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# **Co-movement and causality of Green Bond Returns with Conventional Asset Returns and Economic Uncertainty fluctuations: Evidence from wavelet analysis**

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### **Abstract**

**Purpose:** The aim of this study is to examine the co-movement of green bond (GB) return series with conventional asset classes and uncertainty indices for the US market by using wavelet coherence techniques. Additionally, the causality of green bond return series with conventional asset classes and uncertainty indices is examined for the US market.

**Design/methodology/approach:** The study employs the wavelet analysis method which has provided a significant lending hand to explain the volatility in real-world financial return series. This study has used continuous wavelet transformation to understand the local variance in the GB return series. Wavelet coherence with phase differences is used to examine the co-movement of GB with other asset classes and uncertainty indices. Linear granger causality tests are done to investigate the causality relationship between the times series under study. To overcome the drawback of linear causality tests, non-linear granger causality tests to detect potential non-linear dependencies in the time series are also performed.

**Findings:** A lack of volatility persistence for the green bond return series was observed. Extreme fluctuations showed volatility persistency lasting until 64 days between Jan-May 2020 and are attributed to the extreme events during the uncertainty period induced by the pandemic. The interdependency of green bond returns with fixed-income securities was higher than equity securities. Weak co-movement and no causality were observed between green bonds and uncertainty indices.

**Originality:** The study contributes to the growing literature examining the promising green bonds market segment. It helps in establishing green bonds to be safe havens as they exhibited marginal co-movements with uncertainty indices.

**Keywords:** green bonds, policy uncertainty, wavelets, wavelet coherence, co-movements