

The Chinese Real Estate Bubble

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Abstract

China has seen extraordinary economic growth for the past two decades, coupled with a booming housing market. Following the 2008 financial crisis, however, observers began worrying that the Chinese real estate market had been gripped by a speculative bubble. We use residential rent and price data to assess whether these fears are justified. We conclude that residential real estate markets are bubbly in Beijing and Shanghai, with the Beijing housing market frothier than the Shanghai market.

The Chinese Real Estate Bubble

In recent years, over a quarter of China's GDP has been tied to real estate construction (Nunlist 2017). Some fear that this growth has been fueled by speculation and that a collapse in real-estate prices might trigger an economic crisis not only in China but around the world since China is the largest trading country in the world with combined exports and imports worth \$4.3 trillion, and is currently the top trading partner for 16 Asian countries (Thirlwell 2015; Tian 2018). Using an intrinsic-value analysis of residential property prices in Beijing and Shanghai, we conclude that there is a real estate bubble that could end badly for China and the world.

Models of Real Estate Prices

Real estate can be valued using simple rules based on the market prices of comparable properties, replacement cost, or rental income (French and Gabrielli 2018). Hedonic pricing is a more rigorous approach, using an econometric model to relate sale prices to observed property characteristics, such as living area, lot size, number of bedrooms, number of bathrooms, and the age of the property (Rosen 1974; Palmquist 1980; Hill 2011).

Mankiw and Weil (1989) argued that long-run movements in housing prices are primarily driven by demographics, including the coming of age of the Baby Boomer generation. Others have considered a broader array of macroeconomic factors, including GDP, housing construction, mortgage lending, and interest rates (Abraham and Hendershott 1996; Taltavull de La Paz and White 2012; Sivitanides 2018).

Case and Shiller (1990) predicted price changes in four metropolitan areas by considering a variety of microeconomic and macroeconomic factors, including rent, mortgage payments, construction costs, employment, income, and population between the ages 25 and 44. Others

have emphasized the autocorrelation in housing prices, using past price changes to predict future changes (Schindler 2013).

None of these approaches directly addresses the question of whether there is a housing bubble. Population growth may increase housing demand and housing prices, and 4-bedroom homes may have higher prices than 2-bedroom homes, but these observations do not tell us whether home prices are warranted by the prospective cash flow or are, instead, a bubble propped up by expectations of future price increases.

The Chinese Real Estate Market

A key aspect of China's evolution from a centrally planned economy has been the transition from employer-provided housing to a liberalized housing market. In China, all land belongs to the state. Prior to the housing market transition, the government and state-owned entities provided living accommodations and there was no private home buying, selling or renting. In 1998 the Chinese State Council decided to privatize the property market because housing was increasingly deteriorating under state control (Xu and Chen 2012). This decision was also intended to establish the real estate sector as a new engine for economic growth in the aftermath of the 1997 Asian Financial Crisis (Fang, Gu, Xiong, and Zhou 2016).

This constitutional amendment set forth a wave of state firms selling homes at highly discounted prices to their employees, followed by a surge in housing construction as private demand for housing escalated (Wei, Zhang, and Liu 2017). Local governments now sell "land use rights" to property developers, who buy these rights for several decades (typically 70 years) and then construct properties on top of the land to sell to the public. Over the course of the last two decades, construction costs have remained largely stable (Wu, Gyourko, and Deng 2016)

and, on average, make up only a third of the value of a house—the rest is land value (Glaeser, Huang, Ma, and Shleifer 2017).

The funds generated by the sale of land use rights constitutes a very large share of local government revenue because China's tax system provides few and relatively small channels of fiscal income. Since the central government requires local governments to achieve periodic revenue targets, local governments face substantial pressure to sell land use rights—leading in some cases to ghost cities in rural areas.

From 1998 to 2010, the annual volume of completed private housing units rose from 140 million square meters to over 610 million (Wu, Deng, and Liu 2017). By 2010, homeownership rates reached 84.3 percent of the urban housing stock (Man, Zheng, and Ren 2011).

China has sustained an incredible rate of economic expansion since the adoption of free market reforms in the 1980s, averaging 9.5 percent real annual GDP growth through 2017. This expansion has helped raise approximately 800 million people out of poverty, transforming one of the world's poorest countries into an economic powerhouse, second only to the United States. With a large emerging middle class, it is not surprising that the demand for housing has increased.

Continued urbanization since the 1980s has also contributed to the housing boom (Wu and Liu 2014). In the so-called **first-tier cities** of Beijing, Shanghai, Guangzhou and Shenzhen, the total population rose from 48 million to 70 million between 2004 to 2012—a 4.8 percent annual growth rate compared to the overall 0.5 percent growth rate in China (Fang, Gu, Xiong, and Zhou 2016). The combination of growing disposable incomes and rapid rural-urban migration

naturally increased the demand for housing, especially in more desirable and highly urbanized areas.

In China, real estate is considered a primary investment vehicle, as there are few accessible and stable investment alternatives. China's stock market has been far more volatile than the U.S. market (Figure 1). For example, Chinese stock prices more than quintupled between January 2005 and October 2007, followed by a 70 percent decline over the next 12 months. Eighty percent of the trading volume on the Shanghai Stock Exchange is by individual investors, whose trading behavior is generally not well informed and unpredictable (Ren 2017).

In addition to its volatility, the Chinese stock market is still poorly regulated and dominated by state-owned enterprises (SOEs) that offer relatively unattractive dividends (Chen and Wen 2017), and access to investment opportunities abroad remains limited (Goldman Sachs 2016).

On average, housing prices demonstrated more resiliency than stock prices through the 2008-2009 global economic crisis and provided larger returns (Fang, Gu, Xiong, and Zhou 2016). Figure 2 compares Chinese stock prices to an index of second-hand house prices in Shanghai going back to December 1993 (GlobalPropertyGuide 2019). In comparison to the stock market, residential real estate seems to be a better investment because it has had a relatively attractive return with considerably less volatility. This is the kind of backward/looking, trend-chasing behavior that is surely part of the lure of real estate, but also fuels speculative bubbles.

A strong culture of homeownership among the Chinese has also contributed to the extraordinary growth of property prices, especially as it intersects with the new wealth generated by a robust Chinese economy. A considerable sex imbalance has existed in China for several decades, due largely to an ingrained cultural preference for male children, exacerbated by the

one-child policy enacted from 1979 to 2015. Wei, Zhang and Liu (2017) argue that one consequence of this sex imbalance is that homeownership boosts a person's competitiveness in marriage, as it is perceived as a sign of status.

Yang, Zhang, and Zhou (2012) argue that reduced fertility (from the one-child policy) and a larger sex imbalance (skewed towards males) have also increased saving, which creates greater purchasing power in the real estate market and drives up housing demand and consequently prices.

Another important cultural characteristic that may be driving up housing prices is that Chinese parents often provide for their children well into their adulthoods and, in old age, parents tend to depend on their children (Glaeser, Huang, Ma, and Shleifer 2017). In conjunction with China's new wealth, many Chinese parents have been helping their children buy homes. Chinese households under the age of 35 have a homeownership rate of 55 percent, compared to 37 percent in the United States (Glaeser, Huang, Ma, and Shleifer 2017).

Bubble Concerns

Many find the current state of the Chinese real estate market worrying, and point to the rapid growth in property prices as a sign of a housing bubble. From 2003 to 2013, China's first-tier cities—Beijing, Shanghai, Guangzhou and Shenzhen—experienced a real property price growth rate of 13.1 percent annually. China's second-tier and third-tier cities experienced real property price growth of 10.5 percent and 7.9 percent, respectively (McMahon 2018). Chinese billionaire and real estate magnate Wang Jianlin has warned that Chinese real estate is the “biggest bubble in history” (Mullen, and Stevens 2016).

Others argue that such worries are overblown. China's housing boom is very different from the U.S. boom in the mid-2000s, which was fueled by a surge in lax loan requirements, subprime lending, and the securitization of questionable mortgages. In 2008, more than half of all U.S. mortgages were subprime and had down payments of near zero percent (Wallison 2017). China's housing market does not have the same issues because there are much stricter mortgage lending standards and higher down payment requirements—30 percent for the purchase of a first home and 60 to 80 percent for subsequent home purchases, depending on the purpose of the home (Fang, Gu, Xiong, and Zhou 2016, Zheng 2017).

Chen and Wen (2017) argue that China's housing boom and price appreciation are natural given the rapid expansion, industrialization, and urbanization of the economy. It is rational for the widespread anticipation of an expansion of future demand for property to cause prices to rise. This only becomes a problem if economic growth slows but future expectations for price growth remain irrationally high.

Using the principle of regression to the mean, Pritchett and Summers (2014) predict that China's economic growth will slow significantly towards the two percent average worldwide. This forecast bodes poorly for the Chinese real estate market because a regression in economic growth is likely to undermine the income and price expectations that make housing appear to be a good investment.

Fang, Gu, Xiong, and Zhou (2016) argue that the significant growth in disposable incomes has fueled and explains the rise in property prices. However, the relevant question is not whether buying (and renting) are becoming more or less affordable, but whether home ownership is

justified by the rent savings; i.e., whether market prices are consistent with the intrinsic value of the prospective cash flow from owning a home.

A speculative bubble occurs when an asset's price rises far above the present value of the cash flow because buyers are not buying for the cash flow, but to sell for higher prices. In residential housing, the cash flow is the rent received (or the rent saving if owner-occupied), net of property taxes, maintenance, and other expenses (Smith and Smith 2006; Clark and Coggin 2011).

We will directly assess the “bubblieness” of the Chinese real estate market by comparing market prices to intrinsic-value estimates using matched-pair data for homes that were recently rented or purchased in Beijing and Shanghai.

Methodology

Most measures of speculative bubbles focus on rapidly increasing prices (Kindleberger 1987). However, price increases might be justified if intrinsic values are increasing, too, or if prices were initially below intrinsic values. The real measure of a speculative bubble is a direct comparison of market prices with intrinsic-value estimates.

The intrinsic value of an owner-occupied home is the net present value (NPV) of the expected cash flows from owning the home, which is the rent one would otherwise have to pay, net of the expenses of home ownership (Smith and Smith 2006):

$$NPV = X_0 + \frac{X_1}{(1+R)^1} + \frac{X_2}{(1+R)^2} + \dots + \frac{X_n}{(1+R)^n}$$

where X_0 is the initial down payment and closing costs. The subsequent cash flows represent the rent that the owner would have to otherwise pay if he or she were renting instead, minus the

mortgage payments, property taxes, maintenance costs, and other expenses relating to homeownership. The required rate of return, R , depends on the returns from alternative investments.

There are also non-financial costs and benefits of home ownership (for example, anxiety over possible costly repairs, flexibility in customizing a home, and the pride and status accruing to homeowners), but these are hard to value and are typically ignored.

To assess the intrinsic value of a home, we can assume an infinite holding period—not because the home will never be resold, but because we do not want the intrinsic value estimate to depend on an assumed sale price. This is the same assumption made for assessing the intrinsic value of stocks.

If the NPV is positive, then buying a home is better than renting it, and the market price is justified by the anticipated cash flow. If NPV is negative, then the market price is not justified, so buyers are evidently counting on price appreciation; i.e., they are speculating. Alternatively, if the NPV is monotonically inversely related to the required return, we can calculate the internal rate of return (IRR) that equates the NPV to the market price. If the IRR is less than the required return, the market price is higher than the intrinsic value of the cash flow.

Data

Our rental and sale data come from 链家 (“Lianjia”), one of China’s largest real estate brokerage firms. All of the homes we consider are residential apartment properties in China’s two largest cities, Beijing and Shanghai, and the data span the nine-month period from June 2018 to February 2019. The rental and sale price information include data on location, number of rooms, size, transaction date, price, asking price, facing direction, general floor level ((low, low-

middle, middle, high-middle, or high), total number of floors in the building, year built, and days on market between initial posting and transaction closing.

These data can only be accessed through the company's mobile app—it is not available to the public on a desktop or laptop. The Lianjia website requires a user to input a Chinese cellphone number on its website login page. A confirmation code is sent to the phone number and must then be inputted to the website login page. Once logged in, past home sales and rental transaction data can be found under the section title “查交易”, which translates to “check past transactions.” The house sale and rental transactions were then manually matched based on the criteria discussed below.

There are 16 and 15 districts, respectively, within Beijing and Shanghai. Of these districts, we selected the primary districts in and surrounding the city center. For Beijing, the selected metropolitan areas are Xicheng, Dongcheng, Haidian, Chaoyang, Shunyi and Tongzhou. For Shanghai, they are Pudong, Xuhui, Baoshan, Putuo, Yangpu, Minhang, Changning and Jiading. The data collected for Beijing and Shanghai totaled 404 and 405 matched pairs of homes, respectively. The breakdown of the matched pairs in each city are in Tables 1 and 2.

Table 3 shows that the typical homes appear to be small and expensive but, to gauge whether the prices are justified, we need to compare rents and prices for individually matched pairs of homes.

In selecting the matched pairs, several conditions had to be met. Homes had to be within the same apartment complex, which eliminated differences in building style, age and location. The apartment buildings had to have approximately the same number of floors, and the apartments themselves had to share the same general floor level (low, low-middle, middle, high-middle, or

high). Matched apartments had the same number of bedrooms and bathrooms, and less than a 10 percent differential in square meterage. Lastly, matched apartments had to share a common direction among eight possible facing directions: north, northeast, east, southeast, south, southwest, west, and northwest.

Analysis

Our default assumptions are: initial closing costs equal to 2 percent of the sale price, a 30-year mortgage, 1.5 percent annual maintenance costs, 2 percent sales transaction cost, 20 percent capital gains tax, and no property tax.

We consider a 30 percent down payment for a first home purchase and a 60 percent down payment for later home purchases. During the time period we studied, the mortgage rate in Beijing was 5.5 percent for a first home purchase and 6.0 percent for a subsequent home purchase. For Shanghai, the mortgage rates were 5.0 percent and 5.25 percent, respectively (The People's Bank of China). A variety of assumptions were made for the model's other parameters to assess the robustness of our results.

The NPV calculations with an infinite horizon make no assumptions about future home prices. For our NPV calculations using a finite horizon, the baseline assumption for the annual increase in home prices is 2 percent since the average rate of inflation has been 2.41 percent over the last decade and 1.76 percent over the last five years (Figure 3). We focus on the calculated IRRs to facilitate comparisons with other potential investments.

Tables 4 and 5 summarize the IRR calculations for the 404 matched pairs of homes in Beijing and the 405 matched pairs in Shanghai. The N/A entries are for cases where there is no IRR because the NPV is always negative, no matter what the discount rate. With 2 percent and 3

percent rent, price, and expense appreciation, the IRRs are often negative and clearly unattractive. Even for long horizons with rents and prices increasing by 5 percent annually while expenses increase by only 3 percent, the IRRs seem unappealing. During the period of time covered by this study, China's 10-year government bond yield ranged from 3.2 to 3.6 percent. Since housing investments are significantly less liquid and there is considerable uncertainty about future house prices, a risk premium of at least two percent seems necessary (Wu, Gyourko and Deng 2012), which implies close to a six percent required rate of return for real estate. People who bought homes in Beijing or Shanghai as an investment during this time period were evidently anticipating rapidly rising home prices.

Home ownership may become even less financially appealing if substantial land-use renewal fees and/or property taxes are imposed.

Possible Fees and Taxes

When a land use agreement expires, the owner can apply for an extension, but there are no guarantees about the cost of obtaining an extension. Article 22 of the Law on the Administration of Urban Real Estate says that renewals will normally be approved, but that “the land user shall enter into a new contract for the granting of the land-use right and pay fees for the granting in accordance with the relevant regulations.” The size of these fees is not specified.

Many residents of Wenzhou had 20-year land-use agreements that are now expiring. The government initially said that the renewal-fees would be up to 33 percent of the property's value, but in 2016 it was announced that the proposed fees would be waived. The government cautioned, however, that this was a transitional decision and they would continue to study the question of renewal fees (Cole 2016).

One possibility is that the Chinese government might charge renewal fees based on current market values. However, large lump-sum fees are likely to be perceived as unfair and unaffordable for many home owners (Stein 2017). A less disruptive alternative would be to allow renewal fees to be paid in annual installments, akin to property taxes, or to impose explicit property taxes in lieu of renewal fees. Such annual payments would satisfy local municipalities' desire for a stable source of revenue and would probably be viewed by citizens as a fair and reasonable way of paying for local government services (Stein 2017).

For several years now, the Chinese government has been considering instituting property taxes to provide a steady source of revenue for local governments and to defuse possible housing bubbles (Bloomberg 2012). The Shanghai and Chongqing municipal governments were allowed to begin levying real estate taxes in 2011. In Shanghai there are annual taxes on 70 percent of the original property value at rates of 0.6 percent for taxable houses worth at least as the city average and 0.4 percent for others. In Chongqing the annual taxes are based on 100 percent of the original property value, and are 1.2 percent for houses worth at least four times the city average, 1.0 percent for three to four times the city average, and 0.5 percent for others (Bai, Li, and Ouyang 2012). Shanghai also levies an annual land-use tax on owners of land-use rights at rates ranging from RMB 1.50 (USD 0.221) to RMB 30 (USD 4.38) per square meter.

In 2014, the Chinese government announced that when property taxes become widespread, the tax rates will be set by local governments rather than the central government, and should be based on the market value of a property with a minimum tax-free level to protect ordinary home owners (Reuters 2014).

Table 6 shows how the median IRRs are affected by annual property tax rates equal to 0.5 and 1.0 percent of current market values for the case of a first home purchase and the favorable assumptions of annual increases of 5 percent for rents and home prices, and 3 percent for expenses. With an infinite horizon, the median IRRs drop by up to 0.5 percent. The effects are even larger with finite horizons. Since the property taxes, if any, will be imposed at some unknown future date, the actual median IRRs are somewhere between the case of no property taxes and the values shown in Table 6, which assume that the property taxes begin immediately.

Discussion

Cracks have already appeared in parts of the Chinese housing sector, as evidenced by the widely reported ghost cities throughout the country. If the Chinese economy slows significantly and household incomes drop, the demand for housing, especially in smaller cities, will decline and lead to more ghost cities. Furthermore, if household incomes drop, mortgage payments will become more burdensome, and price-to-income ratios are already very high in major Chinese cities. If a substantial price correction occurs, local government revenue will also be adversely impacted, which will further impair economic growth.

In addition, if the housing sector becomes a less attractive investment, capital outflows may occur as investors consider foreign investment opportunities, especially as China embraces economic liberalization (Ding, Huang, TJin, and Lam 2017). Given the interconnected nature of real estate, the overall economy, and the government, a housing price correction might set off a vicious cycle culminating in a major economic downturn like the 2007-2008 financial crisis.

It is precisely because the possible consequences of a housing crash in China are so frightening that the Chinese government is unlikely to stand by and let it happen. The real estate market is too big to fail:

[T]he government does not wish to create or exacerbate social unrest. If the past is a reliable guide, the central government will do whatever it takes to keep the residential market calm and homeowners placid. The very last thing the government wants to do is act in a way that causes hundreds of millions of citizens to believe that their single largest asset is unstable.... It is nearly inconceivable that the central government will act in any way that shakes the confidence of the many recent homebuyers who believe that their home is a solid investment of great and ever-increasing value. (Stein 2017)

As the housing market evolves, the Chinese government will continue to tinker with housing regulations that might support and stabilize the market; for example, the recent hikes in down payment requirements and the Shanghai and Chongqing pilot property taxes (Chen and Yao 2017; Thomson Reuters 2019). The government might also prop up housing prices by slowing the growth of new housing construction.

Conclusion

Our results indicate that the Beijing and Shanghai housing markets are in a bubble, where market prices are significantly above intrinsic values. We should not anticipate continued double-digit annual increases real property prices; if they do occur, the Chinese real estate bubble will become even larger and more ominous.

If the air begins leaking out of the bubble, the government is likely to intervene through laws, regulations, or outright purchases to prevent a collapse. The Chinese real estate bubble will most likely end with a whimper, not a bang.

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Table 1. Beijing Matched Pairs of Homes District Breakdown

	Subdistricts	Matched Pairs
Xicheng	16	67
Dongcheng	11	48
Haidian	21	182
Chaoyang	5	46
Shunyi	4	48
Tongzhou	1	13
Total	58	404

Table 2. Shanghai Matched Pairs of Homes, District Breakdown

	Subdistricts	Matched Pairs
Pudong	4	58
Xuhui	4	55
Baoshan	8	139
Putuo	5	53
Yangpu	3	25
Minhang	2	40
Changning	1	22
Jiading	1	13
Total	28	405

Table 3. Characteristics of Housing Sample Data

	Average number	Median	Median	Median	Median
	of Rooms	SQM	Monthly Rent	Price	Price/SQM
Beijing	1.75	61.50	\$954	\$707,750	\$11,517
Shanghai	1.64	55.59	\$611	\$409,750	\$6,925

Table 4. Beijing IRRs

	1st home	2nd home	1st home	2nd home	1st home	2nd home
Assumptions						
Down Payment	30%	60%	30%	60%	30%	60%
Mortgage Rate	5.50%	6.00%	5.50%	6.00%	5.50%	6.00%
Annual Price Increase	2.00%	2.00%	3.00%	3.00%	5.00%	5.00%
Annual Rent Increase	2.00%	2.00%	3.00%	3.00%	5.00%	5.00%
Annual Expenses Increase	2.00%	2.00%	3.00%	3.00%	3.00%	3.00%
Results						
First-year median IRR	-18.43%	-7.12%	-15.10%	-5.48%	-9.28%	-2.56%
10-year median IRR	-4.52%	-1.05%	-2.17%	0.29%	2.18%	3.02%
30-year median IRR	-0.34%	0.50%	1.11%	1.68%	4.31%	4.38%
Forever median IRR	N/A	N/A	N/A	N/A	5.89%	5.79%

Table 5. Shanghai IRRs

	1st home	2nd home	1st home	2nd home	1st home	2nd home
Assumptions						
Down Payment	30%	60%	30%	60%	30%	60%
Mortgage Rate	5.00%	5.25%	5.00%	5.25%	5.00%	5.25%
Annual Price Increase	2.00%	2.00%	3.00%	3.00%	5.00%	5.00%
Annual Rent Increase	2.00%	2.00%	3.00%	3.00%	5.00%	5.00%
Annual Expenses Increase	2.00%	2.00%	3.00%	3.00%	3.00%	3.00%
Results						
First-year median IRR	-16.50%	-6.22%	-13.20%	-4.58%	-7.44%	-1.68%
10-year median IRR	-3.17%	-0.26%	-0.92%	1.05%	3.27%	3.72%
30-year median IRR	0.27%	1.02%	1.70%	2.17%	4.87%	4.84%
Forever median IRR	2.18%	2.18%	3.16%	3.16%	6.09%	6.09%

Table 6. Effect of Property Taxes, First home, 5% price, 5% rent, and 3% expense increase

	Shanghai			Beijing		
Assumptions						
Mortgage Rate	5.00%	5.00%	5.00%	5.50%	5.50%	5.50%
Property tax rate	0%	0.5%	1.0%	0%	0.5%	1.0%
Results						
First-year median IRR	-7.44%	-8.05%	-8.66%	-9.28%	-9.89%	-10.50%
10-year median IRR	3.27%	2.27%	1.27%	2.18%	1.18%	0.18%
30-year median IRR	4.87%	4.16%	3.47%	4.31%	3.63%	2.95%
Forever median IRR	6.09%	5.79%	5.59%	5.89%	5.64%	5.49%

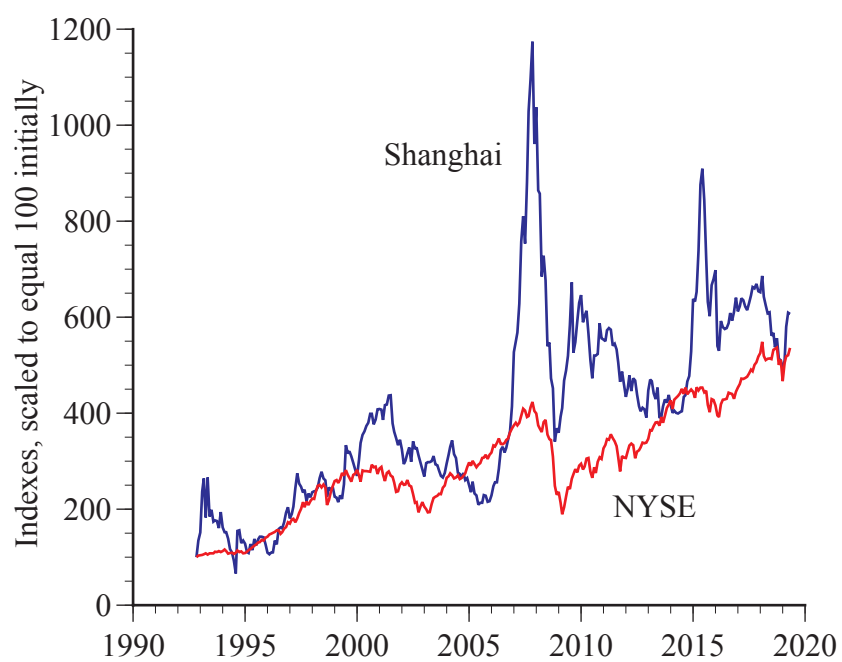


Figure 1. U.S. and China Stock Prices, monthly

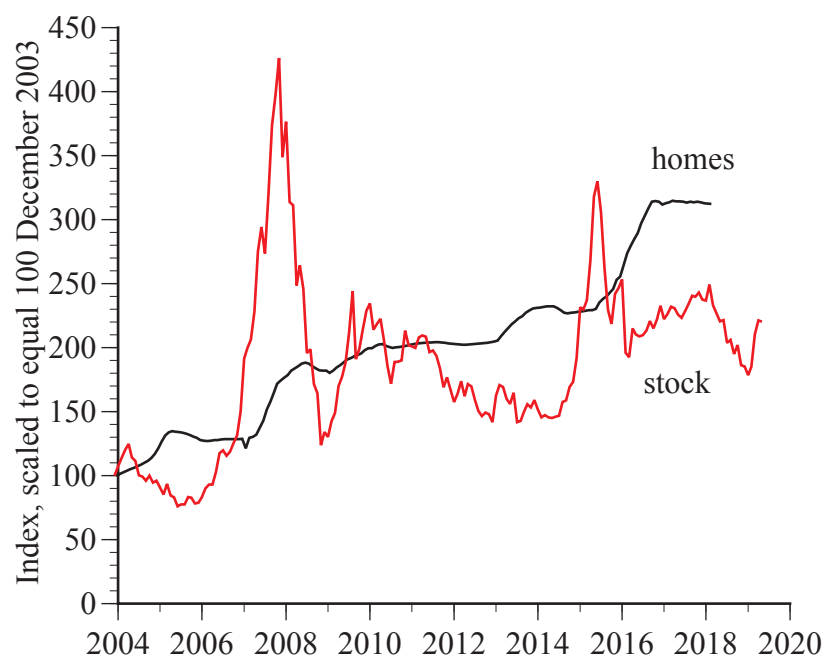


Figure 2 Shanghai Stock Market Prices and Prices of Second-Hand Homes in Shanghai

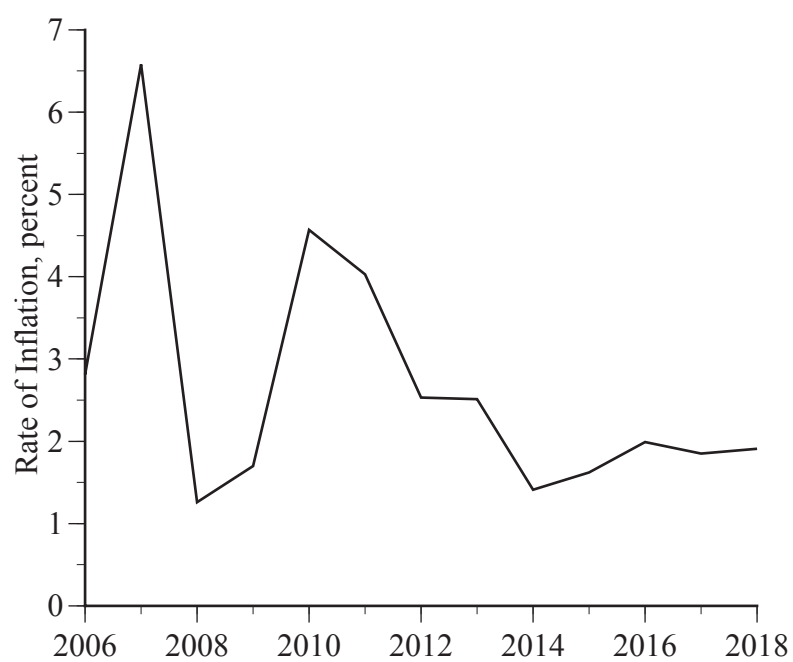


Figure 3 China Inflation Rate