# Extreme Volatility Spillover Between China's Carbon Market and Carbon-Intensive Industries

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## Abstract

The Chinese carbon market, as a key policy tool for achieving the "dual carbon" goals, has attracted considerable attention regarding the risk transmission mechanisms between it and carbon-intensive industries. This paper focuses on the extreme risk spillover effects and employs the Quantile Vector Autoregression (QVAR) model to empirically analyze the extreme risk spillover effects and their time-varying characteristics between the Chinese carbon market and key carbon-intensive industries such as electricity, chemicals, and cement. The study finds that there exists risk spillover effect between the carbon market and carbon-intensive industries, with greater connectivity between markets under extreme quantile conditions. Specifically, the carbon market primarily acts as a risk receiver, and the electricity and chemical markets play the role of the transmitters. The risk spillover effects exhibit significant asymmetry during major events, such as the outbreak of COVID-19, energy price shocks, and periods of market boom. Compared to left-tail dependence, right-tail dependence is more significant and common, indicating that the risk spillover effects are stronger during extreme upward market conditions. Moreover, the extreme risk spillover effects display evident time-varying characteristics, with significant amplifications occurring during specific periods, highlighting the exacerbating impact of external shocks on the risk transmission between the carbon market and carbon-intensive industries. The conclusions drawn from this research provide a theoretical basis and policy insights for preventing systemic financial risks between the carbon market and carbon-intensive industries, offering guidance for improving the risk prevention mechanisms of enterprises within these sectors, including startups. Additionally, this study serves as an important reference for policymakers in addressing risk transmission under extreme market conditions.

## Keywords

Carbon Market, Carbon-Intensive Industries, Extreme Risk Spillover, QVAR