Random matrix approach to shareholding networks

Wataru Souma[†], Yoshi Fujiwara[†], Hideaki Aoyama[‡]

†ATR Human Information Science Laboratories,
Kyoto 619-0288, Japan

‡Graduate School of Science, Kyoto University,
Kyoto 606-8501, Japan

Abstract

Shareholding networks are represented by the real symmetric adjacency matrix. The random matrix theoretical approach to this adjacency matrix shows that the spectrum follows the power law distribution, $\rho(\lambda) \sim |\lambda|^{-\delta}$, in the tail part. This approach also clears the relationship between eigenvectors and corporate complexes. Through empirical studies, it is shown that the degree distribution of shareholding networks follows the power law distribution, $P(k) \sim k^{-\gamma}$, in the large degree range. A strict relation, $\delta = 2\gamma - 1$, is found in shareholding networks, and explained by the local tree-like structure of networks. Based on those findings, we propose new scenario, which produces networks with scale-free structure and tree-like structure.