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A MULTIDIMENSIONAL VISIBILITY NEXUS BETWEEN COMMODITY PRICES CO-MOVEMENTS AND FINANCIAL STABILITY

Abstract:

We propose a complex system perspective to map the panel dimension of several commodity time series and extract meaningful information on their price co-movements, which we show to be mutually related with financial stability in capital markets. In doing so, we first develop co-movement indicators of commodity prices by exploiting the topological information of graph-embedded time series. More specifically, we introduce a novel concept of visibility graph that results in a directed network, namely the \textit{Direct Visibility} algorithm, which maps minima (maxima) of the time series into nodes with high values of the out- (in-) degree according to a predefined ordering criterion. Second, we apply tensor decomposition to extract meaningful information from multiple visibility graphs and to identify periods representing structural breaks across several time series as nodes with the highest centrality. These centralities relate to the extent of up and down co-movements among commodity prices since they reveal whether and when these series present similar market patterns. Finally, we show how these co-movement indicators can be embedded into an econometric model to study the nexus between such topological measures and the stability conditions of the financial system.

Keywords:

Commodities; Co-movements; Financial Stability; Tensor decomposition; Networks

JEL Classification: G17, G01, C10