Accepted Manuscript

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PII: S0140-9883(17)30243-8
Reference: ENEECO 3699

To appear in: Energy Economics

Received date: 5 September 2016
Revised date: 10 April 2017
Accepted date: 13 July 2017

Please cite this article as: Chang, Kai, Pei, Ping, Zhang, Chao, Wu, Xin, Exploring the price dynamics of $CO_2$ emissions allowances in China’s emissions trading scheme pilots, Energy Economics (2017), doi: 10.1016/j.eneco.2017.07.006

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Exploring the price dynamics of CO$_2$ emissions allowances in China’s emissions trading scheme pilots

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Abstract

Establishing regional emissions trading scheme pilots in China is a newly transformative and explorative practice. In this paper, we examine the spot price dynamics, asymmetric clustering and regime-switching behaviors of CO$_2$ emissions allowances in the new China-wide emissions trading scheme (CETS) pilots using AR-GARCH, AR-TARCH and MRS-AR-GARCH models. The regional ETS pilots’ design in China vary widely in their coverage thresholds, sector coverage, emissions allocation and caps setting methods, market trading rules and price stabilization provisions. Our empirical results indicate that the spot prices of regional emissions allowances exhibit significant dynamic behaviors, asymmetric leverage effects and regime-switching behaviors in the entire period considered; previous market overreactions in the Beijing, Tianjin and Guangdong pilots have stronger price clustering effects on future conditional variances than do the Shanghai and Hubei pilots. Unexpected market shocks and greater persistence in the Beijing, Tianjin and Guangdong ETS pilots display stronger market volatility and higher market risks, and their asymmetric leverage effects display a decreasing trend in the volatility of the BEA, TJE A and GDEA prices. The BEA and SHEA prices exhibit significant regime-switching behaviors, price jumps and higher volatility; in addition, the changes in the regime-switching phases are often related to the political mechanism design and the fundamental market factors. Those empirical results are beneficial for government decision-makers and market participants to strengthen risk management strategies, support emission-related investment decisions and optimize co-benefits of alternative energy-environmental policies.

Keywords: emissions allowances; China’s emissions trading scheme, price dynamics, asymmetry effect, GARCH model, regime-switching process

1. Introduction

Exploring the price dynamics of CO$_2$ emissions allowances has been highly popular in recent years. Since the introduction of regional emissions trading scheme pilots, China’s emissions trading scheme (CETS) has grown quickly, and the CETS has created a newly emerging emissions trading market that provides capped firms the right to decrease abatement costs or gain economic benefits. Based on the joint statement of climate change between the United States and China on November 12, 2014, China will launch a unified national emissions trading market in 2017. In the 13th-Five planning (2016-2020), China will establish an allocation system for energy use permits, water use permits, carbon emissions permits and initial emission permits. This system is urgently needed to develop the emissions trading market and to effectively control CO$_2$ emissions in the electric power, iron and steel, building materials and chemical industries.

Previous studies empirically investigated the price dynamics and the pricing drivers of emissions allowances in the European Union emissions trading scheme (EU ETS). The energy price, the economic activity, the unanticipated temperature changes, and the market events drive price changes in emissions allowances (Alberola et al., 2008;
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