

A Graph Laplacian Approach for Anomaly Detection in the US Equity Market Network: Time Varying Dynamism and Macroeconomic Interconnections

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Abstract

The correlation networks of the US equity market is dynamic and models the inter-dependency among nodes, neighborhood, and local and global network structures. In this paper, we propose a graph Laplacian approach for signed graphs and evaluate the evolution of the US equity market network over time and its effect on the overall economy. We find that, at each time point, the Z-score calculated from the k-smallest non-zero eigenvalues of unnormalized Laplacian correlates with, and Granger-causes both market and macroeconomic factors. The outlier points detected in the market network coincide with the significant economic and political events and can be used for event studies. Finally, we show that Z-score has a high predictive capacity and can be used as a factor model for asset pricing. Z-score beta is both statistically and economically significant in explaining one-month, three-month, and twelve-month ahead asset returns.

Keywords:

Dynamic Equity Network; Signed Graph; Laplacian Spectrum; Financial Crisis; Asset Pricing; Market Anomalies.
