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The Complex Networks of Economic Interactions

Essays in Agent-Based Economics and Econophysics

Springer

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Preface

Understanding the mechanism of a socio-economic system requires more than an understanding of the individuals that comprise the system. It also requires understanding how individuals interact with each other, and how the aggregated outcome can be more than the sum of individual behaviors. This book contains the papers fostering the formation of an active multi-disciplinary community on socio-economic systems with the exciting new fields of agent-based modeling and econophysics.

We especially intend to increase the awareness of researchers in many fields with sharing the common view many economic and social activities as collectives of a large-scale heterogeneous and interacting agents.

Economists seek to understand not only how individuals behave but also how the interaction of many individuals leads to complex outcomes. Agent-based modeling is a method for studying socio-economic systems exhibiting the following two properties: (1) the system is composed of interacting agents, and (2) the system exhibits emergent properties, that is, properties arising from the interactions of the agents that cannot be deduced simply by aggregating the properties of the system's components. When the interaction of the agents is contingent on past experience, and especially when the agents continually adapt to that experience, mathematical analysis is typically very limited in its ability to derive the outcome.

Many physicists have contributed to a better understanding of large-scale properties of socio-economic systems, and they open the new research field, "econophysics". An international scientific development has started to gain new insight into the dynamics of socio-economic systems by using methods originally developed in statistical physics and complex theory. This book also covers the current achievements in this rapidly changing field.

This book contains selected papers presented at the 9-th International Workshop on Heterogeneous Interacting Agents (WEHIA), which was held at Kyoto University, Japan, from May 27 to 29, 2004. From the broad spectrum of activities, leading experts presented important papers and numerous practical

problems appear throughout this book. We also encouraged papers dealing with applications of agent-based modeling.

WEHIA was initiated as a result of the growing recognition of the importance of agent-based modeling to study large-scale socio-economic systems at University of Ancona, Italy in 1996. The annual series of WEHIA serve for sharing the most recent theoretical applications and methodological advances on agent-based approaches throughout economists, physicists, computer scientists, and other scientists in professionals. The main goals of WEHIA have been to promote interactions and cross-fertilization among different approaches to understanding complex and emergent behaviors and to mange large-scale socio-economic systems.

WEHIA confers especially to encourage papers at the cutting-edge of other approaches that are relevant socio-economic systems. By bringing together three different emerging fields, economics, echonophysics and computer science under the same umbrella, WEHIA stresses the expanding importance of importance close communication and cooperation of the three areas for the future scientific and technological development. The genuinely interdisciplinary approach will enable researchers and students to expand their socio-economic knowledge and to draw up concepts for future interdisciplinary academic achievement.

Based on the success of WEHIA for many years, the new association, "The society for Economic Science with Heterogeneous Interacting Agents" (ESHIA) (www.es-hia.org) will be launched in 2006. The official society journal, "Journal of Economic Interaction and Coordination" (JEIC) will be published from Springer in 2006. The new society, ESHIA especially features in-depth coverage of important areas and aims to contribute scientific ally in three directions: (1) To examine theoretical and methodological issues of agent-based modeling. (2) To discuss multi-agents based simulations and demonstrate applicability in order to study complex economic behaviors. (3) To contribute to develop methodological tools of agent-based modeling and apply them to complex economic and social problems.

We could solicit many high quality papers that reflect the result of the growing recognition of the importance of the areas. All papers have received a careful and supportive review, and we selected 22 papers out of 94. The contributions were submitted as a full paper and reviewed by senior researchers from the program committee. All authors revised their earlier versions presented at the workshop with reflecting criticisms and comments received at the workshop. The editors would like to thank the program committee for the careful review of the papers and the sponsors and volunteers for their valuable contribution. We hope that as a result of reading the book you will share with us the intellectual excitement and interest in this emerging discipline.

We are grateful to the many people who have made this symposium possible. First and foremost, we thank the authors for providing manuscripts on time and in a standard format. We also thank the many referees who gen-

erously contributed time and Dr. Hiroshi Sato to ensure the quality of the finished product.

Finally, we would like to acknowledge the support and encouragement of many peoples in helping us getting this book to be published. Especially the publication of this book and the 9th WEHIA are financially supported by the grant from the Commerative Organization for the Japan World Exposition ('70), Hayasibara Foundation, Kozo Keikaku Engineering Inc. We would like also thank for the grant-in-aid for Scientific Research (C) No.15201038, Japan Society for the promotion of Science (JSPS).

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