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The Impact of International Commodity Prices and Public Information Acquisition on China's Inflation: Based on the Chained Multiple Mediation Effect Test

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Abstract: Under the background of drastic fluctuations in international commodity prices, the public can search for commodity price information and monetary policy information to quickly adjust personal expectations and behavioral decisions. Therefore, the paper discuss the transmission and mediation effect of international commodity prices on public information acquisition in the process of China's inflation shock. This paper uses Baidu index keywords to construct a search index that measures the public's behavior of acquiring information on commodity prices and monetary policy in China. Using the chain multiple mediation effect model, this paper analyzes the effect of public information acquisition based on network search on the transmission of international commodity prices to China's inflation. The test results show that: there is a "international commodity price→domestic commodity price→commodity information acquisition→monetary policy→Information acquisition→PPI" conduction path. The public information acquisition behavior can alleviate the rise of domestic inflation as a whole, and the higher the information accuracy, the smaller the inflation fluctuation. There are differences in the impact of different regions and different types of commodity price information searches on inflation. Among them, the public's acquisition of energy commodity information mainly affects the PPI, while the agricultural commodity information acquisition has a relatively greater effect on the CPI. Compared with only searching for monetary policy-related information, the intermediary effect of public information acquisition after adding bulk commodity price information search has weakened, indicating that the release of bulk commodity information in China is not sufficient. Therefore, when the regulatory authorities guide public expectations, in addition to increasing the amount of communication and information, more attention should be paid to the possible impact of information on the public during the use and interpretation of information. Based on the above research conclusions, suggestions are put forward to improve the monitoring and early warning mechanism of commodity prices, strengthen traditional energy management, accelerate the development of alternative energy, and formulate commodity strategies.

1. Introduction

Affected by factors such as changes in the global supply and demand pattern, trade frictions, COVID -19, and geopolitics, international commodity prices have fluctuated greatly and frequently in recent years [1,2]. China's economic operation relies on international commodities such as energy, metals, and agricultural products to a certain extent [3]. International commodity prices will inevitably bring new pressure to China's inflation. The effect of inflation control depends on the implementation of policy tools on the one hand, and public expectations on the other hand. In addition, whether economic and policy information can effectively guide public expectations also depends on the public's collection and feedback of information. Information thus plays an important role in the formation of public expectations. Information may not only guide the public to make behavioral decisions that are consistent with the policy direction, which is conducive to the realization of regulatory goals, but also may cause the public to produce behaviors that are contrary to the regulatory goals and reduce the regulatory effect. From a global perspective, regulatory authorities in various countries generally attach great importance to information communication in actual operations, and the convenience of information dissemination channels also makes relevant policy and economic information more accessible to the public and plays a greater role in the formation of expectations. Under the background of drastic fluctuations in international commodity prices, public information acquisition includes not only the attention and acquisition of monetary policy information, but also the attention and acquisition of information related to commodity prices. Considering that the Internet has become an important way for the public to obtain information, it is more practical to describe the public's access to information on commodity prices and monetary policy by using online searches for keywords. The development of information technology has brought new changes to public information acquisition and information analysis. People can use network search methods to filter out redundant information and analyze useful information, so as to quickly adjust personal expectations and behavioral decisions. Therefore, to discuss the transmission and mediation effect of international commodity prices on public information acquisition in the process of China's inflation shock, it is urgent to clarify and answer the following questions:

How to synthesize the index based on the massive data of online search volume to realize the quantitative characterization of the public's access to information related to commodity price fluctuations and monetary policy regulation? Has the effect of China's monetary policy on inflation changed after adding the influence of public information acquisition, and what is the difference between the effects on PPI and CPI? Are the multiple mediating effects produced by the public's access to information about commodity price fluctuations and monetary policy regulation parallel or chained? How does the chain effect process? Since the interaction effect between price and policy information attention is complex and changeable, adding price information acquisition on the basis of policy information acquisition will produce an inflation control effect consistent with the policy direction, or will it be contradictory? In the process of considering the impact of international commodity price fluctuations, the supply and impact of commodities in different countries and regions are inconsistent, and the proportion of different types of commodities in the international and domestic commodity indices is also different. Will the search and acquisition of regional and different types of bulk commodity price information also have a differential impact on the adjustment effect of China's inflation level? Answers to the above questions will help to correctly understand the public's access to and reception of information, so as to prevent and manage inflation caused by international commodity price shocks from the perspective of expectation management, which is important for enriching theoretical basis and exerting the effect of monetary

policy regulation.

Based on the above thinking, this paper intends to use the period from January 2011 to May 2022 as the sample period, and use the Baidu index online search keywords to construct a search index to measure the Chinese public's acquisition of commodity prices and monetary policy information; In the context of influence, through the multiple mediation effect model, empirically analyze the effect of China's monetary policy on inflation after adding the influence of public information acquisition, as well as the effect of public information acquisition in the transmission process, and explain the possible chain transmission process. Further, it analyzes the different influences of different countries, regions and different types of commodity price information search on the effect of China's inflation regulation, and finally gives corresponding policy suggestions based on the research conclusions. The possible marginal contributions of this paper are: First, a search index is synthesized based on online search volume data to achieve quantitative characterization of the public's access to information on commodity price fluctuations and monetary policy regulation; second, the public's perception of commodity price fluctuations and currency The information acquisition angle of the two aspects of policy regulation and control information is the starting point of the research, rather than only considering the public's acquisition of policy information, which helps to enrich the analysis of the impact of information acquisition on the effect of monetary policy on inflation control; third, the use of chain multiplex The mediation effect model empirically studies the mediation effect of public information acquisition on the impact of international commodity price fluctuations on China's inflation, and reveals that commodity prices can affect China's inflation level not only through the two intermediary channels that affect the public's access to commodity price information and monetary policy information, but also Specifically, it can also influence the chain -type intermediary channel of "international commodity prices → the public's acquisition of commodity price information → the public's acquisition of monetary policy information → inflation level", which enriches and refines the transmission mechanism research. Fourth, the article distinguishes the impact of different countries, regions and different types of commodity price information search on PPI and CPI, and provides a further difference test for the impact of commodity prices.

The rest of the article is structured as follows: the second part is literature review; the third part is theoretical analysis; the fourth part is research design; the fifth part is empirical analysis; the sixth part is conclusions and policy recommendations.

2. Literature Review

Early studies on commodity prices mainly focused on volatility characteristics and spillover effects [4,5]. In recent years, with the increasing attention to the impact of commodity prices on the macroeconomy, researches on the analysis of the inflation effect brought by commodity price fluctuations and their relationship with monetary policy have emerged [6,7]. Some scholars have carried out research based on two different representative indicators of inflation, PPI and CPI, but the conclusions of the research are controversial. Tan Xiaofen and Shao Han [8], Wu Liyuan et al. [9], and Liu Jinquan and Liu Yue [10] believe that international commodity prices have a significant impact on PPI, and price shocks decrease from upstream to downstream, but have a limited impact on CPI. On the contrary, Zhang Shaojun et al. [11] proposed that due to the strict price control of upstream industries in China, international trade will not cause inflation in the upstream of the industrial chain. From the perspective of transmission channels, scholars believe that, on the one hand, commodity prices can affect the production cost of enterprises through factors such as trade openness and exchange rate, and pass it on to consumers to cause inflation [12-15]; on the other hand, Long Shaobo et al. [16] studied from the perspective of expectation and found that

an important reason for the negative growth of China's PPI during the sample period was the continuous decline in international commodity prices. Therefore, additional expected analysis of commodity price fluctuations is required; Luo Zuoyan and Zheng Jiao [17], based on the expected impact research, proposed that there are differences in the impact of unanticipated and additionally expected commodity price fluctuations on the economy. The above results have important reference significance, and also lay a good foundation for the follow -up research. However, from the perspective of expectation management, the mediating influence of public information acquisition is ignored, and the role of information in the formation of public expectations cannot be reflected, nor the public's attention and access to commodity prices and monetary policy information are combined to examine. In addition, the existing literature mostly conducts empirical research on the impact of oil prices [18,19], while the international price impact of agricultural commodities and metal commodities has not been paid enough attention, so it has not yet demonstrated the public's understanding of different countries. Different regions and different types of commodity price information have different influences on China's inflation level.

The theory of adaptive learning believes that the public not only realizes self -learning according to a certain measurement method or its own experience, but also learns from each other through the dissemination of information among people [20], and forms the expected effect of the policy according to the obtained information. The difficulty in examining the acquisition and utilization of public information is that the process of receiving and utilizing information and ultimately affecting public expectations is essentially the psychological activity of economic agents, and the quantification and measurement related to it has always been a research difficulty [21]. Most scholars study the continuous impact of public expectations on inflation by constructing a DSGE model that includes expectations, and empirically find that introducing public expectations can effectively improve the regulatory effectiveness of monetary policy [22-26]. Yan Xiandong and Gao Wenbo [27] used the survey data of central bank depositors to characterize the public's inflation expectations. However, the empirical process has not formed a direct measure of information sending, dissemination, and reception and utilization. With the application and popularization of big data technology, the comprehensiveness and objectivity of the resulting data information are incomparable with traditional sampling data. Scholars at home and abroad have begun to use online search data to evaluate the public's judgments on the economic status quo and future. Kholodilin et al. [28] compared the prediction accuracy of the U.S. personal consumption growth rate based on the search index synthesized based on Google search volume data and the traditional consumer confidence index, and found that the former data has a relatively higher availability frequency and accuracy, and has the ability to predict advantage. Xu Yingmei and Gao Yiming [29], Dai You et al. [30] used Baidu search index to synthesize CPI public opinion index, which improved the prediction accuracy of CPI. Zhang Hu et al. [31] used the AMCNN model to combine the Baidu search index and the Tsinghua University online consumer price index to successfully predict the "inflection point" of the CPI. Yuan Ming [32] used search volume data to construct a public information acquisition index to study the impact of public expectations on the effect of monetary policy. The inspiration given by the above research is that with the development of big data technology, it is feasible to use online search volume data to examine the public information acquisition and reception. The results on the acquisition of information related to monetary policy are slightly insufficient.

In addition, the existing studies on the mediating effect of commodity prices on inflation mostly use the single -fold mediation test. Although this test method is clear and intuitive, it is difficult to fully reflect the multi -dimensional process of shock transmission. Compared with the existing research results, this paper examines the use of information by the public in China through dual information acquisition, and then studies the chain -mediated mediation process of its effect on

inflation control. Among them, the application of search volume data is a beneficial attempt of big data analysis in the research on the impact of international commodity price fluctuations.

3. Theoretical Analysis and Research Assumptions

Starting from analyzing the mediating effect of public information acquisition in the process of international commodity price fluctuations impacting China's inflation level, refer to Woodford [33], Bian Zhicun and Gao Jiechao [34] and Guo Yumei and Zhou Xuan [35]. In the framework of the new Keynesian model, the current inflation rate (π_t) depends on the expectations of market participants for the next inflation rate and the output gap. Therefore, the aggregate supply curve is represented by the Phillips curve with additional expectations (as shown in Equation (1)).

$$\pi_t = \beta\left(E_t\pi_{t+1}\right) + \alpha y_t + \mu_t \tag{1}$$

Among them, $E_t\pi_{t+1}$ is the expectation of $t+1$ future inflation expectations in the period, y_t is the output gap in the current period, α is the positive correlation coefficient between inflation and the output gap, and μ_t is the supply shock. Indicated P_z as commodity prices. Since the composition of the inflation rate usually includes the producer price index (PPI) and the consumer price index (CPI), the PPI includes the prices of raw materials such as energy, metals, and agricultural products. π_t in Formula (1) can be further expressed as formula (2). Equation (2) shows that international commodity price shocks may have differential effects on PPI and CPI indicators.

$$\pi_t = \pi_t\left(PPI, CPI\right) = \pi_t(PPI(P_z), CPI(P_z)) = \beta\left(E_t\pi_{t+1}(P_z)\right) + \alpha y_t + \mu_t \tag{2}$$

Equation (3) is the intertemporal aggregate demand curve, and the output gap in the current period depends on the current interest rate and the public's expectations for the inflation level and output gap in the next period.

$$y_t = \left(E_t y_{t+1}\right) - \gamma\ (i_t - E_t\pi_{t+1}) + \xi_t \tag{3}$$

Among them, $E_t y_{t+1}$ is the expected output level, i_t is the current nominal interest rate, γ is the correlation coefficient, and ξ_t is the demand shock.

Refer to Xu Yaping [36] and Wen Bohui et al. [37] to solve the aggregate supply equation with the output gap as an intermediate variable. Suppose the central bank's target loss function is $\min_y L_t = \frac{1}{2}E_t\sum_{\tau=0}^{\infty}\beta^{\tau}\left\{(\pi_{t+\tau} - \pi^T)^2 + y_{t+\tau}^2\right\}$, When β =1, and the model satisfies the time consistency, the objective loss function can be simplified to formula (4):

$$\min_y L = \frac{1}{2}E\left\{(\pi_t - \pi^T)^2 + y_t^2\right\} \tag{4}$$

In the face of international commodity price shocks, market participants with high information sensitivity will, on the one hand, obtain relevant information on commodity prices through information search, and actively evaluate the impact of price changes on their own interests; The policy direction released by monetary policy may affect the overall market expectations and development. On this basis, participants with high information sensitivity will further evaluate the feedback effect of policies on prices through information search, and adjust their own economic decisions and behaviors accordingly. Under the influence of the herd effect, individual choices and

behaviors are contagious, which in turn affects the policy effect of inflation control. Therefore, the public information acquisition formed by the information search of commodity prices and monetary policy can logically form an intermediary effect, and there is a chain relationship of transmission. For this reason, hypothesis 1 is proposed in this paper:

Hypothesis 1: Commodity prices can affect China's inflation level through two intermediary channels that affect the public's access to commodity price information and monetary policy information, and may be through "international commodity prices → public access to commodity price information → public access to currency → policy information acquisition → China's inflation level" chain -type intermediary channel has a gradual impact.

Since the public's information acquisition and reception process is a black box, there are also uncertainties and differences in the decision -making and action results based on this. Therefore, the public's level of attention to information may not only eliminate information asymmetry in the market, but also aggravate market instability, thus having a compound effect on the regulation effect of inflation under the impact of international commodity prices. Introducing public information acquisition, it can be known from the response function of monetary policy on output and inflation that the policy effect depends on the coefficient composed of α. There is uncertainty, σ_α^2 variance determines the degree of uncertainty, incorporating σ_α^2 into (4), the central bank's target loss function is expressed as:

$$\min_y L = \frac{1}{2} E\left\{(\overline{\pi_t} - \pi^T)^2 + y_t^2\left(1+\sigma_\alpha^2\right)\right\} \tag{5}$$

Among them, $\overline{\pi_t} = \left(E_t\pi_{t+1}\left(P_z\right)\right) + \overline{\alpha} y_t + \mu_t$, $\overline{\alpha}$ is the mean of the α coefficients, $y_t^2\sigma_\alpha^2$ is that due to uncertainty, the monetary policy adjustment to achieve the corresponding policy objectives requires greater adjustment and control efforts than under certain conditions.

From the perspective of information search and acquisition, when considering the impact of international commodity price transmission, since the uncertainty contained in σ_α^2 must come from the search for commodity price information (ce) and the search for monetary policy information (me), as well as the public's reception and understanding of the above information, σ_α^2 can be further expressed as:

$$\sigma_\alpha^2 = \sigma_\alpha^2\left(ce, me\right) \tag{6}$$

Substituting Equation (6) into Equation (5), the monetary policy response function is:

$$y_t = \frac{\alpha}{1+\alpha^2+\sigma_\alpha^2\left(ce,me\right)}\pi^T - \frac{\alpha}{1+\alpha^2+\sigma_\alpha^2\left(ce,me\right)}\left(E_t\pi_{t+1}\left(P_z\right)\right) - \frac{\alpha}{1+\alpha^2+\sigma_\alpha^2\left(ce,me\right)}\mu_t \tag{7}$$

$$\pi_t = \frac{\alpha^2}{1+\alpha^2+\sigma_\alpha^2\left(ce,me\right)}\pi^T + \frac{1+\sigma_\alpha^2\left(ce,me\right)}{1+\alpha^2+\sigma_\alpha^2\left(ce,me\right)}\left(E_t\pi_{t+1}\left(P_z\right)\right) + \frac{1+\sigma_\alpha^2\left(ce,me\right)}{1+\alpha^2+\sigma_\alpha^2\left(ce,me\right)}\mu_t \tag{8}$$

From Equation (8), it can be seen that after taking into account the impact of commodity prices and monetary policy searches on public information acquisition, the central bank's inflation management target π^T coefficient becomes smaller, while the $\left(E_t\pi_{t+1}\left(P_z\right)\right)$ number becomes larger, indicating that adding public information acquisition as a whole has an impact on inflation. The influence of the regulation effect was enhanced, and it was positively correlated with the σ_α^2 value.

However, it is worth exploring further, does σ_{α}^{2} become larger or smaller before and after the search for commodity price information with and without it? Let the coefficient of $\left(E_t\pi_{t+1}\left(P_z\right)\right)$ be K, $\frac{\partial K}{\partial \sigma_{\alpha}^{2}}=\frac{\alpha^{2}}{\left(1+\alpha^{2}+\sigma_{\alpha}^{2}\left(ce,me\right)\right)^{2}}$,When $\alpha > 0$, $\frac{\partial K}{\partial \sigma_{\alpha}^{2}}>0$, it means that the higher the accuracy of the information about commodities obtained by the public, the smaller the fluctuation of inflation will be. Although supported by the development of big data technology, due to the relatively short history of marketization in China and the large differences in the level of public knowledge, there are often misinterpretations of information in price and policy communication, or behaviors taken by the public for their own interests. To a certain extent, the effectiveness of monetary policy has been reduced. Under the impact of international commodity price fluctuations, the impact of adding bulk price search will be much different from that of the search -only policy. If the actual effect is lower than the search for monetary policy information only, it means that the Chinese market needs to strengthen the publicity and guidance of international bulk commodity information. So hypothesis 2 is put forward:

Hypothesis 2a: Compared with only searching for monetary policy -related information, the mediating effect of public information acquisition after searching for commodity price information is weakened;

Hypothesis 2b: Compared with only searching for monetary policy -related information, the mediating effect of public information acquisition after searching for commodity price information is enhanced.

Based on the above inferences, considering the influence of international bulk commodity prices, the supply and impact of bulk commodities in different countries and regions are inconsistent, and the proportion of different types of bulk commodities in the international and domestic bulk commodity indices is also different. Hypothesis 3 is proposed.

Hypothesis 3: The public's search and acquisition of price information of different countries and regions and different types of commodities will have different effects on the regulation effect of China's inflation level.

4. Research Design

4.1. Measure of Public Expectations

Internet search keywords can better reflect the public's attention to related events, and can also reflect the public's expected inclination to a certain extent. Therefore, this paper uses Baidu Index to search keywords, constructs a public search index to measure the public's expectations on commodity prices and monetary policy, and clarifies the mediating effect of the two information search behaviors in the transmission of international commodity prices to China's inflation.

4.1.1. Keyword Selection

Considering the overall trend in the Baidu search index to include data from 2011 onwards, this paper selects the monthly data from January 2011 to May 2022, with a total of 137 sample values. This period covers the events that caused large fluctuations in international commodity prices, including the high temperature and drought in the United States, Russia and Ukraine in the summer of 2012, the shale oil revolution in the United States from 2014 to 2016, the 2016 Saudi Arabia agreement to freeze production, the Australian hurricane in March 2019, and the early 2020 The new crown epidemic and the Russian -Ukrainian war in February 2022, etc.

This paper selects two types of keywords to reflect the public's search for commodity price information. The first category selects keywords directly related to bulk commodities, including general terms of bulk commodities and energy, metals, and agricultural commodities; the second category selects the main supply regions of bulk commodities and words closely related to international commodity prices. The final selected 38 keywords are shown in Table 1.

Table 1: Keyword Classification for International Commodity Price Information Search

Category	Key words
Category 1	Commodities, Commodity Prices, Commodities, Energy, Agricultural Products, Agricultural Commodity Prices, Metals, Oil, Crude Oil, Oil Prices, Natural Gas, Coal, Wheat, Soybeans, Corn, Gold, Copper, Nickel, Iron
Category 2	International oil price, US dollar, ruble, import and export, exchange rate, foreign exchange, futures, Russia, OPEC, OPEC, Brent crude oil, Ukraine, United States, Iran, Saudi Arabia, APEC, APEC, NATO, WTI

Referring to Wen Bohui et al. [37], this paper selects three types of keywords to reflect the public's expected behavior of monetary policy. The first category of keywords is based on macroeconomics, and high -frequency words closely related to macroeconomics are selected by consulting financial news and official announcement data; the second category of keywords is based on monetary policy, by consulting "Monetary Policy Events" and comparing China's monetary policy According to the implementation situation, the keywords related to monetary policy are selected; the third category of keywords is based on the daily life of the public, checking financial news and commentary articles, and selecting economic terms that are highly concerned by the public on a daily basis. Table 2 shows the selected 38 keywords related to monetary policy.

Table 2: Keyword Classification of Monetary Policy Expectations

Category	Key words
Category 1	GDP, CPI, PPI, PMI, M2, inflation, deflation, investment, macro -control, real estate, Chinese economy
Category 2	Open market business, deposit reserve ratio, RRR cut, benchmark interest rate, interest rate hike, interest rate cut, People's Bank of China, monetary policy, exchange rate, credit
Category 3	Wealth management, funds, insurance, housing loan, car loan, stock market, loan interest rate, provident fund, national debt, bond, trust, price, Engel coefficient, stagflation, discount, discount rate, Federal Reserve

4.1.2. Construction of Public Search Index

Referring to the literature of Zhang Wei and Pan Ziai [38] and Chen Yin'e et al. [39], this paper uses the principal component analysis method to reduce the dimensionality of the keyword search volume, thereby eliminating the multicollinearity effect that may exist due to too many variables. This paper uses SPSS 27 to synthesize multiple keywords into a public search index, and determines the number of factors according to the standard that the cumulative variance contribution rate reaches 80 %. Among them, 6 factors are extracted from commodities and monetary policy. Taking the ratio of the eigenvalues corresponding to each factor to the sum of the total eigenvalues of the extracted factors as the weight, a comprehensive principal component model is synthesized. Equations (9) and (10) measure the public's expectations on commodity prices and monetary policy, where COMEXP represents the commodity price expectation index, and MOPOEXP represents the monetary policy expectation index.

$$COMEXP = 0.45F_1 + 0.2F_2 + 0.13F_3 + 0.09F_4 + 0.07F_5 + 0.06F_6 \quad (9)$$

$$MOPOEXP = 0.38F_1 + 0.\ 3F_2 + 0.15F_3 + 0.08F_4 + 0.05F_5 + 0.04F_6 \quad (10)$$

Figure 1 shows the trends of the commodity price expectation index and monetary policy

expectation index from January 2011 to May 2022. The comparison shows that the fluctuation trends of the two public search indexes are basically the same, and they are consistent with the major events that have caused changes in international commodity prices in history.

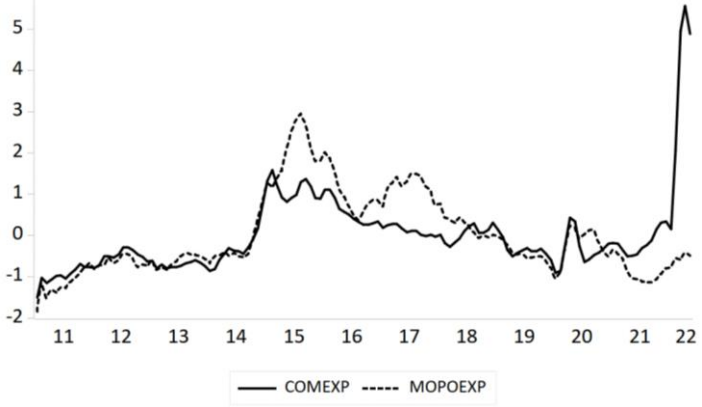

Figure 1: Comparison of the trend of commodity price expectation index and monetary policy expectation index

4.2. Variable Selection and Data Interpretation

4.2.1. Explanatory Variables

Considering the availability of data, this paper chooses the International Monetary Fund (IMF) monthly release of the International Commodity Price Index (IMFC) as the explanatory variable. The index has high accounting accuracy, long data interval, and covers a wide range of categories, and energy, metals, agricultural products, etc., which have a greater impact on domestic production and life, account for a large proportion of the index, so it can effectively reduce the impact of single commodity price fluctuations. In addition, referring to Sui Jianli and Yang Qingwei [40], the Bloomberg Commodity Index (BCOM) was selected as the proxy variable of the IMFC index to conduct robustness test.

4.2.2. Explained Variable

The explained variables are the producer price index (PPI) and the consumer price index (CPI), which represent the degree of inflation at the producer and consumer levels, respectively. As the price of upstream products, PPI is directly affected by the prices of industrial raw materials such as energy, metals, and agricultural products; CPI, as the price of downstream products, is closely related to the prices of final consumer goods such as agricultural products, and the proportion of energy, metals, and agricultural products in the international commodity index If there are differences, the impact of international commodity price shocks on CPI and PPI may also be different. Therefore, this paper selects two indicators, PPI and CPI, in order to explore the difference in the impact of international commodity price shocks on PPI and CPI.

4.2.3. Mediating Variable

Select China Commodity Price Index (CCPI), Commodity Price Expectation Index (COMEXP), and Monetary Policy Expectation Index (MOPOEXP) as intermediary variables. The CCPI index covers a comprehensive range of commodities, including 9 categories of commodities, which can accurately reflect the price fluctuations of commodities in China.

4.2.4. Control Variable

The one -year benchmark lending rate (LR) and broad money supply (M2) are selected as monetary policy control variables. The one -year benchmark lending rate (LR) is the lending guidance rate issued by the central bank to commercial banks, which is used to regulate the operation of the social economy and financial system, and can effectively reflect the implementation of the central bank's monetary policy. LR is selected as the proxy variable of monetary policy price -type instrument [41]. Compared with the narrow money supply (M1), the broad money supply (M2) is more stable and can better reflect the actual and potential purchasing power. Therefore, this paper refers to Jiang Hai et al. [42] to select M2 as the proxy variable of monetary policy quantitative tool.

Data samples come from the official website of the International Monetary Fund, Bloomberg database, Baidu index and Wind database, etc.

4.2.5. Data Preprocessing and Descriptive Statistics

In order to meet the requirements of stationarity, this paper performs X12 seasonal adjustment and standardization on the data. Choose different lag periods to process the data to avoid possible lag correlations between time series data. Table 3 shows the descriptive statistics of each variable. The standard deviations of the explanatory variable IFMC and the mediating variable CCPI are 0.983 and 0.936, respectively, indicating that domestic and foreign commodity prices have fluctuated to a certain extent in the past decade. Due to the complex and ever -changing international situation and economic environment, international commodity prices fluctuate more strongly. However, from the extreme point of view, domestic commodity prices are generally higher than the international commodity price level. The mean values of the explained variables PPI and CPI are -0.038 and -0.065, respectively, and the standard deviations are 0.990 and 0.941, respectively, indicating that the fluctuation range of PPI is slightly larger than that of CPI.

Table 3: Descriptive Statistics for Variables

variable	Observations	minimum	maximum	mean value	standard deviation
IMFC	133	-1.680	1.600	-0.055	0.983
CCPI	133	-2.287	2.631	-0.025	0.936
FC	133	-1.155	4.959	-0.060	0.765
FM	133	-1.523	2.959	0.029	0.995
PPI	133	-1.553	2.611	-0.038	0.990
CPI	133	-2.155	2.963	-0.065	0.941
LR	133	-0.806	1.831	-0.004	1.002
M2	133	-1.360	2.281	0.015	1.010

4.3. Empirical Model Setting

4.3.1. Overall Effects Test Model Specifications

This paper examines the overall effect of international commodity price fluctuations on inflation, and uses PPI and CPI to represent the inflation level. The settings are as follows:

$$PPI_t / CPI_t = \alpha_1 + \alpha_2 IMFC_t + \alpha_3 LR_t + \alpha_4 M2_t + \varepsilon_t \quad (11)$$

Among them, t is the month, ε is the random disturbance term, PPI is the inflation level at the producer level, CPI is the inflation level at the consumer level, IMFC is the international commodity price index, and LR and M2 are the monetary policy control variables. In order to avoid

the reverse causal relationship between the explanatory variables and the explained variables, the explanatory variables take the form of a lag of four periods, and the control variables take the form of a lag of two periods.

4.3.2. Chained Multiple Mediating Effects Model Setting

According to Hypothesis 1, commodity price fluctuations can affect China's inflation level by affecting the public's access to commodity price information and monetary policy information through two intermediary channels. Considering the mutual influence of the public's access to commodity prices and monetary policy information. Therefore, referring to the ideas of Dong Jiachang et al. [43], this paper adopts a chain -type multiple intermediary effect model to test the intermediary effect of public information acquisition in the process of international commodity price fluctuations impacting China's inflation, and to clarify domestic commodity prices and commodity price expectations. The difference between the mediation effect of the index and the monetary policy expectation index, the chained multiple mediation effect model is set as follows:

$$CCPI_t = \beta_1 + \beta_2 IMFC_t + \beta_3 LR_t + \beta_4 M2_t + \varepsilon_t \tag{12}$$

$$COMEXP_t = \gamma_1 + \gamma_2 IMFC_t + \gamma_3 CCPI_t + \gamma_4 LR_t + \gamma_5 M2_t + \varepsilon_t \tag{13}$$

$$MOPOEXP_t = \varphi_1 + \varphi_2 IMFC_t + \varphi_3 CCPI_t + \varphi_4 COMEXP_t + \varphi_5 LR_t + \varphi_6 M2_t + \varepsilon_t \tag{14}$$

$$PPI_t / CPI_t = \eta_1 + \eta_2 IMFC_t + \eta_3 CCPI_t + \eta_4 COMEXP_t + \eta_5 MOPOEXP_t + \eta_6 LR_t + \eta_7 M2_t + \varepsilon_t \tag{15}$$

Among them, CCPI represents the domestic commodity price index, COMEXP represents the commodity price expectation index, MOPOEXP represents the monetary policy expectation index, IMFC represents the international commodity price index, PPI and CPI represent the degree of inflation, LR and M2 represent the monetary policy control variables, other settings are the same as formula (11). Equation (12) examines the impact of international commodity prices on domestic commodity prices, Equation (13) examines the impact of domestic commodity prices on the search for commodity price information, and Equation (14) tests under the control of domestic and foreign commodity prices The influence of commodity price information search on monetary policy search, Equation (15) examines the influence of monetary policy search on inflation under the control of domestic and foreign commodity prices and commodity price information search. The chain intermediary effect is expressed as "international commodity prices → domestic commodity prices → commodity price information search → monetary policy information search → inflation". The specific conduction path is shown in Figure 2:

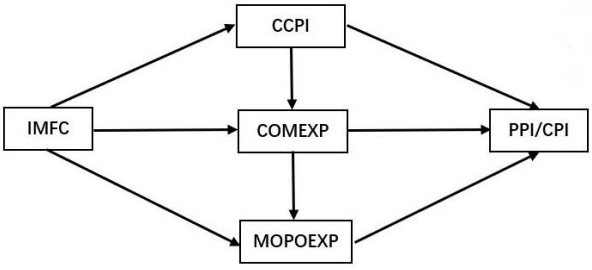

Figure 2: The path of the chained multiple mediator model

In the chained multiple mediation effect model, there are 6 conduction paths, among which the independent mediation effect is expressed as "IMFC→CCPI→PPI/CPI", "IMFC→ COMEXP→ PPI/CPI", "IMFC→MOPOEXP→PPI/CPI" , the chain mediation effects are "IMFC→ CCPI→ COMEXP→CPI/PPI", "IMFC→CCPI→ MOPOEXP→CPI/PPI" and "IMFC→ CCPI→ COMEXP

→MOPOEXP→CPI/PPI", and their sizes are $\beta_2\eta_3$, $\gamma_2\eta_4$, $\varphi_2\eta_5$, $\beta_2\lambda_3\eta_4$, $\beta_2\varphi_3\eta_5$ and $\beta_2\lambda_3\varphi_4\eta_5$. By summing up various mediation effect values, the overall mediation effect value α_2 can also be obtained.

$$\alpha_2 = \eta_2 + \beta_2\eta_3 + \gamma_2\eta_4 + \varphi_2\eta_5 + \beta_2\lambda_3\eta_4 + \beta_2\varphi_3\eta_5 + \beta_2\lambda_3\varphi_4\eta_5 \quad (16)$$

4.3.3. Methods to test The Mediation Effect

Referring to Mao Qilin and Xu Jiayun [44], Sun Guanglin et al. [45], in order to ensure the accuracy and robustness of the estimation results, this paper firstly uses the stepwise regression method to evaluate equations (12) -(15) under the condition of adding control variables. Carry out estimation, and initially analyze the mediation effect according to the estimation results; then systematically estimate the formulas (12) -(15) to further analyze the mediation effect, and use the Bootstrap method to test the coefficient product of the mediation effect.

5. Empirical Analysis

5.1. The Total Effect of International Commodity Price Fluctuation on China's Inflation

In order to test whether the total impact of international commodity prices on inflation is significant, formula (11) is regressed, and the estimated results are shown in Table 4. The regression results of column (1) with PPI as the explained variable show that the total effect of international commodity prices on China's inflation is 1.04, which is significant at the 1 % level, indicating that IMFC is positively correlated with PPI, that is, the growth of international commodity prices intensifies the level of inflation in China. According to the theory of Judd et al. [46], the significance of the estimated coefficient of IMFC in the benchmark regression is a prerequisite for using the stepwise regression method to test the mediation effect. The coefficient is significant, which means that the stepwise regression method can be used to analyze the mediation effect model. Second, a comparative regression is performed with CPI as the explained variable. The results in column (2) show that after adding monetary policy control variables, international commodity prices have not had a strong impact on CPI. It can be seen that the international commodity prices affect the leading indicator of China's inflation PPI, but the impact of international commodity prices on the CPI has a certain degree of lag.

Table 4: Estimated Results of the Total Effect of International Commodity Price Fluctuations on Inflation

	Explained variable: PPI	Explained variable: CPI
	(1)	(2)
IMFC	1.044*** (8.44)	0.020 (-0.14)
LP	-1.113*** (-6.72)	0.480** (1.82)
M2	0.599 (0.53)	-0.115 (-0.87)
Constant term	0.014 (0.22)	-0.620 (-0.82)
Number of samples	133	133
Adjusted R2	0.431	0.145

Note: t-statistics in parentheses; *, ** and *** indicate that the estimated coefficients are significant at the 10 %, 5 % and 1 % levels, respectively

Figure 3 shows the time -series changes of the explanatory variable IMFC, the explained variables PPI, CPI, and the intermediary variable. The results show that the trend of international bulk commodity prices over time is basically consistent with PPI, but there is a certain degree of deviation from CPI. Overall, international commodity prices are divided into two stages. The first is that from 2011 to 2016, the overall trend of national commodity prices was downward. Among them, from 2014 to 2016, under the influence of the shale oil revolution in the United States, traditional energy exporters such as OPEC increased their oil exports, which intensified the downward pressure on energy prices and led to a sharp drop in international commodity prices. At the same time, China's PPI index fell significantly and the decline was larger than the CPI index. The second is from 2017 to the present, due to the impact of geopolitical risks, the new crown epidemic and the changing global supply and demand pattern, international commodity prices have risen, driving the PPI to rise sharply, which is consistent with the analysis results in Table 4. The above analysis provides a basis for the subsequent mediation effect test in this paper.

The reason why international commodity prices have an impact on China's PPI may be that China, as the world's second largest economy, the rapid development of industrial industries has spawned a large number of demand for commodities, and the domestic supply of commodities cannot meet the demand, resulting in imports. Dependency increased. Therefore, China is a net importer of various commodities, such as the world's largest importer of iron ore, the largest importer of soybeans and the second largest importer of crude oil. However, so far, China has not mastered the pricing power of bulk commodities, and can only passively accept international prices. The imbalance of domestic supply and demand and the lack of pricing power have led to the rising prices of bulk commodities. The rise in commodity prices has a negative impact on China's manufacturing industry, the production costs of upstream production enterprises have increased, and profit margins have been severely squeezed. The overall social price level and wage pressure will rise, while the consumption and investment level of residents will decline, which will eventually have an impact on China's inflation level. In addition, frequent fluctuations in international commodity prices lead to unstable public expectations for price and interest rate levels, which may further affect inflation.

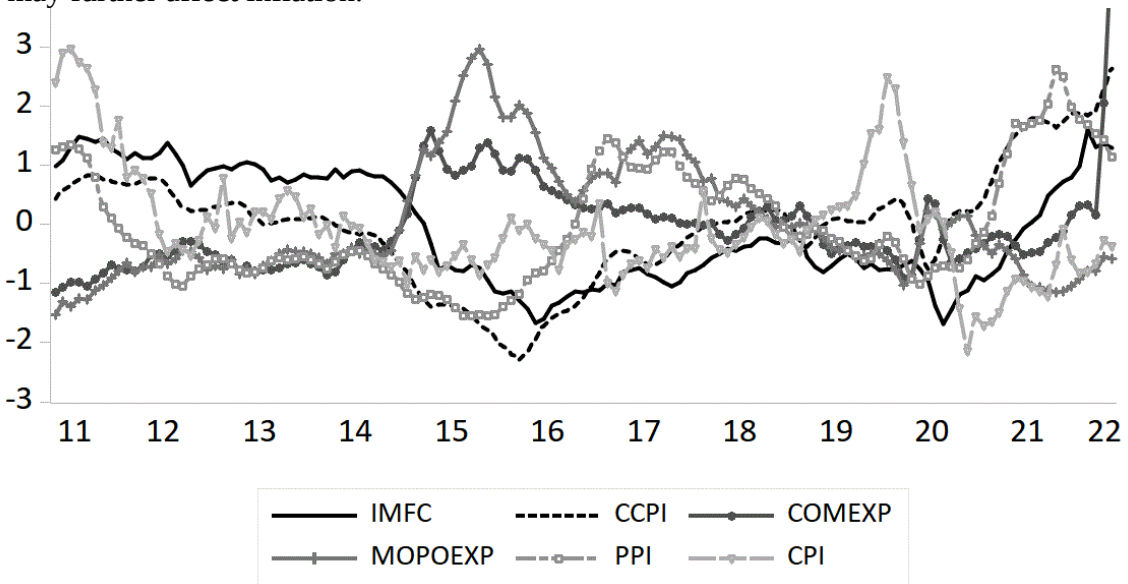

Figure 3: Time series diagram of each variable

5.2. The Chain Mediating Effect Test of International Commodity Price Fluctuation on Inflation

Table 5: Estimated Results of the Chained Multiple Mediating Effects Model

			Explained variable	
	Chinese commodity prices	Commodity price expectations	Monetary policy expectations	Producer price index
	(1)	(2)	(3)	(4)
IMFC	1.237*** (14.01)	0.845*** (5.31)	-0.159 (-1.25)	0.468** (2.51)
CCPI		-0.6038*** (-6.04)	-0.630*** (-7.68)	0.828*** (5.72)
COMEXP			0.456*** (7.14)	-0.358*** (-3.24)
MOPOEXP				0.463*** (3.57)
LP	-0.517*** (-4.37)	-0.911*** (6.34)	0.033 (0.28)	-0.939*** (-5.39)
M2	-0.322*** (-3.96)	0.053 (0.55)	-0.113 (-1.60)	0.321*** (3.07)
Constant term	0.466 (1.00)	-0.032 (-0.61)	0.034 (0.88)	-0.035 (-0.63)
Number of samples	133	133	133	133
Adjusted R2	0.707	0.376	0.807	0.584

Note: t-statistics in parentheses; *, ** and *** indicate that the estimated coefficients are significant at the 10 %, 5 % and 1 % levels, respectively.

Commonly used mediating effect test methods include stepwise regression method, Sobel test and Boostrap method. The Sobel method requires that the estimated coefficients obey a normal distribution. Generally speaking, it is difficult for real data to meet this condition, which increases the possibility of type I errors in the test results possibility. Boostrap test is a non -parametric resampling method, because it has no requirements on the distribution of estimated coefficients and can effectively avoid the problem of non -normal samples. Therefore, this paper mainly uses stepwise regression method and Boostrap method to test the mediating effect. The first step is to calculate the mediating effect of international commodity prices on China's commodity prices and public information acquisition, using China's commodity price index, the public's search index for commodity prices, and the monetary policy search index as explained variables. The second step takes PPI as the explained variable, and incorporates three types of intermediary variables and control variables into the model regression, so as to examine the direct effect of international commodity prices on PPI. Table 5 reports the estimated results of stepwise regression.

The results of the first step show that international commodity prices have a positive impact on domestic commodity prices and public information search behavior, that is, rising international commodity prices will lead to an increase in domestic commodity prices and public attention to commodity -related information. In the second step, according to the regression results of column (4), under the condition of controlling the loan interest rate and M2, the international bulk commodity prices, domestic bulk commodity prices and PPI are positively correlated, indicating that the rise of domestic and foreign bulk commodity prices is to a certain extent. Push up domestic inflation, and the impact of international commodity prices is greater than domestic. The public's search for commodity and monetary policy information is negatively correlated with PPI, indicating that the higher the accuracy of the public's expectations formed by information search, the smaller the inflation fluctuation.

Table 6: Estimated Results of the Chained Multiple Mediating Effects Model

Effect type	Mediation path	Effect coefficient	95 % confidence interval	number of samples	Mediation effect rate
Independent intermediary 1	IMFC➞CCPI➞PPI	1.024***	[0.641, 1.392]	1000	46.86 %
Independent intermediary 2	IMFC➞COMEXP➞PPI	0.303**	[-0.545, -0.004]	1000	13.87 %
Independent intermediary 3	IMFC➞MOPOEXP➞PPI	0.072	[-0.259, 0.016]	1000	3.30 %
Independent intermediary 1	IMFC➞CCPI➞ COMOEXP➞PPI	0.267***	[0.011, 0.460]	1000	12.22 %
Independent intermediary 2	IMFC➞CCPI➞ MOPOEXP➞PPI	-0.361**	[-0.576, -0.093]	1000	16.52 %
Independent intermediary 3	IMFC➞CCPI➞COMEXP ➞MOPOEXP➞PPI	-0.158*	[-0.405, -0.057]	1000	7.23 %
Direct effect	IMFC➞PPI	0.468**	[0.101, 0.834]	1000	
Total effect		1.044***	[0.802, 1.287]	1000	

Note: Mediation effect, direct effect, total effect and mediation effect rate were obtained by 1000 quasi-Bayesian Monte Carlo approximation simulations. Mediation rate = Mediation / Total Mediation

Table 6 reports the results of the chained multiple mediation tests using the Boostrap method. It can be seen from the table that first, the confidence intervals corresponding to the two independent mediating effects and the three chain mediating effects do not include 0, indicating that the mediating effects exist significantly. International commodity prices can affect monetary policy effects not only through domestic commodity prices and public commodity information acquisition, and the mediation effect rates are 46.83 % and 13.87 %, respectively. It is also possible to influence PPI through three chain mediation effect paths of "IMFC→CCPI→COMEXP→PPI", "IMFC→CCPI→MOPOEXP→PPI" and "IMFC→CCPI→COMEXP→MOPOEXP→PPI", and the mediation effect rate is 12.22 % respectively, 16.52 % and 7.23 %. Based on this, Hypothesis 1 is proved.

Second, the independent mediating effect of monetary policy information search behavior is not significant, and the mediating effect rate is 3.3 %, indicating that the transmission mechanism of "IMFC→MOPOEXP→PPI" is relatively weak. When international commodity prices change, market participants cannot influence PPI simply by searching for monetary policy information, but need to transmit through domestic commodity prices. Third, after introducing the commodity information search behavior into the model, the coefficient of the chain mediation effect 1 is significantly positive. With the rise of domestic and foreign commodity prices, the public's increased attention to commodity prices has caused a certain degree of panic, and finally caused the PPI to rise under the influence of the herd effect. Fourth, comparing chained intermediaries 1 and 3, it is found that the intermediary effect coefficient decreases after adding monetary policy information search; comparing chained intermediaries 2 and 3, it is found that the absolute value of the intermediary effect coefficient also decreases after adding bulk commodity information search. It shows that monetary policy search has a calming effect on PPI fluctuations, and that China's monetary policy related information disclosure is more sufficient than commodity price information. The above analysis proves the correctness of Hypothesis 2a.

In order to explore the impact of international commodity price fluctuations on the effect of monetary policy and clarify the impact of commodity price fluctuations on the difference between PPI and CPI, Table 7 reports the results of the mediation effect test with CPI as the parole variable. The difference from Table 6 is that the overall effect is significant when CPI is used as the variable

to be paroled, but neither the direct effect nor the two independent mediating effects hold. At this time, the significance of the chain mediating effect is no longer meaningful. Commodity prices and monetary policy information acquisition → CPI" transmission mechanism is very weak.

Table 7: CPI is the test result of the mediating effect of the explained variable

Effect type	Mediation path	Effect coefficient	95 % Confidence interval	Number of samples
Independent intermediary 1	IMFC➞CCPI➞CPI	-0.534**	[-1.044, 0.109]	1000
Independent intermediary 2	IMFC➞COMEXP➞CPI	-0.053	[-0.412, -0.126]	1000
Independent intermediary 3	IMFC➞MOPOEXP➞CPI	0.091	[-0.023, 0.248]	1000
Independent intermediary 1	IMFC➞CCPI➞ COMOEXP➞CPI	0.047	[-0.076, 0.672]	1000
Independent intermediary 2	IMFC➞CCPI➞ MOPOEXP➞CPI	-0.456**	[0.111, 0.681]	1000
Independent intermediary 3	IMFC➞CCPI➞COMEXP➞MOPOEXP➞CPI	0.199**	[0.089, 0.405]	1000
Direct effect	IMFC➞PPI	-0.001	[-0.469, 0.467]	1000
Total effect		0.020**	[0.262, 0.303]	1000

From the perspective of market clearing and general equilibrium, PPI stands for upstream production cost, and CPI stands for terminal price. There should be a smooth transmission relationship between the two, that is, upstream price fluctuations will be transmitted to the downstream through raw material prices, which will ultimately affect the consumer price. However, the test results in Table 6 and Table 7 are obviously different, indicating that the conduction path from upstream to downstream in China is not smooth, and there is some kind of stagnation. The reason for this analysis may be that the volatility of commodity supply is far greater than that of demand, resulting in an imbalance between domestic supply and demand. From the perspective of the supply side, the international bulk commodity supply structure is relatively concentrated, with abundant potential production capacity, and the elasticity of supply is significantly greater than the elasticity of demand, which means that commodity prices are more dependent on the decision of the supply side. The rise in international commodity prices has brought about the double superposition effect of rising costs and imported inflation, which directly pushes up the prices of domestic energy, raw materials and food, and drives up the PPI indicator. From the demand side, the consumption level has not yet fully recovered due to the impact of the epidemic and other factors, the downstream market is fully competitive, and price stickiness prevents upstream companies from passing on the full cost of rising raw material prices to consumers. Therefore, the price transmission effect is from top to bottom. There is a certain time lag or loss.

5.3. Analysis on the Effect of Commodity Information Acquisition by Different Types and Countries

5.3.1. The Influence of Different Types of Commodity Information Access on Inflation

China's dependence on foreign commodities is relatively high, among which the dependence on imports of commodities such as palm oil, soybean oil, soybean meal, fuel oil and nickel has reached more than 90 %. China is a major demander and importer of the three major energy products. In

addition to being self -sufficient in coal, China mainly relies on imports of crude oil and natural gas [47]. For agricultural commodities, except for the three major staple grains and starch, China is basically in a state of net import of other agricultural products. At the same time, the demand for metal commodities in China accounts for about half of the total global demand, and the supply of metal products cannot meet the demand and is in a net import situation. Therefore, considering the differences in China's dependence on imports of different types of commodities, this paper further explores the impact of the public's information acquisition behavior on different types of commodities on China's inflation. Specifically, we divided commodity search keywords into three categories according to the composition ratio of the IMFC and CCPI indices, namely, energy commodities, agricultural products, and metals (including precious metals and industrial metals) commodities. The Boostrap mediation effect test was carried out on the three sub -search indices, and the test results are shown in Table 8 and Table 9.

Table 8: Categorical mediation test results (PPI)

Category	Effect type	Mediation path	Effect coefficient	95 % Confidence interval
Energy class	Independent intermediary 1	IMFC→CCPI→PPI	0.923***	[0.537, 1.359]
	Independent intermediary 2	IMFC→COMEXP→PPI	-0.140**	[-0.351, -0.031]
	Independent intermediary 3	IMFC→MOPOEXP→PPI	-0.015	[-0.129, 0.054]
	Chain intermediary 1	IMFC→CCPI→COMOEXP→PPI	0.253*	[0.083, 0.472]
	Chain intermediary 2	IMFC→CCPI→MOPOEXP→PPI	-0.227***	[-0.403, -0.053]
	Chain intermediary 3	IMFC→CCPI→COMOEX →MOPOEXP→PPI	-0.176**	[-0.365, -0.046]
	Direct effect	IMFC→PPI	0.333*	[0.030, 0.690]
	Total effect		1.045***	[0.803, 1.287]
Agricultural Products	Independent intermediary 1	IMFC→CCPI→PPI	1.122***	[0.695, 1.502]
	Independent intermediary 2	IMFC→COMEXP→PPI	0.083	[-0.010, 0.194]
	Independent intermediary 3	IMFC→MOPOEXP→PPI	0.019	[-0.035, 0.059]
	Chain intermediary 1	IMFC→CCPI→COMOEXP→PPI	-0.209***	[-0.335, -0.036]
	Chain intermediary 2	IMFC→CCPI→MOPOEXP→PPI	-0.115	[-0.322, 0.090]
	Chain intermediary 3	IMFC→CCPI→COMOEX →MOPOEXP→PPI	-0.025	[-0.109, 0.018]
	Direct effect	IMFC→PPI	0.161	[-0.176, 0.499]
	Total effect		1.045***	[0.803, 1.287]
Metal	Independent intermediary 1	IMFC→CCPI→PPI	1.445***	[0.982, 1.802]
	Independent intermediary 2	IMFC→COMEXP→PPI	-0.030	[-0.155, 0.127]
	Independent intermediary 3	IMFC→MOPOEXP→PPI	0.095	[-0.003, 0.188]
	Chain intermediary 1	IMFC→CCPI→COMOEXP→PPI	-0.137**	[-0.255, -0.004]
	Chain intermediary 2	IMFC→CCPI→MOPOEXP→PPI	-0.603***	[-0.905, -0.272]
	Chain intermediary 3	IMFC→CCPI→COMOEX →MOPOEXP→PPI	0.068**	[0.002, 0.136]
	Direct effect	IMFC→PPI	0.193	[-0.135, 0.521]
	Total effect		1.045***	[0.803, 1.287]

For the inflation leading indicator PPI, the acquisition of energy commodity information is still an important mediating variable, and there are two independent mediation and three chain mediation effects. On the contrary, the intermediary effect of information acquisition of agricultural

commodities is no longer significant, and international commodity prices can only affect PPI through domestic commodities; the chain intermediary effect of information acquisition of metal commodities is significant but independent intermediary is not significant, so only when domestic commodity prices After the commodity price changes with the international commodity price, the public's search behavior for metal commodities will play an intermediary role. The reason is that, on the one hand, due to the low proportion of agricultural products and metal commodities in the composition of the IMFC index, it is difficult for the IFMC index to fully reflect the price changes of this category of commodities. On the other hand, China's reserves of agricultural products and metal commodities are relatively sufficient, and the country's successive price limit policies have played a role. The impact of international price changes on the domestic upstream market is limited, and it is difficult for international bulk commodity prices to affect PPI through agricultural product expectations and metal commodity expectations.

Table 9: Categorical mediation test results (CPI)

Category	Effect type	Mediation path	Effect coefficient	95 % Confidence interval
Energy class	Independent intermediary 1	IMFC→CCPI→CPI	-0.612**	[-1.123, -0.163]
	Independent intermediary 2	IMFC→COMEXP→CPI	-0.097	[-0.265, 0.045]
	Independent intermediary 3	IMFC→MOPOEXP→CPI	0.023	[-0.091, 0.145]
	Chain intermediary 1	IMFC→CCPI→COMOEXP→CPI	0.175	[-0.067, 0.597]
	Chain intermediary 2	IMFC→CCPI→MOPOEXP→CPI	0.341***	[0.172, 0.509]
	Chain intermediary 3	IMFC→CCPI→COMOEX →MOPOEXP→CPI	0.264***	[0.146, 0.415]
	Direct effect	IMFC→CPI	0.033	[-0.414, 0.479]
	Total effect		0.020**	[0.262 , 0.303]
Agricultural Products	Independent intermediary 1	IMFC→CCPI→CPI	0.661***	[-1.052, -0.226]
	Independent intermediary 2	IMFC→COMEXP→CPI	-0.131*	[-0.309, -0.007]
	Independent intermediary 3	IMFC→MOPOEXP→CPI	-0.066	[-0.176, 0.036]
	Chain intermediary 1	IMFC→CCPI→COMOEXP→CPI	0.333***	[0.179, 0.548]
	Chain intermediary 2	IMFC→CCPI→MOPOEXP→CPI	0.407***	[0.213, 0.635]
	Chain intermediary 3	IMFC→CCPI→COMOEX →MOPOEXP→CPI	0.090***	[0.031, 0.170]
	Direct effect	IMFC→CPI	0.044	[-0.361, 0.499]
	Total effect		0.020**	[0.262 , 0.303]
Metal	Independent intermediary 1	IMFC→CCPI→CPI	0.351	[-0.021, 0.766]
	Independent intermediary 2	IMFC→COMEXP→CPI	-0.065	[-0.387, 0.245]
	Independent intermediary 3	IMFC→MOPOEXP→CPI	-0.021	[-0.079, 0.031]
	Chain intermediary 1	IMFC→CCPI→COMOEXP→CPI	-0.298**	[-0.542, -0.009]
	Chain intermediary 2	IMFC→CCPI→MOPOEXP→CPI	0.132	[-0.177, 0.429]
	Chain intermediary 3	IMFC→CCPI→COMOEX →MOPOEXP→CPI	-0.015	[-0.053, 0.022]
	Direct effect	IMFC→CPI	0.100	[-0.448, 0.247]
	Total effect		0.020**	[0.262, 0.303]

For CPI, the final indicator of inflation, the mediation effect of agricultural commodity information acquisition is significant, while the independent mediation effect and direct effect of energy and metals are not significant. It is meaningless to continue to consider the chain mediation effect. China's PPI includes two categories of means of production and means of subsistence, of which means of production (divided into three sectors: raw materials, mining and processing) account for 75 %, and means of living account for 25 % of them. The composition of China's CPI includes food, clothing, There are eight categories including daily necessities and services, of which food accounts for the largest proportion at 34 %. Therefore, agricultural products will inevitably have a more significant impact on CPI, while raw materials will mainly affect PPI.

5.3.2. The Influence of Commodity Information Access on Inflation in Different Countries and Regions

In the current context of enhanced international cooperation and increased geopolitical risks, public expectations based on commodity information searches in different countries and regions may have differential impacts on the effects of China's monetary policy. China's international bulk commodity imports mainly come from the United States, Russia, Ukraine and the Middle East. Therefore, all the bulk commodity search keywords screened above are divided into three categories, namely, the search for information on bulk commodities in the United States and information on bulk commodities in Russia. And search for commodity information in the Middle East, and recalculate the commodity expectation index in different countries and regions. The results of the mediation effect test are shown in Table 10.

Table 10: The results of the mediation effect test by country and region

Region	Effect type	Mediation path	Effect coefficient	95 % Confidence interval
The US	Independent intermediary 1	IMFC➞CCPI➞PPI	0.931***	[0.537, 1.357]
	Independent intermediary 2	IMFC➞COMEXP➞PPI	-0.243***	[0.076, 0.385]
	Independent intermediary 3	IMFC➞MOPOEXP➞PPI	-0.103*	[0.012, 0.244]
	Chain intermediary 1	IMFC➞CCPI➞COMOEXP➞PPI	0.071*	[-0.229, -0.001]
	Chain intermediary 2	IMFC➞CCPI➞MOPOEXP➞PPI	-0.226**	[-0.504, -0.031]
	Chain intermediary 3	IMFC➞CCPI➞COMOEXP ➞MOPOEXP➞PPI	-0.107*	[-0.031, -0.002]
	Direct effect	IMFC➞PPI	0.782***	[0.452, 1.113]
	Total effect		1.045***	[0.803, 1.287.]
Russia	Independent intermediary 1	IMFC➞CCPI➞PPI	1.106**	[0.740, 1.557.]
	Independent intermediary 2	IMFC➞COMEXP➞PPI	-0,178*	[-0.380, -0.017]
	Independent intermediary 3	IMFC➞MOPOEXP➞PPI	-0.035	[-0.133, 0.053]
	Chain intermediary 1	IMFC➞CCPI➞COMOEXP➞PPI	0.216**	[0.388, 2.479]
	Chain intermediary 2	IMFC➞CCPI➞MOPOEXP➞PPI	-0.371***	[0.942, 1.515]
	Chain intermediary 3	IMFC➞CCPI➞COMOEXP ➞MOPOEXP➞PPI	-0.178***	[-0.602, -0.118]
	Direct effect	IMFC➞PPI	0.339	[-0.011, 0.688]
	Total effect		1.045***	[0.803, 1.287]
Middle East	Independent intermediary 1	IMFC➞CCPI➞PPI	1.034***	[0.629, 1.410]
	Independent intermediary 2	IMFC➞COMEXP➞PPI	-0.035	[-0.129, 0.030]
	Independent intermediary 3	IMFC➞MOPOEXP➞PPI	0.035	[-0.029, 0.123]
	Chain intermediary 1	IMFC➞CCPI➞COMOEXP➞PPI	0.121	[-0.068, 0.278]
	Chain intermediary 2	IMFC➞CCPI➞MOPOEXP➞PPI	-0.232**	[-0.441, 0.004]
	Chain intermediary 3	IMFC➞CCPI➞COMOEXP ➞MOPOEXP➞PPI	-0.150**	[-0.280, -0.005]
	Direct effect	IMFC➞PPI	0.229	[-0.116, 0.575]
	Total effect		1.045***	[0.803 , 1.287]

International commodity prices can be transmitted to PPI through the public's access to commodity information in the United States and Russia, but when the Middle East's access to commodity information is used as a mediating variable, the mediating effect is not significant. The United States is the world's largest grain exporter and China's largest source of grain imports, accounting for 37.3 % of China's grain imports. Not only that, since 2019, driven by the continuous increase of shale oil production in the United States, the United States has become the world's largest oil producer, while the OPEC production in the Middle East has reduced the global production share for the third place in the world, and Russia rose to second place. The public searches for commodity information in the United States and Russia more frequently than in other regions, and is more likely to panic because of this, resulting in sharp fluctuations in PPI with the rise in international commodity prices.

According to the above analysis, it can be found that the public's search and acquisition of commodity price information of different types and different countries and regions will have a different impact on the adjustment effect of China's inflation level. Among them, energy commodity information acquisition is closely related to domestic and foreign commodity prices and PPI. The linkage between them is strong, and the information acquisition of agricultural commodities has a more significant impact on the CPI; the mediation effect of the public on the acquisition of commodity information in the United States and Russia is stronger. Based on this, the correctness of hypothesis 3 in this paper is proved.

5.4. Robustness Check

Table 11: The results of the mediation effect test after replacing the explained variable

Effect type	Mediation path	Effect coefficient	95 % Confidence interval	Number of samples	Mediation effect rate
Independent intermediary 1	BCOM➞CCPI➞PPI	0.857***	[0.440, 1.344]	1000	56.01 %
Independent intermediary 2	BCOM➞COMEXP➞PPI	-0.187*	[-0.414, -0.002]	1000	12.22 %
Independent intermediary 3	BCOM➞MOPOEXP➞PPI	0.042	[-0.044, 0.147]	1000	2.75 %
Chain intermediary 1	BCOM➞CCPI➞ COMOEXP➞PPI	0.105*	[0.010, 0.177]	1000	6.86 %
Chain intermediary 2	BCOM➞CCPI➞ MOPOEXP➞PPI	-0.293*	[-0.594, -0.044]	1000	19.15 %
Chain intermediary 3	BCOM➞CCPI➞COMEXP ➞MOPOEXP➞PPI	-0.046*	[-0.151, -0.001]	1000	3.01 %
Direct effect	BCOM➞PPI	1.167***	[0.847, 1.442]	1000	
Total effect		1.726***	[1.396 , 2.027]	1000	

In order to ensure the reliability and accuracy of our empirical results, this paper conducts robustness tests from the following two aspects. The first is to re -use the Boostrap method to test whether the mediating effect is established after replacing the explanatory variables. The Bloomberg Commodity Price Index (BCOM) has a wide time range, includes a wide variety of commodities, and the weight of each component is relatively balanced, minimizing the impact of any commodity on the index, so it can be used as a good substitute for the IMFC index in this paper. The Boostrap test results after replacing the explanatory variables are shown in Table 11. The significance of the mediating effect is basically consistent with the above, which proves the robustness of the conclusions of this paper.

The second is to re -test the significance of multiple mediation effects by setting different Boostrap sampling times. The Boostrap method is to test the mediation effect through random

sampling, and different sampling times may have a certain impact on the results. This paper further selects 1500 times, 2000 times and 2500 times of random sampling. Table 12 lists the test results under different sampling times, which once again proves that the conclusions obtained in this paper are robust.

Table 12: The results of the mediation effect test under different sampling times

Effect type	1500 Samples		2000 Samples		2500 Samples	
	Effect coefficient	95% Confidence interval	Effect coefficient	95% Confidence interval	Effect coefficient	95% Confidence interval
Independent intermediary 1	1.024*** (5.274)	[0.641, 1.392]	1.024*** (5.274)	[0.641, 1.392]	1.024*** (5.274)	[0.641, 1.392]
Independent intermediary 2	-0.303** (-2.231)	[-0.545, -0.004]	-0.303** (-2.231)	[-0.545, -0.004]	-0.303** (-2.231)	[-0.545, -0.004]
Independent intermediary 3	-0.072 (-1.009)	[-0.259, 0.016]	-0.072 (-1.009)	[-0.259, 0.016]	-0.072 (-1.009)	[-0.259, 0.016]
Chain intermediary 1	0.267*** (2.739)	[0.011, 0.460]	0.267*** (2.739)	[0.011, 0.460]	0.267*** (2.739)	[0.011, 0.460]
Chain intermediary 2	-0.361*** (-2.830)	[-0.576, -0.093]	-0.361*** (-2.830)	[-0.576, -0.093]	-0.361*** (-2.830)	[-0.576, -0.093]
Chain intermediary 3	-0.158* (-1.631)	[-0.405, -0.057]	-0.158* (-1.631)	[-0.405, -0.057]	-0.158* (-1.631)	[-0.405, -0.057]
Direct effect	0.468** (2.484)	[0.101, 0.834]	0.468** (2.484)	[0.101, 0.834]	0.468** (2.484)	[0.101, 0.834]
Total effect	1.044*** (7.780)	[0.802, 1.287]	1.044*** (7.780)	[0.802, 1.287]	1.044*** (7.780)	[0.802, 1.287]

Note: The parentheses below the effect coefficients are z statistics; *, ** and *** indicate that the estimated coefficients are significant at the 10 %, 5 % and 1 % levels, respectively.

6. Conclusions and Policy Recommendations

Based on the data from January 2011 to May 2022, this paper uses the Baidu search index to construct a public information index to measure China's public information acquisition behavior, and uses the mediation effect model to analyze how international commodity price fluctuations affect China's currency through public information search. The inflation level and the following main conclusions are drawn: (1) the results of model derivation and stepwise regression test show that the rise in international bulk commodity prices will push up China's PPI, but the impact on CPI is limited. (2) Due to the lack of commodity pricing power in China, some commodities are highly dependent on foreign countries, so the results of the mediation effect test show that domestic commodity prices and public information acquisition behavior have a mediating role. Domestic commodity prices and commodity price information searches are positively correlated with PPI. When international commodity prices rise, information search behavior intensifies public panic, which eventually leads to an increase in PPI. (3) The results of the mediation effect test also show that compared with just searching for monetary policy, the expected mediation effect after adding bulk commodity price search is weakened, indicating that China's information on bulk commodities is not fully released, and the public's bulk commodity expectations cannot be timely and accurate. Adjust the macro economy. (4) Differential regression results show that different regions and different types of commodities are expected to have different effects on inflation. On the one hand, the United States is China's main source of imports, so international commodity price information related to the United States can affect PPI through the public's information search behavior. On the other hand, because the composition and proportion of PPI and CPI indicators are different, the information search of energy commodities mainly affects PPI, while the search behavior of

agricultural commodities has a significant impact on CPI.

Based on the above research conclusions, this paper puts forward the following policy suggestions: First, improve the monitoring and early warning mechanism of commodity prices, and closely monitor the fluctuation range of commodity prices. Regularly release and interpret information on commodity price fluctuations through the platform, strengthen information communication with the public by increasing the number of information releases, expanding information release channels, and improving policy transparency, etc., to guide the public to form rational expectations, and to ensure that market information can be fully accurate. The delivery provides technical support. In addition, government departments also need to focus on improving the accuracy and timeliness of data, and make rational use of emerging new data sources to provide rich information for macroeconomic forecasting and policy formulation. The second is to strengthen the management of traditional energy and accelerate the development of alternative energy to improve the uneven situation of energy supply and demand. For the energy industry, on the one hand, the problem lies in the low market concentration, the high dispersion of enterprises, the existence of a lot of vicious competition in the industry, and the low efficiency of energy use. Therefore, it is necessary to strengthen the construction of the energy industry, improve the concentration and competitiveness of the industry, and establish a management system that adapts to the development of the market economy as soon as possible. On the other hand, developed countries in Europe and the United States have vigorously developed renewable and clean energy such as solar energy, nuclear energy, and wind energy, which can effectively cope with the international energy crisis. Therefore, China should also encourage the development of alternative energy resources and realize energy diversification. Increase the research and application of water energy, wind energy, electric energy, solar energy, nuclear energy and geothermal energy, and reduce the pressure on China's energy import. The third is to formulate a commodity strategy, establish national reserves including various commodities, important strategic materials and foreign exchange, strengthen the resistance to international commodity price fluctuations, and reduce the impact of imported inflation and cost -driven inflation on the development of the national economy. negative impact. Improve China's bulk commodity pricing mechanism and strive for the right to speak in international prices in order to ensure the security of China's energy system.

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