Accepted Manuscript

Modeling GDP fluctuations with agent-based model

Zhuang Chu, Biao Yang, Chang Yong Ha, Kwangwon Ahn

PII: S0378-4371(18)30095-5
DOI: https://doi.org/10.1016/j.physa.2018.02.019
Reference: PHYSA 19139

To appear in: *Physica A*

Received date : 25 August 2017
Revised date : 15 December 2017

Please cite this article as: Z. Chu, B. Yang, C.Y. Ha, K. Ahn, Modeling GDP fluctuations with agent-based model, *Physica A* (2018), https://doi.org/10.1016/j.physa.2018.02.019

Modeling GDP fluctuations with agent-based model

Zhuang Chu[a], Biao Yang[b], Chang Yong Ha[a,*], Kwangwon Ahn[c,**]

[a] *Peking University*
[b] *Bocconi University*
[c] *KAIST*

Abstract

This paper offers a new approach to calibrating parameters of an agent-based model proposed by Ormerod [1] and conducts a comparative analysis of the US and Chinese business cycles for the period 1993-2014 using annual percentage changes in real gross domestic product. Depending on the underlying conditions of the system, the agent-based model is transformed to a damped pendulum, or a forced damped pendulum, through which we get the analytical solutions. These analytical solutions stipulate the speed of recovery from external shocks and the length of a business cycle. After pinning down two parameters in the analytical solutions, we calibrate the model using the Bayesian estimation technique. Our calibration approach captures the fundamental features of the economic fluctuations reasonably well. In particular, we find that the Chinese economy is more volatile and less persistent than the US economy: China has a shorter average duration of business cycles and recovers faster from external shocks; and the two countries move synchronously.

Keywords: GDP fluctuation, Agent-based model, Analytical solution

1. Introduction

Economic fluctuations have long attracted the attention of a large number of economic researchers. The business cycle refers to the downward and upward movement of gross domestic product (GDP) around its long-term growth trend.

*cyha@phbs.pku.edu.cn
**k.ahn@kaist.ac.kr