# When crises hit: Volatility, price discovery leadership, and causal linkages among WTI, Brent, and Shanghai crude oil futures

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**Abstract**

This paper investigates the dynamic linkages among WTI, Brent, and Shanghai crude oil futures markets during two major global crises: the COVID-19 pandemic and the Russia-Ukraine conflict. Using daily data from March 2018 to June 2024, the study employs a suite of econometric techniques, including range-based volatility estimators, the rolling Information Leadership Share (ILS) measure, time-varying Granger causality (TVGC), and wavelet coherence analysis. The results show that WTI futures experienced higher volatility during episodes of severe global uncertainty, whereas Shanghai futures exhibited greater volatility during relatively stable periods. Despite its recent inception, the Shanghai market demonstrated a strong and growing role in price discovery, particularly during daytime trading. Causality analysis confirms WTI's dominant predictive influence on both Brent and Shanghai. Wavelet coherence reveals a persistently strong alignment between WTI and Brent, alongside Shanghai's gradual, long-term integration into global pricing dynamics. These findings contribute to the literature on international financial markets and energy economics, offering new insights into market efficiency during extreme shocks within the global crude oil benchmarks.

**Keywords**

**Author Keywords:** Information leadership share (ILS); Time-varying causality; Yang-Zhang volatility estimator; Wavelet coherence; Crude oil futures; G15; Q41; C58

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**Data availability statement**

Data for this study were obtained under licence from LSEG Refinitiv. A subscription to the database is required for access.

**Conflict of interest statement**

The authors declare no competing financial or other interests that could influence the work reported in this paper.

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