

Bachelor Thesis

Analysis of an Econophysical Financial Market Model

Course of study: Mathematics and CES
Kind of thesis: Analysis of a Dynamical System
Prior Knowledge: ODE Theory, basic knowledge in MATLAB or C++
Start: October 2015

Problem

One challenging task in economics is to explain the formation of stylized facts in financial data. Stylized facts are universal market properties, which can be observed at stock markets all over the world. One famous example are Pareto tails in income distributions and stock returns. There is evidence that these stylized facts are one reason of market crashes.

Econophysical financial market models try to reproduce financial data which exhibits stylized facts. In this thesis we want to have a closer look at the model by Chiarella et al. [1]. The authors analyze a deterministic dynamical system by computing its steady states. They claim that the appearance of stylized facts can be mathematically explained by an interplay between different equilibria and external noise. They also simulate a stochastic version of their model and observe stylized facts numerically.



Tasks

The steady states of the dynamical system should be analyzed. This is done by a stability analysis and characterization of the different bifurcation types. Finally, the model should be implemented in *MATLAB* and be built in an existing framework.

References

- [1] Chiarella, Carl and Dieci, Roberto and Gardini, Laura,
Speculative behaviour and complex asset price dynamics: a global analysis,
Journal of Economic Behavior & Organization, Vol. 49, No. 2, pp. 173-197, Elsevier, 2002.

Supervision

This project takes place in the research group *Computational Nuclear Engineering* (MathCCES) led by Prof. Dr. Martin Frank at the institute MathCCES. The project will be supervised by

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