Research on the Dynamic Relationship between Chinese Pork Price and CPI

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Abstract: CPI and pork price have a very important impact on people's daily lives and macroeconomics. This paper selects the monthly data of China's pork price and CPI from January 2010 to February 2020 and further explores the dynamic relationship between China's pork price and CPI by using the VAR model, impulse response function and variance decomposition method. The results of the study show that pork price and CPI are Granger causality. China's pork price fluctuations are mainly affected by its own factors and its contribution rate shows a downward trend. The fluctuation of China's CPI is mainly affected by its own factors, but the influence of its own factors on CPI gradually weakens. Based on the above conclusions, the author puts forward corresponding policy suggestions.

1. Introduction

Affected by the "double epidemic" of African swine fever and COVID - 19, China's pork price fluctuates frequently and shows an upward trend. Pigs are the most important meat on Chinese people's dinner table. The rising price of pork is not only closely related to everyone's life, but also affects the country's economic decisions. Due to the large proportion of pork in CPI, the increase of pork price will lead to the increase of CPI and the change rate of CPI reflects the degree of inflation to some extent. Therefore, people will worry that the continued increase of pork price will push up CPI, thus forming a new round of inflation. Exploring the dynamic relationship between pork price fluctuation and CPI can not only provide guidance for residents' life, but also provide a certain basis for national economic decision-making, which is of great practical significance. Therefore, this paper analyzes the data of pork price index and CPI in the recent ten years (2010-2020) to explore the relevant mechanism of the relationship between the two, so as to deepen the understanding of this issue.

2. The empirical research

2.1 Data sources and processing methods

Based on the research purpose of this article, considering the availability of data, the data of this article is selected from January 2010 to February 2020, including China's pork price index and consumer price index (CPI), both of them are ring data. The data comes from the National Bureau of Statistics and China's macroeconomic database and the vector autoregressive VAR model is selected as the analysis tool.

2.2 VAR model construction

2.2.1 Variable stability test (unit root test)

Stationarity test is an important issue to be considered in time series data. The main purpose is to keep the data in a stable and random process to ensure that the empirical results can be effective. The

unit root test here mainly uses the ADF statistic and the analysis result is obtained by comparing the value of the statistic with the critical value at different confidence levels (Table 1).Among them, PPI represents pork price index and CPI is consumer price index. The data in the table are obtained with intercept, no difference, no trend and lag period of 12. The results show that the null hypothesis is rejected at the 5% significance level, that is, the time series variables are stable at this time.

Table 1. Unit Root Test Results of Time Series Variables PPI and CPI

variable	ADF statistics	5% level	Prob.	conclusion
PPI	-7.195211	-2.885450	0.0000	steady
CPI	-9.343729	-2.885450	0.0000	steady

2.2.2 Optimal lag order selection

In order to determine the period of the best lag period, the natural log-likelihood function value (Log L), likelihood ratio (LR), final prediction error criterion (FPE), Akaike information criterion (AIC), and Schwarz criterion (SC), Hannan-Quinn criterion (HQ) as a judgment indicator for comprehensive evaluation. It can be seen from Table 2 that the optimal lag order is 2.

Table 2. Optimum lag

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-445.9700	NA	8.876161	7.859122	7.907126	7.878604
1	-433.9253	23.45539	7.707995	7.717988	7.861998*	7.776434
2	-427.4880	12.31003*	7.385996*	7.675227*	7.915245	7.772637*
3	-424.2613	6.057046	7.488362	7.688795	8.024819	7.825168

2.2.3 Model stability test (unit circle test)

The stability of the VAR model can be found by checking the characteristic root of the VAR model. According to the determined order 2 to estimate the model and conduct stability test, all AR characteristic roots are in the unit circle, so the model is stable.

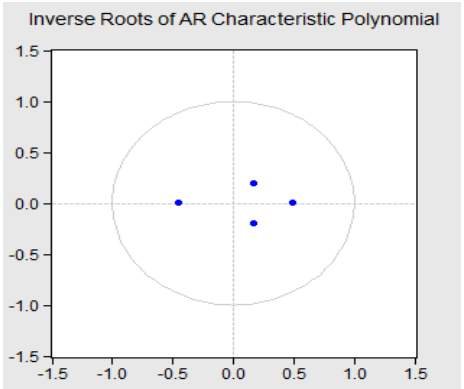

Fig. 1 Unit circle test results

2.3 Granger causality

From the granger causality test results, it can be seen that at the significance level of 5%, there is a two-way granger causality between the pork price index and the consumer price index. The pork price is the granger cause of the CPI and the CPI is the granger cause of the pork price.

Table 3. Granger test results of time series variables PPI and CPI

null hypothesis	Lag orders	Prob.	conclusion
PPI's not CPI Granger cause	2	0.0031	Reject the original hypothesis
CPI's not PPI Granger cause	2	0.0016	Reject the original hypothesis

2.4 Impulse response

In order to understand the relationship between various variables in the model, especially when the endogenous variables affect the degree of interference, the impulse response is generally used to measure. Specifically, when the standard deviation of a certain interference term in the model changes, the change of the standard deviation will have a certain degree of influence on the current and future lags of the endogenous variables. The lag period is 1-15. In Figure 2, the lag period is 15. The horizontal axis represents the number of periods and the vertical axis represents the degree of response of the explained variable to the explanatory variable. The impulse response function can be used to effectively describe the time lag and intensity changes of the transfer effect of pork price and CPI, clearly reflecting the degree of response under the same standard impact of variables.

First, the response of CPI to the information shock of one standard deviation varies greatly, and reaches the maximum in the period of lag 1. The lag period from 1 to 2.5 is a positive impact, which shows a downward trend. The lag period of 2.5 ~ 7 is negative impact. After phase 7, it leveled off and went to 0. Second, the change of CPI causes the pork price to rise in the lag period 1 ~ 2 and the lag period 2 reaches the peak. After the lag period of 2, it begins to decay and approaches zero. After 8 lag periods, it is zero. And is always a positive shock. Third, under the impact of pork price, CPI decreases gradually in the lag period 1-3. CPI is positive shock in phase 1-2 and negative shock in phase 2-3. It is also negative impact in phase 3-8, showing an upward trend. And it levels off after the eighth period and is 0. The lag period of 3 ~ 8 is negative impact, showing an upward trend. After 8 lag periods, the effect is zero. Fourth, the fluctuation of pork price responds to its own price quickly and reaches the maximum in the period of 1 lag. It decreases rapidly in lag 2, and remains relatively stable in lag 2 ~ 3.It shows a downward trend in the lag period of 3 to 10, and the effect of lag period of 10 and later is still 0.

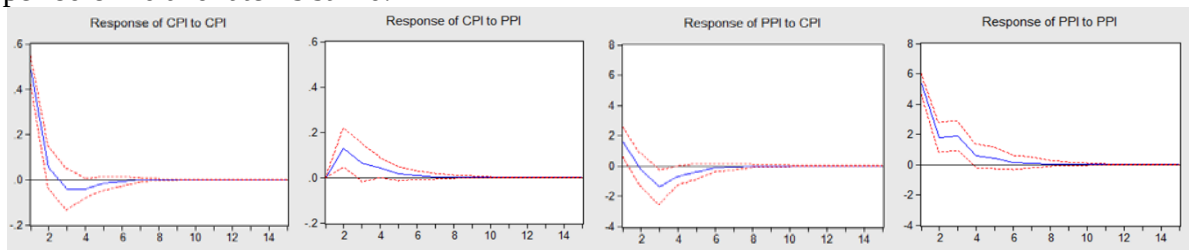

Fig. 2 Pulse Response Results

2.5 Variance decomposition

The impulse response indicates the impact of information shock on each variable, but the specific contribution degree is not clear. In order to further understand the contribution degree of the impact of variable impact, it is necessary to use the variance decomposition method of VAR model to solve the problem. The specific results obtained by using variance decomposition are shown in table 4.

Table 4. Variance analysis results

Period	CPI			PPI		
	S.E.	CPI	PPI	S.E.	CPI	PPI
1	0.481520	100.0000	0.000000	5.566130	8.033066	91.96693
3	0.507493	91.88349	8.116511	6.301829	11.45492	88.54508
5	0.511387	91.26507	8.734931	6.388576	12.61113	87.3887
7	0.511558	91.23635	8.763647	6.392894	12.66330	87.33670
9	0.511567	91.23475	8.765263	6.393138	12.66605	87.33395
11	0.511568	91.23464	8.765355	6.393153	12.66622	87.33378
13	0.511568	91.23464	8.765361	6.393154	12.66623	87.33377
15	0.511568	91.23464	8.765361	6.393154	12.66623	87.33377

It can be seen from the table that CPI fluctuations in China are mainly affected by its own factors and the contribution rate of CPI fluctuations shows a downward trend, from 100% in the first phase to 91.23% in the 15th phase, with the contribution rate in the 11th phase reaching the minimum. CPI

fluctuations were influenced by pork prices on an upward trend, rising from 0% in the first period to 8.77% in the 15th.The price fluctuation of pork in China is mainly affected by its own factors, but the influence of its own factors on the price of pork is gradually weakened, decreasing from 91.97% in the first period to 87.33% in the 15th period and reaching the minimum in the 13th period.The contribution of CPI to pork price fluctuation gradually increased from 8.03% in the first period to 12.67% in the 15th period. According to the above analysis, although CPI and pork price fluctuations in China are most affected by their own factors, there is a certain relationship between the two prices and CPI and pork price are closely related to each other. But in general, the influence of pork price on CPI is greater than that of CPI on pork price.

3. Research results and implications

3.1 Research results and analysis

Pork price and CPI are granger causality. Pork price is the granger cause of CPI and CPI is the granger cause of pork price. They have a strong correlation with each other. The fluctuation of pork price in China is mainly affected by its own factors and the contribution rate is decreasing. CPI fluctuation in China is mainly affected by its own factors, but the influence of its own factors on CPI is gradually weakened. Although the price fluctuation of China's CPI and pork is most affected by its own factors, there is a certain relationship between the two prices. CPI and pork prices interact closely. Overall, however, pork prices have a greater impact on CPI than on pork prices. Rising CPI will lead to various costs of raising pigs, such as feed prices, labor costs, etc. As the cost of raising pigs increases, farmers will raise the price of pork in order to maintain the original income, resulting in an increase in the price of pork. Pork price has a great influence on CPI mainly because pork price has a high weight in CPI food items and is the most important influencing factor of CPI food items.

3.2 Implications

To promote the industrialization of pig breeding and realize the development of specialization, scale and modernization of pig breeding. Farmers continuously cultivate high-quality, high-yield, characteristic pigs to improve the economic benefits of breed pigs. The relevant departments continuously improve the pig related insurance system, improve the ability of farmers to resist risks and reduce the impact of external factors on farmers. The government strengthens the financial support, gives the farmer certain subsidy appropriately to stimulate the farmer's enthusiasm. To establish and improve the surveillance system of swine fever in Africa, so as to detect, report, deal with it in time, stop the loss in time and prevent the epidemic from spreading further. The government should increase investment in scientific research and promote the development process of swine fever vaccine in Africa to reduce the threat of pig disease. We will accelerate the recovery of pig production capacity by combining supplementary raising with epidemic prevention and control. Multi-measures, multi-channel, multi-subject joint efforts to increase pig production to stabilize pig supply. At the same time, the government should step up the inspection of pork market prices and promptly use macro-control measures to curb the excessive growth of pork prices in order to better maintain price stability and safeguard the interests of the people.

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