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The asymmetric effect of oil shocks on the price of carbon emission allowances

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Abstract

In this project, a nonlinear autoregressive distribution lag model (NARDL) is constructed to study the asymmetric relationship between oil shocks and China's carbon emission trading market, and the NARDL model analyzes the short-term and long-term interactions between variables from a nonlinear perspective, that is, the short-term and long-term interactions between oil shocks and carbon emission permit prices. Consider the changes in the relationship between oil shocks and carbon allowance prices before and after China announced the establishment of a unified national carbon market in 2017. Therefore, how will the price of carbon emission allowances change under the different incentives of rising oil prices? Given the strong impact of oil prices on the carbon emission trading market, it is necessary to clarify the mechanism of the impact between oil shocks and carbon allowance prices. By attributing oil volatility to supply, demand, and risk shocks, previous studies have often ignored the impact of these three clear oil shock classifications on China's carbon allowance prices. At the same time, for the existing research, only oil prices and carbon emission trading markets are examined, and on this basis, whether these effects are the same among different oil shocks and the mechanism between different oil shock classifications are explored. Through the study of the oil market, the impact of oil shocks on carbon emission quotas is analyzed, and it is hoped that the research of this project can provide research ideas for the carbon emission quota market, enrich the theoretical basis of the carbon emission market, and provide implementable suggestions.

Keywords

Oil shocks, carbon emission quotas, asymmetric effects, NARDL models.

1. Introduction

Anthropogenic global warming caused by greenhouse gas emissions has attracted worldwide attention. In this regard, the carbon emission trading market can effectively promote the development of a low-carbon economy and reduce greenhouse gas emissions. As a basic factor of production, crude oil affects carbon emissions through various channels such as production materials and energy supply in production, which in turn affects the carbon emission trading market. However, the market analysis of carbon allowance prices for oil price fluctuations caused by different shocks is still scarce. Oil prices are rising because of increased demand, but it is also possible because of reduced supply. The same result, but for different reasons, will have different effects on the amount of oil used, resulting in different carbon emissions. So, how will the price of carbon allowances change under the different incentives of rising oil prices? Given the strong impact of oil prices on the carbon emissions trading market found in previous studies, it is necessary to elucidate the relationship between oil shocks and carbon allowance prices. Oil price shocks from different sources can be classified as supply or demand driven in different ways. A common approach is to look for exogenous instruments of changes in oil

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prices, such as time-series events that affect oil production. Other studies have used oil production data to identify some shortcomings in the decomposition methods of various shocks. It cannot slowly obtain information on changes in oil prices on a daily basis. At the same time, it is unable to determine whether a particular oil demand shock is driven by concerns about future oil supply or by changes in aggregate oil demand. Overcome these shortcomings. Break down oil changes into oil supply, demand, and risk shocks. At the same time, this decomposition method uses everyday data to obtain useful information, resulting in better results than previous methods.

2. Research meaning

2.1. Realistic meaning

In recent years, although China has made remarkable achievements in carbon emission reduction, there are still unclear goals, unsuccessful strategies, and unclear influencing factors. Clarify the main factors affecting carbon emission quotas, so as to improve the efficiency of carbon emission reduction, stabilize the development of the "double carbon" goal, promote the effect of carbon emission reduction on the carbon market, and truly achieve the role of carbon emission reduction and the control of the total amount. At the same time, stabilizing the market foundation can better promote the development of the carbon trading market and inject new development vitality into economic development and environmental protection.

2.2. Theoretical significance

As far as China is concerned, the development history of China's carbon emission quota market is relatively short, the relevant market system and theory are not mature enough, China's carbon emission quota is extremely unstable due to the impact of oil shock, and the research on China's carbon emission market does not reflect China's dominant influence on the carbon emission trading market. From the existing literature, it is found that the study of carbon emission allowances from the perspective of nonlinearity and asymmetry is becoming more and more common. The NARDL model can be constructed to analyze the mechanism between nonlinearity and asymmetry, given that some scholars have used the NARDL model to study the problem of energy cost pass-through to CO2 emission price in the United States. The NARDL model can not only make up for the lack of research on carbon emission quotas in the oil market, but also analyze the short-term and long-term effects of variables from a nonlinear perspective, and explore the mechanism of oil shocks and carbon emission quotas. There is a lack of research on the mechanisms of long- and short-term impacts of oil shocks and emissions trading markets. Therefore, it is of great theoretical significance to study the impact of oil shocks on carbon emission quotas.

3. Research status and development trends at home and abroad:

Crude oil is an important commodity that is essential for the development of economies and financial markets (Engelberg, 2020). It is also related to other factors such as monetary policy, investment sentiment, economic policy uncertainty, Gong Changsheng and Jin Xuejun (2020). However, these studies lack a detailed analysis of the causes of oil price fluctuations. (Kilian, 2009) proposed a structural variance autoregressive (SVAR) model that decomposes oil price fluctuations into three types of oil shocks from different sources; In the literature, research on different oil shocks is also increasing. Kilian and Park (2009) examined the impact of oil price shocks on the U.S. stock market. (Basher, 2012) examines the dynamic relationship between oil

shocks, exchange rates, and emerging market stock prices. On the basis of the model, some scholars have developed a structural model of the global crude oil market that explicitly allows for shocks to speculative demand for oil, as well as shocks to liquid demand and liquid supply, Kilian and Murphy (2014). (Hu, 2018) uses the decomposition model and NARDL model proposed by Kilian, 2009 to study the asymmetric relationship between oil shocks and stock markets. Baumeister and Hamilton (2019) revisit the role of oil supply and demand shocks. Some scholars have even applied this model to the field of corporate finance to study the impact of oil shocks on corporate investment.

4. Literature review

For the existing studies, only oil prices and carbon emission trading markets have been examined, and on this basis, whether these effects are the same for different oil shocks and the mechanism of action between different oil shock classifications. Through the study of the oil market, the impact of oil shocks on carbon emission quotas is analyzed, and it is hoped that the research of this project can provide research ideas for the carbon emission quota market, enrich the theoretical basis of the carbon emission market, and provide implementable suggestions.

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