# **Original Paper**

## Monetary Policy's Regulation and Control of Housing Prices

# under the Novel Coronavirus Pneumonia Epidemic

Ta Changdong<sup>1</sup> & Jiang Yuanying<sup>1</sup>

<sup>1</sup> College of Science, Guilin University of Technology, Guilin Guangxi, China

Received: September 27, 2020	Accepted: October 19, 2020	Online Published: October 28, 2021
doi:10.22158/ijafs.v4n2p18	URL: http://dx.doi.org/10.2	22158/ijafs.v4n2p18

## Abstract

In recent years, the downward pressure and uncertain factors of my country's economic development have gradually increased, especially due to the greater impact of the novel coronavirus pneumonia epidemic in early 2020, it is necessary to adjust the monetary policy to make the economy operate stably. Monetary policy is the main means of controlling housing prices, so this article uses the sample data of my country from January 2011 to September 2020, and uses the time-varying parameter vector autoregressive (TVP-SV-VAR) model under the background of economic policy uncertainty (EPU) for the first time to analyze the price-based and quantitative monetary policies are very necessary to regulate and control housing prices. The study found that the increase in economic policy uncertainty will weaken the regulatory role of quantitative monetary policy but will strengthen the regulatory role of price-based monetary policy; the current economic policy uncertainty has increased, especially since the outbreak of the novel coronavirus pneumonia, the quantitative monetary policy is unstable, and the price-based monetary policy is the best choice for controlling housing prices.

## Keywords

novel coronavirus pneumonia epidemic, house price regulation, monetary policy, economic policy uncertainty, time-varying parameter vector autoregressive model

## 1. Introduction

As we all know, the stability of the real estate market plays a very important role in macroeconomic growth and overall economic recovery, and the stability of the real estate market cannot be separated from the regulation of monetary policy. However, since China's initial establishment of the real estate market in 1998, housing prices have soared nearly five times from 2,090 yuan/square meter in February 1998 to 9,988 yuan/square meter in September 2020. The soaring housing prices have further given birth to the systematic nature of the financial system risks and various financial asset bubbles (Chen &

Dai, 2018). In order to promote the healthy development of the real estate market, China's relevant departments have issued a series of policies to regulate and control housing prices, among which monetary policy is one of the most important means.

After the outbreak of the global economic crisis in 2008, the world's major economies have been hit hard. In order to speed up the economic recovery, all countries have significantly strengthened the regulation and control of economic policies. For example, in order to stimulate the economy, the Japanese government invested 160 trillion yen (about 13 trillion yuan) in batches after the outbreak of the crisis to ease the pressure on economic development. In order to increase the intensity of open market operations, the United States has adopted "quantitative easing" to avoid further economic recession. China has adjusted and implemented a prudent monetary policy and an expansionary fiscal policy. Although the intervention of countries in the economy can play a role in boosting the economy and adapting to the overall goal of macroeconomic control, frequent implementation of economic policies will further increase uncertainty. In recent years, "black swan" incidents such as the European debt crisis, Brexit, and Sino-US trade friction have occurred frequently, causing uncertainty to continue to rise. At the same time, the outbreak of the novel coronavirus pneumonia epidemic in early 2020 has exacerbated the abnormal volatility of the capital market, making the economic outlook even more uncertain. Under the severe and complicated internal and external situation, in order to promote the positive development of the economy, it is necessary to introduce corresponding policies and pay attention to the impact of economic policy uncertainty on economic development (Zhai & Yang, 2020). It is worth thinking about whether economic policy uncertainty will affect the effect of monetary policy on the real estate market in the context of rising economic policy uncertainty, especially since the novel coronavirus pneumonia epidemic. Therefore, this paper introduces the indicator of economic policy uncertainty based on the analysis of the mechanism of monetary policy on housing prices, empirically tests the relationship between economic policy uncertainty, monetary policy and housing prices, and uses dynamic mechanism analysis to explore them. It discusses how to use monetary policy to rationally control housing prices under the background of economic policy uncertainty and since the outbreak of the novel coronavirus pneumonia epidemic, in order to achieve the goal of optimizing the development of the real estate market.

Scholars analyze the relationship between economic policy uncertainty, monetary policy and housing prices. Existing research mainly focuses on the following aspects: Research on the relationship between monetary policy and housing prices-the research by Stelios et al. (2020) shows that expected future house price increases will lead to a decline in loan interest rates, and conversely, house prices will rise. Wang and Pang (2019) construct a TVP-VAR model to empirically study the relationship between real estate prices, household consumption and money supply. The analysis shows that the increase in real estate prices in China is due to the increase in money supply that promotes its growth. Wang and Han (2009) analyzed the volatility correlation between real estate prices, money supply and economic growth, and found that there is no need for the central bank to use monetary policy to peg asset prices,

that is, directly intervene in real estate prices. Through the above research, it is not difficult to find that under the background of rising economic policy uncertainty, if this indicator is not considered in the system for estimating the impact of monetary policy on housing prices, it will cause biased results.

Research on the relationship between economic policy uncertainty and monetary policy-Dixit and Pindyck (2007) show that when there is high uncertainty, the impact of monetary policy will be weakened. Aastveit et al. (2013) empirically analyzed its effect on macro shocks under conditions of varying degrees of uncertainty, and found that the impact of investment, GDP, and consumption on interest rate shocks when the uncertainty is lower than that of higher the effect is stronger. Duan (2017) empirically analyzed the impact of economic policy uncertainty on the effectiveness of monetary policy from the perspective of credit channels. The research results indicate that the high uncertainty of economic policy reduces the effectiveness of China's monetary policy, leading to a decline in the role of monetary policy in regulating corporate credit financing. However, if domestic asset prices are not considered when analyzing their effects, especially the outbreak of the novel coronavirus pneumonia epidemic in early 2020 has a great impact on the property market, the addition of housing prices can better reflect the impact of economic policy uncertainty on monetary policy.

Research on the relationship between economic policy uncertainty and housing prices-Bloom (2009) shows that economic policy uncertainty may lead to changes in housing prices. Brennan and Schwartz (1985) pointed out that investors will delay investment due to the existence of policy uncertainty, that is, if there is a high policy uncertainty, investors will reduce their consumption and investment in housing and further restrain the demand in the real estate market. Since a prudent monetary policy plays an important role in the healthy development of the real estate market, adding the factor of monetary policy when explaining the mechanism of the effect of economic policy uncertainty on housing prices can better reflect the relationship between economic policy uncertainty and housing prices. Although Liu and Bi (2018) used the LT-TVP-VAR model to analyze the effect of monetary policy on housing prices in the context of economic policy uncertainty, the study found that economic policy uncertainty would weaken the effect of monetary policy on housing prices. However, ignoring random fluctuations (SV) will produce biased estimation results because the data generation process will be accompanied by the impact of SV. Since Black proposed SV, it has been included in the empirical analysis of macroeconomics by more and more scholars. At the same time, the research in this article creatively adds data from the outbreak of the novel coronavirus pneumonia epidemic to the model, which can better capture how the epidemic affects the regulation of housing prices by monetary policy.

Based on empirical analysis, the above research shows from different angles that economic policy uncertainty will affect the effectiveness of monetary policy, and economic policy uncertainty also has a certain effect on housing consumption, which will affect the stability of the real estate market. Therefore, the contribution of this article is mainly reflected in the innovative integration of the SV factor into the study of monetary policy on housing price regulation under the background of economic policy uncertainty, and the data since the outbreak of the novel coronavirus pneumonia epidemic, and

the use of TVP-SV-VAR model analyzes the time-varying effects of monetary policy on housing prices. Compared with the traditional VAR model, this model has a more reasonable explanation of economic phenomena because it can better capture the time-varying characteristics and structural changes of the economic system.

## 2. Model Setting and Data Processing

### 2.1 Model Setting

Since Sims introduced the Vector Autoregression (VAR) model to economics in the early 1980s, it has greatly promoted the dynamic analysis of economic systems and has been widely used in economic problem modeling. The VAR model is often used to analyze the impact of random disturbance items on the system and predict the interrelated macroeconomic timing issues, and further explain the impact of various economic systems on variables. For the time-varying nature of time series, at the end of the 20th century, time-varying features were added to the traditional VAR model. Later, the model continued to expand. Taking into account the random fluctuation characteristics of the sample, Primiceri proposed the TVP-SV-VAR model to analyze the U.S. economy. The empirical research results show that the TVP-SV-VAR model can more fully capture the structural changes in the U.S. economy. Since then, more and more scholars at home and abroad have applied this method to solve macroeconomic problems. This article takes into account the impact of the economic development in 2020 by the novel coronavirus pneumonia epidemic and the increase in a series of uncertain factors such as the tensions in Sino-US trade relations in recent years. And the uncertainty of economic policy will affect the implementation of monetary policy and the consumption of houses by micro-subjects, indicating that the endogenous relationship between economic policy uncertainty, monetary policy and housing prices is obvious. The TVP-SV-VAR model can well capture the time-varying characteristics, random fluctuations and spillover effects among the three.

The general VAR model has the following form:

$$Ay_{t} = \Gamma_{1}y_{t-1} + \Gamma_{2}y_{t-2} + \dots + \Gamma_{s}y_{t-s} + u_{t}, t = s+1, s+2, \dots, T$$
(1)

Among them,  $y_t$  is  $k \times 1$ -dimensional sample observation vector,  $A, \Gamma_1, \Gamma_2, \dots, \Gamma_s$  is  $k \times k$ -dimensional coefficient matrix, and  $u_t$  is  $k \times 1$ -dimensional disturbance term.

Assume that A is a lower triangular matrix whose main diagonal element is 1 and is invertible;  $u_i \sim N(0, \Sigma\Sigma)$ , where  $\Sigma$  is the diagonal matrix, and its diagonal element is  $\sigma_i (i = 1, 2, \dots, k)$ , which is the standard error of the structural impact. The model (1) can be rewritten as:

$$y_{t} = B_{1}y_{t-1} + B_{2}y_{t-2} + \dots + B_{s}y_{t-s} + A^{-1}\Sigma\varepsilon_{t}, \varepsilon_{t} \sim N(0, I_{k})$$
(2)

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Among them,  $B_i = A^{-1}\Gamma_i$ ,  $i = 1, 2, \dots, s$ . The elements in  $B_i$  are superimposed to form a  $k^2 s \times 1$ -dimensional vector,  $X_t = I_k \otimes (y_{t-1}, y_{t-2}, \dots, y_{t-s})$ ,  $\otimes$  as the Kronecker product, and the model (2) can be rewritten as:

$$y_t = X_t \beta + A^{-1} \Sigma \varepsilon_t \tag{3}$$

Assuming that all the parameters in the model (3) are time-varying and have SV characteristics, the TVP-SV-VAR model can be obtained. The specific form is as follows:

$$y_t = X_t \beta_t + A_t^{-1} \Sigma_t \varepsilon_t, t = s + 1, s + 2, \cdots, T$$
(4)

Among them, the model coefficient  $\beta_i$  parameters  $A_i$  and  $\Sigma_i$  have time-varying characteristics. Let  $a_i = (a_{21}, a_{31}, a_{32}, a_{41}, \mathbf{K}, a_{k,k-1})'$  be a stacked vector of the lower triangular elements in  $A_i$ , where  $\sigma_{ji}^2 = \exp(h_{ji})$ , the random volatility matrix  $h_i = (h_{1i}, \mathbf{K}, h_{ki}), j = 1, \mathbf{K}, k, t = s + 1, \mathbf{K}, n$ . Assume that the parameters in the model (4) obey the following random walk:

$$\beta_{t+1} = \beta_t + \mu_{\beta t}, \quad a_{t+1} = a_t + \mu_{a t}, \quad h_{t+1} = h_t + \mu_{h t}$$

$$\begin{pmatrix} \varepsilon_t \\ \mu_{\beta t} \\ \mu_{a t} \\ \mu_{h t} \end{pmatrix} \sim N \begin{pmatrix} I & O & O & O \\ O & \Sigma_{\beta} & O & O \\ O & O & \Sigma_{a} & O \\ O & O & O & \Sigma_{h} \end{pmatrix} \end{pmatrix}$$
(5)

Among them,  $t = s + 1, s + 2, \dots, T, \beta_{s+1} \sim N(u_{\beta 0}, \Sigma_{\beta 0}), a_{s+1} \sim N(u_{a0}, \Sigma_{a0}), h_{s+1} \sim N(u_{h0}, \Sigma_{h0}).$ 

Under the framework of Bayesian, Markov Monte Carlo (MCMC) method is adopted by more and more scholars. This article uses the idea of Nakajima block sampling.

### 2.2 Data Source Description and Preprocessing

This paper selects monthly data on housing prices, interbank lending rates, broad money supply, and China's economic policy uncertainty index for modeling. The selected monthly data spans from January 2011 to September 2020, with a total of 117 data. The basic statistical characteristics of the original data of each variable are shown in Table 1, and the source and description are as follows:

Housing price (HP): The cumulative sales of commercial housing is divided by the cumulative sales area of commercial housing to get the average sales price, and then seasonal adjustment is performed and the HP filtering method is used to obtain variables. The data comes from the National Bureau of Statistics.

Interest rate (shibor): In price-based monetary policy, interest rates act as an intermediary tool. For a long time, many countries in the world have frequently used interest rate leverage to regulate their macroeconomics. The interest rate policy is mainly through regulating the supply and demand of currencies to achieve the purpose of regulating the economy. In recent years, interest rate policy has

played an increasingly important role in China's central bank monetary policy. This article selects the Shanghai Interbank Offered Rate to represent the price-based monetary policy. The data comes from the official website of Shanghai Interbank Offered Rate.

Broad money supply (M2): This article uses broad money supply to represent quantitative monetary policy, and the data comes from the RESSET database.

China's Economic Policy Uncertainty Index (EPU): This index can reflect changes in China's economy and policies. Regarding the selection of the economic policy uncertainty index, scholars at home and abroad have always been controversial. Until Baker et al. (2016), scholars used newspaper-based methods to solve this controversial issue more effectively. Therefore, this article uses the Economic Policy Uncertainty (EPU) index jointly compiled by Baker and other scholars based on the South China Morning Post in Hong Kong. The data comes from the Economic Policy Uncertainty website.

In terms of data preprocessing, first, in order to ensure the stability of the sequence, all the original data are processed in logarithm; then the data after logarithm processing is standardized to eliminate the influence of dimensions.

Category	House Price	Interest Rate	Broad Money Supply	Economic Policy Uncertainty Index	
Mean	7398.4031	3.1933	1391529	348.5221	
Standard	1308.0191	0.9871	407429.9000	261.3132	
Deviation					
Max	9936.5690	8.2192	2136837	970.8301	
Minimum	5377.1240	1.9191	733884.8000	26.1443	
Skewness	0.3081	1.8112	0.0920	0.9591	
Abnormal	-1.1347	5.1191	-1.1685	-0.2492	
Kurtosis					
Shapiro-Wilk	0.9363*	0.8423**	0.9555*	0.8721**	
Q(10)	882.5000**	225.8303**	902.8400**	647.4702**	
$Q^{2}(10)$	878.3400**	114.8702**	884.7000**	605.0801**	

Table 1. Basic Statistical Characteristics of Raw Data

## 3. Empirical Result Analysis

### 3.1 Model Establishment

#### 3.1.1 Data Stationarity Test

The unit root test is performed on the preprocessed data, and this method is used to judge whether the data are all stable. If the data is non-stationary, it may produce larger errors and false conclusions in the results. In this paper, the method of unit root test is KPSS test, which is tested after all data difference. According to the results in Table 2, at a significance level of 1%, the t statistic values of housing prices,

interest rates, broad money supply, and economic policy uncertainty index are all not greater than 0.739, so the null hypothesis that the data series is stationary cannot be rejected.

Variable	t statistic	P value	Test Result
House Price	0.1454	0.7390	stationary
Interest Rate	0.0432	0.7390	stationary
Broad Money Supply	0.1811	0.7390	stationary
Economic Policy Uncertainty Index	0.0503	0.7390	stationary

#### 3.1.2 Analysis of Parameter Estimation Results

After the data is stable, first determine the order of the TVP-SV-VAR model. Use information criteria such as AIC, SC, HQ and FPE to select the order, and determine the optimal lag order of the model as 1. After 2,000 burn-in, another 20,000 samplings are performed to obtain the parameter estimation results of the model, as shown in Table 3 and Figure 1. According to Table 3, when the significance level is 5% (critical value 1.96), the Geweke value of convergence diagnosis cannot reject the null hypothesis of "convergence to the posterior distribution". Similarly, from Table 3, the ineffective factors of the parameters are very low, indicating that the parameter estimation results of the TVP-SV-VAR model are effective. After calculation, about 319 (20000/62.5811) uncorrelated samples can be obtained, so it is more sufficient to make a posterior inference.

Parameter	Posterior	Standard	95% Confidence	Geweke	Non-effective
	Mean	Deviation	Interval		Factor
$(\Sigma_b)_1$	0.0042	0.0012	[0.0025,0.0073]	0.2771	36.4432
$(\Sigma_b)_2$	0.0041	0.0012	[0.0025,0.0071]	0.0533	36.1121
$(\Sigma_a)_1$	0.0057	0.0016	[0.0035,0.0096]	0.0662	37.0633
$(\Sigma_a)_2$	0.0051	0.0013	[0.0033,0.0081]	0.9613	20.2823
$(\Sigma_h)_1$	0.0058	0.0020	[0.0034,0.0106]	0.5441	55.6213
$(\Sigma_h)_2$	0.5745	0.1494	[0.3136,0.8951]	0.0922	62.5811

**Table 3. TVP-SV-VAR Model Parameter Estimation Results** 



Figure 1. Sample Autocorrelation Function, Simulation Path and Posterior Distribution of TVP-SV-VAR Model Parameters

### 3.2 Random Fluctuation Analysis

Figure 2 shows the changes in the random fluctuations of the above variables. From the perspective of random volatility of house prices, from January 2011 to November 2014, the random volatility of house prices first decreased and then increased; since November 2014, the random volatility of house prices first increased slowly and then increased sharply. This is due to the tightening trend of major banks for financing real estate enterprises in 2014, leading to increased fluctuations in the real estate market. In November of the same year, the central bank cut interest rates. The benchmark interest rate cut improved the credit environment. The housing loan interest rate is expected to fall. The expectation of the real estate market has improved, which has exacerbated the volatility of housing prices. From the perspective of the random volatility of the broad money supply, the random volatility of the broad money supply is relatively low before 2020, and at the same time it basically revolves around zero, but it has surged since the beginning of 2020 and gradually decreased after reaching its peak in March. The reason is that the outbreak of the novel coronavirus pneumonia epidemic in early 2020 has a serious impact on economic development and has a major impact in the short term. This also caused the random volatility of the broad money supply to fluctuate sharply at the beginning of the year. Since then, as the country continues to regulate the economy, the form gradually Change for the better. From the perspective of the random volatility of economic policy uncertainty, starting from 2016, the random volatility of economic policy uncertainty has been significantly strengthened, and reached its peak at the end of 2019, after which the random volatility has gradually decreased. This is because 2016 is the first year of China's economic and social development during the 13th Five-Year Plan period, which

has increased the random volatility of economic policy uncertainty. It is worth noting that after 2018, the random volatility of economic policy uncertainty has shown an approximately linear growth trend. The reason is that the Sino-US trade friction began in July 2018, which led to further uncertainty in economic policies. It was not until December 2019 that the turning point appeared. It was because of the conclusion of the first phase of the Sino-US trade agreement. From the perspective of the random volatility of interest rates, the overall volatility has shown a downward trend, but there will be some local peaks. In February, April, and July of 2011, China's central bank raised the benchmark interest rates for RMB deposits and loans three times, resulting in great changes in the random volatility of interest rates and July 6, which caused the random volatility of interest rates to have local peaks. In July 2013, when the loan interest rate control of financial institutions was completely lifted, the random volatility once again showed an upward trend, and after reaching a peak, it gradually declined. At the same time, the central bank's interest rate cut in November 2014 also led to another local peak in the random volatility of interest rates. However, since 2015, interest rates have gradually stabilized. This is because 2015 marked China's nominal interest rate marketization.



Figure 2. Trend Chart of Four Series (Top) and Stochastic Volatility Chart (Bottom)

## 3.3 Impulse Response Analysis

This paper chooses the 4th, 8th and 12th periods as the lag period at equal intervals to measure the short-term, medium-term and long-term monetary policy's regulatory effects on housing prices; as the uncertainty of economic policy is constantly changing, this paper selects three time points with

different intensities, that is, the economic policy uncertainty in December 2016 is stronger than that in July 2013 and weaker than that in February 2020. The analysis results show that the time-varying characteristics of the impulse response function of housing prices to price-based and quantitative monetary policy shocks are significant. However, in the context of increasing economic policy uncertainty, the impact of economic policy uncertainty on price-based and quantitative monetary policies is different, and their impact mechanisms on housing prices are asymmetrical.



Figure 3. Impulse Response Function Diagram of Housing Price to Price-type and Quantity-type Monetary Policy Shocks (Different Lead Times)



Figure 4. Impulse Response Function Diagram of Housing Price to Price-type and Quantity-type Monetary Policy Shocks (Different Points in Time)

It can be seen from Figure 3 that when housing prices are positively impacted by interest rates with different lead times (*shibor*  $\uparrow \rightarrow HP$ ), there will be a negative effect, indicating that there is an obvious negative correlation between interest rates and housing prices. The timeliness of the type of monetary policy indicates that it is effective in regulating housing prices. At the same time, it can also be seen that the long-term interest rate policy does not have a significant effect on housing prices, while the short-term interest rate policy is significantly better than the medium-term regulation of housing prices from the point of view of the peak size. It shows that when using price-based monetary policies to control housing prices, more attention can be paid to the implementation of price-based monetary

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policies in the short term. When there is a positive impact on interest rates in the short term, rising interest rates will inhibit the growth of housing prices: on the one hand, China has a large number of people who purchase houses with loans, and the increase in interest rates will reduce their expectations for house purchases, and ultimately reduce the demand for houses; on the other hand, due to the growth of interest rates, the financing of real estate companies will also be restricted, and investment in the real estate market will also be reduced. Taking these two aspects together, raising the benchmark interest rate will slow down the growth of house prices and even lead to their decline. Combining the results of the impulse response of house prices to the positive impact of interest rates at different time points in Figure 4, it can be seen that as the degree of uncertainty in economic policies increases, the effect of interest rates on house prices is different, and the adjustment range has also shown a significant expansion trend. The uncertainty of economic policy significantly enhances the regulatory role of price-based monetary policy. Except for February 2020, all peaks are around 1 period ahead. At the same time, the three curves tend to become more and more zero after 8 periods ahead. It further illustrates that the effect of short-term price-based monetary policy on housing prices is significantly better than that of medium- and long-term price-based monetary policies. At the same time, the higher the uncertainty of economic policies, the more significant the effect of interest rates on housing prices. The reason is that the increase in interest rates has weakened the consumption of individuals in the real estate market, and at the same time, there is a blessing of rising economic policy uncertainty. In anticipation of good news, consumption or investment behavior will be delayed as a result, as shown in Figure 4. It is verified that the higher the uncertainty of economic policy, the greater the lag period, and the longer it lasts. Especially since the outbreak of the novel coronavirus pneumonia epidemic, the impact on the real estate market has been obvious, and the price-based monetary policy has a significant effect on housing prices.

In Figure 3, when housing prices are positively impacted by broad money supply with different lead times ( $M \ 2 \ \rightarrow HP$ ), the trends of the three curves are highly coupled, and the effect of long-term quantitative monetary policy on housing prices is basically insignificant around zero. In terms of peak size, the short-term quantitative monetary policy controls housing prices significantly better than the medium-term. It is worth noting that at the beginning of 2020, the effect of quantitative monetary policy on housing prices is zero, that is, the adjustment failure. After that, the medium and long-term quantitative monetary policy continues to be zero while the short-term quantitative monetary policy turns from zero to negative. The reason is that due to the outbreak of the novel coronavirus pneumonia epidemic in early 2020, economic policy uncertainty has increased sharply, the real estate market was once stagnant, and the traditional offline sales model pressed the pause button; although the monetary policy is relatively loose at this time, the real estate industry has entered a period of dormancy, and the short-term flow is scarce, and this scarcity pressure has a tendency to expand. Many real estate companies went bankrupt because they were unable to raise funds. At the same time, the results of the impulse response of house prices to the positive impact of broad money supply at different points in

time can also be corroborated. With the increase in economic policy uncertainty, the effect of quantitative monetary policy on house prices is gradually weakening. And in February 2020, the effect of quantitative monetary policy on the positive impact of housing prices directly turned negative, indicating that the uncertainty of economic policy significantly weakened the regulatory role of quantitative monetary policy. The reason is that due to the high uncertainty of economic policy, the consumption or investment behavior of micro-individuals in the real estate market has slowed down; and the effect disappeared after two consecutive periods. The gradual improvement of the credit environment is conducive to the development of the real estate industry, leading to the gradual recovery of the real estate market. From the results of the impulse response of house prices to the positive impact of broad money supply at different time points in Figure 4, they all reach their peaks around 1 period ahead of time. At the same time, the three curves all tend to zero more and more after 8 periods ahead of time, that is, the adjustment effect is not effective. Significantly, it further shows that the effect of short-term quantitative monetary policy on housing prices is significantly better than that of medium-term and long-term quantitative monetary policies, but a short-term reversal occurred in December 2016. This is because the Central Economic Conference proposed in December 2016 that "housing should not be speculated". Since then, relevant departments of our country have issued a series of policies to regulate the real estate market. The wait-and-see sentiment in the real estate market is relatively strong, and the impact is significant in the short-term, but the mid-to-long-term effect is not very obvious.

In summary, in the context of economic policy uncertainty, especially since the outbreak of the novel coronavirus pneumonia epidemic, regarding the issue of house price regulation, in general, price-based monetary policies are effective for house price regulation and the higher the economic policy uncertainty, the better the effect. However, quantitative monetary policy will fail due to the impact of the epidemic. In other words, quantitative monetary policy will be unstable. The specific manifestation is that there will be a short-term reversal in the early stage and gradually return to near zero in the later period, that is, the regulatory effect is basically insignificant. This shows that the increase in economic policy uncertainty will weaken the control effect of quantitative monetary policy on housing prices, but it will strengthen the control effect of price-based monetary policy on housing prices. It can be seen that changes in economic policy uncertainty have diametrically opposite effects on price-based and quantitative monetary policies; therefore, when the degree of economic policy uncertainty is low, compare the peak value of price-based and quantitative monetary policies on housing prices. It can be obtained that the quantitative monetary policy has obvious advantages compared with the price-based monetary policy; and as the degree of uncertainty in economic policy increases, and because of the unstable performance of quantitative monetary policy, the effect of price-based monetary policy is better than that of quantitative monetary policy.

### 4. Conclusion

This article incorporates the economic policy uncertainty index into the model to better reflect the effect of economic policy uncertainty on monetary policy, which in turn will have a more profound impact on the real estate market regulation.

Using the MCMC method in the context of Bayesian estimation, in the context of economic policy uncertainty and the novel coronavirus pneumonia epidemic, a TVP-SV-VAR model was constructed to empirically analyze the regulatory role of monetary policy on housing prices. The research results show that both price-based and quantitative monetary policies can have a significant impact on the regulation of housing prices, but the quantitative monetary policy has been unstable after the outbreak of the novel coronavirus pneumonia epidemic. At the same time, with the uncertainty of China's economic policy, the monetary policy has a more obvious regulatory effect on housing prices, and the time-varying characteristics are outstanding, indicating that compared with the traditional constant coefficient model, the construction of the time-varying parameter model is more competitive. Although housing prices are affected by the two types of monetary policy, the effect is obvious, but the form is asymmetrical, that is, the increase in economic policy uncertainty will weaken the regulatory role of quantitative monetary policy, but it will strengthen the regulatory role of price-based monetary policy. When the degree of economic policy uncertainty is low, if China's housing prices grow too fast, the quantitative monetary policy can play a very good role; but if China's economic development is under greater downward pressure, especially the Sino-US trade war and the novel coronavirus pneumonia epidemic, the degree of uncertainty in economic policies has been relatively high. Due to the unstable performance of quantitative monetary policies, the use of price-adjusted monetary policies in a short period of time has more obvious effects. Based on the above analysis results, the following suggestions are put forward: when regulating the real estate market, it is necessary to strengthen the combined use of price-based and quantitative monetary policies. This is because the two types of monetary policies have a relatively good complementary effect under different levels of economic policy uncertainty. In the face of the current impact of the novel coronavirus pneumonia epidemic, if the real estate market is regulated: in the short term, price-based monetary policy should be adjusted mainly because the current economic policy has a high degree of uncertainty, and from the peak of the control effect, the short-term monetary policy is better than the medium and long-term control effect.

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