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The Impact of International Energy and Domestic Carbon Emission Rights Prices on the Stock price of New Energy under the Russia-Ukraine Conflict

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Abstract: *Based on VAR model with relevant variables involved in the year before and after the Russia-Ukraine conflict respectively, the paper analyzed and verified the influence of the prices of international energy and the carbon emissions rights on the stock price of new energy. The empirical results show that: Before the Russia-Ukraine conflict, no factor significantly affected the stock price of new energy, while after the conflict, international energy prices and other factors significantly affected the stock price. This reflects that the Russia-Ukraine conflict has indirect affection on the share price of new energy by influencing international energy prices, which has significantly changed the impact of energy prices on energy share prices. Thus, the government should control the prices of imported energy, accelerating the establishment the carbon emission rights market, in order to better stabilize the stock price of new energy.*

Keywords: *stock price of new energy; international energy prices; carbon emissions rights prices; Russian-Ukraine conflict*

1. Introduction

As the lifeblood of a country's development, energy supply, demand and price stability are vital. As a major energy importing and consuming country, it is of necessity for China to study the impact of energy price fluctuations.

Under current world environment, the international political environment is tense, the world economy continues to decline, and international energy sources are also under great impact:

First, the traditional energy supply is insufficient. As Russian energy imports are restricted, there is an energy shortage everywhere, especially in the EU. Various black swan events have occurred, resulting in violent fluctuations of international energy prices in recent years.

Second, the risk of global energy trading has been increasing. After the Russia-Ukraine conflict, on the one hand, due to the economic and financial sanctions imposed on Russia by Europe and the United States, making international energy transactions, settlements and other aspects increasingly complex and difficult; on the other hand, due to the dollar interest rate hike led to the global economic downturn, high inflation, default events and default risks are increasing, which have led to the increasing risk of global energy trade.

Under the situation that traditional energy sources are subject to many constraints, domestic and foreign efforts to develop new energy sources can, on the one hand, share the burden of industrial and agricultural production difficulties and inflation due to the fluctuation of traditional energy prices, and on the other hand, alleviate the greenhouse effect caused by the rapid development of the world economy.

In 1997, more than 100 countries around the world signed the Kyoto Protocol, which stipulates the emission reduction obligations of developed countries due to global warming. In 2005, along with the entry into force of the Kyoto Protocol, carbon emissions rights officially became a commodity and entered the market. The establishment of the carbon emissions rights market has great significance and impact on both the traditional energy industry and the new energy industry, and its price fluctuations will inevitably affect the stock market price changes.

In the current special environment, it is of practical significance to study the impact of traditional energy represented by crude oil, natural gas and coal and new energy represented by carbon emission rights on the stock price of new energy in China.

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2. Literature Review

Traditional energy sources such as crude oil, natural gas, and coal, as raw materials for the world economy, have been the focus of research by domestic and foreign scholars. Yang Wei and Bian Junxian (2019)[1] introduced geopolitical factors while exploring international crude oil prices and China's energy stock prices, and the empirical study showed that the synchronized fluctuations of crude oil prices and energy stock prices increased during geopolitical events and had a positive impact. By constructing the Divisia energy price index, which reflected the consumption of coal, oil and natural gas in China, Kang Jijun and Zheng Siyue (2021)[2] discussed and demonstrated that crude oil prices alone cannot represent energy prices, as a combination of crude oil, natural gas and coal prices were used as energy prices. Chen Tianni (2021)[3] explored the structural impact of international energy price volatility on China's PPI by constructing a VAR model, and the empirical results showed that China's PPI was significantly affected by international energy prices, and along the industrial chain, this effect had a decreasing trend. Bagchi (2017)[5] extended the study to the BRIC countries to explore the extent to which stock prices in each country were affected by crude oil prices and the results showed that there was an asymmetric effect of crude oil price volatility in the stock markets of the four countries. Reboredo and Ugolini (2018)[5] used data on traditional energy sources in the European and American markets in order to investigate whether there was a spillover effect of traditional energy sources on the share prices of new energy companies and the significance of the effect of each traditional energy source, and the empirical results showed that there was a spillover effect of traditional energy prices on the share prices of new energy companies.

Due to the establishment of the carbon emission trading market, scholars at home and abroad gradually shift the research target to new energy sources. In order to explore the relationship between share prices and carbon prices of two types of energy companies in China, Zeng Qing (2018)[6] established a vector error correction model (VECM) to conduct an empirical study, and the empirical results show that the impact of carbon prices on company share prices is different under different conditions of time and company types. Hu, Gang-Yao et al. (2022)[7] used supply and demand theory to propose the transmission path of carbon price fluctuation on the share price of energy companies, and verified it by VAR model. The empirical results showed that the impact of carbon price on the share price of traditional energy companies showed a positive and then negative trend, while the impact and duration of carbon price on the share price of new energy companies were longer, and the positive impact was produced in the early stage and the negative impact trend was produced in the later stage.

In summary, scholars have explored the impact of traditional and new energy sources on energy capital markets and national economies, and basically agree that there are significant volatility spillovers from international energy and domestic carbon prices to capital markets. On this basis, this paper investigates whether there is a significant change in the impact of international energy and domestic carbon emission rights prices on energy stock prices before and after the outbreak of the Russia-Ukraine conflict, in order to determine whether the Russia-Ukraine conflict has an impact on China's energy stock prices by affecting energy prices.

3. Mechanistic Analysis

3.1 Mechanistic Analysis of the Impact of International Energy Price Fluctuations on New Energy Stock Prices before the Russia-Ukraine Conflict

Traditional energy and new energy can exist as substitutes, then when international energy prices rise leading to an increase in the price of traditional energy, its demand decreases, which will make the demand for new energy products increase, on this basis, the production of new energy enterprises increases, which eventually makes the sales revenue of new energy enterprises increase, which in turn increases the share price of new energy enterprises.

However, this is based on the basic theory that international energy price changes are directly transmitted to domestic energy prices, while in practice, due to the national conditions and nature of China, it is more difficult for international energy prices to directly affect domestic energy prices, and thus the role of new energy as a substitute is reduced, and the impact of new energy stock prices is reduced; on the other hand, our government and the Energy Regulatory Commission has been strictly regulated and controlled domestic On the other hand, the Chinese government and the Energy Regulatory Commission have been strictly regulating and controlling domestic energy prices, so as not to make large-scale fluctuations and thus affect normal domestic economic production and living activities.

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Therefore, under the premise of limited impact of international energy prices on domestic energy prices, the impact of international energy price fluctuations on the share prices of new energy companies is limited.

Theoretical hypothesis 1: Before the Russia-Ukraine conflict, international energy price increase has limited impact on the share price of new energy enterprises.

3.2 Mechanistic Analysis of the Impact of International Energy Price Fluctuations on New Energy Share Prices after the Russia-Ukraine Conflict

Due to the existence of state-owned enterprises protection mechanism and government, regulatory agencies supervision and management of energy prices, international energy prices are difficult to affect domestic energy prices and thus affect the share price of new energy companies, so before the Russia-Ukraine conflict, the impact of international energy prices on the share price of new energy companies is limited.

But after the outbreak of the Russian-Ukrainian conflict, the situation has changed. Although the international energy prices were not influenced by domestic energy prices, the international economic, political and energy environment was very volatile, and China's stock market was weak in resisting shocks, so the stock prices of the general market moved, which caused significant fluctuations in the share prices of new energy companies. Because the movement only comes from indirect factors, such as the general stock price decline, investor confidence in the reduction of factors such as transmission, so the impact does not last long.

Theoretical hypothesis 2: Under the Russia-Ukraine conflict, international energy market movements (both up and down) cause new energy companies' share prices to fall, but the duration is short.

3.3 Mechanistic Analysis of the Impact of Carbon Emission Rights Price Fluctuations on New Energy Share Prices

When the price of carbon emission rights rises, the price of traditional energy enterprises' products rises in the short term, and the demand for new energy as a substitute for traditional energy increases, which in turn increases the sales revenue of new energy enterprises; in addition, due to the trading rules of the carbon emission trading market, new energy enterprises, as sellers of carbon emission trading, can also increase their sales revenue by selling carbon emission rights, both of which eventually Both of them increase the stock of new energy enterprises.

In the long run, the only way for new energy companies to increase their sales revenue is to sell carbon credits at a higher price, as the government's involvement in traditional energy prices is limited. Therefore, in the long run, the increase in sales revenue of new energy companies decreases, and the increase in share price decreases as well.

This assumption applies to the full time horizon.

Theoretical Hypothesis 3: An increase in the price of carbon emissions increases the share price of new energy companies.

4. Empirical Analysis

In order to investigate whether there is a significant impact of international energy and domestic carbon emission rights prices on new energy stock prices under the Russia-Ukraine conflict, this paper establishes a VAR model with new energy stock prices as the core variables using February 21, 2022 as the cut-off date, and the data before and after one year to conduct an empirical analysis.

4.1 Data Description

In this paper, six sets of data are selected, including Brent crude oil futures, Newcastle coal futures and Henry Hub natural gas spot closing prices, of which the first two are obtained from the British Financial Disclosure data and the latter from the U.S. Energy Information Administration; carbon emission rights prices The closing price of daily carbon emission rights announced by Guangzhou Carbon Emission Exchange is selected; the 10-year bond yield is used to represent investors' psychological expectation, which is disclosed in China Money Network; the closing price of CSI 300 index is used to

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represent the general market trend; and the closing price of CSI Mainland New Energy Index is used to represent the share price of new energy enterprises. The data selection interval of this paper is from February 21, 2021 to February 20, 2022, with a total of 229 sets of valid data, and from February 21, 2022 to February 20, 2023, with a total of 229 sets of valid data, respectively.

Under the definition of this paper, international energy has the composition of imported energy oil, natural gas, and coal, so in the empirical test, the collected international prices of oil, coal, and natural gas are weighted and averaged according to the annual import volume, and the result is the international energy price (daily price):

$$\text{price} = \alpha \times \text{oil} + \beta \times \text{gas} + \gamma \times \text{coal} \tag{1}$$

Based on the annual energy imports published by the National Bureau of Statistics, the annual import ratios of oil, coal and natural gas are calculated to be like Table 1:

Table 1: China's annual energy import ratio

	Oil Ratio α	Natural gas Ratio β	Coal Ratio γ
2020	0.571	0.107	0.321
2021	0.546	0.124	0.330
2022	0.552	0.130	0.318

Since the data in this paper are time series data, in order to avoid heteroskedasticity in the data, the logarithmic rate of return is processed for each data, i.e:

$$R_t = \ln P_t - \ln P_{t-1} \tag{2}$$

where R_t represents the logarithmic return and P_t represents the price or index price at time t.

In addition, since this paper uses more data and there are time differences between the same data, Table 2 presents the sign of each data.

Table 2: Variables, symbols and abbreviations used in this paper

	Variables	**Symbols**
Yield	CSI Mainland New Energy Index	r_{s1}
	CSI Mainland New Energy Index Log Yield	r_{s2}
	CSI 300 Stock Index Log Yield	r_{s3}
	Guangzhou Carbon Emission Rights Log Yield	r_{carbon}
	Ten-Year Treasury Yield Log Yield	r_{bond}
	International Energy Price Log Yield	r_{price}
Model	Russia-Ukraine pre-conflict model	b
	Russia-Ukraine post-conflict model	a
Abbreviations	New energy stock price	NESP

4.2 VAR Model Theory

The vector autoregressive model (VAR) is a non-structural system of equations model. The model is not based on economic theory and takes the form of a multiple equation linkage in which endogenous variables are regressed on the lagged terms of all endogenous independent variables of the model in each equation of the model, which in turn estimates the dynamic relationships of all endogenous variables, and is commonly used to forecast interconnected time series systems and to analyze the dynamic shocks of stochastic perturbations to the system of variables.

As an example, a VAR model with two variables $y_{1,t}$ and $y_{2,t}$ lagged 2 periods:

$$\begin{cases} y_{1,t} = \mu_1 + \pi_{11,1}y_{1,t-1} + \pi_{12,1}y_{2,t-1} + \pi_{11,2}y_{1,t-2} + \pi_{12,2}y_{2,t-2} + \mu_{1,t} \\ y_{2,t} = \mu_2 + \pi_{21,1}y_{1,t-1} + \pi_{22,1}y_{2,t-1} + \pi_{21,2}y_{1,t-2} + \pi_{22,2}y_{2,t-2} + \mu_{2,t} \end{cases} \tag{3}$$

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4.3 VAR Model Building and Application

4.3.1 Smoothness Test

The VAR model is stable provided that the roots of the characteristic equation $|\lambda \boldsymbol{I} - \boldsymbol{\Pi_1} L - \boldsymbol{\Pi_2} L^2| = 0$ are all within the unit circle.

Table 3: Results of smoothness test for each variable

	Before the conflict		After the conflict	
	$p-value$	$t-value$	$p-value$	$t-value$
r_{s2}	0.01	-11.39	0.01	-10.26
r_{s3}	0.01	-11.27	0.01	-11.10
r_{bond}	0.01	-10.92	0.01	-12.06
r_{carbon}	0.01	-9.08	0.01	-10.98
r_{price}	0.01	-11.36	0.01	-9.11

It is obvious from the results in Table 3 that the t-values of the five variables significantly reject the original hypothesis with p-values less than or equal to 0.01, so the five variables are smooth and there should not be unit roots, and they are all smooth time series and do not need to be differenced.

4.3.2 Order Selection and Model Building

In this paper, the optimal order of the four models is solved by the VARorder() function in R language, and the final results feedback the AIC, BIC, and HQ values of the models, and we take the AIC criterion as the optimal.

Table 4: Results of model order selection

	b			a		
lag	AIC	BIC	HQ	AIC	BIC	HQ
1	**4.205**	4.580	4.356	**3.069**	3.444	3.220
2	4.317	5.067	4.620	3.205	3.955	3.508
3	4.348	5.472	4.801	3.307	4.432	3.761
4	4.475	5.975	5.080	3.347	4.846	3.952
5	4.550	6.425	5.306	3.478	5.352	4.234
6	4.624	6.873	5.532	3.603	5.852	4.510
7	4.774	7.398	5.833	3.695	6.319	4.753
8	4.837	7.836	6.047	3.794	6.793	5.004
9	4.872	8.245	6.233	3.660	7.034	5.021
10	4.994	8.743	6.506	3.685	7.434	5.197
11	5.075	9.198	6.738	3.725	7.848	5.388

According to Table 4, the optimal lag order of the two models is order 1, so two VAR(1) models will be developed for empirical analysis.

The following are the fitting results and total expressions of the two VAR(1) models with stock price as the explanatory variable.

Table 5 shows the results of model b fitting and the formula is the full expression of VAR(1) established by b. As can be seen from the table below, the NESP is not linearly influenced by any factors in this period and is judged to be the change due to the outbreak of the epidemic and the Russian-Ukrainian conflict leading to stock market turmoil, the break in the international supply chain, and the drastic downward spiral of the world economy. Subsequently, Granger causality analysis will be used to test whether there is a relationship between the factors other than linearity.

Table 5: B-model fitting results

	estimate	p-value
$r_{s2,t-1}$	-0.068	0.393
$r_{s3,t-1}$	-0.002	0.988
$r_{bond,t-1}$	-0.060	0.805
$r_{carbon,t-1}$	-0.037	0.649
$r_{price,t-1}$	-0.065	0.359
c	0.137	0.402

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$$\begin{cases} r_{s2,t} = -0.7r_{s2,t-1} - 0.00r_{s3,t-1} - 0.06r_{bond,t-1} - 0.03r_{carbon,t-1} - 0.07r_{price,t-1} + 0.14 \\ r_{s3,t} = -0.05r_{s2,t-1} + 0.01r_{s3,t-1} - 0.09r_{bond,t-1} - 0.01r_{carbon,t-1} + 0.01r_{price,t-1} - 0.06 \\ r_{bond,t} = -0.01r_{s2,t-1} + 0.02r_{s3,t-1} - 0.02r_{bond,t-1} - 0.03r_{carbon,t-1} + 0.02r_{price,t-1} - 0.07 \\ r_{carbon,t} = -0.03r_{s2,t-1} + 0.04r_{s3,t-1} - 0.01r_{bond,t-1} + 0.17r_{carbon,t-1} + 0.07r_{price,t-1} + 0.30 \\ r_{price,t} = 0.03r_{s2,t-1} - 0.16r_{s3,t-1} + 0.02r_{bond,t-1} - 0.01r_{carbon,t-1} + 0.08r_{price,t-1} + 0.26 \end{cases} \quad (4)$$

Table 6 shows the results of a model fit and the equation is the full expression of VAR(1) established by a. From the results, it can be seen that after the Russian-Ukrainian conflict, the current NESP will be significantly and linearly affected by the previous period's own factors, the broad market index, Treasury bond yields, and international energy prices, but not by the carbon emission price.

Table 6: A-model fitting results

	estimate	p-value
$r_{s2,t-1}$	0.168	**0.068**
$r_{s3,t-1}$	-0.229	**0.133**
$r_{bond,t-1}$	-0.494	**0.015**
$r_{carbon,t-1}$	0.006	0.953
$r_{price,t-1}$	0.083	**0.058**
c	-0.051	0.721

$$\begin{cases} r_{s2,t} = 0.17r_{s2,t-1} - 0.23r_{s3,t-1} - 0.49r_{bond,t-1} + 0.01r_{carbon,t-1} - 0.08r_{price,t-1} - 0.05 \\ r_{s3,t} = 0.09r_{s2,t-1} - 0.13r_{s3,t-1} - 0.25r_{bond,t-1} - 0.04r_{carbon,t-1} - 0.05r_{price,t-1} + 0.04 \\ r_{bond,t} = -0.08r_{s2,t-1} + 0.18r_{s3,t-1} - 0.07r_{bond,t-1} + 0.01r_{carbon,t-1} + 0.02r_{price,t-1} + 0.02 \\ r_{carbon,t} = 0.01r_{s2,t-1} - 0.12r_{s3,t-1} + 0.11r_{bond,t-1} - 0.18r_{carbon,t-1} - 0.08r_{price,t-1} - 0.01 \\ r_{price,t} = -0.22r_{s2,t-1} + 0.61r_{s3,t-1} - 0.50r_{bond,t-1} - 0.66r_{carbon,t-1} + 0.04r_{price,t-1} - 0.01 \end{cases} \quad (5)$$

To ensure that the subsequent VAR model applications are reliable, the roots() function is used to calculate the unit roots to ensure the smoothness of the models. The unit roots are all less than one, so the quantitative analysis results reflect that each model is smooth and can be used for subsequent model applications. Table 7 shows the result of unit roots.

Table 7: Model smoothness test

$b: VAR(1)$	0.165	0.086	0.079	0.047	0.047
$a: VAR(1)$	0.316	0.161	0.161	0.087	0.038

4.3.3 Granger Causality Analysis

Before the Russia-Ukraine conflict, NESP was not a Granger outcome of any factor.

While the results changed significantly after the Russia-Ukraine conflict occurred, the broad market index, treasury bond yields and international energy prices are called significant Granger causes of NESP. This indicates that the impact of energy on stock prices before and after the Russia-Ukraine conflict produced a significant change, and the Russia-Ukraine conflict clearly and indirectly affected NESP. The granger causality analysis results are showed as Table 8.

Table 8: Results of Granger causality analysis for each model

$b: VAR(1)$		F-value	P-value	$a: VAR(1)$		F-value	P-value
r_{s2}	r_{s3}	0.01	0.92	r_{s2}	r_{s3}	3.57	**0.06**
	r_{carbon}	0.25	0.62		r_{carbon}	0.25	0.62
	r_{bond}	0.05	0.82		r_{bond}	7.78	**0.01**
	r_{price}	0.88	0.35		r_{price}	4.44	**0.05**

4.3.4 Impulse Response Analysis

In this section, four graphs are plotted, the first two and the last two are the impulse responses of international energy and carbon emission rights prices to NESP one year before and after the Russia-Ukraine conflict, respectively.

According to Figure 1, it shows that under a positive international energy price shock, NESP moves

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negatively throughout, peaks negatively in the second period, and returns to a zero value in the sixth period.

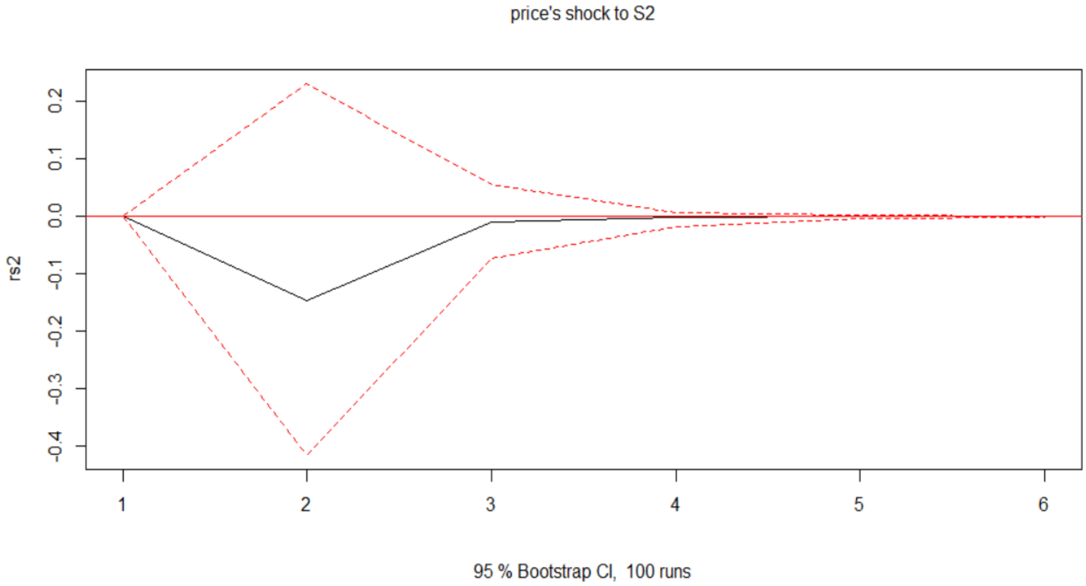

Figure 1: Impulse response of international energy prices to NESP before the conflict

According to Figure 2, it shows that under the positive shock of one carbon emission price, NESP first shows a negative change, and then shows a weak positive change in the third period, returning to a zero value in the sixth period.

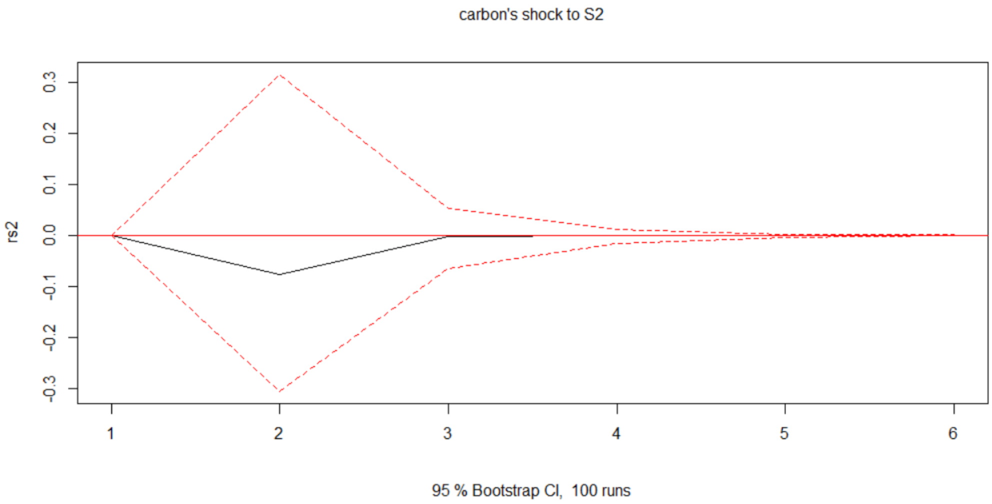

Figure 2: Impulse response of carbon emission prices to NESP before the conflict

According to Figure 3, it shows that after the Russia-Ukraine conflict, under a positive international energy price shock, NESP first generates negative volatility, reaching a negative volatility maximum of -0.256 in the second period, and then the volatility rapidly decreases and stabilizes in the third period until the aftermath completely disappears in the fifth period. Therefore, NESP is affected by the international energy prices for negative volatility, and the impact of the shock is greater, the maximum value of -0.26, negative volatility continues for five periods before stabilizing.

According to Figure 4, it shows that after the Russia-Ukraine conflict, NESP generally shows positive volatility under a positive domestic carbon price shock, reaching a positive volatility maximum of 0.085 in the third period, and then slowly weakening to return to zero in the sixth period. Thus, NESP is affected by the price of carbon credits with positive volatility and lasts for a long time before leveling off in the sixth period.

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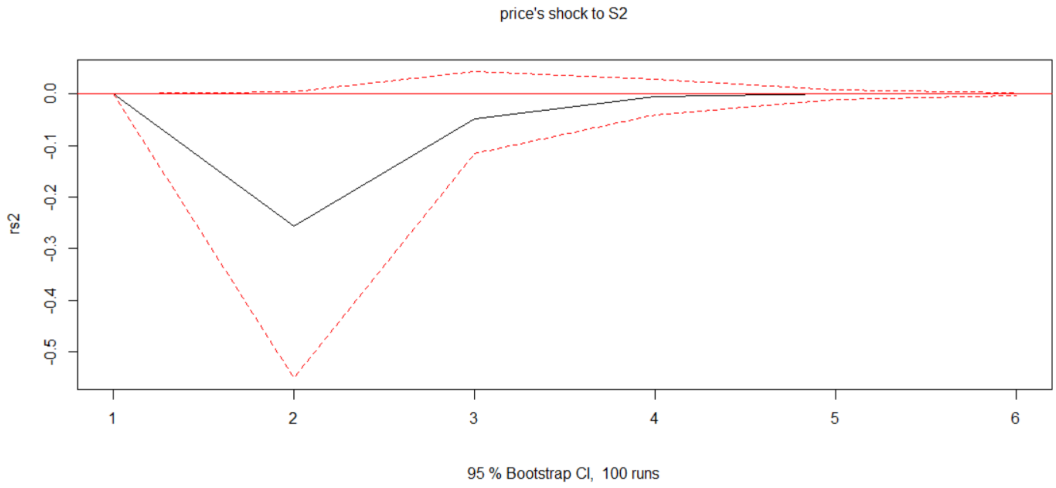

Figure 3: Impulse response of international energy prices to NESP after the conflict

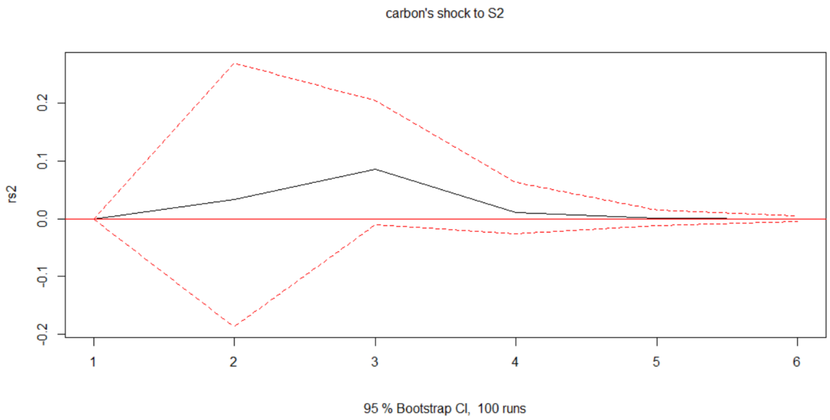

Figure 4: Impulse response of carbon emission prices to NESP after the conflict

Prior to the Russia-Ukraine conflict, the new share price was not significantly influenced by any factors. After the Russian-Ukrainian conflict, NESP is influenced by long-term interest rates, the broader stock market and international energy prices. It can be clearly seen that the results of the model developed before and after the Russian-Ukrainian conflict show a huge difference, which indicates that the Russian-Ukrainian conflict has some ability to change the results of the impact of energy prices on stock prices. After the Russia-Ukraine conflict, NESP are more influenced by the broader stock market and long-term interest rates, which indicates that the outbreak of the Black Swan event makes investors invest more cautiously and pay more attention to the direction of the overall broader market, the world economy and long-term profitability; on the other hand, the establishment and improvement of China's carbon emission market enables NESP to be significantly influenced by the carbon emission trading market. Table 9 lists the mechanism analysis and empirical results, providing a clearer comparison between the two.

Table 9: Mechanistic analysis and empirical results

		Before the conflict	**after the conflict**
International energy price	Mechanistic Analysis	Limited impact	Decline
	Empirical results	Decline	Decline
Carbon emissions rights price	Mechanistic Analysis	Rise	Rise
	Empirical results	First down then up	Rise

Before the outbreak of the Russia-Ukraine conflict, impulse response plots show that international energy prices have a negative impact on domestic NPS prices in the first five periods, which is inconsistent with Hypothesis 1. This may be due to the outbreak of the epidemic and the Russia-Ukraine conflict causing the empirical results to deviate from the mechanistic analysis. In the aftermath of the outbreak, international trade was hit hard, global production was halted, supply chains were disrupted, and NESP were highly volatile, when weak fluctuations in international energy prices could affect various industries around the world and thus be transmitted to NESP.

After the outbreak of the Russia-Ukraine conflict, international energy prices moved differently, as shown in the impulse response diagram. The positive shock of international energy prices caused NESP to fall, but the duration of the large fluctuations was short and quickly stabilized in the third period, which is consistent with Hypothesis 2.

Before the outbreak of the Russia-Ukraine conflict, the shock to the price of carbon emission rights presents a negative impact on NESP first and then a positive one. In the short term, hypothesis 3 is not valid, probably because: on the one hand, China's carbon emission rights trading market is not mature enough, the transmission mechanism is not stable enough, and the trading volume is less, which makes the actual result not consistent with the theoretical result; on the other hand, the speculation in China's A-share market is serious, and a negative short-term volatility is normal, which may be caused by the speculative operation of stockholders or their activities. While in the long run, hypothesis 3 holds, i.e., in the long run, the positive shock of carbon emission rights does make NESP rise. After the outbreak of the Russia-Ukraine conflict, the impact of the increase in the price of carbon emission rights on NESP generally shows positive fluctuations, and this impact gradually decreases over time, which is consistent with hypothesis 3. A comparative analysis with the results before the Russia-Ukraine conflict concludes that the carbon emission rights trading market in China, after the Russia-Ukraine conflict, is gradually established and perfected, so the empirical results are consistent with the logic of economic theory.

5. Conclusion

(1) Before the Russia-Ukraine conflict, no factors could significantly affect NESP. On the one hand, it may be due to the imperfection of China's carbon emission rights market, which leads to the deviation of the empirical results from the theoretical results; on the other hand, the influence of the epidemic in recent years and the internal fluctuations of the new energy industry itself may also lead to the discrepancy between the empirical results and the realistic results.

(2) After the Russia-Ukraine conflict, international energy price changes have a significant impact on NESP, and the impulse diagram also shows a significant impact effect. Therefore, it can be explained that secondly, the series of effects generated by the Russia-Ukraine conflict are indirectly transmitted to NESP.

(3) After the Russia-Ukraine conflict, the change in carbon emission rights price has an impulse shock on NESP. Compared with the pre-Russian-Ukrainian conflict, the price of carbon emission rights no longer has a negative impact on NESP, i.e., both prices move in the same direction, which indicates the rapid development of China's carbon emission trading market during this year and the gradual formation of a perfect and sound carbon emission trading market.

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