Title: Energy-transition risk across markets: Tail connectedness between fossil fuels, clean energy, and financial assets

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Abstract: This paper investigates how volatility is transmitted across fossil-fuel commodities, renewable-energy assets, gold, and equity markets. We combine generalized forecast error variance decompositions with a factor-augmented quantile VAR to distinguish connectedness under average, downside, and upside market conditions. Fossil-fuel commodities are generally the most persistent net transmitters, whereas equities primarily absorb volatility but can become transmitters during periods of broad market repricing. Gold alternates between transmission and absorption, consistent with its state-dependent hedge and safe-haven properties. Renewable-energy assets are heterogeneous: wind becomes a more frequent transmitter after the mid-2010s, while solar and broad clean-energy exposure more often act as receivers. The intensity and direction of these spillovers vary with financial stress, macroeconomic uncertainty and commodity-market conditions. We further compare a conventional minimum-risk portfolio with a connectedness-aware allocation that reduces exposure to strong net receivers. The results indicate that network information can improve the management of extreme portfolio losses, as measured by value-at-risk and expected shortfall, particularly during stress episodes. The findings show that average connectedness measures can obscure important state-dependent patterns in energy-transition markets.