Empirical Economics Letters, 24 (12): pp. 105-122, (December 2025) ISSN 1681 8997
https://doi.org/10.5281/zenodo.18032366

Time–Frequency Co-Movements between Global and Domestic Volatility Indices and Sustainability, Technology and Digital-Finance Markets: Evidence from VIX, ESG, AI, IT and Bitcoin

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Abstract: This study analyzes time–frequency co-movements between global (CBOE VIX) and domestic (India VIX) volatility indices and three asset groups: ESG benchmarks (ESG USA and ESG India), technology markets (AI Index and NIFTY IT), and digital finance (Bitcoin). Using daily data from April 2018 to March 2025, wavelet coherence reveals persistent and significant linkages, with volatility indices consistently leading asset movements. ESG benchmarks and technology indices exhibit strong negative correlations with volatility, indicating reactive but non-hedging behavior. While the AI Index occasionally serves as a short-term conduit for shocks, the NIFTY IT Index reflects this vulnerability to volatility spillovers. Bitcoin, despite its reputation as a diversifier, shows limited hedging capacity and speculative tendencies. Overall, the findings highlight the limited defensive role of ESG, technology, and digital assets during market stress, offering novel insights for portfolio construction and systemic risk management.

Keywords: VIX, Wavelet Coherence, ESG Benchmarks, AI Index, Bitcoin, India Information Technology Sector, Volatility Transmission

JEL Classification Number: C58, G15, G11, Q56, G32

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