Measuring complexity based on integration and modularity in financial markets

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Abstract

We propose a novel approach to quantify the complexity based on modularity and integration using multivariate data sets in the financial markets. We employ the cross-correlation value to measure interactions between individual stocks. In order to check the utility of our method, we generate the multivariate data sets by the coupled random walks. We find that the complexity estimated from the coupled random walks is closely related to the integration and modularity. We also apply our method to stock data for U.S., Korean, and Japanese stock markets and find the modularity strength of industry sector have an anti-correlation with the degree of integration. Notably, for all data sets the modularity of industry sector during the market crisis significantly decreases.

Keywords
complex, modularity, integration, industry sector

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