Does Rising Commodity Prices Pose an Inflation Risk

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Abstract. In the context of rising commodity prices, this paper mainly analyzes the transmission between domestic upstream and downstream prices and the impact of commodity prices on upstream and downstream prices, and aims to study whether rising commodity prices will cause inflation risks. In this paper, a Vector Autoregressive Model (VAR) is constructed by using time series data of RMPI, PPI, CGPI, CPI and commodity prices in China, and it is founded through impulse response analysis that the upper and midstream prices in China have a significant dynamic transmission effect on the downstream prices, while the downstream prices have a reverse transmission mechanism against the midstream price and the midstream price on the upstream price.Based on this, this paper believes that there is an indirect dynamic transmission mechanism between the rise in commodity prices and the risk of inflation, and there is a transmission time delay, and it is necessary to pay close attention to the structural changes in consumer prices. Finally, relevant policy recommendations were proposed.

Keywords: Commodity Prices, Price Transmission, Inflation.

1. Introduction

Domestic research on CPI and PPI mainly focuses on the conduction mechanism, but the conclusions of the study are different, and the more consistent is that there is positive conduction of PPI to CPI, and the discussion point focuses on the feedback mechanism of CPI to PPI. Liu Fengliang (2011) introduced the monetary policy analysis framework to study the price transmission mechanism using the grauter causal test of leveraged boots, and concluded that the Granger reason why the CPI is the PPI is not true. Bai Xuemei (2009) used the Granger causality test based on vector autoregression model to analyze the conduction mechanism of producer prices and consumer prices in China, and found that PPI is the one-way Granger cause of CPI; secondly, the impulse response function analysis found that PPI is the most important influencing factor of CPI. Different from the above research results, Yang Zihui et al. (2013) from the perspective of nonlinear research, using multinational data to conduct in-depth research on the nonlinear conduction mechanism and role relationship between CPI and PPI, it is found that the rise of PPI will be transmitted positively to CPI, and there is also a reverse pushback mechanism of CPI to PPI, which aggravates the difficulty of price macro-control and the uncertainty of future inflation risk. Zhang Chengsi (2010) used the cointegration analysis method under the vector system to analyze the driving mechanism of domestic upstream and downstream prices and currency factors on prices, and the results showed that the upstream and midstream prices have a significant dynamic transmission effect on the downstream prices, while the downstream prices have a reverse transmission mechanism on the midstream price and the midstream price on the upstream price, respectively; the monetary factors have obvious effects on the upstream price, but do not directly act on the downstream price.

In view of the divergence phenomenon of CPI and PPI, domestic studies have also analyzed the causes. Lu Jie (2015) analyzed the divergence of domestic CPI and PPI using the three-sector dynamic stochastic general equilibrium model, and found that the loose monetary policy caused the flow of labor across sectors to lead to an increase in CPI and a decrease in PPI, revealing the structural reasons for the divergence of CPI and PPI. Chen Jianqi (2008) combined with the specific market structure of China, made a long-term investigation of the price determination mechanism, explored the reasons for the inversion of CPI and PPI, and found that the asymmetric supply and demand structure is the main reason for the inversion of PPI and CPI.

In summary, domestic research on price transmission and inflation warning mainly focuses on the conduction mechanism of CPI and PPI, but it should be noted that there are multiple transmission links in the price chain transmission, and CPI and PPI are only part of it. Therefore, it is necessary to study the various links in the price chain to restore the price transmission as objectively as possible. At present, the price indexes that can be obtained include the price of the materials consumed by industrial enterprises for production activities (RMPI), the trend of factory price changes and changes of industrial products (PPI), the change of wholesale prices of commodity transactions (CGPI), and the consumer price index (CPI), and the above four price indexes can be more comprehensively represented the transmission from the price of means of production to the price of means of living.

This paper first analyzes the driving force of the rise of international commodity prices and its impact on China; secondly, the innovative use of the whole chain price index to conduct conduction research on all aspects of the price, explore the domestic upstream, middle and downstream price transmission mechanism, and hope to explore and discover the inflation warning indicator; third, the impact of the commodity price index on the price chain is analyzed, and the question of whether the rise in commodity prices will bring about inflation is explored. Finally, this paper puts forward policy suggestions such as focusing on excavating the micro-changes and transmission mechanisms of the internal structure of prices, and strengthening price management expectations.

2. International Commodity Price Operation Characteristics and Upward Drivers

At present, there are many indexes that describe the trend of international commodity prices, such as the Goldman Sachs Commodity Price Index (GSCI), the Dow Jones Commodity Price Index (DJ-AIG), the S&P Commodity Price Index (SPCI), the International Monetary Fund Commodity Price Index, etc. However, the more authoritative and commonly used is the RJ/CRB index, which is compiled from the prices of 22 economically sensitive commodities in the world market, and the practice proves that the RJ/CRB commodity futures index effectively reflects the comprehensive trend of the underlying commodity prices at the macro level, especially in revealing the inflection point of economic operation.

Figure 1. RJ/CRB Commodity Price Index

The current round of price increase cycle began after the new crown epidemic, the economic recovery of various economic entities, the demand side into the repair stage, but the degree of repair is different in various countries, and the supply side of various commodities is affected by the impact, resulting in a mismatch between supply and demand, and prices rise. From the perspective of rising speed, the current round of growth rate is significantly faster than the previous two rounds, the annualized increase of the RJ/CRB commodity futures index is 83.04%, higher than the first and second rounds of rising cycles of 24.38 and 47.86 percentage points; from the perspective of commodity categories, the structural rise characteristics of this cycle are obvious, and the increase in different commodities varies greatly. As can be seen from Figure 2. Energy prices have risen the most in this cycle, with annualized increases in energy price indices of 5.4 times and 2.4 times that of non-energy and metals, respectively. The reason for the structural rise of different commodities is that the impact of the epidemic on the supply side of different commodities is relatively large.

3. The operation of domestic commodity prices

Domestic commodity prices are basically synchronized with international commodity prices, but the fluctuations are relatively stable than international prices. In the near term, domestic commodity prices fell due to the impact of the epidemic in February 2020, and by May 2020, they stopped falling and rebounded, and soared all the way, reaching a record high of 179.60 points by the beginning of June, 31.12 points higher than the 2008 price high.

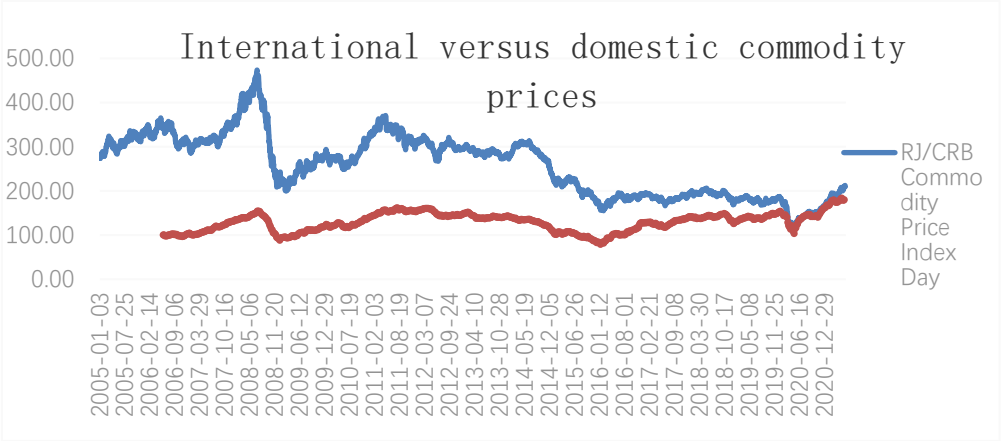

Figure 2. Comparison of international and domestic commodity prices

From the perspective of sub-indexes, energy commodities rose the most prominently, with an increase of 103% from April 2020 to March 2021. In addition, the prices of minerals, rubber, nonferrous metals, oils and fats, steel, and agricultural products rose by 70.2%, 53%, 52%, 44.9%, 39.7% and 26.6% respectively.

4. Empirical analysis of domestic price transmission path

Through the analysis of the driving force and impact of the rise in commodity prices, it can be seen that the current round of commodity price increases has a greater impact on the PPI, but the impact on China's CPI is limited. In order to further analyze the impact of this round of commodity price increases on domestic inflation, this paper first analyzes the domestic upstream, middle and downstream price transmission, explores the path of price transmission, and excavates the factors affecting the change of CPI, and then discusses the impact of commodity prices on domestic prices.

From January 2005 to June 2020, this paper selects the time series data of RMPI, PPI, CGPI and CPI in China for analysis, and uses vector autoregressive model (VAR) for impulse response analysis, and finds that the upstream and midstream prices have the same-directional effect on the downstream CPI price, the negative feedback mechanism of the downstream price CPI on the upper and midstream price PPI and RMPI price, and the influence of the midstream price CGPI on the upstream PPI and RMPI is the same directional effect. Commodity prices have the largest and significantly positive impact on domestic upstream prices RMPI, while the impact on downstream prices (CPI) is slight and not significant.

4.1 Data selection and statistical analysis

In this paper, 186 monthly data between January 2005 and June 2020 were selected as sample points. In terms of variable selection, the transmission of upstream and downstream prices is measured by four prices: the price of materials consumed by industrial enterprises for production activities (RMPI), the trend of factory price change and change trend of industrial products (PPI), the change of wholesale price of commodity transactions (CGPI), and the consumer price index (CPI). Domestic commodity price indexes process daily data into monthly data. The data in this article comes from wind, the National Bureau of Statistics, Chinese Minmin Bank, etc.

Through the analysis of the national RMPI, PPI, CGPI and CPI from January 2005 to June 2020, it is found that the increase is mainly divided into five stages: the first stage (2005.11-2008.11), RMPI

bottomed out in November 2005, until the end of June 2008, fell to 23.4 in November 2008, the second stage (2008.12-2011.12), the bottom rebound in December 2008, It began to run high volatility in January 2010, reached its highest point in November 2010, and rose in December 2011 The third stage (2012.01-2016.06) showed low volatility; the fourth stage (2016.06-2018.10), which began to rise in June 2016, reached its highest point in December 2016, and then ran at a high level until October 2018; the fifth stage (2018.12-2020.06) ran with low volatility.

From the perspective of the timing of change, the RMPI change is obviously ahead of the other three types of price changes, and secondly, the CGPI is obviously ahead of the other two types of price changes, but the PPI and the CPI have no obvious leading relationship, and the synergistic trend between the two is stronger.

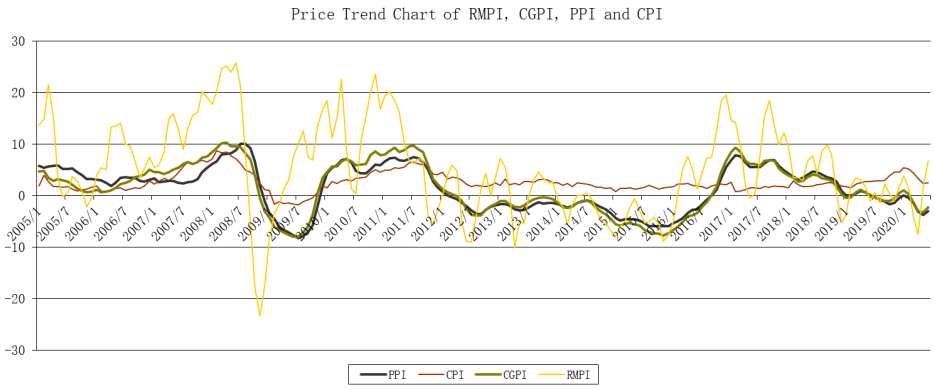

Figure 3. Price Trend Chart of RMPI, CGPI, PPI and CPI

4.2 VAR and impulse response function

4.2.1 VAR and impulse response function

(1) VAR

Let the VAR(p) model be:

$$Y_t = \alpha + A_1 Y_{t-1} + A_2 Y_{t-2} + ... + A_p Y_{t-p} + \varepsilon_t \tag{1}$$

wherein, Y_t is a vector composed of 4 endogenous variables, i.e Yt=(RMPIt,PPIt,CGPIt,CPIt), OW: RMPI: Purchase Price Index for Raw Materials, PPI: Producer Price Index, CGPI: Corporate Goods Exchange Price Index, CPI: Consumer Price Index, ε_t is a perturbation vector, A_1, A_2, .., A_p is the parameter matrix.

(2) Impulse response function.

The impulse response function characterizes the effect of adding a one-time shock to the perturbation term on the current and future values of endogenous variables. The impact on one variable directly affects that variable and is transmitted to other endogenous variables through the dynamic structure of the VAR model. The vector moving average model (VMA) obtained from Equation (1) is:

$$Y_t = \psi_0 \varepsilon_t + \psi_1 \varepsilon_{t-1} + \psi_2 \varepsilon_{t-2} + ... + \psi_p \varepsilon_{t-p} \tag{2}$$

$\psi_p = (\psi_{pij})$ is a matrix of coefficients, p=0,1,2,…. The response function caused by y_j is $\psi_{0,ij}$, $\psi_{1,ij}$, $\psi_{2,ij}$ ...

4.2.2 Unit root test

VAR (variable autoregression) models require that variables must be stationary, so the unit root test is performed on each variable first. The root-of-unit test assumes that the data have a cubic root, and if the absolute value of the corresponding ADF statistic is greater than the critical value at the corresponding significant level, it means that there is no cubic root, that is, the data is stationary;

conversely, the data is not stationary. Further, to eliminate its instability, the data need to be differentiated in the first order.

Table 2 shows the critical values of ADF statistics at the 5% significance level for the five indicators of RMPI, PPI, CGPI, CPI, and index. DRMPI, DPPI, DCGPI, DCPI, Dindex represent a first-order difference for the above indicators.

From the structure of the unit root test in Table 2, it can be seen that in addition to the RMPI being stationary at the 1% level, the other three indicators are non-stationary at the 1% significance level. Therefore, the first-order difference is performed on the selected indicator, and it can be seen from the table that the four indicator variables have reached a plateau at the 1% level. Therefore, the first-order difference of each indicator is used in the following analysis.

Table 1 ADF unit root test results

Variable	ADF test value	T value	P value	Conclusion
RMPI	-5.42	-3.46	0.03	Not smooth
DRMPI	-10.02	-3.47	0.00	smooth
PPI	-3.29	-3.46	0.02	Not smooth
DPPI	-6.27	-3.46	0.00	smooth
CGPI	-2.91	-3.46	0.04	Not smooth
DCGPI	-4.45	-3.47	0.00	smooth
CPI	-2.77	-3.47	0.06	Not smooth
DCPI	-6.13	-3.47	0.00	smooth
index	-2.64	-3.46	0.08	Not smooth
Dindex	-7.51	-3.47	0.00	smooth

4.2.3 Cointegration test

The cointegration test is used to test whether there is a long-term equilibrium relationship between the variables, the cointegration test requires that all variables need to be stable, after the above unit root test, it can be seen that the four index variables are first-order monotigged, so the multivariate Johansen cointegration relationship test can be performed. According to the results of the cointegration relationship test in Table 3, it can be seen that there are multiple long-term equilibrium relationships between DRMPI, DCGPI, DPPI, and DCPI

Table 2 Johansen cointegration test results

Null hypothesis	Trace statistics	5% level	P value
There is no cointegration	93.72	47.86	0.0000
At most one cointegration	43.92	29.79	0.0007
Up to two cointegration relationships	21.15	15.49	0.0063

Note: Rejects the null hypothesis when the P-value is less than 0.05 and accepts the null hypothesis instead.

4.2.4 Granger causality test

In order to further analyze the conduction relationship between upstream and downstream prices, granger causality tests are performed on various prices to confirm the conduction direction of each other, and the granger causal test results are shown in Table 4:

Table 3 Granger causal test results

Null hypothesis	F statistic	P value
RMPI is not the Granger reason for PPI	16.6852	0.0207
PPI is not RMPI's Granger reason	0.20069	0.8184

RMPI is not the Granger reason for CGPI	7.34337	0.0009
CGPI is not RMPI's Granger reason	4.11748	0.0179
RMPI is not the Granger reason for CPI	6.89232	0.0013
CPI is not rmpi's Granger reason	7.22826	0.0010
PPI is not the Granger reason for CGPI	1.90403	0.1520
CGPI is not the Granger reason for PPI	21.5072	0.0041
PPI is not the Granger reason for CPI	8.32152	0.0004
CPI is not the Granger reason for PPI	3.58934	0.0296
CPI is not the Granger reason for the CGPI	2.91371	0.0569
CGPI is not the Granger reason for the CPI	13.7191	0.0036

Note: Rejects the null hypothesis when the P-value is less than 0.05, and accepts the null hypothesis instead.

From Granger's test, it can be seen that RMPI is the Granger cause of PPI, CGPI and CPI, but PPI is not the Granger cause of RMPI; CGPI is the Granger cause of CPI, PPI and RMPI, but CPI and PPI are not granger reasons of CGPI; CGPI and RMPI are each other Granger reason; CPI and PPI are Granger reasons for RMPI.

Figure 3. CPI

From the perspective of the conduction chain, the transmission of the upstream, middle and downstream price chains is incomplete, which is mainly reflected in: First, there is no positive conduction between the two midstream prices (PPI to CGPI), resulting in the rupture of the positive conduction chain; second, the downstream price CPI has no reverse conduction to the midstream price CGPI, and the midstream price PPI has no reverse conduction to the upstream price RMPI, resulting in the rupture of the reverse conduction chain. However, although the price transmission chain is incomplete, it does not affect the transmission of upstream and downstream prices, especially the direct positive and negative conduction between the rmPI and CPI of the two terminal prices.

The comprehensive test results can draw the following conclusions: first, the upper and midstream prices (RMPI, PPI, CGPI) can be directly transmitted to the downstream price (CPI); second, the downstream price (CPI) has a reverse pressure mechanism for the midstream price PPI and the upstream price RMPI, but there is no reverse conduction to the CGPI; third, the midstream price CGPI has an adverse effect on the PPI and the upstream price RMPI, and there is a reverse force effect; fourth, There is no backlash mechanism between midstream price PPI and upstream price RMPI.

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