Spanning trees and centrality measures of financial networks

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Investigating a financial market is usually done via analyzing the price time series of assets traded on the market [1]. Dependencies and similarities between the assets can be measured by equal-time correlations, and these are important, for instance, in investment theory, risk management and portfolio theory [2]. Recently, various filtering techniques have been applied on the correlation matrix, that contains the pairwise correlations of the time series, in order to reduce statistical uncertainty it contains and get better estimates e.g. for the risk of an investment, return of a portfolio, or, in general, for a future state of the market. Utilizing the complex network approach has been proved to be well-applicable for such purposes.

A *financial network* is defined as a graph where the nodes correspond to assets and the edges between them to distances that are transformed correlation coefficients. In this talk present various concepts to investigate financial networks, such as the *random matrix theory* [3] and *hierarchical clustering* approaches [4]. The latter is closely related to the minimal spanning tree of the network. We define the stability of a financial network in terms of spanning trees. Besides, we also define the *Neumann entropy* of a node as a centrality measure.

Experimental results on several data sets, namely the price of stocks traded in the Budapest Stock Exchange and exchange rate of major cryptocurrencies, show that these concepts are quite useful for information filtering and better understanding of financial networks.

References

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