

Bachelor Thesis or Project Work

Sensitivity Analysis of an Econophysical Model using Automatic Differentiation

Course of study: Mathematics and CES
Kind of thesis: Modeling and Simulation of a Particle Model
Programming language: 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. To give an answer to this question it is necessary to have a model of financial markets.

One very popular approach is to model a financial market as a random walk model of many interacting agents. The goal of these models is to discover connections between the microscopic behavior of agents and the appearance of stylized facts. We are interested in the influence of several input parameters on the stock price behavior. One possibility to analyze the sensitivity of these parameters, is to use automatic differentiation (AD).



Preliminary Work Several agent-based financial market models are implemented in MATLAB. Furthermore, there exist an AD tool in C++ developed at the institute of Prof. Dr. Naumann.

Tasks

The first task is to translate the existing code into C++ in order to use the AD tool. Finally, one should analyze the sensitivities of the model with respect to several quantities of interest.

Supervision

This project is a cooperation of the *Software and Tools for Computational Engineering* research group led by Prof. Dr. Naumann, and the *Computational Nuclear Engineering (MathCCES)* research group led by Prof. Dr. Martin Frank. The project will be supervised by

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