Book Review:

The Economy as an Evolving Complex System, III
Current Perspectives and Future Directions
Edited by Lawrence E. Blume and Steven N. Durlauf

When in 1988 the first volume of *The Economy as an Evolving Complex System* appeared, it marked one of the most pronounced steps towards true transdisciplinary research to be institutionalized at the Santa Fe Institute. Two particularly contrasting contributions summarized the perspectives of this book; one written by P. W. Anderson, the other one written by Kenneth J. Arrow. While the former articulated the almost revolutionary aspects of scientific confluence – fashionably dubbed *science of complexity* – the latter took the pain to expound the continuity of economic theory building implicit in these latest developments.

The recently published third volume *The Economy as an Evolving System, III* is explicitly devoted to Kenneth Arrow, the 'intellectual leader of the SFI Economics program ever since its inception', as the editors write. The fame of the Santa Fe Institute as a role model for successful and innovative research organization has spread all over the world in these last twenty years, there is no doubt that the scholars, which passed some time at the SFI had a deep impact on their disciplines. But reading the introductory chapter of Blume and Durlauf one could get the impression that the original excitement, the innovative upsurge of the work done by this research community has been lost on the way. The editors' judgement that 'The models presented here do not represent any sort of rejection of neoclassical economics.', and that the latter was 'able to absorb SFI-type advances without changing its fundamental nature' are fortunately enough proven wrong by the papers collected in this volume. Though it has to be admitted that it needs careful reading to discover the many subtle subversions – perhaps this is a strategy to pay homage to Kenneth Arrow.

There are thirteen papers in the book, many of them trying to combine a new theoretical model with a part on empirical research giving some plausibility to the assumptions. As remarked above there are many ingredients of these models which run counter the usual assumptions of mainstream neoclassical theory – and which are extremely interesting:

In Christopher Caroll's article on macroeconomic expectation formation the communication process between agents is made explicit (an infection process);

In Charles Manski's paper subsequent cohorts of decision makers learn from past experiences in a quite general – though fully specified – information environment;

Lawrence Blume and David Easley discard the simple rational expectations framework but retain the assumption that agents are subjective utility maximizeres;

Eugene Stanley et al. give a compact introduction to two important concepts of econophysics that can enrich economic analysis: scaling and universality;

In all four papers standard assumptions of mainstream models are replaced by interesting, and more adequate formulations – so they are really worth reading. The empirical or sometimes computational part of each of these papers is a bit less convincing. Finding laws in economics is not the same thing as discovering eternal laws in physics. So one might doubt that an asset market is a natural system, which is governed by universal laws; laws to be discovered as soon as enough data becomes available (Stanley et al.). It is not necessary to focus empirical research on financial markets due to the availability of large datasets. The really important theoretical innovations come from the new model features; to mimic scientific procedures of a laboratory experiment in the natural sciences is at best misleading.

The next paper by Doyne Farmer et al. carries the just mentioned dualism - considering a 'natural' financial market and at the same time providing an innovative new behavioural model – one step further. Here the proposed model indeed is judged by its predictive power with respect to actual markets. Thus market mechanisms, i.e. some of the most intriguing questions of economics, are taken as exogenously given – what is studied are behavioural rules of agents in this given environment. The emerging model therefore is particularly apt to discuss this environment, providing ample technical detail (e.g. on an order-density master equation) that indeed could even inform technically inclined traders on these markets. Nevertheless the contribution to economic theory proper is less visible. To reduce the number of variables of an economic problem by the use of dimensional analysis is an interesting methodological proposal, but does this mean that economics falls apart into empirically determined disparate sets of essential variables and models? In other words, is there anything more general to be learned from the specified financial market behaviour?

Next, In 'Multinomial Choice and Social Interaction' Brock and Durlauf take the pain to carry the implications of their broad approach to the topic to the concise difficulties of econometric application. Steven Morris and Hyun Song Shin provide an analogue approach, interaction games, that enrich standard game theory. Both articles are tremendously rich in detail leading the reader to the research frontiers of the respective field. The paper of Conley and Tropa, later in the book, adds detail to econometric practice and calibration techniques by carrying out a simulation study on unemployment distribution in the L.A. area.

The real highlights of the volume are the four contributions of some rather well-known mavericks in this area. *Larry Samuelson* takes up a theme from James Duesenberry's relative consumption hypothesis and thus grafts a Keynesian topic on intricacies, on the complexity of the decisions of single households. His chapter is short but extremely useful. *Peyton Young* introduces network analysis to discuss geographically bound innovation activities. The adoption of innovations across the network is governed by countervailing forces; interesting dynamics – demanding a lot of specification – are given as an example. Again this is a rather short piece, clearly documenting work in progress, but highly original and informative. *Joel Mokyr* provides the one paper that really explains the complexity approach to economic theory in the larger context of the evolution of 'useful knowledge' – a term coined by Ken Arrow. This helps to understand many of the singular issues of other contributions in this

volume, and to identify them as pieces of the mosaic of evolutionary economics. Finally **Sam Bowles and Herbert Gintis** add a new and extremely refreshing perspective by introducing models of emotions to complex decision analysis. Though their reference to empirical importance due to results in experimental economics is somewhat overstating the relevance of the latter, their idea to explain the emergence of emotions as long-run evolutionary phenomenon is not. In several respects this last paper is the most explorative and innovative contribution.

Taking stock, it can be summarized that this book is highly readable and important. It advances from papers in financial economics with only subtle methodological subversion towards highly original and surprising articles later in the book. And: it's fun to read high quality papers.

Hardy Hanappi