

Directional connectedness between the electricity prices and natural gas prices: evidence from Alberta's electricity market

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Abstract-

Purpose

This study aims to assess volatility spillovers and directional connectedness between electricity (EPs) and natural gas prices (GPs) in the Canadian electricity market, based on a hydrothermal power generation market strongly dependent on exogenous variables such as fossil fuel prices and climatology factors.

Design/methodology/approach

The methodology is divided into two stages. First, a quantile vector autoregression model is used to evaluate the direction and magnitude of the influence between natural gas and electricity prices through different quantiles of their distributions. Second, a cross-quantilogram is estimated to measure the directional predictability between these prices. The data set consists of daily electricity and natural gas prices between January 2015 and December 2023.

Findings

The main finding shows that electricity prices are pure shock receivers of volatility from natural gas prices for the different quantiles. In this way, natural gas price fluctuations explain 0.20%, 0.98% and 22.72% of electricity price volatility for the 10th, 50th and 90th quantiles, respectively. On the other hand, a significant and positive correlation is observed in the high quantiles of the electricity prices for any natural gas price value.

Originality/value

The study described the risk to the electricity market caused by nonrenewable source price fluctuations and provided evidence for designing regulatory policies to reduce its exposure in Alberta, Canada. It also allows us to understand the importance of natural gas in the energy transition process and define it as the fundamental determinant of the electricity market dynamic.

Index Terms- Volatility spillovers, electricity prices, natural gas prices, quantile vector autoregression model, cross-quantilogram.

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