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The Impact of Climate Policy Uncertainty on Product Prices in Futures Markets

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ABSTRACT

As climate issues become more frequent, the government's macro-climate policy regulation plays an increasingly important role in financial markets. Based on this, this article starts from four types of futures products in the futures market: food, agricultural products, energy, and chemicals, and explores the potential effects caused by climate policy uncertainty at the level of climate transition risks. The research results show that climate policy changes in the current period are significantly positively correlated with the price index of grain, agricultural products, and energy futures products, and are significantly negatively correlated with the price index of chemical futures products. These results are still robust after lag one period and adding control variables. Climate policy uncertainty has a great impact on futures product prices.

KEYWORDS

Climate policy uncertainty; Green finance; Climate policy uncertainty index; Futures market

1. INTRODUCTION

From scorching droughts to heavy rainfall, from polar vortices to marine heat waves, extreme weather events have broken through the prediction framework of traditional climate laws, showing systematic upgrades in the three dimensions of speed, frequency and amplitude [1]. As a major developing country with a huge economy and complex climate spectrum, our country is under multi-level and multi-dimensional climate risk pressure. In order to cope with climate change, our country is bound to formulate and implement a series of climate policies: In 2020, our country issued the "On Promoting Climate Response" "Guiding Opinions on Change Investment and Financing", which provides guidance on better utilizing investment and financing to promote green and low-carbon development; in 2021, the State Council Information Office published the white paper “Responding to Climate Change: China's Policies and Actions” to actively respond to climate change and jointly build a global climate governance system. While these climate policies have alleviated the pressure brought by climate change on the people to a certain extent, due to the strong uncertainty in whether, when, when, and how strongly the climate policies will be implemented [2], This set of climate policies formulated to tackle climate change will likewise heighten the unpredictability of climate-related policy frameworks. [3], and climate policies are uncertain. Qualitativeness is specifically reflected in the level of the subject of policy promulgation, the content of policy promulgation, and the role of policy promulgation [4]. This uncertainty in climate policy will first affect physical enterprises, and then cause panic among investors in the financial market. Under the influence of the "broken window effect" and "herding effect", investors' investment strategies will be changed, and it will boost the fluctuations of the entire financial market [5].

The futures market is an important part of my country's financial market. Futures prices are a barometer of spot prices. Stabilizing futures product prices is of great practical significance for stabilizing my country's spot market. Whether used as hedging, speculative arbitrage, or to avoid financial risks, futures (Futures) reflect future expectations. Their price discovery function focuses on investors' different understandings of market supply and demand changes and various different information. In the face of frequent changes in climate policies, the information disclosed by the news media, which serves as a "mouthpiece", will amplify the uncertainty of climate policies, affect the supply and demand relationship of spot products, and also affect the public's understanding and judgment of newly promulgated climate policies. This will eventually be transmitted to the futures market, reflecting the uncertainty of climate policies through changes in futures product prices. Hence, exploring how it impacts the prices of futures products from the standpoint of climate policy uncertainty carries immense importance for nations in formulating policies and maintaining price stability across both futures and spot markets.

2. LITERATURE REVIEW

The issues of climate change and extremism are attracting more and more attention from around the world. Chen Yulu, deputy governor of the People's Bank of China, mentioned at the "2019 China Society for Finance and Banking Academic Annual Conference and China Financial Forum Annual Conference" that the disadvantages brought by climate factors are one of the major factors leading to structural changes in the economic and financial systems. Climate change will lead to macro-financial risks. This speech attracted the attention of central policy agencies around the world.

Initially, Back in December 2015, the G20-affiliated Financial Stability Board set up the Task Force on Climate-related Financial Disclosures (TCFD) and categorized climate-associated risks into two distinct types: physical climate risks and transition climate risks. The former refers to extreme weather and climate and related natural disasters caused by climate change, while the latter refers to the costs, policies, etc. incurred by economies in the process of transitioning to a low-carbon economy and zero emissions. Gradually, this classification gained widespread recognition in the academic community.

Among various studies on climate risks, previous literature focused on the study of climate physical risks and continues to explore more information about climate physical risks. Ginglinger and Moreau found that extreme weather events can have a negative impact on the daily operating activities of companies [6]; Zhou Yingying and others further pointed out that physical risks can have a negative impact on corporate ESG performance [7]; Alenazi found after studying the industrial market that the impact of physical risks usually increases the volatility of the industrial metal market under extreme market conditions [8]; Albanese et al. studied the stock market and found that, especially in the short term, physical risks have a negative impact on stock returns and have a direct impact [9]. Clearly, previous literature has recognized the important impacts of climate physical risks.

Nevertheless, climate transition risks have received insufficient attention—particularly those risks and their resultant impacts typified by climate policy uncertainty, which serves as a core component of national macro policies [10]. In essence, climate policy uncertainty is a form of policy uncertainty analogous to economic policy uncertainty. As such, it exerts a comparable influence on the structure of the economic and financial system as economic policy uncertainty does [11]. Employing the GMM-PanelVAR approach, Owjimehr and Mehdi demonstrated that climate policy uncertainty leads to a gradual escalation of financial strains across all segments of the financial industry over time [12]; for their part, Wang Mudan and Hu Wentao indicated that climate policy uncertainty exerts a notable negative effect on the level of green and low-carbon innovation among enterprises. Such research outcomes underscore the profound impact of climate policy uncertainty on microeconomic entities [13].

At present, the measurement method of climate policy uncertainty generally adopts the method of big data text analysis of news newspapers. Specifically, it is mainly divided into two types: word frequency method and machine learning algorithm. Gavrilidis used the word frequency method and used eight major newspapers in the United States as a quantitative basis to construct the U.S. climate policy uncertainty index [14]. Noailly et al. in 2022 constructed a climate policy uncertainty index based on ten major newspapers in the United States using a support vector machine supervised machine learning algorithm [15]. Based on these two ways of quantifying climate policy uncertainty, many scholars have applied them to practical research. Guo Jing and Yong Zhiting developed China's climate policy uncertainty index by means of the word frequency approach and demonstrated that climate policy uncertainty exerts an inhibitory impact on corporate green innovation [16]; Liang et al. employed the climate policy uncertainty index to measure the sensitivity of U.S. agricultural productivity to regional climate conditions. By connecting climate impacts with national economic outcomes, they laid an empirical foundation for comprehensive evaluations [17]; Xi et al. explored the time-varying influence of climate policy uncertainty on renewable energy consumption via the climate policy uncertainty index, validating that climate policy uncertainty exerts an influence on renewable energy consumption [18].

In the study of climate policy uncertainty, the stock market, as a "barometer" of the national economy, comprehensively reflects the national macroeconomic and financial market conditions. Some literature has found that climate policy uncertainty will have an impact on the stock market. He and Zhang found that climate policy uncertainty is an important predictor of stock returns in the crude oil industry [19]. As an extension to the commodity market, the futures market has scarce literature centered on climate policy uncertainty and how it affects the market [20].

Regarding the reasons for futures price fluctuations, in addition to futures price fluctuations being mainly based on changes in supply and demand, previous literature has also analyzed it from different perspectives: First and foremost, the influence of economic policy uncertainty on futures prices has been explored by relevant scholars. Lin Ling and Yan Jie have demonstrated that economic policy uncertainty exerts a risk spillover effect on agricultural product futures, primarily those of wheat and corn [21]; Chen Xingyu has found that economic policy uncertainty brings a notable inhibitory impact on the yield rates of non-ferrous metal futures [22]. Second is the research on the correlation between the futures market and the stock market. Shi Zhichao and others found that there is Granger causality between the stock market and the commodity futures market [23]; Jin Tao further pointed out that my country's commodity futures market and the stock market are linked in the same direction, and changes in futures market prices have a greater impact on stock market prices [24]. Thirdly, it concerns the correlation between futures prices and spot prices. Hua Renhai has demonstrated that the futures and spot prices of copper, aluminum and rubber hold a long-term equilibrium relationship [25]; Xia Tian and Cheng Xiyu further pointed out that there is a mutual influence and mutual guidance relationship between the DCE and CBOT soybean futures markets and the domestic soybean market [26]. According to this, there is a close correlation between futures prices and spot prices.

This study conducts a systematic review of existing literature and reveals that while the academic community has developed relatively abundant theoretical discussions on the economic and social impacts brought about by climate change, in practical research, there is a paucity of literature exploring the price fluctuations of China's futures market from the standpoint of policy-level climate transition risks characterized by climate policy uncertainty. Accordingly, this research intends to examine the impact of climate policy uncertainty on changes in China's futures prices.

Possible marginal contributions of this article: First, it expands the impact of traditional climate transition risks on the futures market to the impact of climate policy uncertainty on the futures market. By exploring the internal mechanism of the impact of climate policy uncertainty on the futures market, it provides more detailed empirical evidence to deepen the impact of climate policy uncertainty and help mitigate futures price fluctuations. Secondly, it adds relevant literature on China's climate policy uncertainty and futures markets. The majority of research samples in existing literature center on climate policy uncertainty in the United States, while research on domestic climate policy uncertainty remains scarce. Finally, in the context of climate change, it is of practical significance to carry out large-scale representative research on futures markets with functions such as hedging and speculative arbitrage.

3. THEORETICAL ANALYSIS AND RESEARCH HYPOTHESES

The relationship between supply and demand is the core factor that affects futures prices. Its mechanism of action not only follows the basic principles of economics, but also presents unique laws due to the particularity of the futures market. So, will climate policy uncertainty, as a climate transition risk, have an impact on futures product prices and change futures product prices? In this regard, this article will explain respectively the four types of futures products: food, agricultural products, energy, and chemicals. This article proposes the following hypothesis:

Climate policies constrain the supply side of grain and agricultural products and change the expectations of market participants, thereby affecting the prices of grain and agricultural futures products. From the perspective of production and supply chain fluctuations, the ambiguity of climate policy tools (such as carbon emission limits, agricultural subsidy adjustments, technical standards) will cause agricultural enterprises to face a dilemma: immediately transforming to low-carbon technologies may face the risk of policy shift, while maintaining the status quo may suffer the risk of future compliance costs. This dilemma forces companies to make the optimal solution: postpone long-term investments such as drought-tolerant crop research and development, irrigation facility construction, etc., and choose to adopt short-term strategies such as reducing sowing area and planting low-risk crops to avoid risks, thereby reducing production efficiency and medium- and long-term supply. In terms of short-term supply, there are conversion barriers to the transformation of the green technology structure promoted by low-carbon climate policies. The initial capital investment is high and the output is low, which poses a financial threshold for small farmers or micro-enterprises. The government's forced conversion will lead to a decline in short-term output. At the same time, specific fertilizer production restriction policies or the imposition of carbon footprint surcharges on fertilizers and pesticides to directly reduce the output of fertilizer manufacturers will lead to an increase in farmers' planting costs. On the basis of insufficient funds and rapidly rising costs, the supply of short-term agricultural products and grains will decline. From the perspective of investors in the market, the emergence of extreme weather is accompanied by the promulgation of climate policies, and market participants' expectations for future climate policy directions expand. Grain and agricultural futures products are relatively sensitive to climate physical risks. Therefore, the market expects long-term supply contraction, and the futures market discounts the expected supply gap, exerting upward pressure on futures prices.

Hypothesis 1: Climate policy uncertainty is positively correlated with food and agricultural product futures.

Climate policy uncertainty affects the prices of energy futures products through two channels: supply and demand. Climate policy is mainly reflected in the control of traditional fossil energy and the supervision of low-carbon transformation. Therefore, the supply and demand of traditional fossil energy will be affected. From the perspective of the supply side, in the upstream mining process, the increase in carbon tax rates will increase the cost of fossil energy mining, and carbon emission quota restrictions will significantly reduce the allowed mining volume, which will reflect the reduction in the supply of upstream products to midstream refining and chemical plants. At the same time, the carbon pricing mechanism directly affects the marginal cost of energy companies. Companies postpone capital expenditures on traditional energy and instead transform and upgrade to the clean energy industry under the effect of policies. In the short term, it will be difficult for enterprises to rapidly transform to low-carbon, and the supply of traditional energy will decline. In the medium to long term, the competitiveness of traditional energy companies will be weakened, and clean energy will supplement the energy gap. From a demand-side perspective, the market's demand for green energy cannot increase rapidly. The market's demand for traditional energy is still huge in the short and medium term, while the demand for clean energy cannot increase in a short period of time, and energy futures prices are overflowing significantly.

Hypothesis 2: Climate policy uncertainty is positively correlated with energy futures.

Uncertainty in climate policies has forced downstream companies to adopt preventive low-carbon transformation strategies. The green transformation of downstream industries has accelerated, and the end consumer market has shrunk. On the one hand, downstream companies are accelerating the adoption of low-carbon green materials due to concerns about future carbon tax costs. On the other hand, climate policies force downstream companies to adopt recycled green materials, directly suppressing the demand for high-carbon chemicals. The ambiguous adjustment of the EU's CBAM policy in 2025 prevents exporters from accurately estimating future carbon tariff costs. In this case, the futures market has evolved into downward pressure on prices, which in turn has caused panic pricing in the market for policy changes. The chemical industry is highly dependent on fossil energy. Uncertain climate policies have driven up the cost of traditional fossil energy, raising the production costs of chemical companies and compressing corporate profit margins. Policy uncertainty has forced companies to invest in emission reduction technologies, increasing cost pressure on chemical companies. However, consumer demand for green chemical products has not increased due to the policy. The supply of a large number of green chemical products has not only failed to increase the profits of chemical companies, but has instead reduced prices, resulting in systematic downward pressure on chemical futures prices.

Hypothesis 3: There is a negative correlation between climate policy uncertainty and chemical futures.

4. RESEARCH DESIGN

4.1. Model Building

In order to study the impact of climate policy uncertainty on the prices of different types of futures products, this article constructs the following equations for analysis:

$$Y_{i,t} = \alpha + \beta_1 CCPU_t + \beta_2 EPU_t + \beta_3 CPI_t + \beta_4 VIX_t + \beta_5 CSI_{t+} \varepsilon_{i,t} \quad (1)$$

The subscripts i and t represent the type of futures product and the month, respectively. $Y_{i,t}$ indicates the price of the i-th type of futures in the t-th month, $CCPU_t$ represents the climate policy uncertainty index of China in the t-th month, EPU_t represents the economic policy uncertainty index of China in the t-th month, CPI_t represents the consumer price index of China in the t-th month, VIX_t represents the Chicago Board Options Exchange Volatility Index in the t-th month, and CSI_t represents the CSI 300 Index in the t-th month. α represents the constant term, and $\varepsilon_{i,t}$ represents the random error term. The specific types and names of each variable and their corresponding variable symbols are shown in Table 1.

Table 1. Specific Variables

Variable type	Variable name	Variable symbol
Explained variable	Grain futures	GR
	Agricultural futures	FP
	Energy futures	EN
	Chemical futures	CI
Explanatory variables	Climate policy uncertainty	CCPU
Control variables	Economic policy uncertainty	EPU
	Consumer Price Index	CPI
	CBOE implied volatility index	VIX
	CSI 300 Index	CSI
	RMB real effective exchange rate	REER

4.2. Variable Description

4.2.1. Explained Variable

Due to the short development history of my country's futures market, in order to ensure the stability, universality and representativeness of the data, and in order to fully reflect the sensitivity to climate physical risks and climate transition risks, this article selects food, agricultural products, energy, and chemical futures product indices as the explained variables of this article. Based on extant studies, grain and agricultural futures products demonstrate greater sensitivity to the effects of climate physical risks, whereas energy and chemical futures products exhibit higher sensitivity to the impacts of climate transition risks.

4.2.2. Explanatory Variables

The method of quantifying climate policy uncertainty indicators proposed by Noailly has received widespread attention from the academic community as a highly feasible indicator with mature research methods. However, its research sample is ten major newspapers in the United States, and its actual index is significantly different from China's actual climate policy uncertainty. Against this backdrop, this study adopts the Climate Policy Uncertainty Index (CPU) proposed by Noailly as its theoretical foundation, drawing on the conventional methodologies applied in extant research. It further constructs China's Climate Policy Uncertainty Index (CCPU) through manual review and deep learning algorithms (the MacBERT model), based on climate policy-related sensitive keywords retrieved from six mainstream newspapers: People's Daily, Economic Daily, Guangming Daily, Science and Technology Daily, China News Service and Global Times. This self-constructed CCPU is then used as the explanatory variable of the research model.

4.2.3. Control variables

Referring to the indicators selected by Ni Yingzhao when studying futures prices, this paper selects the economic policy uncertainty index, consumer price index, CBOE implied volatility index and CSI 300 index as control variables [27].

The Economic Policy Uncertainty Index (EPU) serves to quantify market expectation fluctuations stemming from government policy adjustments as well as the ensuing impacts on the economy; the Consumer Price Index (CPI) is employed to reflect price movements of consumer goods and services, together with the development status and level of China’s economy; the Chicago Board Options Exchange Implied Volatility Index (VIX) is used to reflect investors' expectations of future market risks; the CSI 300 Index (CSI) is used to express the overall situation, market sentiment and liquidity of the stock market.

Table 2. Descriptive statistics of variables

Variable	Number of samples	Mean	Median number	Standard deviation	Minimum value	Maximum value
GR	225	160.3	154.8	44.63	96	281.9
FP	225	140.6	135.7	24.53	96.64	208.7
EN	225	231.3	219.6	89.77	92.79	518.1
CI	225	152.4	142.4	36.15	90.68	279.9
CCPU	225	2.093	2.033	0.655	0.943	3.860
EPU	225	188.2	108.0	225.8	0	1425
CPI	225	102.4	102.1	1.869	98.20	108.7
VIX	225	19.60	17.15	8.420	9.510	59.89
CSI	225	3245	3335	1074	855.9	5689
REER	225	110.6	114.3	15.25	82.80	132.7

4.3. Sample Data Description

4.3.1. Data Source

In view of the late listing and trading of futures, but at the same time to ensure the universality of the empirical results and the availability of data, this article selects the four most representative types of futures in the CSI Index: Grain CFCI (H11066), Agricultural CFCI (H11062), Energy CFCI (H11065) and Chemical CFCI (H11064) as the data of the explained variables. Given that the CSI 300 Index was officially launched on April 8, 2005, this study adopts the monthly data spanning from the index's launch in April 2005 to December 2023, and forms four groups of samples for empirical research.

The economic policy uncertainty indicator comes from the monthly data of the research results of Stevenetal [28].; the consumer price index comes from the monthly data published by the National Bureau of Statistics; the Chicago Board Options Exchange Implied Volatility Index comes from the CBOE official website; the data of the Shanghai and Shenzhen 300 Index comes from the Guotai'an Database (CSMAR).

4.3.2. Descriptive statistics

The data cleaning process in this article is mainly to eliminate samples with missing values. Table 2 shows the descriptive statistical results of the full sample, where REER is the real effective exchange rate of the RMB. This control variable will be specifically mentioned in the robustness test later. The mean value of the main explanatory variable CCPU is 2.093, the standard deviation is 0.655, and the difference between the maximum value and the minimum value is small, indicating that CCPU is relatively stable during the sample period.

5. EMPIRICAL RESULTS AND ANALYSIS

5.1. Baseline Regression Results

Table 3 reports the benchmark regression results of climate policy uncertainty and futures product prices. The results in columns (1) to (4) respectively show the impact on grain, agricultural products, energy, and chemical futures.

The findings from Columns (1) and (2) indicate that the regression coefficient of CCPU is significantly positive at the 1% statistical level, supporting hypothesis 1 of this article, that is, there is a positive correlation between climate policy uncertainty and grain and agricultural futures, indicating that the higher the climate policy uncertainty, the higher the price of grain and agricultural futures. The results in column (3) show that the CCPU regression coefficient is significantly positive at the 1% level, supporting hypothesis 2 of this article, that is, there is a positive correlation between climate policy uncertainty and energy futures, indicating that as climate policy uncertainty increases, the price of energy futures will also increase. The findings from Column (4) reveal that the regression coefficient of CCPU is significantly negative at the 1% statistical level, meaning climate policy uncertainty has a negative correlation with chemical futures. This indicates that a rise in climate policy uncertainty will in fact lead to a decline in the prices of chemical futures.

Table 3. Climate policy uncertainty and futures product prices

Variable	(1)	(2)	(3)	(4)
	GR	FP	EN	CI
CCPU	0.561*** (6.68)	0.368*** (5.09)	0.436*** (4.24)	-0.290*** (-2.39)
EPU	0.353*** (0.45)	0.085 (-2.82)	0.293*** (0.62)	-0.309*** (-2.78)
CPI	0.077 (-2.87)	-0.018 (-3.07)	0.036 (-2.55)	0.257*** (-2.72)
VIX	0.093 (3.62)	0.091 (2.98)	0.079 (2.53)	-0.084 (-1.58)
CSI	0.557*** (5.46)	0.388*** (4.00)	0.463*** (4.40)	-0.196*** (0.58)
Constant term	402.320*** (3.17)	336.964*** (4.14)	775.006*** (2.68)	541.100*** (4.24)
Adj_R^2	0.445	0.264	0.303	0.167
F	36.94	15.72	19.06	8.77

Note: The t values are in parentheses; *, **, and *** indicate significance at the 10%, 5%, and 1% levels respectively.

5.2. Robustness Check

To ensure the reliability of the empirical results, robustness testing is required. This paper refers to the research method of Li Ning and conducts a robustness test by lagged one-period variables and adding control variables [29].

5.2.1. Lag

This paper uses lagged variables to conduct robustness testing, and lags the explained variables and explanatory variables by one, three, and six periods respectively.

First, the explanatory variable (climate policy uncertainty) is lagged by one period to form a new variable L.CCPU. After the actual regression analysis, the results showed that the lag period only produced different coefficients and different significances, but the final conclusion did not change and still satisfied the three assumptions proposed above. Table 4 reports the significance level of L.CCPU under the lagged one-period explanatory variables.

Table 4. Explanatory variables lagged one period

Variable	(1)	(2)	(3)	(4)
	GR	FP	EN	CI
L.CCPU	0.551*** (6.32)	0.371*** (4.56)	0.434*** (4.29)	-0.281*** (-2.39)
Adj_R^2	0.438	0.231	0.282	0.161
F	32.40	13.30	17.12	8.91

Note: The t values are in parentheses; *, **, and *** indicate significance at the 10%, 5%, and 1% levels respectively.

To enhance the reliability of the research conclusions, this paper further adopts the method of lagging the explained variable by one period to conduct a robustness test, thus constructing four new variables (L.GR, L.FP, L.EN, L.CI). The test yields conclusions that are consistent with those from the original regression and the regression with the one-period lagged explanatory variable. Table 5 reports the regression results for the one-period lagged explained variables.

Taking into account further stability, the next step of this article is to conduct tests with a lag of three periods and a lag of six periods respectively. The results did not change significantly, so the four tables are omitted. The results of the lag test remain almost unchanged, which shows that the climate policy uncertainty index can still maintain effective prediction and explanation capabilities in the face of data changes.

5.2.2. Add Control Variables

The RMB real effective exchange rate (REER) is added to the control variable factor for testing. This control variable is used to control the exchange rate, an important factor that affects product prices in the futures market, and avoid inaccuracies in research conclusions caused by changes in consumer preferences caused by changes in the value of the domestic currency and changes in the price competitiveness of commodities in the external market.

Table 5. The explained variable lagged one period

Variable	(1)	(2)	(3)	(4)
	L.GR	L.FP	L.EN	L.CI
L.CCPU	0.574*** (7.25)	0.384*** (6.01)	0.443*** (4.97)	-0.277*** (-1.11)
Adj_R²	0.447	0.254	0.288	0.137
F	34.13	14.96	17.56	7.53

Note: The t values are in parentheses; *, **, and *** indicate significance at the 10%, 5%, and 1% levels respectively.

Table 6. RMB real effective exchange rate and futures product prices

Variable	(1)	(2)	(3)	(4)
	GR	FP	EN	CI
CCPU	0.561*** (6.34)	0.368*** (4.98)	0.436*** (4.69)	-0.290*** (-1.52)
REER	0.392*** (1.48)	0.188*** (0.08)	0.148** (-2.63)	-0.486*** (-5.80)
Adj_R²	0.448	0.243	0.31	0.258
F	31.31	13.04	17.47	14.00

Note: The t values are in parentheses; *, **, and *** indicate significance at the 10%, 5%, and 1% levels respectively.

The empirical results show that futures product prices do not change the direction of the impact due to the impact of the RMB real effective exchange rate, and the significance level does not change, but the degree of impact changes slightly, which further confirms the robustness of the benchmark regression results. Among them, Table 6 reports the significance of CCPU and REER on the prices of different futures products respectively.

6. RESULT

Using monthly data covering the period from January 2005 to December 2023, this study applies a multiple regression model to analyze the impact of climate policy uncertainty on the prices of four categories of futures products: food, agricultural, energy and chemical futures. The main research conclusions are set out as follows:

(1) Climate policy uncertainty exhibits a positive correlation with the price index of food and agricultural futures products. Increased uncertainty about climate policy increases demand expectations ahead of supply adjustments, thereby increasing expectations for the supply and demand gap, thereby pushing up futures prices.

(2) Climate policy uncertainty is positively correlated with energy futures product price indexes. There are conversion barriers in the process of converting traditional energy to low-carbon energy, exacerbating the shortage of energy. In the process of converting old and new energy, low-carbon transformation policies have increased short-term demand and weakened long-term demand, resulting in a pulse-like rise in prices. The increase in climate policy uncertainty has led to an overall upward trend in energy futures prices.

(3) Climate policy uncertainty has a negative correlation with the price index of chemical futures products. In the context of climate policy changes, high-carbon chemicals (such as traditional plastics, synthetic ammonia) compete with green chemicals, and long-term demand expectations weaken. Companies invest in technological transformation funds to meet low-carbon standards, resulting in insufficient short-term cash flow supply. However, the demand side shrinks faster than the supply side output. Therefore, the uncertainty of climate policy has led to a decline in chemical futures prices.

7. CONCLUSION

(1) Categorized policies. It aims to implement subsidy policies for enterprises that are engaged in green transformation of industries, to help enterprises overcome green barriers, reduce enterprises' transformation costs, and reduce the problems of insufficient production capacity and capital shortages caused by enterprises' transformation. The government should formulate reasonable climate policies from the supply side to help achieve a balance between product supply and demand.

(2) Improve policy transparency and predictability. At a time when extreme climate events are becoming more frequent around the world, the government needs to formulate policies prudently. In the process of formulating green policies, the government should focus on the risks arising from climate policy uncertainty, uphold the consistency of internal government decision-making, enhance the transparency of governmental policies, and avert panic among investors and enterprises triggered by frequent adjustments to climate policies as well as the mispricing of futures products that may result therefrom.

(3) Enhance policy stability. Relevant authorities should conduct a more precise assessment of the impacts of climate policy adjustments on financial stability, and proactively formulate more robust and effective climate policies as well as supportive policies for green and low-carbon innovation, so as to minimize the occurrence of financial risks and safeguard the security of the financial market and the stability of the overall economy.

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