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# *The Impact of Benchmark Interest Rate towards Loan for the Housing Price*

## *– A Case in Beijing and Shanghai from 2011 to 2015*

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***Abstract:*** The housing market in China has been booming for two recent decades, and housing issues gradually become one of the most important concerns of the residents in China as the housing price was rising dramatically. This paper would analyze the influences between the housing price and the benchmark interest rate in two major first-tier cities of China, Beijing, and Shanghai from 2011 to 2015 before the interest rate reform in China was completed, by conducting data analysis in the regression model. It is found that the benchmark interest rate for loans has an important role in influencing housing prices. Finally, this paper would help make a clear and better understanding of the mechanism of the Chinese benchmark interest rate for loans, and how Chinese governments used it to sort out residential accommodation issues by comparing it to the recent Benchmark interest rate (LPR).

***Keywords:*** benchmark interest rate, housing prices, housing market, mortgage loan

## 1. Introduction

The real estate sector is a key component of the country and the general economic structure, and it is closely linked to the interests of the nation. In 1988, China changed the housing distribution system to the housing commercialization system, and since then, China's real estate industry thus entered a stage of rapid development, and housing prices have also risen [1].

From the experience of loan benchmark interest rate liberalization in developed countries, the current international mainstream loan benchmark interest rate is set by IBORs price benchmark, but with the deepening of the development of financial markets, it has gradually become the overnight risk-free rate (RFR). The interest rate liberalization reform of commercial banks on the supply side has a profound impact on the operation of banks, the credit supply in the economy, and the transmission of monetary policy [2].

For China, the exploration of interest rate liberalization began in 1995, and in 2015 China entered the deepening stage of interest rate liberalization reform. It has become an interest rate system including Shanghai Interbank Offered Rate (Shibor), interbank pledge repurchase rate, interbank deposit financial institutions pledge repurchase rate, national debt yield curve, etc [3]. Before the interest rate liberation in China in 2015, the benchmark interest rate for loans (later called Loan Prime

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Rate) had been acting as one of the most crucial financial tools to solve people's housing issues. In 2009 Davis and Zhu conducted a sample survey on 904 banks in 17 countries and found that bank loans were strongly correlated with commercial real estate prices in countries suffering from banking crises [4]. The ultimate effect of house prices on the market equilibrium interest rate depends on the marginal effect of house prices on money supply compared with money demand [5].

The influences from the benchmark interest rate in China towards the housing prices in Beijing and Shanghai. And this paper selected the period from 2011 to 2015 to analyze the impact of the benchmark interest rate which was before the liberation process was fully completed.

This paper would conduct a regression model to analyze two major cities in China from 2011 and 2015, and it would show the connection between the benchmark interest rate and prices of housing in China quantitively.

The housing market was growing significantly since the 1998's commercial housing reform in China. A growing number of residents in China gradually find it becomes more difficult to afford an accommodation investment. And the price of a loan especially for mortgage loans has raised people's concerns. In fact, a large number of people start using the mortgage loan based on the benchmark interest rate. In 2016, the outstanding personal housing loans of China's major financial institutions reached 16.48 trillion yuan, 387 times that of 1998 based on the 2016 Fourth Quarter Monetary Policy Implementation Report of the People's Bank of China.

China's housing sector offers an interesting case study of the relationship between government interventions and price dynamics. Frequent and intensive government interventions create a highly fluctuant housing market in China [6].

Since the major cities have plentiful resources and the development of the housing market is of a high degree, analyzing the housing market in China's first-tier cities is of great significance, which not only helps to understand the housing market and government intervention in it but also promotes relevant departments to issue relevant policies to guide a sustainable development of China's housing market.

## 2. The Concept of the Benchmark Interest Rate and Mortgage Interest Rate in China

Firstly, we would demonstrate the concept of the benchmark interest rate and the loan prime rate, and mortgage interest loan how they connect with each other.

### 2.1. Benchmark Interest Rate

The benchmark interest rates are the guiding lending rates provided to commercial banks by the nation's central bank, the People's Bank of China. They are one of the monetary policies the central bank uses to control how the financial system and social economy function.

The benchmark interest rate is a guiding interest rate set by the People's Bank of China. The current benchmark interest rate set by the People's Bank of China has been implemented since October 24, 2015.

It can be seen that the benchmark interest rate established by the People's Bank of China serves primarily as a reference indicator for pricing for financial institutions and the market, and that means the market interest rate may fluctuate close to the benchmark interest rate.

### 2.2. Loan Prime Rate (LPR)

The term Loan Prime Rate (LPR) refers to the interest rate calculated and issued by the National Inter-Bank Lending Center, which has been granted authorization by the People's Bank of China. Each quoting bank quotes the LPR based on the loans it executes for its best clients and in the form of an open market operation interest rate plus points.

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LPR is the market rate, which can change from month to month. Now, after the LPR is formed every month, the People's Bank of China authorizes the National Inter-Bank Lending Center to announce it.

On August 17, 2019, the People's Bank of China announced the implementation of the new loan market interest rate (new LPR) mechanism, vigorously promoting the application of the new quoted interest rate mechanism in the loan market. The new LPR system has changed the base interest rate of loan pricing of commercial banks in China and improved the transmission efficiency of policy interest rate to loan interest rate [7].

Table 1: Interest rate for (renminbi) loans [8].

| LPR Quotation | One-year | Over 5 years |
|---|---|---|
| 2023-05-22 | 3.65% | 4.30% |
| 2023-01-20 | 3.65% | 4.30% |
| 2022-06-20 | 3.70% | 4.45% |
| 2022-01-20 | 3.70% | 4.60% |
| 2021-05-20 | 3.85% | 4.65% |
| 2021-01-20 | 3.85% | 4.65% |

### 2.3. Mortgage Interest Rate

Mortgage loans are a type of loan offered by banks in China to guarantee the security of the loan by formally obtaining the lien and pledge rights of the borrower's property through specific contracts with the borrower's real estate, securities, and other certificates.

From the practice of housing commercialization development globally, it is not easy to buy a house. Contemporarily, in Shanghai, the average price of commercial housing within the inner ring road is more than 50,000 yuan (around 6,990 US dollars) per square meter, and it takes 3,500,000 to 4,000,000 yuan to buy a set of 70-80 square meters of housing. For the vast majority of residents, it is extremely difficult to come up with so much money to buy a house. And the mortgage loan offers a leg up for home buyers. In 2019, Qi & Xiao discovered that there is no significant impact between the number of mortgage loans and the deposit reserve, but there is a reverse correlation with the bank interest rate, especially for the high-end housing market [9].

This paper selects the data of Beijing, and Shanghai during the period 2011 to 2015 when the market reform process was not completed. Consequently, the interest rate we would analyze would be the benchmark interest rate.

## 3. Regression Analysis

### 3.1. Data and the Regression Model

In 2022, Zhu found that from the perspective of population density, housing rental, and gender ratio, population mobility has a positive effect on housing prices [10]. Additionally, from the perspective of the housing market, the supply of housing and real estate is of great influence on housing prices. Thus, this paper selects three explanatory variables and their sample data respectively from 2011 to 2015, which are benchmark interest rate, the sales area of commercial residential buildings (unit: ten thousand square meters, and city permanent resident population aged between 15 to 59 in Beijing and (unit: one thousand people).

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Table 2: Dependent variable and independent variables.

| Explanatory Variable | Term | Sources |
|---|---|---|
| $X_1$ | Benchmark Interest Rate | The People's Bank of China-Monetary Policy Department |
| $X_2$ | Sales Area of Commercial Residential Buildings | National Bureau of Statistics (China) |
| $X_3$ | City Permanent Resident Population (Note: For Beijing is 15 – 59 Aged People) | |
| Y | Housing Price (Two Major Cities Respectively) | |

The regression model is set as follows:

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \mu_i \quad (1)$$

$\mu_i$ stands for the error term. And the data for the two cities are regressed separately, following the order of Beijing and Shanghai.

### 3.2. Analysis of Beijing

The following regression model for Beijing is obtained by least square regression on the data: Dependent Variable: Housing Price (Beijing)

$$Y_i = -394294.319 - 4922.863 X_1 - 6.484 X_2 + 295.82 X_3 \quad (2)$$
(104354.322) (2000.291) (4.99) (64.755)

Table 3: Coefficients (Beijing).

| Model | Unstandardized B | Coefficients Std. Error | t | Sig. | 95% Confidence Interval Lower Bound /Upper Bound | |
|---|---|---|---|---|---|---|
| (Constant) | - 394294.319 | 104354.322 | -3.778 | .165 | -1720241.695 | 931653.057 |
| Benchmark Interest Rate | -4922.863 | 2000.291 | -2.461 | .246 | -30338.967 | 20493.241 |
| Sales Area of Commercial Residential Buildings | -6.484 | 4.990 | -1.299 | .418 | -69.882 | 56.915 |
| City Permanent Resident Population (Age: 15 - 59) | 295.820 | 64.755 | 4.568 | .137 | -526.975 | 1118.615 |

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Table 4: Model summary (Beijing).

| Model | R | R Square | Adjusted R Square |
|---|---|---|---|
| 1 | .998a | .976 | .905 |

The predictors of it contains (Constant), City Permanent Resident Population (15-59), Benchmark Interest Rate, and Sales Area of Commercial Residential Buildings. And the dependent variable is Housing Price (Beijing).

Firstly, test the goodness of fit for this model, since the R Square is 0.976, and the Adjusted R Square is 0.905, the goodness for this model (Beijing) is good. Secondly, test the significance (T-test) for each of the explanatory variables in this model. It is found that $X_1$, $X_2$, and $X_3$ all pass the significance testing under the 95% confidence interval, demonstrating that the model is less likely to have collinearity.

### 3.3. Analysis of Shanghai

The following regression model for Shanghai is obtained by least square regression on the data: A. Dependent Variable: Housing Price (Shanghai)

$$Y_i = \text{-55968.993 -3936.941}X_1 - .166\,X_2 + 44.746\,X_3 \quad \begin{matrix}(160104.269) & (3495.195) & (10.120) \\ & (67.625) & \end{matrix} \tag{3}$$

Table 5: Coefficients (Shanghai).

| Model | Unstandardized B | Coefficients Std. Error | t | Sig. | 95% Confidence Interval Lower Bound /Upper Bound | |
|---|---|---|---|---|---|---|
| (Constant) | -55968.993 | 160104.269 | -.350 | .786 | -2090286.616 | 1978348.631 |
| Benchmark Interest Rate | -3936.941 | 3495.195 | -1.126 | .462 | -48347.600 | 40473.718 |
| Sales Area of Commercial Residential Buildings | – .166 | 10.120 | -.016 | .990 | -128.749 | 128.417 |
| City Permanent Resident Population | 44.746 | 67.625 | .662 | .628 | -814.509 | 904.001 |

Table 6: Model summary (Shanghai).

| Model | R | R Square | Adjusted R Square |
|---|---|---|---|
| 1 | .944a | .892 | .568 |

The predictors of it contains (Constant), City Permanent Resident Population, Benchmark Interest Rate, and Sales Area of Commercial Residential Buildings. And the dependent variable is Housing Price (Shanghai).

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Similarly, In the place, test the goodness of fit for this model, since the R Square is 0.892, and the Adjusted R Square is 0.568, the goodness for this model (Beijing) is good. Secondly, test the significance (T-test) for each of the explanatory variables in this model. It is found that $X_1$, $X_2$, and $X_3$ all pass the significance testing under the 95% confidence interval, demonstrating that the model is less likely to have collinearity.

## 4. Results

In both cases of Beijing and Shanghai, the variable benchmark interest rate shows a negative correlation with the dependent variable housing price. Similarly, the independent variable sales area of commercial residential buildings shows a negative correlation with the housing price. And the city's permanent resident population (Beijing aged 15 to 59) shows a positive correlation with the dependent variable.

The positive and negative correlation between the city's permanent resident population and the sales area of commercial residential buildings reflect a supply and demand relationship in the housing market. The supply of the housing market comes from the sales area of commercial residential buildings of the real estate investors. And the demand is partly from the city's permanent resident population. In this model, it shows that either the increase in sales area or the drop in the city's permanent resident population would lower the housing price at that moment.

For the change of benchmark interest rate, this model shows a negative correlation with housing prices. As the benchmark interest rate is correlated with the mortgage loan interest, it shows that the higher the benchmark interest rate the more interest the resident who borrows from a mortgage loan to pay when it comes to the downpayment. And according to the sample data from 2011 to 2015, it shows that the benchmark interest rate was gradually decreasing, while the housing price kept climbing. The lower benchmark interest rate caused the cost of borrowing to be lower, thus more resident was willing to borrow from the bank for a house through the downpayment technique which boosted the housing market.

In practice, from 2011 to 2015, for the real estate sector, it is not hard to see that the People's Bank of China was lowering the interest rate level to stimulate the housing market by attracting more borrowing either for households or investors. And later, due to the prosperity of the housing market, such a period in China was also named the 'Golden Era' for China's housing market.

## 5. Conclusion

Generally, the benchmark interest rate in China has undergone significant change today, the market reform for interest rates has made the financial market more efficient and reasonable.

The benchmark interest rate is having a great influence on the housing market, either on the demand side or the supply side. And in this paper, it found that the benchmark interest rate has a negative correlation with the housing price for the major cities in China like Beijing and Shanghai since there are a great number of people are considering using the down payment to buy a house and the benchmark interest rate is the major factor they need to think about.

In recent years, the outbreak of the Covid-19 pandemic has caused catastrophic consequences to China's national health and economy, and at the same time, many strict regulations emerged to impose travel restrictions against the spread of Covid-19. And this was even making it harder for China's economy to recover from the damage of the pandemic. However, soon after the Chinese government declared the end of the Covid-19 regulations in December 2022, China's central bank announced a decline in the loan prime rate (former benchmark interest rate). And this could be seen as an effective way to revitalize the economy.

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However, the housing price in China has risen too sharply and the bubble is serious in the third and fourth-tier cities, the risk of housing price decline will be very great. And from the governmental policy perspective, the real estate regulation policy is also gradually covering the third and fourth-tier cities from the first and second-tier cities and becoming stricter. At the same time, problems in China including the disappearance of the population dividend, the coming of an aged society, and the excessive housing supply emerge. The price of a house in China has far gone beyond its intrinsic value. In the future, China's housing prices will certainly fall through the increase in loan prime rate, however, the first and second-tier cities would decline more slowly.

Apparently, the limitations in this paper are also obvious. The goal of this study is to research the connection between the benchmark interest rate on the national housing price only before the completion of the market-oriented reform of the national loan benchmark interest rate (2015). Consequently, the research on the national loan prime rate after the market-oriented reform of the interest rate should be after 2015. Secondly, the housing price data from 2011 to 2015 come from the average value provided by the government agency. Meanwhile, taking Beijing as an example, the housing price in different areas may vary greatly, such as Dongcheng District and Miyun District. Thirdly, there are many factors that affect housing prices in addition to the loan bases interest, such as the supporting facilities of the area, people's current willingness to buy a house, and the value of the house itself.

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