ГАЛУЗЕВА ЕКОНОМІКА

UDC 332.1:338.2:005.21
JEL Classification: E52, R31, C32, E44
DOI: 10.20535/2307-5651.33.2025.335866

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MONETARY POLICY AND MACROECONOMIC DETERMINANTS OF THE REAL ESTATE MARKET: A VAR APPROACH

МОНЕТАРНА ПОЛІТИКА ТА МАКРОЕКОНОМІЧНІ ДЕТЕРМІНАНТИ РИНКУ НЕРУХОМОСТІ: ПІДХІД VAR

In 2024, the Chinese government aimed to optimize real estate policies to reduce sector risks. The State Council emphasized ensuring timely building deliveries and improving the housing supply system. To assess the effectiveness of these policies, this study analyzed time series data from 2006 to 2023, including the Chinese Consumer Price Index (CPI), per capita disposable income, household leverage ratio, M2 money supply (M2), loan interest rates, and real estate prices. Utilizing the Vector Auto-Regression (VAR) model. Key findings include: increased M2 money supply can lower housing prices initially but raises them in the long term; interest rate policies mainly impact the short and medium terms; per capita disposable income positively affects prices short-term, but may have a negative long-term impact; a higher household leverage ratio boosts prices short-term, requiring government controls to avoid a housing bubble; the CPI influences real estate prices cyclically, showing initial rises followed by declines, then stabilization.

Keywords: *monetary policy, household leverage ratio, CPI, per capita disposable income, real estate prices, Impulse response, VAR model.*

У 2024 році у звіті про роботу уряду Китаю було запропоновано оптимізувати політику в сфері нерухомості з метою зменшення ризиків у цьому секторі шляхом усунення як симптомів, так і першопричин. На засіданні Державної ради було підкреслено важливість забезпечення здачі будівель в експлуатацію, захисту засобів до існування населення та підтримання стабільності. Для досягнення цих цілей було закликано прискорити вдосконалення системи постачання житла та провести реформи основних систем, пов'язаних із комерційною нерухомістю. Для оцінки ефективності цих політик у дослідженні було проаналізовано часові ряди з 2006 по 2023 рік, включаючи індекс споживчих цін (CPI) Китаю, рівень наявного доходу на душу населення, коефіцієнт заборгованості домогосподарств, грошову масу M2, відсоткові ставки за кредитами та ціни на нерухомість. Із використанням моделі векторної авторегресії (VAR) було досліджено взаємозв'язки за допомогою функцій імпульсного відгуку для вивчення впливу різних економічних шоків. В результаті встановлено, що по-перше грошово-кредитна політика, яка базується переважно на грошовій масі, суттєво впливає на ціни на нерухомість у короткостроковій перспективі. Зокрема, збільшення грошової маси M2 може спочатку призвести до зниження цін на житло; однак у довгостроковій перспективі цей ефект є позитивним. Натомість політика, що орієнтована на відсоткові ставки, впливає на ринок у коротко- та середньостроковому періодах, але має обмежений довгостроковий ефект. Тому, центральному банку слід комплексно та раціонально використовувати різні інструменти грошово-кредитної політики. По-друге, рівень наявного доходу міського населення позитивно впливає на ціни на нерухомість у короткостроковій перспективі, стимулюючи попит на житло та інвестиції. Проте в довгостроковій перспективі цей вплив має тенденцію до зниження, що свідчить про важливу роль рівня доходів у формуванні цін на житло. По-третє, коефіцієнт заборгованості домогосподарств позитивно впливає на ціни на житло в короткостроковій перспективі. Щоб запобігти надмірному притоку коштів у сектор нерухомості через кредитування населення – що може знизити ліквідність реаль-

ного сектора економіки та створити ризик утворення «бульбашки» на ринку нерухомості – уряду необхідно посилити контроль над рівнем заборгованості домогосподарств. Нарешті, індекс споживчих цін впливає на ціни на житло циклічно: спочатку спричиняє їх зростання, потім – зниження, а згодом стабілізує ціни навколо нульової позначки в довгостроковій перспективі. Це свідчить про те, що коливання цін на нерухомість частково залежать від змін загального рівня цін.

Ключові слова: *монетарна політика, коефіцієнт левериджу домогосподарств, CPI, наявний дохід на душу населення, ціни на нерухомість, імпульсна реакція, модель VAR.*

Problem statement. China's real estate market has driven economic growth for more than 20 years of rapid development, but it has also gradually formed bubbles and hidden systemic financial risks. At present, real estate loans account for a relatively high proportion of commercial bank loans, and real estate is the main collateral. If the housing price fluctuates sharply, it will cause financial risks. To ensure the healthy development of the market, the central bank has continued to introduce regulatory measures. The 2020 Financial Street Forum clearly proposed that "the prudent monetary policy should be more flexible and appropriate", which raised the requirements for macro-control of the real estate market. In 2023, when the economy recovered after the epidemic, the People's Bank of China adhered to a prudent monetary policy and balanced internal and external balance. In 2024, in the face of the downturn in the real estate market, the central bank launched supportive policies, including lowering the down payment ratio, cancelling the lower limit of mortgage interest rates, and lowering the interest rate of provident fund loans.

Monetary policy is one of the important means used by the central bank to regulate the real estate market. The implementation of monetary policy depends on two types of monetary policy tools: quantitative monetary policy tools and price monetary policy tools. Among them, the quantitative monetary policy tool is mainly used to regulate the money supply; that is, the central bank's money supply regulation target is mainly achieved through the adjustment of the open market operation, the rediscount rate, and the statutory deposit reserve ratio. Changes in asset prices will affect the micro economic subject spending cost and income expectations, public expectations is an important factor affecting the stability of the real estate market, abnormal public expectations will lead to the real estate market fluctuations, and the price of monetary policy tools by affecting the asset prices, thereby allowing the individual macroeconomic control signals, including interest rate policy and exchange rate policy to adjust the behaviour of monetary policy tools, so the price of monetary policy implementation focuses on affecting the asset prices, public expectations and microeconomic subject behaviour, indirect macro-control goals.

State of the Art. Garriga and Hedlund (2020) think that low interest rate policies accelerate the recovery in housing and consumption. Zhao, Y. (2020) argued that income-stable homeowners may benefit more from low interest rates, which also pushed up house prices. Miles and Monro (2021) proved that the rise in UK house prices relative to income between 1985 and 2018 may have accounted for the sharp decline in real risk-free interest rates during that period. Hoesli and Malle (2022) believe that the lack of a negative impact on housing prices is largely due to the low interest rate environment for housing prices. Howard and Liebersohn (2023) found that low interest rates make house prices more volatile. The loan interest rate has become the main factor in real estate price fluctuation. Yiu, C. Y. (2023) has used the two global interest rate shocks as quasi-experiments to test the impact and causality of interest rates on housing prices. Amaral et al. (2024) proposed that a uniform decline in the actual risk-free interest rate may have a heterogeneous spatial impact on home values.

According to Duan et al. (2021), house prices may rise along with the money supply, which leads to further changes in house prices. Bahmani-Oskooee et al. (2023) found that there is a complex link between the money supply and house prices. Wang et al. (2020) state that the money supply leads to house prices to rise, fluctuate, and eventually stabilize. Akpolat, A.G. (2024) believes that the money supply can be considered as one of the most effective macroeconomic factors affecting housing prices. Zhang et al. (2023) think that the money supply has the greatest impact on house prices.

Xiong et al. (2021) argue that per capita disposable income also had an impact on the demand for commodity housing. Yang and Pan (2020) found that high income had a positive price effect on housing. Pennington, K. (2021) proposed that high-income newcomers have pushed up housing prices. Zhang Y. (2020) found a significant positive association between house prices and income. Gan et al. (2021) proved that the influence of public service level on urban housing prices varies with the per capita disposable income of urban residents, showing an inverted U-shaped curve. According to Liu, G. (2022), there was a significant positive correlation between the per capita disposable income and the real estate price. The higher the level of the per capita disposable income of urban residents, the higher the urban real estate price, and the better the urban real estate market. Li et al. (2022) think that the per capita disposable income of urban residents and the consumer price index of urban residents affect housing prices. The increase in per capita disposable income of urban residents led to an increase in housing funds, while people raised their housing standards and stimulated the demand for real estate, thus contributing to the rise in housing prices.

Zulkifli et al. (2022) believe that the Consumer Price Index (CPI) is included as a determinant of house prices because it is a component of the consumer price index. Wolski, R. (2023) studied the relationship between residential real estate prices and expected CPI inflation indicators. Ding et al. (2023) believe that China's CPI calculation method should take into account the rise of housing prices, so as to more accurately reflect China's actual inflation level. The study by Abasimi et al. (2023) concludes that both the consumer price index (CPI) and purchasing power parity have a significant positive impact on house prices. Therefore, it is essential for the government to maintain stability in these two indicators to help keep house prices stable. Additionally, Akpolat (2024) raises an important research question regarding whether dividing the construction cost index by the CPI will affect housing supply and prices.

Xie and Li (2023) found that rapidly rising housing prices significantly increase household leverage ratios. Stabilizing house prices is a key factor in reducing leverage. The real estate market should regulate supply and demand. Kohler et al. (2023) simulate the expected consumption of a family, which influences credit demand. However, credit supply is determined by the family's leverage ratio, dependent on housing prices. Schembri, L. L. (2024) found that household leverage rises with rising housing prices as households take advantage of low post-crisis interest rates. Crossley et al. (2024) found that households with leverage 1 unit higher than the average

level rose by 10% above the average leverage level, increasing residential investment by 8.8%. Li, B. (2024) showed that, induced by credit expansion, this household leverage cycle leads to stronger circular differences in housing prices, housing construction, and housing-related industries in areas with high net export growth.

Article goals. Currently, the central government regulates the real estate market using both quantitative and price-related monetary policy tools, although quantitative monetary policy tools are still the primary instruments within this framework. However, due to the unique characteristics of the real estate market, current monetary policy struggles to effectively control it. For instance, when the central bank raises mortgage interest rates to reduce the demand for loans among home buyers, these buyers and real estate companies often find ways to secure financing through alternative channels. As a result, by the first half of 2020, demand in the real estate market remained strong, perpetually driving up housing prices.

By the end of 2020, various issues in the real estate market became apparent, highlighting the necessity for a thorough evaluation of monetary policy's effectiveness in regulating this sector. It is essential to consider how monetary policy impacts real estate market prices over different periods and to analyse the effects of various monetary policies on housing prices.

This study utilizes the VAR model to analyse the annual data of China's real estate market, focusing on factors such as per capita disposable income, the consumer price index, household leverage ratios, and changes in monetary policy. The aim is to capture the dynamic trends in real estate market prices. The findings contribute to the theoretical understanding of how monetary policy tools can be implemented and adjusted to control real estate prices. This research highlights the importance of using flexible monetary policy tools to enhance the effectiveness of regulations in the real estate market, making it practically significant.

Main Results. This study gathers relevant data on the annual interest rates for RMB loans from the central bank from 2006 to 2023. It also includes information on the money supply (M2), per capita disposable income, the household leverage ratio, the consumer price index (CPI), and other pertinent data from the National Bureau of Statistics up to 2023. A descriptive statistical analysis of these variables is presented in Table 1:

Housing prices and macroeconomic fundamental indicators often interact and are highly endogenous. To address this, we can use instrumental variables in place of endogenous variables, while the VAR (Vector Autoregression) model can help identify the long-term equilibrium relationships between these variables, thereby alleviating the issues related to endogeneity. Additionally, the VAR model is not restricted by a specific economic structure, which allows us to directly measure the interactions between changes in housing prices and macroeconomic fundamental variables.

Since the national average housing price (NAHP), loan interest rate (LR), M2 money supply (M2), urban residents' per capita disposable income (INC), household leverage ratio (CHLR), and consumer price index (CPI) exhibit instability, they may lead to heteroscedasticity in the time series data. To enhance the robustness and effectiveness of the analysis, we first applied differentiation to the variables NAHP, LR, and CHLR, resulting in DNAHP, DLR, and DCHLR, respectively. Additionally, we logged the M2 and INC variables, yielding lnM2 and lnINC.

1. *Stability test.* Before analysing the relationship between real estate price and each variable, it is necessary to test the time series of each variable. Using ADF test, the stability results obtained are shown in Table 2.

As shown in Table 2, for DNAHP, the t-statistic for this time series data ADF test is -3.072 with a p-value of 0.029,1%, 5%, and 10% cut-offs of -4.223, -3.189, and -2.730, respectively. P=0.029 <0.05, with above 95% confidence to reject the null hypothesis, at which time the sequence is stable.

As seen in Table 2, for the DLR, the t-statistic for this time series data ADF test was -5.126 with a p-value of 0.000, with 1%, 5%, and 10% thresholds of -4.138, -3.155, and -2.714, respectively. P = 0.000 <0.01, with above 99% confidence to reject the null hypothesis, at which time the sequence is stable.

Table 1

Descriptive statistical analysis table of the variables

Variable Quantity	National average house price	Loan interest rate	M2 Money Supply	Per capita disposable income of urban residents	Household leverage ratio	Consumer price index
Average	6940.78	5.64%	1349157.49	30863.65	40.17%	102.39
Median	6558	5.59%	1254200.56	30317.15	37.6%	102.05
Maximum	10437	7.49%	2845576.92	51821	63.5%	105.4
Minimum	3367	4.24%	346000	11759	17.5%	99.3
Standard Deviation	2362.1	0.99%	777436.56	12863.01	16.64%	1.68
Observed Value	18	18	18	18	18	18

Source: authors' elaboration

Table 2

Results of ADF single root test

Variable	Differential order	t	p	Critical value		
				1%	5%	10%
DNAHP	0	-3.072	0.029	-4.223	-3.189	-2.73
DLR	0	-5.126	0	-4.138	-3.155	-2.714
lnM2	0	-4.065	0.001	-3.964	-3.085	-2.682
lnINC	0	-9.947	0	-4.332	-3.233	-2.749
DCHLR	0	-4.626	0	-4.332	-3.233	-2.749
CPI	0	-3.686	0.004	-3.924	-3.068	-2.674

Source: authors' elaboration

From Table 2, for lnM 2, the t-statistic for this time series data ADF test is -4.065 with a p-value of 0.001,1%, 5%, and 10% with -3.964, -3.085, and -2.682, respectively. P=0.001 <0.01, with above 99% confidence to reject the null hypothesis, at which time the sequence is stable.

Visible in Table 2, for the lnINC, the t-statistic of this time series data ADF test is -9.947 with a p-value of 0.000,1%, 5%, and 10% cutoffs of -4.332, -3.233, and -2.749, respectively. P = 0.000 <0.01, with above 99% confidence to reject the null hypothesis, at which time the sequence is stable.

As shown in Table 2, for the DCHLR, the t-statistic for this time series data ADF test was -4.626 with a p-value of 0.000, with 1%, 5%, and 10% cut-offs of -4.332, -3.233 and -2.749, respectively. P = 0.000 <0.01, with above 99% confidence to reject the null hypothesis, at which time the sequence is stable.

As shown in Table 2, for the CPI, the t-statistic for this time-series data ADF test is -3.686 with a p-value of 0.004, with 1%, 5%, and 10% thresholds with -3.924, -3.068, and -2.674, respectively. P = 0.004 <0.01, with above 99% confidence to reject the null hypothesis, at which time the sequence is stable.

2. *Select the lag order.* The lag order of a VAR (Vector Autoregression) model is closely related to the degrees of freedom in the model's time series data. As the lag order increases, the degrees of freedom decrease correspondingly. The challenge lies in determining the appropriate lag order for the model. A sufficiently large lag order can allow for a more comprehensive representation of the model's characteristics. However, if the lag order is excessively large, it can complicate the parameter estimates, reducing their accuracy. Therefore, when determining the lag order, it's important to strike a balance between including enough lag terms and maintaining an adequate number of degrees of freedom. Table 3 presents the results of the VAR model.

As can be seen from Table 3, order 1 should be applied for the AIC criterion, 1 for the BIC criterion, 1 for the FPE criterion and 1 for the HQIC criterion. The minimum value of the four index values is order 1, so the VAR model is finally constructed based on order 1.

Table 3

Results of the VAR model lag-order test

Order	AIC	BIC	FPE	HQIC
0	-17.225	-16.935	0	-17.21
1	-28.013*	-25.985*	0.000*	-27.910*

*Note: * represents the fixed order of the term*

Source: authors' elaboration

3. *The VAR model stability test.* The VAR model results are shown in Table 4. Using the AR test, if the inverted values of the feature roots of the model fall within the unit circle, it indicates that the VAR model is stable; if they do not, the model is considered unstable. Figure 1 demonstrates that the inverse of all feature roots of the VAR model lies within the unit circle, confirming the stability of the established VAR model. Additionally, as shown in Table 5, the residual test of the differenced term was conducted, and the results indicate that the VAR model is effective.

After constructing the VAR model, the stability of the model can be assessed using the AR root diagram. If all the eigenvalues lie within the unit circle – meaning all the points are contained within the circle – it indicates that the model is stable. The AR feature root diagram shows that all the root values fall within the unit circle, which suggests that the constructed VAR model is stable.

Table 5 indicates that the residual sequence accepts the null hypothesis (p = 0.476 > 0.05), which suggests that the VAR model residuals meet the normality assumption.

4. *Impulse response analysis.* The impulse response function illustrates the short-term dynamic effects of a one-unit standard deviation impact from one variable on other variables. Following this principle, the generalized impulse response function is employed to analyse how these variables respond to impulses. The results of the impact of various variables on real estate prices are presented in Figures 2 through 7.

Table 4

Results of the VAR model

	DNAHP	DLR	lnM2	lnINC	DCHLR	CPI
Constant	-11056.745 (-1.063)	0.097 (1.240)	0.383 (0.771)	0.901* (2.385)	-0.855 (-1.430)	188.499** (9.537)
L1 DNAHP	-0.211 (-0.396)	0.000 (0.254)	-0.000 (-0.364)	-0.000 (-0.513)	0.000 (1.297)	0.001 (1.211)
L1 DLR	-37596.694 (-1.261)	0.172 (0.769)	-4.065** (-2.856)	2.486* (2.296)	-4.516** (-2.633)	319.824** (5.643)
L1 lnM2	1046.566 (0.269)	0.051 (1.750)	1.000** (5.373)	0.295* (2.083)	0.023 (0.103)	0.874 (0.118)
L1 lnINC	-1387.570 (-0.251)	-0.074 (-1.779)	-0.077 (-0.294)	0.513* (2.556)	-0.020 (-0.062)	-3.707 (-0.353)
L1 DCHLR	4204.162 (0.489)	0.035 (0.543)	-0.560 (-1.363)	0.273 (0.875)	-0.343 (-0.694)	5.195 (0.318)
L1 CPI	107.495 (1.108)	-0.001 (-0.754)	0.005 (1.171)	0.001 (0.175)	0.007 (1.313)	-0.590** (-3.202)
nobs	16					
llf	129.889					
AIC	-10.986					
SC	-8.958					
HQI	-10.882					

** p<0.05 ** p<0.01 Inside the parenthesis is the t-value.*

Source: authors' elaboration

Table 5

Residuals for normality test

Hypothesis H0	χ2	df	p	5% critical value
The residue sequences were normally distributed	11.63	12	0.476	21.026

Source: authors' elaboration

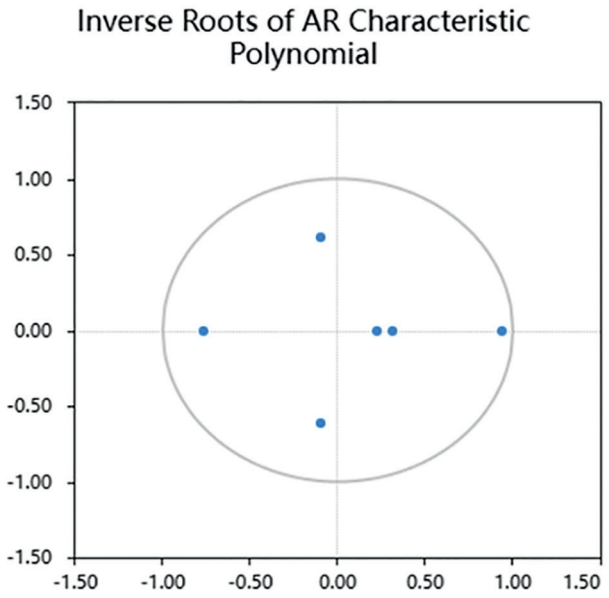

Figure 1. Lag-wise structural stability test of the VAR model

Source: authors' elaboration

As illustrated in Figure 2, the impact response of real estate prices to their own fluctuations is evident. Initially, after a change in real estate prices, there is a significant increase, which represents the first phase. This is followed by a decline. In the second phase, there is a slight rebound, but this is again followed by a decline in the third phase. The fourth phase experiences another minor rebound, while the fifth phase sees a continued decline, ultimately reaching the lowest point by the eleventh phase. Eventually, the real estate prices stabilize. It can be concluded that the initial impact on real estate prices is substantial; however, over time, they gradually stabilize and fluctuate within a range of positive and negative levels.

From Figure 3, interest rates significantly affect real estate prices. Initially, the rise in interest rates has a strong impact, particularly in the first phase. However, in the second and third phases, this impact begins to decline. By the fourth and fifth phases, a recovery starts, followed by fluctuations around zero, eventually leading to stabilization. Overall, it can be concluded that the effect of interest rates on real estate prices is most pronounced at the beginning and then gradually stabilizes. Generally, higher loan interest rates have a negative effect on real estate prices.

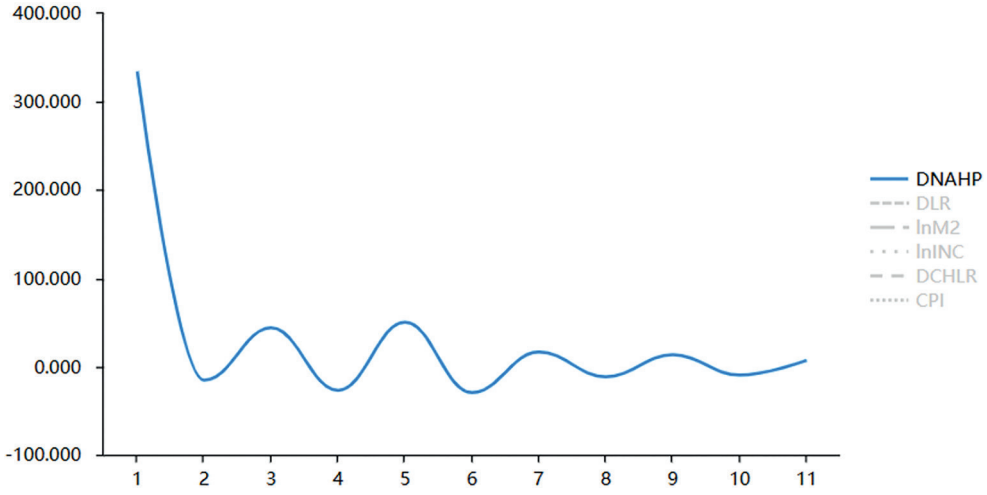

Figure 2. Orthogonal Impulse Response from DNAHP

Source: authors' elaboration

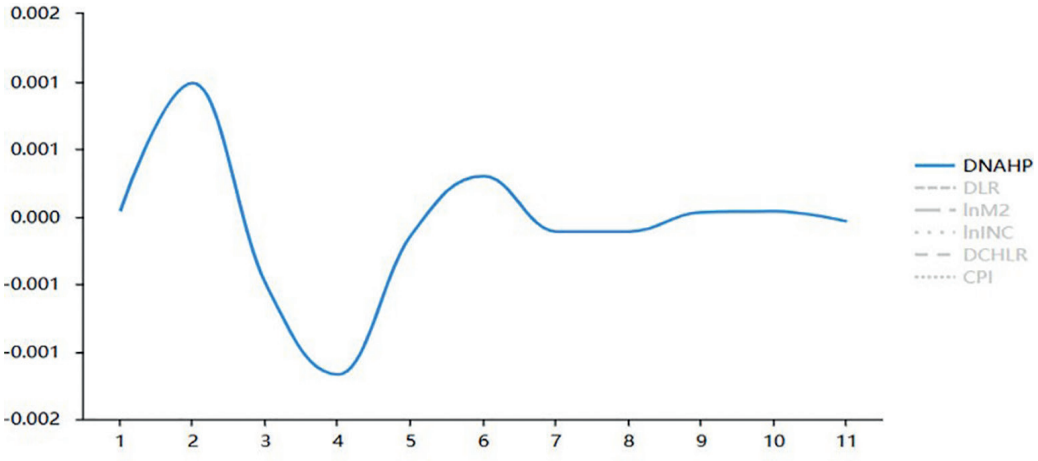

Figure 3. Orthogonal Impulse Response from DLR

Source: authors' elaboration

As shown in Figure 4, the influence of the money supply (M2) on real estate prices initially decreased from the beginning to the end of the second phase. It began to rise again toward the end of the fifth phase and subsequently entered a period of steady growth.

The impact of urban residents' per capita disposable income on real estate prices is illustrated in Figure 5. Initially, as per capita income increases, housing prices rise during the first and second phases. However, in the third phase, the prices begin to decline. They then rise again during the fifth and sixth phases, drop in the seventh phase, and finally stabilize with a steady increase. This pattern indicates that the influence of urban residents' per capita disposable income on real estate prices is significant at the outset but becomes more stable over time.

As illustrated in Figure 6, the impact of the residential leverage ratio on real estate prices shows a declining trend during the first and second phases. It then begins to rise in the third phase, decreases again in the fourth, fifth, and sixth phases, before experiencing another increase in the seventh phase, ultimately stabilizing. This pattern suggests that the effect of the residential leverage ratio on real estate prices is significant at the

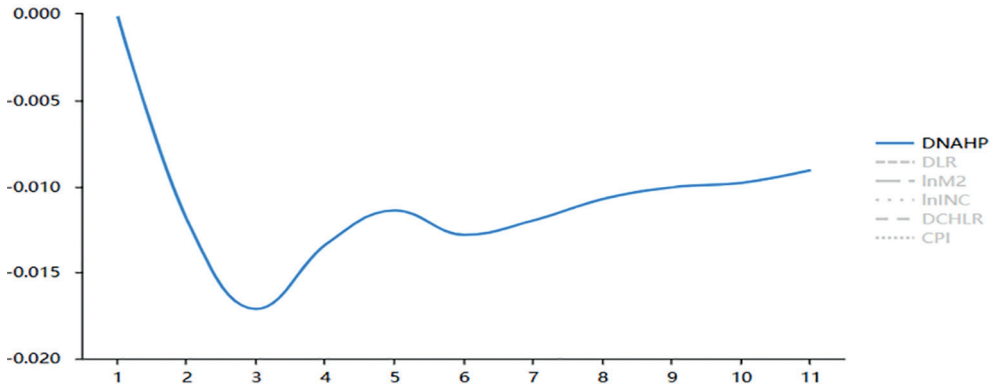

Figure 4. Orthogonal Impulse Response from InM2

Source: authors' elaboration

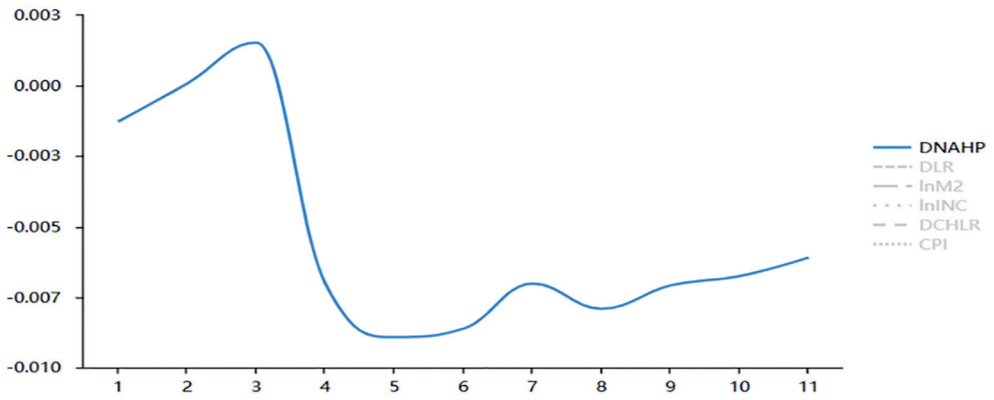

Figure 5. Orthogonal Impulse Response from InINC

Source: authors' elaboration

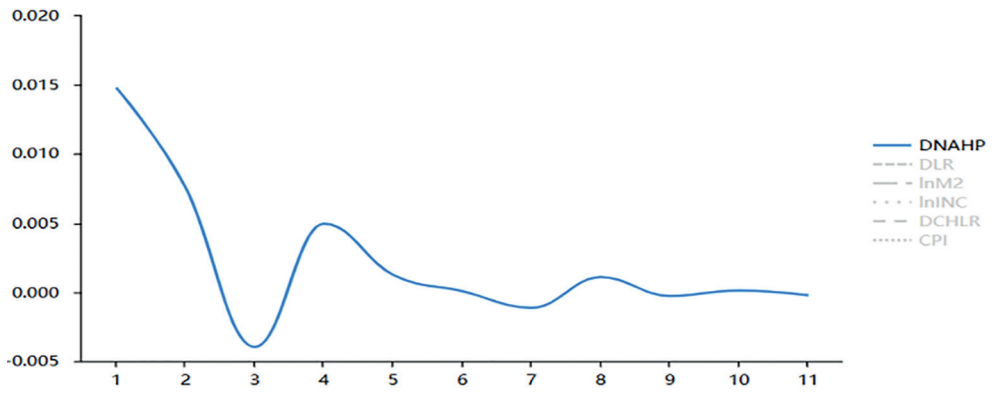

Figure 6. Orthogonal Impulse Response from DCHLR

Source: authors' elaboration

outset but gradually stabilizes over time. As household leverage ratios increase each year and loan interest rates decline, substantial amounts of money flow into the real estate market, contributing to a housing price bubble. Additionally, this trend raises the financing costs for the real economy, affecting its liquidity and posing potential risks to the stability of the financial system.

As can be seen in Figure 7, the impact of the consumer price index (CPI) on real estate prices first increased during the initial phase. It then began to decline during the second, third, and fourth phases. In the fifth phase, the impact started to rise again, but in the sixth phase, it decreased once more and eventually stabilized around zero. Overall, it can be concluded that the consumer price index has a significant effect on real estate prices.

5. *Variance decomposition.* To investigate the impact of loan interest rates, M2 money supply, per capita disposable income of urban residents, household leverage ratios, and consumer price indexes on housing prices, we decompose the variance of the impulse response function. We consider both the short-term and long-term effects of these variables on housing prices. A total of 10 forecast periods were chosen for the analysis, and the results of the impact assessment are presented in Table 6 and Figure 8.

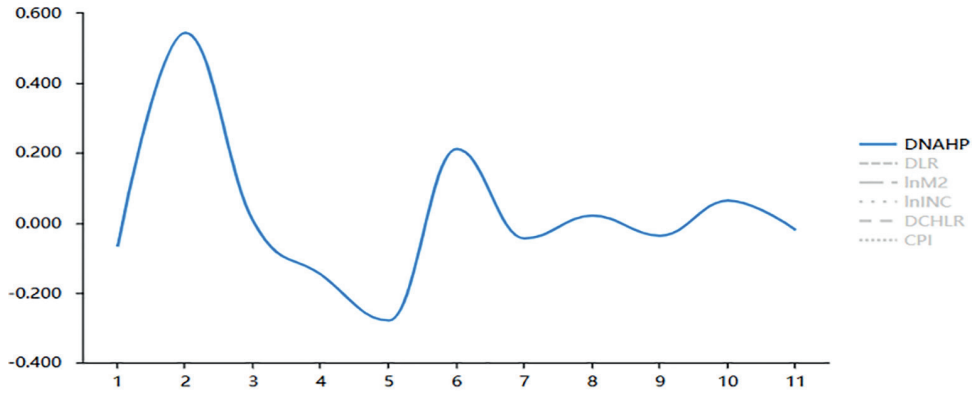

Figure 7. Orthogonal Impulse Response from CPI

Source: authors' elaboration

Table 6

Variance Decomposition-DNAHP

Order period	Variance Decomposition of S.E.	DNAHP(%)	DLR(%)	lnM2(%)	lnINC(%)	DCHLR(%)	CPI(%)
1	334.544	100	0	0	0	0	0
2	360.357	86.374	3.578	0.154	5.578	3.2	1.116
3	371.434	82.701	3.434	0.188	8.015	4.531	1.132
4	376.391	81.051	3.469	0.189	8.54	5.639	1.111
5	380.697	80.975	3.4	0.196	8.493	5.842	1.094
6	382.895	80.651	3.422	0.2	8.638	5.979	1.111
7	384.054	80.353	3.42	0.199	8.81	6.1	1.12
8	384.656	80.193	3.409	0.198	8.888	6.192	1.12
9	385.056	80.145	3.402	0.198	8.905	6.23	1.119
10	385.292	80.111	3.4	0.199	8.92	6.25	1.12

Source: authors' elaboration

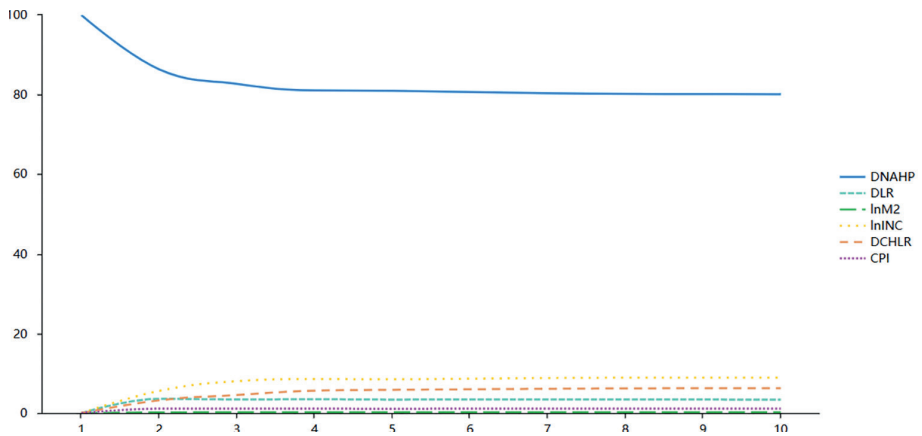

Figure 8. Variance decomposition

Source: authors' elaboration

In analysing the variance decomposition over the 10 forecast periods, it is evident that housing price fluctuations are primarily influenced by their own past values and household disposable income. The household leverage ratio and loan interest rates also have significant, albeit lesser, effects. In contrast, the M2 money supply and consumer price index exert a minimal impact on housing prices.

Conclusions. This paper compiles and analyses the economic statistics of annual interest rates for RMB loans, M2 money supply, per capita disposable income, household leverage ratio, consumer price index, and real estate prices in China from 2006 to 2023. Using a VAR model, the study presents descriptive statistical results and empirical research findings. From the data between 2006 and 2023, it is observed that the Chinese household leverage ratio increased from approximately 17.5% to 63.5%, marking a rise of 30.00% over 10 years. For comparison, Japan's residential leverage ratio was 68.3% in 1990 and 44.4% in 1980, a 23.9% increase over a decade. Before the subprime mortgage crisis, the leverage ratio of U.S. residents reached 98.7%, growing by 32.7% in the same time frame. Notably, China's household leverage ratio grew at a faster pace than Japan's before the crisis and slightly lower than that of the United States, highlighting a significant concern for government authorities. Additionally, China's money supply surged from 34.6 trillion in 2006 to 284.56 trillion in 2023, with an average annual growth rate of 40.15%, indicating relatively rapid money growth. Conversely, the interest rate decreased from 6.62% to 4.24%, demonstrating relative stability.

The impulse response analysis reveals relationships among monetary policy, per capita disposable income of urban residents, household leverage ratio, price index, and fluctuations in housing prices. Specifically, monetary policy appears to influence housing price fluctuations; quantitative monetary policy is negatively correlated with these fluctuations, with the impact of M2 money supply on housing prices initially exceeding -0.015 and consistently growing to around -0.01, indicating a positive trend over time. The price policy also demonstrates an overall negative correlation, with the effect of loan rates on housing prices falling from 0.01 to -0.01, stabilizing around zero thereafter. Per capita disposable income for urban residents significantly affects housing prices, initially showing a positive impact of nearly 0.03 before dropping to -0.08 in the long term, suggesting a negative correlation. This indicates that urban residents' income levels are crucial in determining housing prices, whether in meeting consumption demands or stimulating investment demand in housing. The relationship between the household leverage ratio and housing prices shows a decreasing trend, followed by an increase, with the overall impact shifting from suppressive to a driving force.

Furthermore, the price index generally presents a positive correlation with real estate prices, exhibiting a pattern of initial growth followed by a decline, eventually stabilizing around zero. This suggests that fluctuations in the price level have a short-term, cyclical impact on real estate prices.

Variance decomposition analysis demonstrates that housing price fluctuations are primarily influenced by the residents' disposable income, accounting for 80% of the explanation, followed by 8.5% attributed to household leverage ratios and loan interest rates. In contrast, the impact of M2 money supply and the consumer price index (CPI) on housing prices is relatively low.

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Стаття надійшла до редакції 05.06.2025
Стаття опублікована 30.06.2025