Correlation Between Inflation and Real Estate Prices: Case Analysis of China and the United States

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Abstract. Establishing economic theory suggests a correlation between inflation and asset prices, and real estate price is a typical form of asset prices. This study empirically examines real estate prices and inflation data in China and the United States from 2006 to 2023, drawing on existing economic theories and relevant data. The analysis reveals an inherent interaction mechanism between inflation and real estate prices in both countries. It is observed that fluctuations in real estate prices positively affect inflation in both China and the United States. However, the effect of inflation change on real estate prices is different between the two countries, as China's inflation rates exert a negative influence on real estate prices, contrasting with the situation in the United States. These results contribute to a deeper understanding of the intrinsic relationship between inflation rates and real estate prices, providing a theoretical basis for developing macroeconomic policies, enhancing inflation monitoring, and managing real economy markets.

Keywords: Real estate finance, macroeconomics, financial investment, inflation.

1. Introduction

Currently, China’s regulatory authorities enhance property financing by adjusting financial institutions' policies to restrict real estate enterprises' access to financing, thereby boosting demand for the real estate sector. However, it may be challenging for industry profitability to recover within the real estate sector in the short term. China's Consumer Price Index (CPI) exhibited a systematic decrease in 2023 and is anticipated to experience moderate growth in 2024 as economic momentum gradually improves. The U.S. real estate market has been experiencing a downward trend for the past two years, while the average property market price has surged by 40%. The implementation of accommodative monetary policies in the U.S. over the three-year pandemic resulted in a significant increase in inflation. To address inflationary pressures, the U.S. Federal Reserve executed six interest rate hikes in 2023, but inflation has remained high. In December 2023, the CPI in the U.S. increased by 3.4%, with a marginal growth rate of 0.3%. It is anticipated that inflation levels will continue to surpass market expectations in 2024, constraining the Federal Reserve's ability to reduce interest rates.

Among current research on the correlation between real estate prices and inflation rates, two primary viewpoints are delineated. One stream of research focuses on real estate prices, investigating the interplay between changes in real estate prices and inflation. Conversely, another strand posits that beyond fluctuations in real estate prices, various indicators collectively influence the inflation level, necessitating the development of a comprehensive inflation index incorporating real estate prices. Some scholars have observed that the impact of fluctuations in the real estate price index on inflation tends to be more significant during financial crises [1]. Likewise, research indicates that real estate exerts a significant isotropic effect on inflation, with the intensity of this effect exhibiting a pro-cyclical time-varying pattern. The intensity of the impact grows during periods of asset market expansion, and it diminishes or becomes ineffective during downturns [2]. On this basis, fluctuations in real estate prices can offer some indicative insight into future inflation [3]. By applying the structural vector autoregressive models, one can see that positive shocks in real estate prices eventually drive inflation and GDP growth rates to new highs, concurrently causing the money supply growth rate to decrease to a lower level [4]. According to autoregressive distributed lag (ARDL) models and recursive regression analysis, it can be concluded that real estate prices serve as a reliable long-term hedging tool against inflation [5]. However, some scholars have analyzed data from 31

provinces and cities in China from 1995-2006 and found that real estate prices are predominantly influenced by interest rates and inflation rates. Over the medium to long term, macroeconomic factors such as real estate supply and income levels also contribute to the fluctuations in real estate prices [6]. Foreign scholars have inferred by developing a more comprehensive price index that fluctuations in asset prices contain information regarding the forthcoming inflation, suggesting that it should be inherently incorporated into the price index [7]. On this basis, an empirical analysis is conducted to examine the modifying effect of asset prices on China's conventional core inflation index. Subsequently, a dynamic Keynesian model is employed to test this effect after including a pegging pricing strategy as a constraint. The findings indicate that the modified index can enhance the effectiveness of the established monetary policy [8]. The influence of real estate prices on inflation and output is limited in the short term but exhibits a crucial positive feedback mechanism in the long term [9]. In addition, unexpected fluctuations in asset prices can serve as a leading indicator of inflation [10]. In this study, the monthly Consumer Price Index (CPI) and monthly real estate price indices of China and the U.S. from 2006 to 2023 were analyzed using a VAR model, and the stationarity was tested in order to depict the connections between inflation rates and real estate prices in both countries. At the end of the paper, relevant policy recommendations will be provided based on the issues uncovered in the study and the conclusions drawn, considering the current circumstances in China and the goals of macroeconomic policy.

2. Methodology and Theoretical Base

Inflation impacts house prices primarily through the cost effect and the interest rate effect. Regarding the cost effect, when inflation spurs a general price increase in society, individuals tend to lean towards purchasing homes rather than renting, leading to an upsurge in the demand for property purchases. Concurrently, the associated production costs in the real estate sector increase, consequently driving property prices upwards. From the perspective of the interest rate effect, inflation-induced currency devaluation prompts a significant influx of funds into the real estate market as individuals seek to preserve and enhance the value of their money, thus raising real estate prices. It also influences the supply of the real estate market. Inflation results in an increase in the costs of raw materials and labor, thus reducing the supply of real estate. Moreover, inflation leads to a decrease in real interest rates, lowering the financial cost of loans obtaining loans for real estate developers. Consequently, developers will be more willing to seek loans for real estate projects, which can lead to an increase in real estate supply. Still, due to the lengthy construction period of real estate projects, newly developed projects can hardly boost the real estate market's supply in a short period. Therefore, under the influence of inflation, the real estate market will experience a short-term decrease and a long-term increase in supply. Real estate prices influence future inflation levels primarily through the wealth effect, the balance sheet effect, the credit effect, and Tobin's Q effect.

This study selected China's monthly CPI and the monthly price index of newly built commercial housing from 31 December 2006 to 31 December 2023 to represent the inflation rates and the house price index, respectively. The monthly CPI data was sourced from the National Bureau of Statistics of China, and the monthly price index of newly built commercial housing was obtained from the RoyalFlush iFinD database. The price index of newly built commercial housing portrays the fluctuations in house prices across various periods on a percentage scale, thus reflecting the extent and trend of housing price changes over a certain time frame. The other control variables include the year-on-year growth rate of China's money and near money supply (M2) for the month, the average USD to CNY exchange rate for the month (ER), and the weighted average interest rate of China's interbank lending for the month (Loan). The fluctuations in China's monthly CPI and monthly real estate price index are shown in Fig. 1.

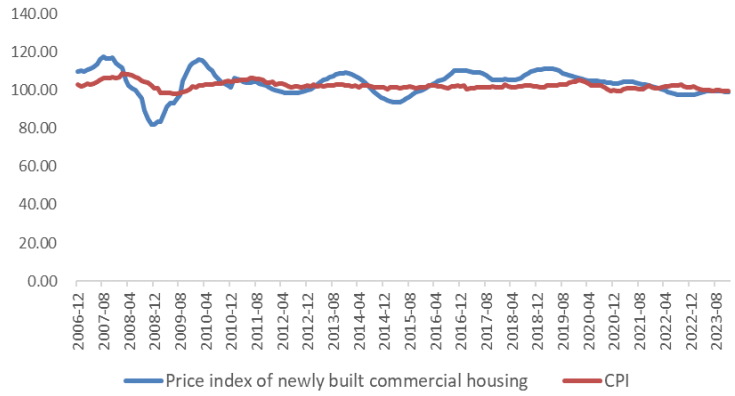

Figure 1. Fluctuations in China's monthly CPI and monthly real estate price index

Regarding the U.S., this study selected the monthly CPI and monthly OFHEO purchase-only house price index in the U.S. from December 2006 to December 2023, representing inflation rates and the house price index, respectively. The monthly CPI data was sourced from the U.S. Department of Labor, and the monthly price index of newly built commercial housing was obtained from the U.S. Federal Housing Finance Agency. The other control variables include the year-on-year growth rate of U.S. money and near money supply (M2) for the month, the average USD to CNY exchange rate for the month (usdrmb), and the weighted average interest rate of U.S. interbank lending for the month (interstrate). The fluctuations in U.S. monthly CPI and monthly real estate price index are shown in Fig. 2.

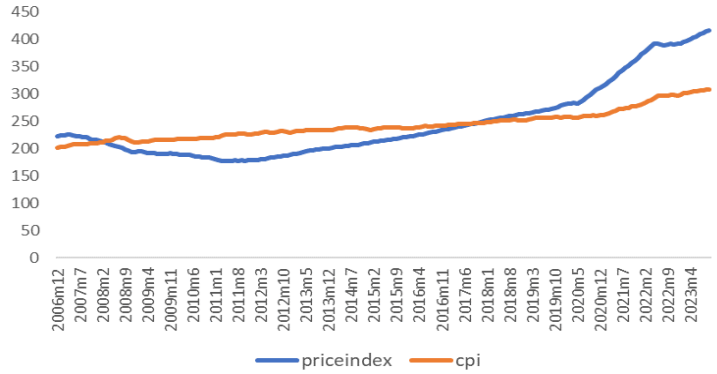

Figure 2. Fluctuations in the U.S. monthly real estate price index and monthly CPI

Table 1. Descriptive statistics results for data from China

Variable	N	Mean	Min	Max	SD
Price	216	0	-0.070	0.075	0.014
CPI	216	0	-0.025	0.016	0.006
ER	215	-0.001	-0.027	0.043	0.009
Loan	216	0.014	-0.525	0.815	0.167
M2	216	-0.001	-0.138	0.244	0.060

Results and Discussion

2.1. The Interaction Mechanism between Real Estate Prices and Inflation in China

In this study, China and the U.S. were examined as case studies. The VAR model was used to empirically analyze both countries' real estate price index and inflation rates and discuss their inherent interaction patterns. When analyzing the data from China, all variables were transformed into growth rates for descriptive statistical analysis. The results are shown in Table 1. Subsequently, the data stationarity was analyzed by conducting a unit root test on each transformed variable. The test results are presented in Table 2. After confirming the stationarity of all variables, the Akaike information

criterion (AIC) was used to identify the optimal lag order, which was determined to be 2. Subsequently, a VAR model with a two-period lag was constructed. The test results are presented in Table 3.

Table 2. Stationarity test results for data from China

	ADF test value	P value	Stable or not
Price	-6.648	0.000	Stable
CPI	-13.309	0.000	Stable
ER	-8.461	0.000	Stable
Loan	-16.722	0.000	Stable
M2	-15.229	0.000	Stable

Table 3. The correlation between the real estate price index and CPI in China

	Price	CPI
L.Price	0.484*** (7.13)	0.010 (0.28)
L2.Price	0.236*** (3.62)	0.084** (2.45)
L.CPI	-0.310** (-2.51)	0.070 (1.08)
L2.CPI	-0.050 (-0.40)	0.146** (2.21)

Note: **, *** represents for p<0.01, 0.001

Fluctuations in real estate prices are influenced by inflation rates, with coefficients of -0.310 and -0.050, implying a negative relationship between inflation rate changes and real estate prices. Given the limitations within China's context, the effect is insignificant and reduces sharply in the third period. It indicates that the influence of inflation rate changes on real estate prices is primarily concentrated over a shorter duration. The coefficient of real estate prices lagged by one period is 0.010, and for two periods, it is 0.084, indicating a positive effect of real estate prices on the inflation rates, which increases significantly over time. The stationary test is shown in Fig. 3. It suggests that it takes some time for real estate price fluctuations to affect the inflation rates. It also demonstrates that the real estate prices in the current year will influence its in the following year and that real estate prices contain valuable information for forecasting inflation. The delay in the influence of real estate prices on the inflation rates is presumed to result from the lengthy construction cycle of real estate.

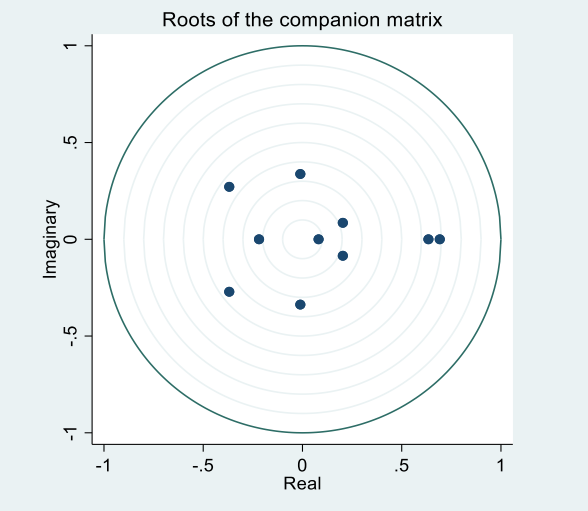

Figure 3. Stationarity test results on the interaction between real estate prices and inflation in China

2.2. The Interaction Mechanism between Real Estate Prices and Inflation in the U.S.

For the U.S., similarly, a descriptive statistical analysis was performed on the variables. The results are shown in the Table 4. Subsequently, a stationarity test for the variables was conducted. The results are presented in the Table 5. After the first-order stationarity of all variables was confirmed, the

optimal lag order was determined to be 2 according to the AIC criterion. Consequently, a VAR model with a two-period lag was developed. The regression results of the model are presented in Table 6.

The real estate price index lagged by one period is positively associated with inflation rates, with a coefficient of 0.043. The real estate price index lagged by two periods also positively influences the inflation rates, with a coefficient of 0.057. While the influence of the lagged real estate price index on the inflation rates is not significant, it is stronger when lagged by two periods. This observation further suggests a time delay for real estate price index changes affecting inflation rates. The impact of inflation rates lagged by one period on real estate prices is positive, with a coefficient of 0.036, whereas the impact of inflation rates lagged by two periods on real estate prices is negative, with a coefficient of -0.217. Finally, two stationarity tests proved that the inflation rates influence the real estate price index and vice versa. The test results are shown in Fig. 4 and Fig. 5.

Table 4. Descriptive statistics results for data from the U.S.

Variable	N	Mean	Min	Max	SD
Price	203	245.570	177.110	416.260	67.397
CPI	205	246.063	201.800	307.79	26.515
usdrmb	205	6.683	6.104	7.820	0.391
interestrate	205	1.375	0.084	5.500	1.704
M2	205	6.873	-4.527	26.890	5.388

Table 5. Stationarity test results for data from the U.S.

	ADF test value	P value	Stable or not
Price	-3.943	0.0017	Stable
CPI	-7.330	0.000	Stable
usdrmb	-8.344	0.000	Stable
interestrate	-10.551	0.000	Stable
M2	-6.638	0.000	Stable

Table 6. The correlation between the real estate price index and CPI in the U.S.

	Price	CPI
L.Price	0.689*** (9.86)	0.043 (0.70)
L2.Price	0.245*** (3.44)	0.057 (0.90)
L.CPI	0.036 (0.45)	0.558*** (7.81)
L2.CPI	-0.217*** (-2.60)	-0.134* (-1.82)

Note: *, *** represents for p<0.05, 0.001

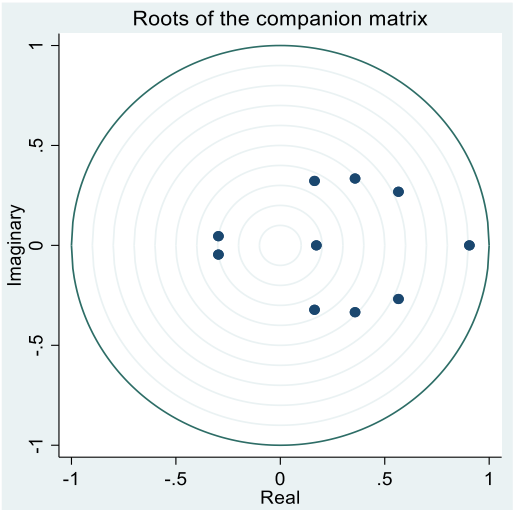

Figure 4. Stationarity test results for the effect of inflation rates on the real estate price index

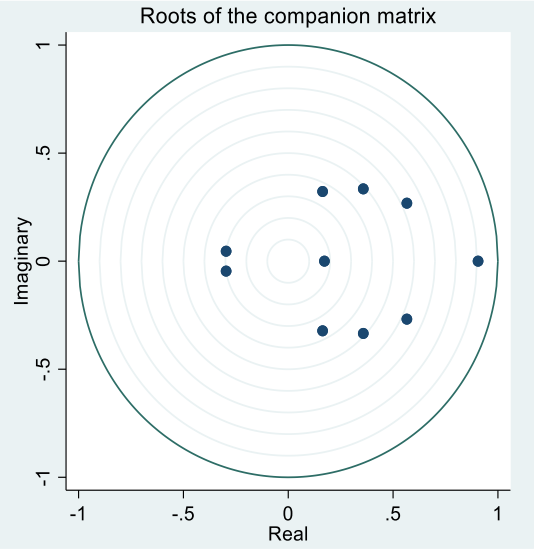

Figure 5. Stationarity test results for the effect of real estate price index on inflation rates

The comparative analysis reveals that real estate prices positively influence the inflation rates in both China and the U.S., and such influence requires a certain amount of conduction time. During the initial phase, the influence of real estate prices on the inflation rate is more significant in the U.S. than in China. It implies that in the U.S., where the financial and real estate industries exhibit a higher degree of market orientation, fluctuations in real estate prices have a greater impact on inflation. Afterward, the effect of real estate price fluctuations on inflation increased more substantially in China than in the U.S., possibly due to the higher endogeneity of money and the more prominent wealth effect in China. Moreover, the Chinese tradition of buying a house as a prerequisite for marriage and the historical prevalence of property speculation mirror China's large housing market. These phenomena also demonstrate Chinese individuals' increased focus on the economic information contained in housing price fluctuations and their readiness to adjust their spending habits accordingly. In China, the impact of inflation on real estate prices is negative, whereas in the U.S., it transitions from positive to negative.

3. Recommendations and Suggestions

Based on the results of the above analyses, the following recommendations are proposed. Fluctuations in real estate prices substantially influence inflation and offer some insight into its future changes. So, it is advisable to integrate real estate prices into the inflation rate assessment framework, analyze the future trajectory of the inflation rate by monitoring real estate price fluctuations, and thus effectively manage inflation. In addition, real estate price fluctuations can be included in the key considerations for developing monetary policy. It is important to strengthen real estate market monitoring, ensure information disclosure, develop suitable monetary policies, and enhance policy effectiveness. Besides, macroeconomic regulation and control should be enhanced. At the national level, currency can be withdrawn through open market operations to decrease the circulating money supply. The money supply can be indirectly regulated by adjusting the reserve requirement and rediscounting policy to impact financial institutions' ability to provide credit. Selective monetary policy tools like real estate credit control and consumer credit control can assist in regulation and control. Furthermore, innovative monetary policy tools such as standing lending facilities can also assist in regulatory efforts by the government. Last but not least, it is advised to uphold the marketization of interest rates and incentivize financial institutions to offer diversified financial products to cater to the public's need for wealth preservation and growth. When loan interest rates are primarily determined by the market, it is recommended that deposit rates be appropriately floated to progressively shift the anticipation of interest rate increases toward market-based pricing. The

financial and monetary systems can be stabilized through the marketization of interest rates to achieve a rational allocation of resources and stable economic growth.

4. Conclusion

To sum up, there is an intrinsic interactive correlation between real estate prices and inflation, with a mutually positive effect between the two according to the analysis. However, the specific intensity of the effect is contingent upon macro-level factors such as the capital market environments and national development levels of various countries, necessitating a detailed analysis of specific issues. This study suggests that real estate prices could serve as one of the indicators for monitoring the inflation rate. The specific calculation method, as well as the weight of real estate prices in the formula for measuring the inflation rate, has not yet been derived and can be explored in subsequent research. Furthermore, the subsequent research will also delve into the different scenarios in which major economic variables affect inflation by influencing real estate price fluctuations, focusing on their differences. The empirical analysis in this paper provides a deeper understanding of the extent of the interaction between inflation rates and real estate prices in diverse economic environments, offering a theoretical basis for macroeconomic policy formulation, inflation rate monitoring, and financial and economic market regulation.

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