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Interest Rate Marketization and Asset Prices Transmission Channel: Dynamic Impacts on the Chinese Economy

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Abstract

This empirical study uses the TVP-VAR model to analyze the dynamic impacts of asset price transmission channels (stock price and real estate price channels) on China's macroeconomic indicators (GDP and CPI) at three stages of interest rate marketization: the deepening stage (1996–2003), the improvement stage (2004–2015), and the comprehensive promotion stage (2016–2024). It explores how M2 influences these asset price channels and their effects on

GDP and CPI. The results show that M2 has a stable negative impact on the stock price channel, while its short-term impact on the real estate price channel is positive and becomes consistently positive in the medium and long term. The effects of both channels on GDP are complex and unstable across different time spans: the stock price channel exhibits high volatility in its impact on CPI, whereas the real estate price channel has a strong short-term positive impact that weakens in the long term. The study connects its findings to theoretical frameworks such as Tobin's Q theory and Modigliani's wealth effect, providing insights for monetary policy formulation, financial market regulation, and investor decision-making.

Keywords: Interest rate marketization, Asset price channels, TVP-VAR model, Macroeconomic

1. Introduction

In an era of global financial liberalization, interest rate marketization has emerged as a cornerstone of economic reform, reshaping monetary policy transmission mechanisms and asset market dynamics. For China, a key emerging market undergoing profound financial transformation, understanding how interest rate marketization influences asset price transmission channels—such as stock and real estate prices—and their subsequent impacts on macroeconomic stability is critical. This study employs a time-varying parameter vector autoregressive (TVP-VAR) model to analyze dynamic linkages among interest rate marketization, asset price transmission channels, and macroeconomic variables over three distinct policy stages (1996–2024), integrating theoretical frameworks such as Tobin's Q theory and Modigliani's wealth effect with China's institutional context.

China's interest rate marketization process began in the mid-1990s and has gone through the deepening stage (1996-2003), the improvement stage (2004-2015), and the comprehensive promotion stage (2016-2024). The policy priorities and market reactions have been evolving continuously across these stages. Tobin's Q theory (1969) posits that rising stock prices stimulate investment through the ratio of market value to capital replacement cost. Modigliani's wealth effect theory (Modigliani & Miller, 1958) emphasizes the role of real estate in driving consumption. However, in China, these theoretical expectations are complicated by a unique institutional environment, such as policy-driven stock market fluctuations (Dong & Hu, 2018) and the dominant position of the real estate market in household asset allocation (Iacoviello, 2005).

Against this backdrop, this study addresses three interconnected research questions: how has the impact of broad money supply (M2) on stock prices (ASC) and real estate prices (AUH) evolved across marketization stages? What is the time-varying effects of ASC and AUH on macroeconomic outcomes (GDP and CPI)? To what extent do stage-specific policy environments shape the efficiency of asset price transmission? By analyzing monthly data (January 1996–September 2024) with the TVP-VAR model, this research captures short-term, medium-term, and long-term dynamics while accounting for structural shifts in China's financial system, such as interbank rate liberalization in the 1990s and benchmark rate reforms (e.g., LPR) in recent years.

The TVP-VAR framework allows for flexible modeling of parameter changes over time, enabling to distinguish transmission patterns in the deepening stage (characterized by partial marketization), the improvement stage (marked by gradual rate deregulation), and the comprehensive promotion stage (focused on market-based pricing mechanisms). By bridging theoretical expectations with empirical evidence, this study aims to reveal non-linear, stage-dependent relationships that static models overlook, contributing to debates on monetary policy effectiveness in emerging markets and providing insights for China's ongoing financial reforms.

The remainder of the study proceeds as follows: Section 2 reviews the literature on asset price channels and interest rate marketization; Section 3 details the methodology, data, and stage classification; Section 4 presents dynamic impulse response results; and Section 5 discusses policy implications and concludes, emphasizing the importance of stage-specific monetary strategies in optimizing asset price transmission and macroeconomic stability.

2. Literature Review

China's interest rate marketization reform, launched in the mid-1990s, has reshaped the landscape of monetary policy transmission, with asset price channels (stock and real estate markets) emerging as critical yet controversial pathways. Existing research on this topic has yielded both consensus and conflicting conclusions, primarily due to methodological limitations and divergent perspectives on institutional impacts.

First，Theoretical frameworks like Tobin's Q theory and Modigliani's wealth effect provide a foundation for understanding asset price transmission. Tobin's Q Theory (1969) points out that when asset prices rise and a firm's Q value (the ratio of the firm's market value to the cost of capital replacement) is greater than 1, the firm will increase its investment, expand its production scale, and drive the growth of the real economy. During the boom period of the stock market, the market value of a firm increases due to the rise in stock prices. Since it is less costly compared to building new factories and purchasing new equipment for capital replacement, the firm will be more proactive in making investments, thus promoting the development of related industries. The monetary policy transmission mechanism according to Tobin's Q theory is:

Money supply↑↓→Stock price↑↓→Tobin's Q↑↓→Investment and consumption↑↓→Output↑↓

Another key to the asset price channel is Modigliani's theory of wealth effects (Modigliani & Miller, 1958). The increase in asset prices leads to an increase in the wealth of residents, thereby enhancing their consumption ability and willingness to consume (Mehra, 2001). The transmission mechanism of the wealth effect theory is:

Money supply↑↓→Asset price↑↓→Wealth↑↓→Investment and consumption↑↓ →Output↑↓

However, empirical applications in China reveal complexities. Most studies agree that real estate prices (AUH) act as a dominant channel. Cecchetti (2000) believes that asset prices can be indicators of future developments in output and demand. Changes in equity and bond prices, house prices, credit, and debt may impact inflation and provide crucial information for

central banks. Boivin et al. (2010) regard that asset price transmission channel is mainly stock market and real estate market. Additionally, Iacoviello (2005) provides empirical insights on the importance of housing wealth to consumption decisions in advanced economies. Yi & Wang (2002) research argue that monetary policy has an impact on stock prices, and that investment with economies of scale and increased labor productivity will lower the price level and increase total output in the long run. However, Dong & Hu (2018) point out that at present, the financing scale of China's stock market is small compared with that of developed countries, and the proportion of all stock proceeds in the total capital formation is small, so it is difficult to give full play to Tobin's Q effect, and the housing market is also difficult to play its due transmission role to monetary policy due to factors such as insufficient marketization degree and unreasonable supply structure.

Second, a key point of contention lies in how marketization stages influence transmission efficiency. There exists a complex and close interactive relationship between monetary policy and asset prices. This relationship keeps evolving during the process of interest rate marketization, exerting a profound influence on the asset price transmission channel. McKinnon (1973) argues that due to various restrictions on financial activities in developing countries, strict controls on interest rates and exchange rates distort interest rates and exchange rates, making it impossible to accurately reflect the relationship between money supply and demand, and foreign exchange supply and demand. Yi (2002) suggests that the function of asset price channel must be established on the sound capital market. Adekunle et al. (2013) believes interest rate marketization is considered a crucial component of financial market reforms, as it helps to better leverage the market's role in resource allocation. Liao and Tapsoba (2014) indicates interest rate marketization can helps enhance the effectiveness of monetary policy, making interest rates a more flexible and efficient policy tool. Qian (2017) believes that during the early stage of interest rate regulation, the impact of monetary policy on asset prices was mainly achieved through direct credit control and interest rate adjustment. Poon & Wong (2011) find with the improvement of interest rate liberalization level, monetary policy began to rely more on market-based interest rates as a transmission mechanism. Li et al.(2021) points out that in a high degree of interest rate marketization, the efficiency of monetary policy transmission channel significantly improved, making the implementation of monetary policy more precise and effective.

However, some scholars have negated the role of interest rate marketization in the asset price transmission channel. Liu et al. (2021) argue that the development of interest rate marketization will exacerbate the misallocation of resources. During the process of marketization, if issues such as the imperfection of the financial market and information asymmetry are not effectively addressed, funds may not flow to the most efficient enterprises and projects, but rather to some high-risk or low-efficiency areas. This runs counter to the objectives of monetary policy, which aim to promote the rational allocation of resources and drive economic growth. Lan et al. (2024) have found that interest rate marketization may exacerbate the volatility of the financial market, leading investors to make wrong investment decisions. Similarly, Bell and Quiggin (2006) believes in the process of financial liberalization, interest rates are no longer strictly regulated, and the influence of market

factors on interest rates increases, resulting in more intense fluctuations in interest rates. Such fluctuations will be directly transmitted to the asset market, making the changes in asset prices more frequent and difficult to predict.

The vast majority of existing literature relies on static research methods, neglecting the dynamic interaction between policy stages and transmission mechanisms. By decomposing the period from 1996 to 2024 into three distinct phases and applying the TVP-VAR model, this study addresses two key gaps: first, the failure to quantify stage-specific elasticities (such as the varying impact of M2 on AUH across different stages). Second, there is a lack of comparative analysis between stock and real estate channels within a unified dynamic framework. In doing so, it provides a nuanced understanding of how China's unique reform trajectory has influenced asset price transmission, offering insights overlooked by static models and single-channel studies.

3. Data and Methodology

3.1 Data and Sample

This study selects secondary time series monthly data from the period 1996.01 to 2024.09 to exam the changes arising from the impact under the period of interest rate marketization. Although China started the interest rate marketization reform from 1978, which allowed some independent adjustments of deposit interest rates, overall, the deposit interest rates of Chinese banks also still received relatively strict control, which limited the interest rate formation mechanism and the play of market forces (Wu, 2018). Since 1996, China began a series of interest rate marketization reforms, gradually deregulating bank deposit and loan interest rates. Now, the marketization of interest rates in China is still ongoing. This study aims to explore the role of China's asset price transmission channel on effect of GDP and CPI in different stages of interest rate marketization. So it divides 1996-2024 into three stages: deepening stage (1996-2003), improvement stage (2004-2015), and comprehensive promotion stage (2016-2024).

3.2 Variables Selection

The money supply (M2), is an important indicator of monetary policy, and its explanatory (predictive) power for economic variables is much higher than that of other monetary variables (Sheng & Wu, 2008). The macroeconomic variables selected are the Gross Domestic Product (GDP) and the Consumer Price Index (CPI). The asset price transmission channel is divided into the stock price channel (ASC) and the real estate price channel (AUH). And the Shanghai Composite Index is chosen as the proxy variable for the stock asset price channel (Farag et al., 2015), and the unit price of commercial housing, which refers to the price per unit area, is taken as the representative variable for the real estate price channel (Diewert & Shimizu, 2015).

3.3 Model Selection

According to Korobilis (2013), in the TVP-VAR model treats all variables as endogenous variables and explains the current value by their lagging value. This method is particularly

suitable for dealing with the dynamic relationship between multiple time series variables, capturing their mutual influence and their time-varying characteristics (Wang & Lee, 2022). By applying the TVP-VAR model, it can dynamically track changes in the monetary policy transmission channels under different stages and conditions, revealing the impact of interest rate marketization on the roles of these channels.

The vector of endogenous variables y_t is defined as

$$y_t^{'} = \left[GDP_t,\ CPI_t,\ M2_t, ASC_t,\ AUH\right] \tag{1}$$

Where, the GDP is stand for Gross Domestic Product, CPI is inflation, M2 is monetary supply, ASC is the shanghai composite index, AUH is the unit price of commercial housing.

According to Primiceri (2005), Omori et al. (2007) and Jouchi (2011), the TVP-VAR model is constructed form the basic structural VAR model by allowing the parameters to change over time. This study considers a basic structural VAR model defined as:

$$Ay_t = Fy_{t-1} + \ldots + F_s y_{t-s} + u_t, \qquad t = s+1, \ldots, n. \tag{2}$$

Where y_t is the $k \times 1$ vector of observed variables, and $A, F_{1,\ldots} F_S$ are $k \times k$ matrices of coefficients. The disturbance u_t is a $k \times 1$ structural shock and assume that $u_t \approx N(0, \sum\sum)$, where

$$\sum = \begin{pmatrix} \delta_1 & 0 & \mathrm{L} & 0 \\ 0 & \mathrm{O} & \mathrm{O} & \mathrm{M} \\ \mathrm{M} & \mathrm{O} & \mathrm{O} & 0 \\ 0 & \mathrm{L} & 0 & \delta_k \end{pmatrix} \qquad A = \begin{pmatrix} 1 & 0 & \mathrm{L} & 0 \\ a_{21} & \mathrm{O} & \mathrm{O} & \mathrm{M} \\ \mathrm{M} & \mathrm{O} & \mathrm{O} & 0 \\ a_{k1} & \mathrm{L} & a_{k,k-1} & 1 \end{pmatrix}$$

Rewrite model (1) as the following reduced form VAR model:

$$y_t = B_1 y_t + \cdots + B_s y_{t-s} + A^{-1} \sum \varepsilon_t, \varepsilon_t : N(0, I_k) \tag{3}$$

Where $B_i = A^{-1} F_i$, for $i = I, \mathrm{K}\ s$. Stacking the elements in the rows of the $B_i{}'$ s to form $\beta\left(k^2 s \times 1\ vector\right)$, and defining $X_t = I_k \otimes (\mathrm{y}_{t-1}^{'}, \mathrm{K}, \mathrm{y}_{t-s}^{'})$, where $\otimes$ denotes the Kronecker product, the model can be written as

$$y_t = X_t \beta + A^{-1} \sum \varepsilon_t \tag{4}$$

Now, all parameters in equation (4) are time-invariant. This is extended to the TVP-VAR model by allowing the parameters to vary over time. Consider the stochastic volatility of TVP-VAR model by

$$y_t = X_t\beta_t + A_t^{-1}\Sigma_t\varepsilon_t, \qquad t = s+1,\text{K}\ ,n. \tag{5}$$

Coefficients β_t, and the parameters A_t and Σ_t are all time varying. There are many ways to model the process for these time-varying parameters. According to Primiceri (2005), let $a_t = (a_{21}, a_{31}, a_{32}, a_{41}, \text{L}\ , a_{k,k-1})$ be a stacked vector of the lower-triangular elements in A_t and $h_t = (h_{1t}, \text{K}\ h_{kt})'$ with $h_{jt} = \log\delta_{jt}^2$, for $j = 1,...k$, $t = s+1,\text{K}\ ,n$. Assume that the parameters in (4) follow a random walk process as follows:

$$\beta_{t+1} = \beta_t + u_{\beta t}, \qquad a_{t+1} = a_t + u_{at}, \qquad h_{t+1} = h_t + u_{ht},$$

$$\begin{pmatrix} \varepsilon_t \\ u_{\beta t} \\ u_{at} \\ u_{ht} \end{pmatrix} : N\left(0, \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & \Sigma_\beta & 0 & 0 \\ 0 & 0 & \Sigma_a & 0 \\ 0 & 0 & 0 & \Sigma_h \end{pmatrix}\right),$$

For $t = s+1,\text{K}\ ,n,$ where $\beta_{s+1} : N\left(u_{\beta 0}, \Sigma_{\beta 0}\right)$, $a_{s+1} : N(u_{a0}, \Sigma_{a0})$ and $h_{s+1} : N(u_{h0}, \Sigma_{h0})$.

Where Σa and Σh are assumed to be diagonal matrices. The assumption of random walk process allows for both temporary and permanent shifts in the coefficients. In this specification, possible non-linearity such as a gradual change or a structural break can be estimated. The construction of TVP-VAR model is completed.

After the model is set up, it is necessary to estimate the parameters within the model using methods such as maximum likelihood estimation or Bayesian estimation.

In this study a Markov Chain Monte Carlo (MCMC) method in a Bayesian framework is used to estimate the parameters. The MCMC method obtains the samples of parameters by constructing a Markov chain, starting from the prior distribution, sampling iteratively, and finally converging to the posterior distribution (Brooks, 1998).

Nakajima (2011) states that the prior distribution should be first given, and then samples should be drawn from a multidimensional posterior distribution function containing latent variables, and then statistically inferred. This study refers to Koop and Korobilis (2010), First, set the prior value, and then use MCMC simulation to complete the model estimation. The parameters $A_{i,t}$ and Σ_t are estimated using the Markov Chain Monte Carlo (MCMC) method. MCMC is particularly suitable for this context as it efficiently handles the high-dimensional parameter space and the time-varying nature of the model. The initial priors for the parameters are set based on historical data and expert judgment. According to Eisenstat et al.(2016) and Nakajima (2011), let β, α and h follow a prior normal distribution，

and $u_{\beta_0} = u_{\alpha_0} = u_{h_0}$, $\Sigma_{\beta_0} = \Sigma_{\alpha_0} = \Sigma_{h_0} = 10 \times I$.

$\left(\Sigma_\beta\right)_i^{-2} : Gamma(40, 0.02)$, $\left(\Sigma_a\right)_i^{-2} : Gamma(4, 0.02)$, $\left(\Sigma_h\right)_i^{-2} : Gamma(4, 0.02)$.

let $y=\{y_t\}_{t=1}^{n}$ and $\omega=(\Sigma_\beta,\Sigma_a,\Sigma_h)$, Set the prior probability density as $\pi(\omega)$ for ω. Given the data y, and draw samples from the posterior distribution, $\pi(\beta,a,h,\omega/y)$, by the following:

(1) Initialize β,α,h and ω

(2) Sample $\beta/\alpha,h,\Sigma_\beta,y$

(3) Sample Σ_β/β

(4) Sample $\alpha/\beta,h,\Sigma_a,y$

(5) Sample Σ_a/a

(6) Sample $h/\beta,a,\Sigma_h,y$

(7) Sample Σ_h/h

(8) Go to (2) and iterate until MCMC converges.

4. Result Analysis

4.1 Data Preprocessing

First, the data are seasonally adjusted using EViews 12's X-12 method to eliminate seasonal effects. Secondly, to narrow the data range and facilitate comparison across different magnitudes on the same scale, all variables are logarithm and one-order differences. Thirdly, use the Augmented Dickey-Fuller test (ADF) by Eviews to check the stationarity of each data set. The ADF test is a statistical test used to determine whether a time series has a unit root. If a unit root is present, it indicates that the time series is non-stationary; conversely, if no unit root is present, the time series is stationary (Okunade & Karakus, 2001). The TVP-VAR model requires that the input data be stationary, meaning the statistical properties of the data remain unchanged over time. The ADF test can check for the presence of a unit root in the time series, thus assessing whether the data is stationary.

Table 4.1 ADF Unit Root Test for Variables

Variables		M2	ASC	AUH	GDP	CPI
ADF statistic	T-statistic	-7.762837	-17.04942	-42.9124	-4.237822	-7.623077
	Prob.*	0.0000	0.0000	0.0001	0.0007	0.0000
	1% level	-3.449332	-3.44922	-3.449276	-3.449562	-3.449857
	5% level	-2.8698	-2.86975	-2.869775	-2.869901	-2.870031
	10 level	-2.571239	-2.571213	-2.571226	-2.571293	-2.571363

Table 1 shows that the ADF unit test results that the values of Prob.* are all less than 0.05. This shows that the processed data of each group reject the null hypothesis at the significance

levels of 1%, 5% and 10%, that is, there is no unit root in the variables, and the data are stationary, which can be used for the establishment and analysis of TVP-VAR model.

Fourth, selecting an appropriate lag order is crucial for capturing the true dynamic relationships between variables (Ivanov & Kilian, 2005). As shown in Figure 1, the optimal lag order of the TVP-VAR model was finally determined to be fourth-order.

VAR Lag Order Selection Criteria
Endogenous variables: DLNM2_SA DLNX1_SA DLNX2_SA DLNY1_SA DLNY2_SA
Exogenous variables: C
Sample: 1996M01 2024M09
Included observations: 338

Lag	LogL	LR	FPE	AIC	SC	HQ
0	4834.592	NA	2.67e-19	-28.57746	-28.52091*	-28.55493
1	4906.604	141.4681	2.02e-19	-28.85564	-28.51632	-28.72041
2	4938.174	61.08563	1.95e-19	-28.89452	-28.27243	-28.64659
3	4986.385	91.85827	1.70e-19	-29.03187	-28.12700	-28.67124
4	5040.152	100.8521*	1.43e-19*	-29.20208*	-28.01445	-28.72876*
5	5056.545	30.26462	1.51e-19	-29.15116	-27.68075	-28.56514

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Figure 1. The Result of Selecting the Optimal Lag Order

Additionally, it is necessary to verify the stability of the fourth-order model. ADF is still used here to determine whether the model has a unit root. According to Figure 2, all variables all variables have no roots lying outside the unit circle, indicating that the model is stationary.

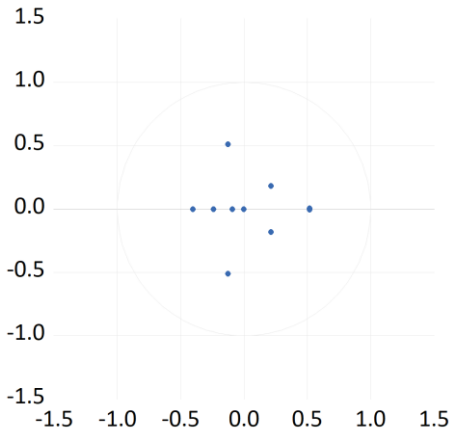

Figure 2. ADF Unit Circle Root Test for Model

4.2 Parameter Estimation Results of the MCMC Simulation

In this study, the posterior estimates of the parameter values in the TVP-VAR model are calculated through 50,000 MCMC simulations. The simulation process is completed by programming in OxMetrics6. Table 2 presents the estimation results of the system parameters.

The effectiveness of the MCMC simulation is evaluated using the Geweke statistic and the Inefficiency Factor (Eraker, 2001). The Geweke statistic can be used to determine whether the MCMC chain obtained from the simulation converges to the posterior distribution. The Inefficiency Factor (IF) can be used to assess the ratio of the variances of the posterior sample mean and the sample mean of the uncorrelated sequence.

Table 2. Estimation Results for the Variables Set of M2, ASC, AUH, GDP and CPI

Estimation Result						
Parameter	Mean	Stdev	95%L	95%U	Geweke	Inef.
sb1	0.0225	0.0026	0.0182	0.0284	0.274	20.11
sb2	0.0203	0.0020	0.0169	0.0246	0.052	11.43
sa1	0.0752	0.0275	0.0403	0.1486	0.714	126.05
sa2	0.0671	0.0203	0.0397	0.1183	0.320	88.12
sh1	0.4808	0.0486	0.3952	0.5853	0.049	39.10
sh2	0.3377	0.0373	0.2699	0.4171	0.464	37.13

As shown in Table 2, all Geweke values are within 1.96 (the 5% critical value), and the means of all parameters fall between the 95% upper bound and the 95% lower bound, indicating that the MCMC sampling is effective, which increases the confidence in the reliability of the parameter estimation results. The highest IF among all parameters of the model is 126.05, and the values of the other inefficiency factors are not large. This indicates that at least 396.67 (50000/126.05) uncorrelated samples can be obtained. This number is larger than the sample size, which is sufficient for posterior inference.

4.3 The Time-varying Parameter Paths of the MCMC Simulation

Figure 3 reflects the dynamic simulation paths of six variables: $(\Sigma_\beta)_1$, $(\Sigma_\beta)_2$, $(\Sigma_\alpha)_1$, $(\Sigma_\alpha)_2$, $(\Sigma_h)_1$, $(\Sigma_h)_2$ in the TVP-VAR model of the interest rate transmission channel.

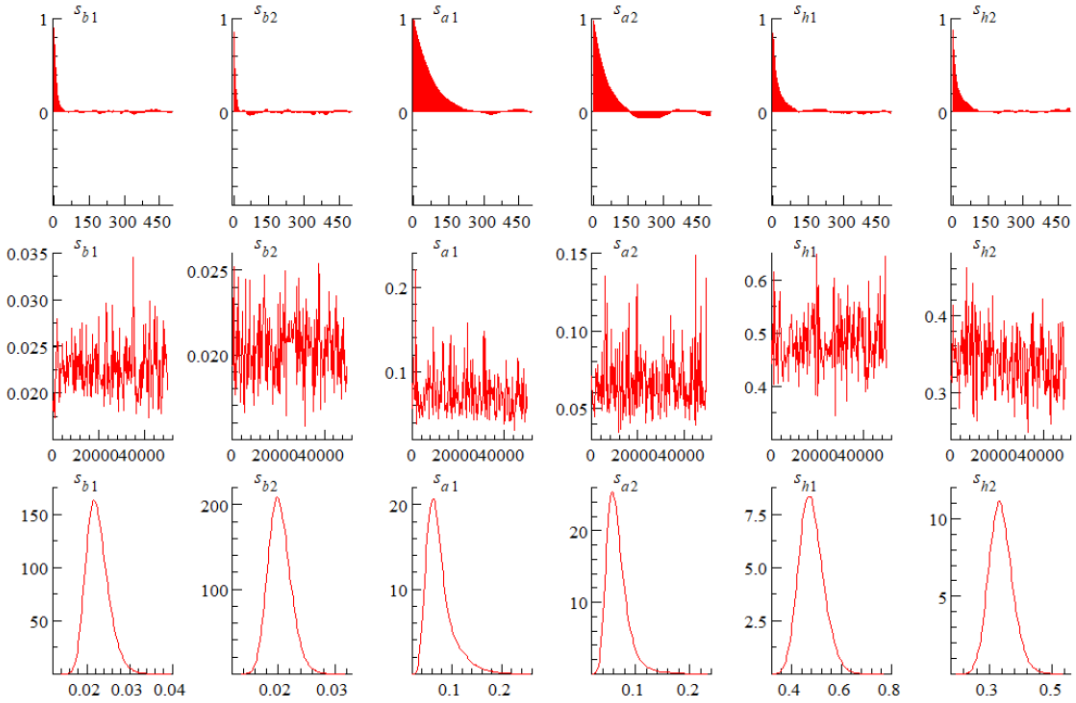

Figure 3. The Parameter Distribution Situation of MCMC Simulation

The posterior distribution density plot in Figure 3 shows that after 50,000 MCMC samplings, the estimators of the parameters exhibit good convergence and volatility clustering phenomena. This proves the effectiveness of the model simulation, and the TVP-VAR model can be further utilized for analysis.

4.4 Time-varying Effects of Impulse Response at Different Time

By setting impulse responses at different intervals in the TVP-VAR model, the time-varying impacts of a unit shock to the independent variable on the dependent variable at different horizons within the sample period can be clearly reflected (Christou et al., 2020). Selecting lag 1, lag 6, and lag 12 periods respectively represents short-term, medium-term, and long-term shock impacts. For different time-lag periods, a positive shock is given to each variable to form the time-series function graphs of impulse responses at different time-lag periods. Figure 4.4 displays the impulse response functions of M2 to ASC and AUH across different periods from January 1996 to September 2024.

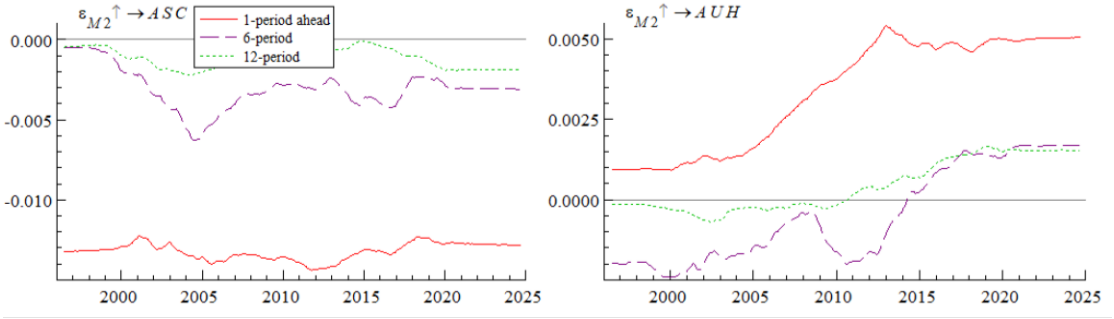

Figure 4. The Time-Varying Impulse Response Functions of M2 on ASC and AUH in Different Periods

According to $\varepsilon_{M2}{}^{\uparrow} \rightarrow ASC$ of Figure 4 shows the impact of M2 on ASC. The three curves of 1-period ahead, 6-period, and 12-period all exhibit fluctuations predominantly with negative values. This indicates that the changes in M2 have a relatively stable negative impact on the stock price market across different time periods, without any obvious improvement or deterioration as time goes by. The negative impact of M2 on ASC persists throughout all stages, which contradicts the expectations of Tobin's Q theory and reflects the "policy-driven market" feature of the Chinese stock market. This conclusion drawn here is the same as the research of Dong and Hu (2018).

$\varepsilon_{M2}{}^{\uparrow} \rightarrow AUH$ shows the impact of M2 on AUH. According to the 1-period ahead curve, before 2005, M2's positive impact on AUH was relatively stable, and it maintained a significant growth trend between 2005 and 2013. Thus, it can be seen that M2 has always had a positive impact on AUH in the short term, and this impact has gradually increased over time. The 6-period curve before 2015, M2 had a relatively obvious negative impact on AUH, particularly a rapid upward trend observed around 2000–2008. However, after 2015, the impact of M2 on AUH turned positive, and as time went on, the positive impact became more and more obvious. The 12-period curve shows that before 2011, M2 had a slight negative impact on AUH with relatively small fluctuations. Overall, M2's impact on AUH exhibits a trend of short-term positivity, medium-to-long-term transition from negative to positive, and strengthening, which aligns with Modigliani's wealth effect. Especially after 2016, with the advancement of interest rate marketization measures such as the LPR reform, the positive effect of M2 on AUH has significantly intensified, highlighting the core position of the real estate market in household asset allocation and the synergistic effect between policy regulation and market mechanisms.

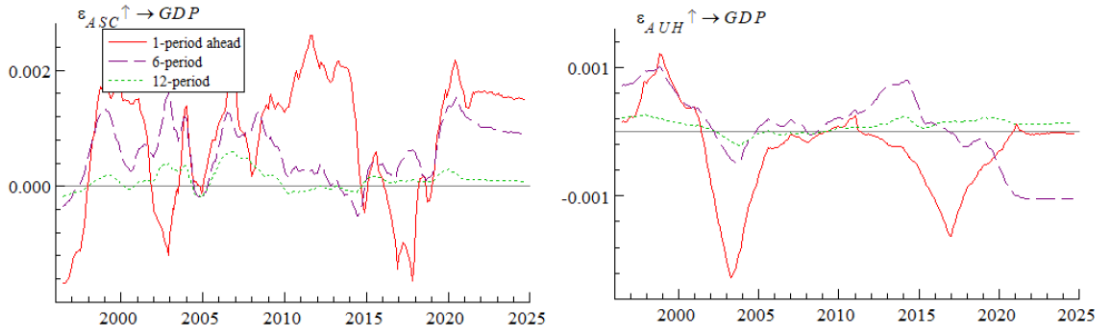

Figure 5. The Time-Varying Impulse Response Functions of ASC and AUH on GDP in Different Periods

The Figure 5 reflects the time-varying impulse response functions of ASC and AUH on GDP in different periods. As can be seen from $\varepsilon_{\text{ASC}}{}^{\uparrow} \rightarrow GDP$, According to the 1-period ahead curve, a positive shock to ASC sometimes promotes GDP positively and sometimes shows a negative effect, with obvious volatility. This indicates that in the short term, the impact of ASC on GDP is not stable. Within the 6-period curve, the volatility of the impact of ASC on GDP has decreased, and it has maintained a positive impact for most of the time during the period from 1996 to 2024. It only had a negative impact during the periods of 1996-1997 and 2014-2015. In the 12-period, the curve becomes flatter but still shows a fluctuating state. The results show that the impact of ASC on GDP exhibits significant volatility in the short term, with positive and negative effects alternating. While volatility decreases in the medium term, periodic negative effects persist. In the long term, the impact tends to flatten but with no significant positive effect, reflecting that China's stock market is constrained by factors such as high speculative activity and low profitability of listed companies, leading to low and unstable transmission efficiency to GDP.

As can be seen from $\varepsilon_{\text{AUH}}{}^{\uparrow} \rightarrow GDP$, in the short term (1-period ahead), a positive shock to AUH still causes obvious volatility in GDP, with more prominent negative impacts. Especially between 2002 and 2021, AUH only had a slight positive effect on GDP from 2010 to 2012, with negative impacts for the rest of the period. The 6-period curve has a relatively small fluctuation range and shows a fluctuating state. Within the 6-period, the volatility of the impact of AUH on GDP has decreased, and the positive impact has increased. This shows that in the medium term, the impact of a positive shock of AUH on GDP is also unstable. In the 12-period, the curve becomes flatter but still shows a fluctuating state. The impact of AUH on GDP, however, demonstrates characteristics of predominantly negative in the short term, gradually turning positive and stabilizing in the medium to long term. Short-term negative effects arise from overinvestment and policy regulation, while medium-term positive effects emerge with the advancement of policies such as inventory reduction. In the long term, significant positive effects are sustained due to the structural support of the real estate

industry chain, highlighting the critical role of the real estate market in economic growth.

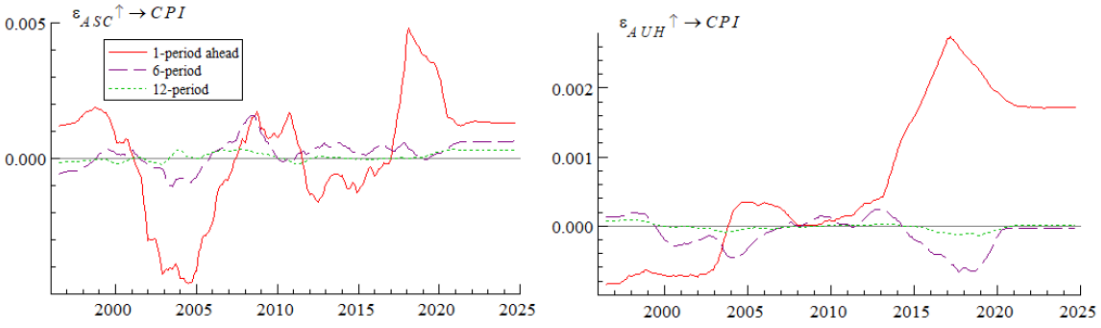

Figure 6. The Time-Varying Impulse Response Functions of ASC and AUH on CPI in Different Periods

The Figure 6 reflects the time-varying impulse response functions of the ASC and AUH on CPI in different periods. According to the 1-period ahead curve in $\varepsilon_{\text{ASC}}^{\uparrow} \rightarrow CPI$, the impact of a positive shock of ASC on CPI is significantly volatile, experiencing several large fluctuations, especially in 2002 and 2017 with relatively large changes. However, after 2022, the positive impact of ASC on GDP has been relatively stable. Within the 6-period, the volatility of the impact of ASC on CPI is decreasing, and the positive impact has become significant. But there is an obvious negative impact during the period from 2002 to 2006. Within the 12-period, both the volatility and the impact force of ASC on CPI are decreasing and tending to be stable. The results show that the impact of ASC on CPI is highly volatile and directionally uncertain in the short term, and there is a negative effect in phases in the medium term and tends to be stable but weak in the long term. This reflects that due to the insufficient wealth effect in China's stock market, the transmission efficiency of ASC to CPI is low and unstable.

As can be seen from $\varepsilon_{\text{AUH}}^{\uparrow} \rightarrow CPI$, in the short term (1-period ahead), the impact of AUH on CPI generally shows an upward trend. This shows that the impact force of a positive shock of AUH on CPI is gradually increasing. In the medium term (6-period), the impact of AUH on CPI is relatively unstable, with both positive and negative fluctuations. Within the 12-period curve, both the volatility and the effect of AUH on CPI are decreasing and tending to be stable. AUH exhibits the characteristics of a strong short-term positive shock to CPI, with fluctuations narrowing and stabilizing in the medium to long term. In the short term, this this can be attributed to the significant increase in CPI driven by rising housing costs and demand from industrial chains. In the medium term, policy regulation causes positive and negative fluctuations. In the long term, with the de-financialization process of real estate, the positive effect gradually converges to a stable level.

4.5 Time-varying Effects of Impulse Response at Different Points

During the deepening, improvement, and comprehensive promotion stages of interest rate marketization, the response of monetary supply on the asset price transmission channel, and the response of the asset price transmission channel on the GDP and CPI, may all differ. Analyzing key time points in different stages of interest rate marketization can capture the dynamic responses of the asset price transmission channel under economic structural adjustments and changes in the macro-economic environment. 2000.9, 2007.1, and 2019.8 are selected to represent the three different stages of China's interest rate marketization development: the deepening stage, the improvement stage, and the comprehensive promotion stage.

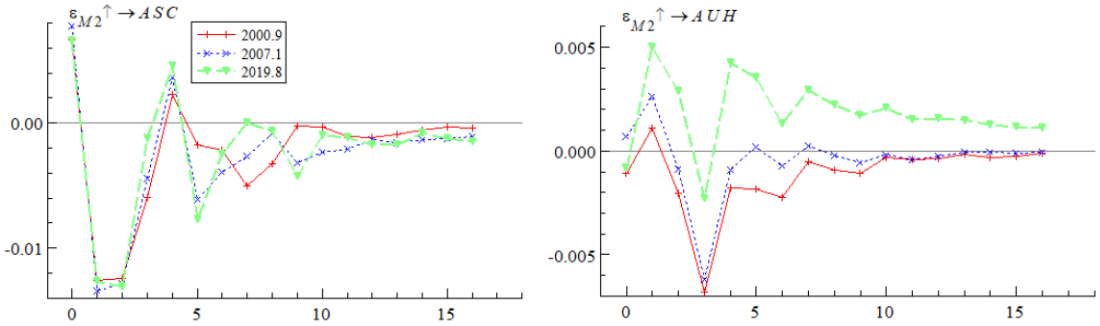

Figure 7. The Time-Varying Impulse Response Functions of M2 on ASC and AUH in Different Points

The figure 7 shows the time-varying impulse response functions of M2 on ASC and AUH in three different points. According to $\varepsilon_{M2}{}^{\uparrow} \rightarrow ASC$, at the three time points of September 2000 (the red curve), January 2007 (the blue curve), and August 2019 (the green curve), the initial impacts of M2 on ASC are consistent. The starting parts of these three time points are identical. The initial reactions are all positive, but they quickly turn negative, which indicates that the impact of M2 on ASC is only positive in the current period, and then it is significantly negative within 1 to 3 periods. After the second period, the fluctuation patterns of the three time points start to differ. The curve of August 2019 has a steeper slope, suggesting that during the comprehensive promotion stage of interest rate marketization, ASC's response to M2 is more sensitive compared to the other two periods. This indicates that under the LPR mechanism, the efficiency of monetary policy transmission has improved, and bank lending rates have responded more quickly to market changes. Overall, the process of interest rate marketization failed to reverse the negative impact of ASC on M2. This reveals that the long-standing institutional bottlenecks in China's stock market (such as the imperfect delisting mechanism and the dominance of state-owned capital) have restricted the exertion of the Tobin Q effect.

The three curves in $\varepsilon_{M2}{}^{\uparrow} \rightarrow AUH$ show significant differences. The red curve of September

2000 indicates that the positive shock of M2 mainly has a negative impact on AUH. Only after the first period does a slight positive impact emerge, which then quickly turns negative. By the 10th period, the curve approaches 0, indicating that the influence of M2 on AUH is almost zero after the 10th period. The AUH had a predominantly negative impact on M2, reflecting that the real estate market was not yet fully marketized under the interest rate control system, and credit resources were difficult to flow into it. The blue curve of January 2007 shows that in the initial stage, M2 has a positive effect on AUH. Although the fluctuation pattern is somewhat consistent with that of September 2000, the obvious negative effects are decreasing. This indicates that the gradual relaxation of interest rates, combined with the urbanization demand, has improved the efficiency of transmission through the real estate channel. As can be seen from the green curve of August 2019, in the initial stage, although M2 has a negative effect on AUH, it quickly turns positive, and the positive effect is more obvious than that at the other two time points. Moreover, after the 16th period, it still does not approach 0. This shows that during the comprehensive promotion stage, the effect of M2 on AUH has been significantly improved, and the influence is more long-lasting. This indicates that the development of interest rate marketization helps the market mechanism of the real estate market function better. Overall, the development of interest rate marketization promotes the impacts of M2 on both ASC and AUH, but its impact on the AUH channel is more significant.

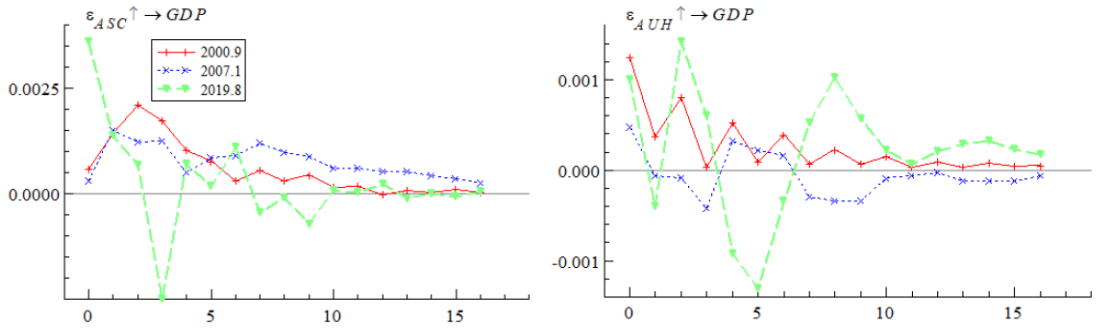

Figure 8. The Time-Varying Impulse Response Functions of ASC and AUH on GDP in Different Ppoints

The figure 8 shows the time-varying impulse response functions of ASC and AUH on GDP in three different points. Based on the curves of the three time points in $\varepsilon_{ASC}^{\uparrow} \rightarrow GDP$. The red curve of September 2000 shows that ASC has a mild positive impact on GDP, with a moderate persistence. During this period, China's capital market was still in its early stage of development. The stock market had limited influence on the macroeconomy, the investor structure was immature, and the market mechanism was incomplete. The blue curve of January 2007 shows that ASC has a stronger impact on GDP, with a higher peak, and has a more significant positive effect on GDP. After the shareholding structure reform, the market capitalization of China's stock market has grown rapidly, and the stock market has gradually

become an important platform for corporate financing. The increase in stock prices improves the balance sheets of enterprises, stimulates consumption and investment, and has a relatively significant positive impact on GDP. The green curve of August 2019 shows that the impact of ASC on GDP was initially highly reactive but negative. Subsequently, it fluctuated and approached zero. During this period, China's financial market became more open, and the correlation between stock price fluctuations and the real economy weakened. Overall, in the early stage of interest rate marketization, ASC strengthened the positive transmission to GDP. However, after its deepening, due to the financial assetization and structural imbalance, the transmission path between stock prices and GDP has become more complex and even ineffective.

Similarly, as can be seen from $\varepsilon_{AUH}{}^{\uparrow} \to GDP$, there are significant differences among the three curves. The red curve of September 2000 shows that the housing price shock had a short-term boost on GDP, but the subsequent fluctuations were quite significant. This is because during this period, China's real estate industry had just become a new driving force for economic growth. The rise in housing prices led to an increase in construction, home decoration, and raw materials industries, exerting a preliminary positive effect on GDP. The blue curve of January 2007 turns negative after the first period, and it only remains positive from the 4th to the 7th period, with negative impacts during the rest of the time. This is because during this period, China's policies emphasized "reducing investment-driven and speculative housing purchases", and the marginal contribution of real estate to GDP tended to decline. This shows that as interest rate marketization progresses from the deepening stage to the improvement stage, the impact of AUH on GDP does not improve. The volatility of the green curve of August 2019 increases significantly. Both the positive and negative impacts are stronger than those of the other two curves. This indicates that during the comprehensive promotion stage, the impact of AUH on GDP is enhanced, but the increased volatility makes AUH more sensitive. The transmission of AUH to GDP was suppressed by policies in the early stage of interest rate marketization, but after the market interest rate formation mechanism was improved, it still had a short-term stimulating effect, although the transmission path was more dependent on the financial structure and regulatory control.

Overall, from the deepening stage to the comprehensive promotion stage of interest rate marketization, there is a promoting effect on the impacts of the stock price channel and real estate price channel on GDP. In particular, the initial effect of stock price channel is more significantly enhanced. However, the development of interest rate marketization also increases the volatility of the stock price channel and real estate price channel, causing frequent changes in the direction of influence and making them more sensitive.

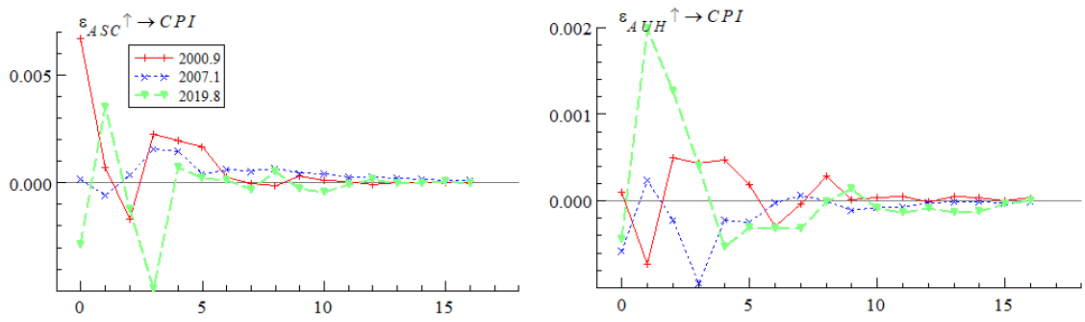

Figure 9. The Time-Varying Impulse Response Functions of ASC and AUH on CPI in Different Ppoints

The figure 9 shows the time-varying impulse response functions of ASC and AUH on CPI in three different points. Based on the three curves in $\varepsilon_{ASC}^{\uparrow} \rightarrow CPI$, significant differences emerge before the 7th lag period. In the initial stage, the position of the red curve of September 2000 is higher than that of the other two curves. The capital market is not yet well-developed. Monetary policy is mainly transmitted through the credit channel. The impact of ASC on CPI may be transmitted to inflation through channels such as the wealth effect and investment expectations, and the effect is relatively significant. The blue curve of January 2007 shows that the impact of ASC on CPI has significantly weakened, and the reaction of CPI has become more moderate with smaller fluctuations. At this stage, the stock market has gradually developed, and the central bank has enhanced its ability to regulate market interest rates. The direct impact of ASC fluctuations on the CPI has weakened. The green curve of August 2019 shows that at the initial stage, the impact of ASC on CPI is negative, but it turns positive after the first period, then negative again after the second period, reaching its maximum negative impact in the third period, and then quickly turning positive once more. Evidently, during the comprehensive promotion stage, the financial market has become more flexible, interest rates have become more market-oriented, and the transmission of asset prices to the CPI is no longer linear. This transmission may be weakened or even reversed due to the neutralization of monetary policy and the strengthening of macroprudential supervision.

In contrast, based on the three curves in $\varepsilon_{AUH}^{\uparrow} \rightarrow CPI$, the development of interest rate marketization is notably more effective for the AUH channel. The red curve of September 2000 shows that the impact path of AUH on CPI has significant fluctuations but is generally positive, and it has a certain boosting effect on CPI. The blue curve of January 2007 shows that the impact of AUH on CPI initially had a slight negative reaction, then gradually approached zero, and the overall effect was relatively weak. By this time, real estate has become an important driver of economic growth, but the regulatory measures such as purchase restrictions and loan caps stipulated in the "National Decree No. 10" have strengthened, resulting in the transmission of AUH to CPI being inhibited. The green curve of

August 2019 shows that the impact of AUH on CPI initially had a significant positive shock, but then quickly declined exerting a certain boosting effect on CPI. During this period, China's real estate market policies became more stable. The "housing for living, not for speculation" policy was clearly defined. In the short term, the impact of housing price fluctuations still has an influence on CPI (such as rental prices and construction material prices), but the long-term transmission has significantly weakened, demonstrating the weakening of the timeliness and structural changes in the transmission of real estate assets to CPI.

Overall, interest rate marketization has altered the impacts of both stock price channel and real estate price channel on CPI, but its promoting effect on the real estate price channel is more significant.

5. Conclusion and Implications

This study uses the TVP-VAR model to conduct an in-depth analysis of the data from January 1996 to September 2024 and divides the process of interest rate marketization into three stages. The aim is to explore the impacts of the broad money supply (M2) on the stock price channel (ASC) and the real estate price channel (AUH) at different stages of interest rate marketization, as well as the impacts of ASC and AUH on Gross Domestic Product (GDP) and the Consumer Price Index (CPI), respectively. The research findings exhibit multi-faceted characteristics, which hold important implications for monetary policy formulation, financial market supervision, and investor decision-making.

The impact of the asset price transmission channel on the macroeconomy is time-varying. Firstly, M2 consistently has a negative effect on ASC, which contradicts Tobin's Q theory. This phenomenon is attributed to the characteristics of China’s "policy-driven stock market." In contrast, the impact of M2 on AUH has shifted from short-term ambiguity to long-term positivity, aligning with Modigliani's wealth effect, particularly after the 2019 LPR reform improved market-oriented interest rate transmission efficiency. Second, the effects of the two asset channels on GDP are complex and unstable: the short-term volatility of ASC and the initial negative effect of AUH gradually give way to more stable positive effects in the long term, reflecting the structural role of real estate in economic growth. Third, the impact of ASC on CPI remains volatile and indirect, while the strong short-term positive impact of AUH on CPI weakens over time, consistent with policy efforts to curb speculative demand and anchor long-term price stability.

Second, the effects of ASC and AUH on GDP and CPI are complex and time dependent. The impact of the stock price channel on GDP is unstable, shifting between positive and negative in the short term, reflecting its volatility and sensitivity to external shocks and investor behavior. In contrast, the real estate channel exhibits a clearer pattern: its short-term impact on GDP tends to be negative (especially in the early stages), but it gradually transforms into a more positive and stable effect as interest rate marketization deepens. Similarly, ASC’s influence on CPI is unstable and lacks a clear direction, while AUH consistently demonstrates a strong short-term positive shock to CPI before stabilizing. These temporal differences across variables and channels indicate that the macroeconomic effects of monetary policy are

neither immediate nor uniform but evolve with institutional changes.

When formulating policies, monetary authorities must consider the stage-specific nature of asset price responses. For example, the stock market's delayed or even negative reaction to M2 suggests that monetary expansion alone is insufficient to stimulate investment through equities unless accompanied by structural reforms to enhance investor confidence and market depth. Second, the increasing sensitivity of the real estate price channel implies that growth-stimulating policies must be carefully balanced to avoid triggering housing bubbles. Macroprudential tools such as differentiated credit policies, property taxes, and supply-side reforms should be integrated with monetary policy to ensure that the AUH channel enhances stability rather than amplifies inflationary pressures. Third, given real estate's dominant role in household wealth and consumption, the central bank should focus on transmission mechanisms beyond traditional interest rates, including housing-related credit conditions and local government financing reforms.

Finally, while this study provides robust empirical evidence and addresses several research gaps, it has limitations. It does not fully account for exogenous shocks such as global financial crises or geopolitical risks, which may alter the dynamics of asset price channels. Future research could incorporate external variables or use Bayesian TVP-FAVAR models for cross-country analyses to test whether the patterns observed in China are generalizable to other emerging economies undergoing financial liberalization.

In conclusion, this study finds that interest rate marketization has not only altered the effectiveness of China's asset price transmission channels but also reshaped their impacts on GDP and CPI. The real estate channel has emerged as the dominant pathway, becoming more responsive and stable with advancing reforms. However, increased volatility in both channels also highlights the risks of incomplete liberalization. Policymakers must adopt nuanced, stage-aware strategies to leverage these channels for price stability and economic growth while minimizing systemic risks.

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