicators related to housing price

Housing price to income ratio and housing price to rental price ratio are two commonly used index for housing affordability [4] [5]. Typical, a lower housing price to income ratio and a lower price to rent ratio both indicate higher affordability of the house.

2.4 Discounted Cash Flow Model with Terminal Value

DCF model, Discounted Cash Flow model, is a model used to analyze the rationality of an investment. The principle of DCF model is to estimate how much cash flow an investment can generate within given amount of time, and then compare the income to the investment. An important step in DCF modelling is to discount the future cash flow and terminal value into current price, just as the name suggests. The original formula of the DCF model is as follows:

$$DCF = \frac{CF_1}{1+r} + \frac{CF_2}{(1+r)^2} + \frac{CF_3}{(1+r)^3} + \cdots \frac{CF_n}{(1+r)^n}, \quad (1)$$

where CF_t is the cash flow generated by the investment in the t-th year, and r is the discounted rate, in many cases, the inflation rate.

Many scholars have also tried to employ an adapted version of DCF model in housing price analysis [6] [7]. When used in real estate modelling, a DCF model with a terminal value is used because typically after having owned an apartment or a house for years, people can still sell it for money. Cash flow in this case would just be the rent. Therefore, the DCF model for real estate market can be written as follows:

$$DCF = \frac{RM_1}{1+r} + \frac{RM_2}{(1+r)^2} + \frac{RM_3}{(1+r)^3} + \cdots \frac{RM_n}{(1+r)^n} + \frac{TV}{(1+r)^n}, \quad (2)$$

where $RM_t$is the rent money for the t-th year, r is the inflation rate, TV is the resale value of the house.

In our study, our terminal time is 10 years. We will be modelling and estimating the rental price for 10 years and terminal value of a real estate after 10 years.

2.5 Estimation for housing price increase, and real estate depreciation rate

For estimation of future housing prices, we compared China's 70 cities' housing price change monthly report [8] and decided on a fair estimation. Future real estate price is also estimated based on the past trend of housing price in times of no significant economic or political events. Expected housing price increase is different in different cities since it has been proved in the past 20 or more years that China's real estate prices grow at uneven rate in different places.

We also have to consider the depreciation of houses in ten year's period, which is varied significantly in different places for various reasons. For this depreciation value, we have to find suitable samples and estimate on our own. We used a simplified method: we first find several pairs of housing compound in each city which are in the same region but with roughly 10 years apart in terms of construction time. Closeness of houses in our study is necessary because in many Chinese cities, housing price of a particular property is highly related to the schools near the property (or "Xuequ", meaning schools

ISSN 2616-5902 Vol. 6, Issue 3: 229-235, DOI: 10.25236/AJBM.2024.060328

homeowners are entitled to send their kids to because of their ownership to a particular property). By comparing different pairs, we decided on 1.5 depreciation ratio for houses after 10 years, meaning that the estimated price for terminal value would be estimation for future housing prices divided by 1.5.

3. Results

3.1 Basic information of all city samples

Basically information including average housing price per meter squared, average rental price per square meter per month, and median income in the six sample cities is listed in the table below (Table 1). All data are from credible sources as stated before.

Table 1: Basic information of six sample cities

	Shanghai	Shenzhen	Nanjing	Jinan	Lanzhou	Luzhou
Average housing price per meter squared	70,527	75,358	31,226	17,076	11,133	6,389
Average rental price per sq meter per month	113	115	61	27	26	17
Median income	154,342.5	903,22	116,625.6	105,195	90,516.6	73,459

3.2 Inflation rate

In this article, we suggest that the average inflation level in the next ten years in China is rate of 2% approximately. This figure comes from the World Bank's most recent estimation of China's inflation rate in a 12-month timespan [9].

3.3 Housing Price to Income

Housing price to income ratio is calculated as below (Table 2). The ratios differ drastically in first tier super cities and smaller cities like Luzhou.

Table 2: Housing Price to Income Ratio

	Shanghai	Shenzhen	Nanjing	Jinan	Lanzhou	Luzhou
Average Housing Price	70,527	75,358	31,226	17,076	11,133	6,389
Average Income level	154,343	147,600	116,626	105,195	90,517	73,459
Ratio	0.457	0.511	0.268	0.162	0.123	0.087

The ratio basically indicate for how long a person would have to work to buy one square meter of house in that particular city.

3.4. Housing Price to Rent

Housing price to rent raio is listed below (Table 3). This ratio indicates whether it is favorable to own a house or not. A very high ratio can indicate that the housing market is imbalanced and inefficient [10].

Table 3: Housing price to rent ratio

	Shanghai	Shenzhen	Nanjing	Jinan	Lanzhou	Luzhou
Average Housing Price	70,527	75,358	31,226	17,076	11,133	6,389
Average rental price	113	115	61	27	26	17
Rent per year per square meter	1356	1380	732	324	312	204
Ratio	52.01	54.61	42.66	52.70	35.68	31.32

3.5 DCF Model Results

A brief summary of the DCF modeling results is shown in Table 4. In general, cities with lower current housing price tend to have smaller differences between the DCF value and their current housing price.

ISSN 2616-5902 Vol. 6, Issue 3: 229-235, DOI: 10.25236/AJBM.2024.060328

Table 4: DCF results summary

	Shanghai	Shen Zhen	Nan Jing	Ji Nan	Lan Zhou	Lu Zhou
DCF Value	51442	55168	24704	13311	9819	6233
Current Value	70537	75358	31226	17076	11133	6389

Detailed calculations are shown in the following tables.

Table 5: DCF Calculation for Shanghai

Time	Rent/sq meter	Discount	Discounted rent
Year 1	1,356	1.02	1329.411765
Year 2	1383.12	1.06998	1292.659676
Year 2	1419.12	1.12240902	1264.35192
Year 4	1455.12	1.17740706	1235.868246
Year 5	1491.12	1.23510001	1207.286852
Year 6	1527.12	1.29561991	1178.679017
Year 7	1563.12	1.35910528	1150.109575
Year 8	1599.12	1.42570144	1121.637358
Year 9	1635.12	1.49556081	1093.315621
Year 10	1671.12	1.56884329	1065.19243
		Total rent	11938.51246
current value	70,537.00	Rent price is projected to rise about 2% annually. Housing price annual increase is estimated at 3%.	
housing price increase	0.030		
estimated future price	94,795.83		
old house depreciation rate	1.5		
future old house price	63,197.22		
discounted future old housing price	40,282.68		
final value	52,221.20		
% overpriced	35%		

As is seen in the table (Table 5), value from the DCF model is significantly less compared to the current housing price in Shanghai, indicating a serious overvalue of the houses in shanghai. For house owners in Shanghai, they will lose money if they decide to view their house as an investment.

Table 6: DCF calculation for Shenzhen

Time	Rent/sq meter	Discount	Discounted rent
Year 1	1,380	1.02	1352.941176
Year 2	1407.6	1.06998	1315.538608
Year 2	1443.6	1.12240902	1286.162151
Year 4	1479.6	1.17740706	1256.659696
Year 5	1515.6	1.23510001	1227.107109
Year 6	1551.6	1.29561991	1197.573447
Year 7	1587.6	1.35910528	1168.121424
Year 8	1623.6	1.42570144	1138.807854
Year 9	1659.6	1.49556081	1109.684063
Year 10	1695.6	1.56884329	1080.796283
		Total rent	12133.39181
current value	75,358.00	Rent price is projected to rise about 2% annually. Housing price annual increase is estimated at 3%.	
housing price increase	0.030		
estimated future price	101,274.85		
old house depreciation rate	1.5		
future old house price	67,516.57		
discounted future old housing price	43,035.89		
final value	55,169.28		
% overpriced	37%		

For the other major city in our list, Shenzhen displays a similar pattern with Shanghai (Table 6). According to our model, the houses are overpriced.

ISSN 2616-5902 Vol. 6, Issue 3: 229-235, DOI: 10.25236/AJBM.2024.060328

Table 7: DCF calculation for Nanjing

Time	Rent/sq meter	Discount	Discounted rent
Year 1	732	1.02	717.647059
Year 2	746.64	1.06998	697.807436
Year 2	782.64	1.12240902	697.285915
Year 4	818.64	1.17740706	695.290547
Year 5	854.64	1.23510001	691.960161
Year 6	890.64	1.29561991	687.42383
Year 7	926.64	1.35910528	681.801484
Year 8	962.64	1.42570144	675.204479
Year 9	998.64	1.49556081	667.736137
Year 10	1034.64	1.56884329	659.492254
		Total rent	6871.6493
current value	31,226.00	Rent price is projected to rise about 2% annually. Housing price annual increase is estimated at 3%.	
housing price increase	0.030		
estimated future price	41,965.13		
old house depreciation rate	1.5		
future old house price	27,976.76		
discounted future old housing price	17,832.73		
final value	24,704.38		
% overpriced	26%		

Houses in Nanjing, a new first-tier city in Yangtze River delta, is also overpriced as bigger cities. However, the houses are only overage 26% overpriced (Table 7), a much smaller percentage compared to bigger cities like Shanghai and Shenzhen.

Table 8: DCF calculation for Jinan

Time	Rent/sq meter	Discount	Discounted rent
Year 1	324	1.02	317.647059
Year 2	330.48	1.06998	308.865586
Year 2	366.48	1.12240902	326.511988
Year 4	402.48	1.17740706	341.835898
Year 5	438.48	1.23510001	355.015786
Year 6	474.48	1.29561991	366.218516
Year 7	510.48	1.35910528	375.600041
Year 8	546.48	1.42570144	383.306058
Year 9	582.48	1.49556081	389.472628
Year 10	618.48	1.56884329	394.226755
		Total rent	3558.70031
current value	17,076.00	Rent price is projected to rise about 2% annually. Housing price annual increase is estimated at 3%.	
housing price increase	0.030		
estimated future price	22,948.72		
old house depreciation rate	1.5		
future old house price	15,299.14		
discounted future old housing price	9,751.86		
final value	13,310.56		
% overpriced	28%		

Jinan, the capital city of Shandong Province, is also overpriced in housing market (Table 8). Though the overall housing price is not as higher as Nanjing in the previous table, it is more overpriced compared to Nanjing.

House price in Lanzhou is much less overpriced compared to the previous four cities at only 13% (Table 9). With current house price at 11,133 CNY and value from DCF model at 9819.16, the houses in Lanzhou are much more affordable and reasonably priced compared to some of the other cities.

ISSN 2616-5902 Vol. 6, Issue 3: 229-235, DOI: 10.25236/AJBM.2024.060328

Table 9: DCF calculation for Lanzhou

Time	Rent/sq meter	Discount	Discounted rent
Year 1	312	1.02	305.882353
Year 2	318.24	1.06998	297.42612
Year 2	354.24	1.12240902	315.606872
Year 4	390.24	1.17740706	331.440173
Year 5	426.24	1.23510001	345.105657
Year 6	462.24	1.29561991	356.771301
Year 7	498.24	1.35910528	366.594116
Year 8	534.24	1.42570144	374.72081
Year 9	570.24	1.49556081	381.288407
Year 10	606.24	1.56884329	386.424828
		Total rent	3461.26064
current value	11,133.00	Rent price is projected to rise about 2% annually. Housing price annual increase is estimated at 3%.	
housing price increase	0.030		
estimated future price	14,961.82		
old house depreciation rate	1.5		
future old house price	9,974.55		
discounted future old housing price	6,357.90		
final value	9,819.16		
% overpriced	13%		

Table 10: DCF calculation for Luzhou

Time	Rent/sq meter	Discount	Discounted rent
Year 1	204	1.02	200
Year 2	208.08	1.06998	194.470925
Year 2	244.08	1.12240902	217.460833
Year 4	280.08	1.17740706	237.878648
Year 5	316.08	1.23510001	255.914499
Year 6	352.08	1.29561991	271.746365
Year 7	388.08	1.35910528	285.540793
Year 8	424.08	1.42570144	297.453581
Year 9	460.08	1.49556081	307.630419
Year 10	496.08	1.56884329	316.20749
		Total rent	2584.30355
current value	6,389.00	Rent price is projected to rise about 2% annually. Housing price annual increase is estimated at 3%.	
housing price increase	0.030		
estimated future price	8,586.28		
old house depreciation rate	1.5		
future old house price	5,724.19		
discounted future old housing price	3,648.67		
final value	6,232.97		
%overpriced	2%		

The final city in our list is Luzhou, a small city in western province of Sichuan, is much smaller compared to other cities on our list. Nevertheless, its housing price is the least overpriced with only 2% (Table 10), meaning that the house price is almost balanced there.

4. Discussion

4.1 Horizontal comparison

First tier cities are less affordable compared to other cities. However, even in smaller cities, people would have to work roughly more than 2 months to buy just one square meter of house. For example, in Nanjing, a couple of two with average salary would have to work for more than 93 years without spending any money in order to buy a 50 square meters apartment. This is another angle to explain why right now in China, typically extended families are involved when a couple needs to buy a house. Parents of both the husband and the wife would provide monetary support to the newlywed couple should they wish to buy an apartment.

ISSN 2616-5902 Vol. 6, Issue 3: 229-235, DOI: 10.25236/AJBM.2024.060328

4.2 Bubble or not

All six cities we sampled, with our estimation, show signs of bubble in housing market. However, the degrees of bubble vary. Luzhou, the smallest city in our sample, has a relatively healthy real estate market, with DCF value very close to current value. Lanzhou, the second smallest city in the sample (based on tier ranking) is also relatively healthy with current value only slightly higher than the DCF value (13%). However, larger cities in our study are not as optimistic. Both Shanghai's and Shenzhen's housing price being more than 36% overvalued based on the DCF model. The potential bubble should be closely monitored in both markets.

4.3 Limitation of this research

The Housing Price and Economic activities are serious affected by political influences. However, in our study, possible future policies are not taken into consideration. With China's strong government system, policy can transform the market in very short amount of time. In addition, accuracy of long-term estimations is also plagued by unforeseeable future events such as natural disasters, armed conflicts, or the policy and events of other countries. These are also factors we are unable to take into consideration when making estimations and projections.

5. Conclusion

In this study, we carefully selected six cities of different tiers to investigate the potential bubble in China's housing markets. We conclude that potential bubbles exist in major cities in China, like Shanghai and Shenzhen, and in the meantime, smaller cities tend to have a healthier real estate market compared to larger cities. We suggest authorities closely monitor housing market of major cities and make appropriate decisions to help avoid the growth of the bubble and to eliminate the bubble without causing distress to the overall economy.

References

[1] J. Shang and S.-L. ONG, "Bubble in China's Housing Market," International Real estate Review, vol. 26, no. 3, pp. 392-419, 2023.
[2] YICAI, "China's city ranking," YICAI, 30 May 2023. [Online]. Available: https://m.yicai.com/news/101770503.html. [Accessed 6 Feb. 2024].
[3] Creprice, "China Residents Price," CREPRICE, 2024. [Online]. Available: https://www.creprice.cn/. [Accessed 6 Feb. 2024].
[4] N. M. S. Rahim, "Price to Income Ratio Approach in Housing Affordability," Journal of Economics, Business and Management, vol. 3, no. 12, pp. 1190-1193, 2013.
[5] I.-C. Tsai, "Housing Supply, Demand and Price: Construction Cost, Rental Price and House Price Indices," Asian Economic Journal, vol. 26, no. 4, pp. 381-396, 2012.
[6] G. Guthrie, "Evaluating Real Estate Development Using Real Options Analysis," 9 Nov. 2009. [Online]. Available: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1501946. [Accessed 6 Feb. 2024].
[7] K. C.-K. Leung, "Beyond DCF analysis in real estate financial modeling: probabilistic evaluation of real estate ventures," 2014. [Online]. Available: https://dspace.mit.edu/handle/1721.1/87612. [Accessed 9 Feb. 2024].
[8] National Bureau of Statistics, "National Bureau of Statistics," National Bureau of Statistics, 2024. [Online]. Available: https://www.stats.gov.cn/. [Accessed 3 Feb. 2024].
[9] World Bank, "Inflation, consumer prices (annual%)-China," World Bank, 2023. [Online]. Available: https://data.worldbank.org/indicator/FP.CPI.TOTL.ZG?locations=CN&name_desc=false. [Accessed 6 Feb. 2024].
[10] D. Lo, M. J. McCord, J. McCord, P. T. Davis and M. Haran, "Rent or buy, what are the odds? Analysing the price-to-rent ratio for housing types within the Northern Ireland housing market," International Journal of Housing Markets and Analysis, vol. 14, no. 5, 2021.