



Contribution ID: 38

Type: **Contributed talk (20 min)**

Evolving network analysis of S&P500 components. Covid19 influence on cross-correlation network structure.

Thursday, 1 July 2021 13:20 (20 minutes)

Interaction is the basic feature of economic systems. Although it is possible to imagine a primitive self-sustained tribe, in the case of a developed economy the interaction (in positive and negative sense i.e. co-operation and competition) are a crucial factor of development. Those interactions are influenced by some events or the state of the systems. The special cases are global events such as crises or recently the Covid19 pandemic. In the present work changes in the correlation structure of economic interactions are investigated, particularly the economy network features. The easiest achievable and reliable characteristic of the company is its value, particularly in the case of the companies quoted on a stock market. The study analyses evolution of the network of companies quoted on New York stock components being the components of the S&P500 index. In the analysis, the returns of daily logarithmic returns are considered. In the analysis, the distance matrices are calculated using a sliding time window for the chosen set of time windows sizes (i.e. 5, 10 and 20 days) and for each of the distance matrix the corresponding network is constructed assuming that the companies with the distance within the interquartile range of the sets of the distances on the matrix are connected on the network. The construction algorithm removes extreme connections remaining the typical ones. Finally, the following network parameters are discussed: node rank entropy, cycle entropy, clustering coefficient and transitivity coefficient. Particularly interesting are changes triggered by the recent events – the significant changes observed in entropy time series indicated structural changes in the network of correlation structure induced by the pandemic.

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Session Classification: S2