

Growth Model of Japanese Inter-firm Trading Network with Money Transport

Yuta MURAKAMI^{*1}, Hideki TAKAYASU^{2,3}, and Misako Takayasu^{1,2}

¹Department of Computational Intelligence and Systems Science, Interdisciplinary Graduate School and Engineering, Tokyo Institute of Technology, 4259 Nagatsuta-cho, Midori-ku, Yokohama 226-8502, Japan

²Institute of Innovative Research, Tokyo Institute of Technology, 4259 Nagatsuta-cho, Midori-ku, Yokohama 226-8502, Japan

³Sony Computer Science Laboratories, 3-14-13 Higashi-Gotanda, Shinagawa-ku, Tokyo 141-0022, Japan

E-mail: *murakami.y.ao@m.titech.ac.jp

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In the Japanese inter-firm trading network, the non-linear interaction between transaction amount and the sizes of firms of a buyer and a supplier has been studied [1]. We introduce a simple non-linear transport model which derives sales value of each firm from a given network structure of transaction using such non-linear interaction. However, the structure of a real network is not static, and it changes temporally [2], which affects the money transport on the network.

To solve this problem, we combined the above non-linear interaction model with an extended temporal evolution model of network structure originally proposed by Miura-Takayasu-Takayasu [3], taking into account of new entry, bankruptcy, merger and split of firms. As a result, the combined model successfully describes both the evolution of network and money transport.

In this presentation, we report the simulation results of the combined model and compare the results with the real data analysis.

References

- [1] K. Tamura, W. Miura, M. Takayasu, H. Takayasu, S. Kitajima, and H. Goto, Int. J. Mod. Phys. Conf. Ser, 16, 93-104 (2012).
- [2] H. Goto, H. Takayasu, and M. Takayasu, Proceedings of the International Conference on Social Modeling and Simulation, plus Econophysics Colloquium 2014, Springer Proceedings in Complexity, 195-204 (2015).
- [3] W. Miura, H. Takayasu, and M. Takayasu, Phys. Rev. Lett. 108, 168701 (2012).