Research on the impact of certification emission reduction price on energy price based on big data

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Abstract. Global warming has seriously affected human production and life. At present, countries around the world are committed to finding ways to save energy and reduce emissions. The Kyoto Protocol introduced a market mechanism to trade the power of carbon dioxide and other greenhouse gas emissions as a commodity. In the process of actual economic operation, due to advanced emission reduction technology, extensive use of new energy, implementation of environmental protection policies and other factors, certification emission reduction (CER) in some countries are less than the emission limit. At present, the scarcity of CER is mainly determined by the government, and the government can intervene in the dynamics of the carbon emission trading market through various means, such as formulating different carbon quota allocation methods, or holding periodic auction of emission rights, etc. This paper studies the phenomenon that CER is a commodity traded in the market, and the tight relationship between supply and demand of CER determines the carbon price. This paper analyzes the application of big data in the price control of CER, and the influence mechanism of CER on energy prices. Finally, the development plan and prospect of the exploration market are put forward.

Keywords: Big data, Certification emission reduction, Energy price.

1. Introduction

In the era of big data, in order to slow down the pace of global warming, the Kyoto Protocol introduced a market mechanism to trade the right to emit greenhouse gases such as carbon dioxide as a commodity [1]. Carbon trading price is also called carbon trading price and carbon price. Among them, the market for studying the price influence mechanism of CER trading belongs to China's financial market as well as China's carbon market and traditional energy market, and is affected by the same macro-political and economic factors, so there is a linkage between carbon price and traditional energy price [2]. The two attributes often cross and complement each other, which makes the relationship between carbon price and traditional energy price more complicated. Help government decision-making institutions to consider the impact of traditional energy prices on carbon prices and the risks brought by the fluctuations of traditional energy prices when formulating carbon market policies and systems, so as to formulate more perfect policies and systems and ensure the smooth operation of the carbon market [3]. Therefore, based on big data technology, this paper focuses on the relationship between energy price and carbon price, and analyzes the impact of CER price on energy price [4-5]. The path and effectiveness of the interaction between energy prices and carbon prices will be specified to further enrich and expand the relevant content of the low-carbon economic system.

2. Analysis of energy market and carbon market

2.1 Carbon emissions trading.

CER in carbon trading market evolved from emission right, which is the product of international climate and political environment and a new financial product [6]. CER like conventional commodities, can be circulated in the market. In the actual economic operation process, due to the advanced emission reduction technology, the wide application of new energy sources, the implementation of environmental protection policies and other factors, some countries' carbon emissions are less than the emission limit. International Emissions Trading (IET) allows developed countries to transfer part of their emissions. Because the development of science and energy-saving

technology in developed countries is different from the speed of industrial energy consumption and emission, there will be a mismatch between the supply and demand of emission allowances in the carbon markets of various countries [7]. On the other hand, countries that can't complete the emission reduction task according to the regulations, or can't afford the higher emission reduction cost and are unwilling to complete the emission reduction task.

According to the principle of economics, the price of CER is determined by the supply and demand of CER, and other factors affect the supply and demand through the transmission mechanism, thus affecting the carbon price. From the supply side, the main factor that affects the carbon price is the carbon quota set by the government [8]. It can be said that due to the participation of financial institutions in global carbon emissions trading, the relationship between carbon market and financial capital is increasingly close. In this process, carbon emissions not only have the value attribute of commodities, but also have the trading attribute of financial instruments. Generally speaking, the most common transaction is the regional carbon emission transaction. In this transaction, each subject involved in the transaction is an economic participant in a specified region, and the regional carbon transaction is the most widely distributed in the United States. According to the classification of market types, the market types of carbon emission trading are divided into primary market and secondary market. In the primary market, government decision-makers initially allocate CER according to the emission situation. The process of redistribution of CER by the holders has formed a secondary market system. The number of subordinate governments and performing enterprises that have obtained CER is limited. After obtaining the CER, the subordinate governments and performing enterprises will simultaneously obtain the right to control CER.

2.2 Construction of Carbon Emissions Trading Market.

Human beings can't do without energy when carrying out productive activities, which promotes the economic development and the progress of human civilization. Among these energy sources, fossil energy is the earliest and most widely used. It has brought the world economy into the industrial age, brought great changes in production technology and fundamentally changed the way of human production and life [9]. Carbon financial market is the general name of greenhouse gas emission rights trading and various related financial activities, including quota emission rights trading market, as well as project transactions that can generate amount and amount of decentralization (various emission reduction units), and various derivatives transactions related to related rights. Under mature market conditions, the consumption or demand of fossil energy is bound to be related to its price, which leads to the conclusion that there is a certain degree of correlation between the fossil energy market and the carbon market. The proportion of China's carbon emissions trading volume in the total carbon emissions of the country is rising exponentially, and the carbon emissions trading market is developing very fast.

In the age of big data, the scarcity of carbon emission quotas is mainly determined by the government. The government can intervene in the dynamics of the carbon emission trading market through various means, such as developing different carbon quota allocation methods, or holding intermittent emission auctions. The essence of emission reduction in emission trading market is to make use of the scarcity of carbon quota to encourage enterprises to participate in carbon asset trading and implement emission reduction.

3. Transmission mechanism between carbon emission trading price and energy price

3.1 Analysis on the mechanism of the influence of energy price change on carbon price.

As a commodity traded in the market, the tension between supply and demand of CER determines the carbon price. From the demand side, when the national society is in a period of rapid development, large-scale production activities will stimulate energy consumption, which will increase the demand

for carbon emissions and CER [10]. When the demand for traditional energy is reduced, that is, when the use of traditional energy is reduced, the carbon dioxide emissions will also be reduced, and the demand for CER will also be reduced. When the supply is certain, the price of CER will also be reduced; On the contrary, similarly, when the demand for traditional energy increases, the price of CER will also increase. According to economic principles, changes in the price of traditional energy can affect the demand of industrial enterprises for traditional energy, which can be decomposed into income effect and substitution effect.

The income effect has opposite effects on normal products and low-grade products. When the economic situation is in a downturn, the global economic growth slows down and the total demand decreases, but the energy supply will not be reduced immediately. Therefore, although the energy price drops, the pessimistic economic environment leads to the reduction of the output scale of production departments, the reduction of energy consumption, so enterprises sell them off, resulting in a lower carbon price. So theoretically, there is a positive relationship between the energy market and the carbon market. The change of carbon emission price satisfies the classical supply and demand theory. When other conditions remain unchanged, the increase of carbon emission quota supply will lead to the decrease of carbon emission price. On the contrary, the reduction of carbon emission quota supply will lead to the decline of carbon emission price. The Carbon emission right price formation diagram are shown in Figure 1:

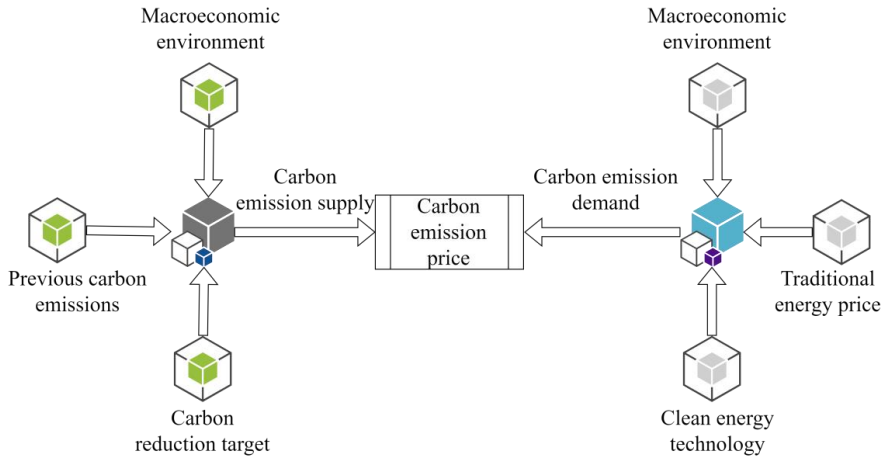

Figure 1. Carbon emission right price formation diagram

3.2 Application of Big Data in Price Regulation of CER.

The price elasticity of energy demand is low. As economic growth drives the increase of energy demand and causes its price to rise, it is difficult to reduce energy consumption in the short term, and it is also difficult to cause the decline of carbon price; On the contrary, due to rigid demand, economic growth drives the growth of energy consumption, which will lead to the simultaneous rise of energy prices and CER in the short term. This seems abnormal, but it is normal. The distribution and proportion of carbon brewing rights are also factors that affect its price. If the free allocation quota is greater than the actual emissions of the emission reduction enterprises, it may cause the carbon market price to drop sharply, so the transaction is meaningless. In order to avoid the recurrence of such problems, we have to re-evaluate the emissions of the main emitters strictly, reduce the free quotas and increase the auction methods. The trading price of CER and coal price are shown in Table 1:

Table 1. Descriptive statistical table of carbon emission trading price and coal price

	Carbon emission demand	Coal price
Average value	22.68	449.37
Median	22.25	512.78
Standard deviation	6.47	80.34
Variance	42.58	6534.66
Minimum value	10.57	365
Maximum	45.98	611

We can see some conclusions. Firstly, the minimum value of carbon emission trading price series is 10.57, the maximum value is 42.58, and the standard deviation is 6.47. The minimum value of coal price series is 365, the maximum value is 611, and the standard deviation is 80.34. Therefore, the overall volatility of coal price is greater than that of carbon emission trading price.

4. Conclusion

The energy market and the carbon emission market are closely linked. Affected by relevant climate treaties, carbon price is often a counterpart of the energy market. Currently, the global economy is closely connected, and when the energy market is impacted, it will quickly have a certain degree of impact on the carbon market; When the carbon market is tightened, the energy market will also be suppressed. The conclusion shows that under the policy environment of China, the trading price of CER is guided by the government. Therefore, the impact of the trading price of CER on the price of fossil energy is the main aspect of the correlation between the two markets, and the trading price of CER should be used inversely for the price of fossil energy.As the price of CER drops, enterprises will make full use of emission rights to produce and burn more fossil energy to maximize production, so the demand for energy will increase, which will eventually lead to higher energy prices. To expand the carbon market, it is necessary to comprehensively cover carbon emissions, include key carbon emission departments compulsorily, and lower the threshold for enterprises to enter the carbon market.

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