SOE 22: Economic Models

Time: Thursday 15:00–17:00 Location: MA 001

SOE 22.1 Thu 15:00 MA 001

A Stock-Flow Consistent Input-Output Model with Applications to Energy Price Shocks and Interest Rates — •Oliver Richters[1,2], Matthew Berg[3], and Brian Hartley[4] — [1]Theoretical Physics / Complex Systems, Institute for Chemistry and Biology of the Marine Environment, Carl von Ossietzky University Oldenburg — [2]Sustainable Money Research Group — [3]University of Missouri Kansas City — [4]The New School for Social Research

By synthesizing Stock-Flow Consistent (SFC) models, Input-Output (IO) models, and aspects of Ecological macroeconomics, a method is developed to simultaneously model monetary flows through the financial system, flows of produced goods and services through the real economy, and flows of physical materials through the natural environment. We highlight the linkages between the physical environment and the economic system by emphasizing the role of the energy industry. First, the model is applied to analyze the role of energy price shocks in contributing to recessions, incorporating several propagation and amplification mechanisms. Second, it is demonstrated that contrary to some claims, 0% interest rates are not a necessary condition for a stationary economy in stock-flow equilibrium, although this does not necessarily imply that the economy is also ecologically sustainable. Connections to econophysics are emphasized.

SOE 22.2 Thu 15:15 MA 001

Constrained Dynamic Models (CD-Models) in Economics as a Unification of commonly used Economic Models — •Erhard Glötzl — Karl-Kautsky-Weg 26, A-4040 Linz, Austria

Constrained dynamics are well known from classical Mechanics. Identifying *economical forces* with physical forces, *economical power* with the reziproke value of mass and realizing that economical constraints mostly are given by accounting identities one can transform the concept of constraint dynamics to economic models. It can be shown, that commonly used economic models such as Classic, Neoclassic, GE, DSGE, Keynesian, Post-Keynesian, ABM and SFC models can be interpreted as special cases of CD-Models. CD-Models thereby provide the basis for a wide variety of different closures of economic models, which are ultimately the result of different assumptions about the power relations between economic agents.

SOE 22.3 Thu 15:30 MA 001

Modeling the dynamics wealth inequality and its possible control — •Yonatan Berman, Yoash Shapira, and Eshel Ben-Jacob — Tel-Aviv University, Tel-Aviv, Israel

In the past few decades, wealth inequality is rapidly increasing in western economies, thus imposing social and economic instabilities. One of the major challenges in studying the mechanisms that govern wealth inequality is the need to bridge between the individual and the population levels. In this talk we will present a new modeling approach for the dynamics of wealth inequality using stochastic iterated maps. By incorporating various economic parameters and their historical values, we were able to accurately capture the historical dynamics of wealth inequality in the United States during the 20th century.

We show that the capital income to national income ratio and the personal savings fraction are the most critical factors in determining inequality. The sensitivity of wealth inequality to the economic mobility is found as relatively low at the current mobility state.

Most notably, it is found that the most probable and important contributor to the recent surge in inequality is the major decrease in personal savings since the 1980's. Following these results we use the model to predict a further increase in wealth inequality in the near future. However, given a substantial increase in private savings or a major decrease in capital income to national income ratio, this scenario might be prevented.

SOE 22.4 Thu 15:45 MA 001

The Role of Nonergodicity for Economic Theory — •Mark Kirstein — TU Dresden, Chair of Managerial Economics

The direction of the mathematisation of predominant economics is unthinkable without the tacit underlying assumption of ergodicity. Despite its foundational character, the assumption of (non)ergodicity is virtually unrecognised in the economic discipline, closely intertwined with equilibrium concepts, and absent from the curriculum, as contrasted with such popular assumptions like rational expectations formation, representative agent, efficient markets, perfect competition, etc.

Nonergodicity is fulfilled, if the time average of a system is unequal to its ensemble average. Nonergodicity is a necessary property of a mathematical model, if the model is supposed to describe occurences of endogenous novelties and change. The nonergodic case is the more general, whereas the ergodic case is much easier to handle mathematically. Capitalistic economies are downright defined through their potential of evolution and non-routine change and so are its very centerpiece financial markets. Accepting that proper mathematical models of economic or financial processes should posses the property of nonergodicity, puts emphasis on the crucial role of time through which a certain amount of uncertainty enters into economic reasoning. This contribution seeks to clarify this specific relation between the idea of (non)ergodicity from statistical mechanics and its role in and for economics and finance.

SOE 22.5 Thu 16:00 MA 001

Economic Growth and the Piketty Data — •Juergen Mimkes — Physics Department, Paderborn University

In physical economics the model equations of economic growth lead to exponential functions of income for capital and labor. The growth coefficients depend on the distribution factor (p) of annual profits between capital and labor. A low participation of labor in annual profits leads to an efficient economy, to high growth rates of the DAX (for capital) and low growth rates of the GDP/capita (for labor). This agrees with the data by Piketty. Several ways are diskussed to follow Piketty in equalizing growth rates for capital and labor.

SOE 22.6 Thu 16:15 MA 001

Cycles and phases of prosperity and depression in an agent-based macroeconomic system with financial markets — •Wenzhi Zheng and Yu Chen — Department of Human and Engineered Environmental Studies, the Graduate School of Frontier Science, the University of Tokyo, Kashiwa City, Chiba ken, Japan

The operation of market-based economy today is strongly fueled by the financial system. As in the prosperity, growing demands and enough capacity to produce keep the development of the economy. Meanwhile huge amounts of credit is created and the boom of asset and equity price create even more virtual wealth. This process usually would not last long. After the prosperity, people have to suffer dramatic fluctuations which may hurt the economy for a short period, like several crashes in the U.S.A, or for decades, like which is happening in Japan. However, traditional macroeconomics overlooks the important interactions between the economy and the financial system. In this work, we will introduce an agent-based economy in which the financial system plays a significant role. In the model, while the financial system accelerates the growth of economy, it also induces short-term and long-term cycles. In this perspective, Japan is just in a long-term recession phase in which strong financial stimulus is not the solution to reactivate the economy. At last, we will try to give policy advice for economies falling into different phases for different reasons based on effective control parameter in our model.

SOE 22.7 Thu 16:30 MA 001

Price dynamics: zero-intelligence and strategic traders. — •Wei-Te Yu and Hsuan-Yi Chen — Department of Physics, National Central University, Jhongli 32001, Taiwan

Understanding price dynamics is one of the important things in studying financial markets. We propose an agent-based model with an order book to study how the price changes evolve. In our model, the agents have infinite money to put buying orders. Shares held by the agents are put on the selling order according to specific strategies which depends on price history. First, agent with zero intelligence, i.e., buying and selling orders are put randomly, are used in the simulations. Then the results of zero-intelligence-agent simulations are compared to markets with technical trading strategies. This allows us to distinguish features of price dynamics that could be attributed to the price-history-dependent trading strategies.

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