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What can we learn from the network approach in finance?¹

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Correlations between variations of stock prices reveal information about relationships between companies. Different methods of analysis have been applied to such data in order to uncover the taxonomy of the market. We use Mantegna's minimum spanning tree (MST) method for daily data in a dynamic way: By introducing a moving window we study the temporal changes in the structure of the network defined by this "asset tree." The MST is scale free with a significantly changing exponent of the degree distribution for crash periods, which demonstrates the restructuring of the network due to the enhancement of correlations. This approach is compared to that based on what we call "asset graphs:" We start from an empty graph with no edges where the vertices correspond to stocks and then, one by one, we insert edges between the vertices according to the rank of their correlation strength. We study the properties of the created (weighted) networks, such as topologically different growth types, number and size of clusters and clustering coefficient. Furthermore, we define new tools like subgraph intensity and coherence to describe the role of the weights. We also investigate the time shifted cross correlation functions for high frequency data and find a characteristic time delay in many cases representing that some stocks lead the price changes while others follow them. These data can be used to construct a directed network of influence.

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