

Energy market bubbles under the green transition

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Abstract-

The 2021–2022 energy crisis generated pronounced episodes of explosive price behavior followed by sharp corrections in gas and electricity markets and raised concerns about whether observed price surges reflected fundamental scarcity or speculative dynamics. This paper examines the presence and synchronization of explosive price behavior across a comprehensive set of European and U.S. gas and electricity benchmarks, as well as carbon-neutral hydrogen and renewable Power Purchase Agreement (PPA) price series. We apply the multiple-bubble testing framework of Phillips, Shi and Yu (2015) and its panel extension to detect and date-stamp common episodes of explosivity across fossil-fuel and transition-related markets. Our results reveal synchronized explosive dynamics during the crisis period, with evidence that exuberance was not confined to traditional energy markets but also extended to hydrogen and renewable PPA benchmarks. For gas and electricity markets, where futures data are available, spot-forward diagnostics provide additional evidence on the interpretation of explosive episodes. Overall, the findings offer new insights into the propagation of instability across fossil and green energy price benchmarks and contribute to the debate on energy market dynamics during periods of systemic stress.

Index Terms- Bubble; Gas futures; Power futures; PPA; Low carbon hydrogen; Green transition; Global energy crisis; Speculation

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