A detailed study on the phase diagram of a toy model for macroeconomic systems

Ye SUN[*1], Yu CHEN[2]

[1]GPSS-GLI, The University of Tokyo, 5-1-5, Kashiwanoha, Kashiwa City, Chiba, 277-8563, JAPAN

[2]Department of Human and Engineered Environmental Studies, The University of Tokyo, 5-1-5, Kashiwanoha, Kashiwa City, Chiba, 277-8563, JAPAN

E-mail: * yesun@s.k.u-tokyo.ac.jp

Keyword: make 0, phase transition, control parameter, employment, sustainability

Abstract

Previous research on a simple agent-based economic model “mark 0” [1] revealed four distinctive phases and suggested two control parameters for the phase transition of unemployment dynamics. However, a close examination of the dynamics reveals the 5th phase with features distinctive from the previous four. By mapping the average unemployment rate with time-series fluctuating modes into a color map, we can observe the phase transition and its boundary visually and explicitly. In addition, we can further examine other parameters as potential control parameters. We found, besides the two control parameters proposed in previous study, another two parameters could be equally control parameters at least. Therefore, a detailed phase diagram is proposed for mark 0 under four main parameters scanning with five distinctive phases recognized. With the help of the color map, the sustainability of the economy could be also discussed in terms of trajectory crossing different region as different combination of control parameters.

References

[1] Gualdi, S., Tarzia, M., Zamponi, F., and Bouchaud, J.-P. (2015). Tipping points in macroeconomic agent-based models. Journal of Economic Dynamics and Control, 50:29 – 61.

[2] Crises and Complexity Research Initiative for Systemic Instabilities (CRISIS) Workshop, 2013.