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Hierarchical Cont-Bouchaud model

In econophysics, the Cont-Bouchaud model is well-known, simple model which explains fat tails in the distribution of the logarithmic returns by taking into account the phenomenon of herding. In last 15 years, the model has been studied and developed and various extensions have been proposed to improve its compatibility with reality. Our approach focuses on basic component of every agent-based model, topology, which in the Cont-Bouchaud model is too simplified and far from reality. Widely known fact is that many real systems are hierarchical e.g. Internet, the food chain, a polity, the social network, therefore we propose hierarchical topology for stock exchange brokers network in Cont-Bouchaud model. Hierarchy in our model emerges as a result of a multiple merging of clusters in such a way that existing clusters are combined in clusters of higher order. For such a topology we adopted three-state Potts dynamic. In the so-defined model we examine changes in the distribution of the logarithmic returns, depending on the structure of the network and the interaction coefficients between agents at different levels of hierarchy. Moreover we compare the results obtained using our model with the classical Cont-Bouchaud model and answer the question whether or not hierarchical topology improves the consistency of results with reality.