

Econophysics And Sociophysics

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Econophysics and Sociophysics: Recent Progress and Future Directions
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Bikas K. Chakrabarti
Frédéric Abergel
Gheorghe Savoiu
Frédéric Abergel
Gheorghe SȚivoiu
Kishore Chandra Dash
Dariusz Grech
Arnab Chatterjee
Sitabhra Sinha
Hideaki Aoyama
Frantisek Slanina
Frédéric Abergel
J. Barkley Rosser, Jr.
Bikas K. Chakrabarti
Amit Sinha
Fr D Ric Abergel
Peter Richmond
Ji-Ping Huang
Carlo Requião da Cunha

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using tricks to handle coupled nonlinear dynamical many body systems several advancements have already been made in understanding the behavior of markets economic social systems and their dynamics the book intends to provide the reader with updated reviews on such major developments in both econophysics and sociophysics by leading experts in the respective fields this is the first book providing a panoramic view of these developments in the last decade

this book presents the proceedings from econophys 2015 an international workshop held in new delhi india on the interrelated fields of econophysics and sociophysics which have emerged from the application of statistical physics to economics and sociology leading researchers from varied communities including economists sociologists financial analysts mathematicians physicists statisticians and others report on their recent work discuss topical issues and review the relevant contemporary literature a society can be described as a group of people who inhabit the same geographical or social territory and are mutually involved through their shared participation in different aspects of life it is possible to

observe and characterize average behaviors of members of a society an example being voting behavior moreover the dynamic nature of interaction within any economic sector comprising numerous cooperatively interacting agents has many features in common with the interacting systems of statistical physics it is on these bases that interest has grown in the application within sociology and economics of the tools of statistical mechanics this book will be of value for all with an interest in this flourishing field

the remarkable evolution of econophysics research has brought the deep synthesis of ideas derived from economics and physics to subjects as diverse as education banking finance and the administration of large institutions the original papers in this collection present a broad summary of these advances written by interdisciplinary specialists included are studies on subjects in the development of econophysics on the perspectives offered by econophysics on large problems in economics and finance including the 2008-9 financial crisis and on higher education and group decision making the introductions and insights they provide will benefit everyone interested in applications of this new transdisciplinary science ten papers present an updated version of the origins issues and applications of econophysics economics and finance chapters consider lessons learned from the 2008-9 financial crisis sociophysics chapters propose new thinking on educational reforms and group decision making

this book presents the latest perspectives and challenges within the interrelated fields of econophysics and sociophysics which have emerged from the application of statistical physics to economics and sociology economic and financial markets appear to be in a permanent state of flux billions of agents interact with each other giving rise to complex dynamics of economic quantities at the micro and macro levels with the availability of huge data sets researchers can address questions at a much more granular level than was previously possible fundamental questions regarding the aggregation of actions and information and the coordination complexity and evolution of economic and financial networks are currently receiving much attention in the econophysics research agenda in parallel the sociophysics literature has focused on large scale social data and their interrelations in this book leading researchers from different communities economists sociologists financial analysts mathematicians physicists statisticians and others report on their recent work and their analyses of economic and social behavior

this book will appeal to the lay reader with an interest in the history of what is today termed econophysics looking at various works throughout the ages that have led to the emergence of this field it begins with a discussion of the philosophers and scientists who have contributed to this discipline before moving on to considering the contributions of different institutions books journals and conferences in nurturing the subject

this book presents the proceedings of the 54th winter school of theoretical physics on simplicity of complexity in economic and social systems held in Łódź, Poland from 18 to 24 February 2018 the purpose of the book is to introduce the new interdisciplinary research that links statistical physics and particular attention is given to link physics of complex systems with financial analysis and sociology the main tools used in these areas are numerical simulation of agents behavior and the interpretation of results with the help of complexity methods therefore a background in statistical physics and in physics of phase transition is necessary to take the first steps towards these research fields called econophysics and sociophysics in this perspective the book is intended to graduated students and young researchers who want to begin the study of this established new area which connects physicists economists sociologists and it

professionals to better understand complexity phenomena existing not only in physics but also in complex systems being seemingly far from traditional view at physics

econophysics research studies which apply methods developed by physicists to solve problems in economics enable you to deepen your understanding of what financial systems are and how they operate articles in this book identify and explain the statistical behavior of the underlying networks in trading banking and stock markets as well as other financial systems authors also debate the latest issues arising from these econophysics studies

filling the gap for an up to date textbook in this relatively new interdisciplinary research field this volume provides readers with a thorough and comprehensive introduction based on extensive teaching experience it includes numerous worked examples and highlights in special biographical boxes some of the most outstanding personalities and their contributions to both physics and economics the whole is rounded off by several appendices containing important background material

this book explains the role of big data and statistical physics in understanding macroeconomic concepts

this book is a course in methods and models rooted in physics and used in modelling economic and social phenomena it covers the discipline of econophysics which creates an interface between physics and economics besides the main theme it touches on the theory of complex networks and simulations of social phenomena in general after a brief historical introduction the book starts with a list of basic empirical data and proceeds to thorough investigation of mathematical and computer models many of the models are based on hypotheses of the behaviour of simplified agents these comprise strategic thinking imitation herding and the gem of econophysics the so called minority game at the same time many other models view the economic processes as interactions of inanimate particles here the methods of physics are especially useful examples of systems modelled in such a way include books of stock market orders and redistribution of wealth among individuals network effects are investigated in the interaction of economic agents the book also describes how to model phenomena like cooperation and emergence of consensus the book will be of benefit to graduate students and researchers in both physics and economics

the primary goal of this book is to present the research findings and conclusions of physicists economists mathematicians and financial engineers working in the field of econophysics who have undertaken agent based modelling comparison with empirical studies and related investigations most standard economic models assume the existence of the representative agent who is perfectly rational and applies the utility maximization principle when taking action one reason for this is the desire to keep models mathematically tractable no tools are available to economists for solving non linear models of heterogeneous adaptive agents without explicit optimization in contrast multi agent models which originated from statistical physics considerations allow us to go beyond the prototype theories of traditional economics involving the representative agent this book is based on the econophys kolkata vii workshop at which many such modelling efforts were presented in the book leading researchers in their fields report on their latest work consider recent developments and review the contemporary literature

this book presents a survey of the aspects of economic complexity with a focus on foundational interdisciplinary ideas the long awaited follow up to his 2011 volume complex evolutionary dynamics in urban regional and ecologic economic systems from catastrophe to chaos and beyond this volume draws together the threads of rosser s earlier work on complexity theory and its wide applications in economics and an expanded list of related disciplines the book begins with a full account of the broader categories of complexity in economics dynamic computational hierarchical and structural before shifting to more detailed analysis the next two chapters address problems associated with computational complexity especially those of computability and discuss the godel incompleteness theorem with a focus on reflexivity the middle chapters discuss the relationship between entropy econophysics evolution and economic complexity respectively with applications in urban and regional dynamics ecological economics general equilibrium theory as well as financial market dynamics the final chapter works to bring together these themes into a broader framework and expose some of the limits concerning analysis of deeper foundational issues with applications in all disciplines characterized by interconnected nonlinear adaptive systems this book is appropriate for graduate students professors and practitioners in economics and related disciplines such as regional science mathematics physics biology environmental sciences philosophy and psychology

the distribution of wealth and income is never uniform and philosophers and economists have tried for years to understand the reasons and formulate remedies for such inequalities this book introduces the elegant and intriguing kinetic exchange models that physicists have developed to tackle these issues this is the first monograph in econophysics focussed on the analyses and modelling of these distributions and is ideal for physicists and economists it is written in simple lucid language with plenty of illustrations and in depth analyses making it suitable for researchers new to this field as well as specialized readers it explores the origin of economic inequality and examines the scientific steps that can be taken to reduce this inequality in the future

economics requires understanding and analyzing forces that bring buyers and sellers to a market place who then negotiate exchanges of goods and services based on a mutually agreeable price economists have their own method of modeling whereby models are first conceived of some notion of economic and financial thinking before being empirically tested and anomalies are then recognized if the observed data is inconsistent with the hypothetical underpinning this is in inherent contradiction with the modeling approaches of physicists who develop their theories principle and laws after observing empirical data the awareness that physics can enlighten the understanding of human behavior and thus economics and the interest of physicists in applying their training and models to understanding the complexities of finance and economics led to the creation of a new field of study appropriately termed as econophysics selected topics on econophysics is a collection of essays on topics that enhance and enrich our understanding of economic modeling when the same rigor of modelling used by physicists is brought to developing financial and economic theories these articles include discussions on modeling bitcoins stock index modeling using geometric brownian motion agent based modeling wealth distribution modeling as well as modeling related to fractal regression and chaotic processes this interdisciplinary book will interest researchers graduate students and professionals in the fields of economics finance as well as physics

an understanding of the behaviour of financial assets and the evolution of economies has never been as important as today this book looks at these complex systems from the perspective of the physicist so called econophysics and its application to finance has made great strides in recent years less emphasis has been placed on the broader subject of macroeconomics and many economics students are still taught traditional neo classical economics the reader is given a

general primer in statistical physics probability theory and use of correlation functions much of the mathematics that is developed is frequently no longer included in undergraduate physics courses the statistical physics of boltzmann and gibbs is one of the oldest disciplines within physics and it can be argued that it was first applied to ensembles of molecules as opposed to being applied to social agents only by way of historical accident the authors argue by analogy that the theory can be applied directly to economic systems comprising assemblies of interacting agents the necessary tools and mathematics are developed in a clear and concise manner the body of work now termed econophysics is then developed the authors show where traditional methods break down and show how the probability distributions and correlation functions can be properly understood using high frequency data recent work by the physics community on risk and market crashes are discussed together with new work on betting markets as well as studies of speculative peaks that occur in housing markets the second half of the book continues the empirical approach showing how by analogy with thermodynamics a self consistent attack can be made on macroeconomics this leads naturally to economic production functions being equated to entropy functions a new concept for economists issues relating to non equilibrium naturally arise during the development and application of this approach to economics these are discussed in the context of superstatistics and adiabatic processes as a result it does seem ultimately possible to reconcile the approach with non equilibrium systems and the ideas are applied to study income and wealth distributions which with their power law distribution functions have puzzled many researchers ever since pareto discovered them over 100 years ago this book takes a pedagogical approach to these topics and is aimed at final year undergraduate and beginning graduate or post graduate students in physics economics and business however the experienced researcher and quant should also find much of interest

experimental econophysics describes the method of controlled human experiments which is developed by physicists to study some problems in economics or finance namely stylized facts fluctuation phenomena herd behavior contrarian behavior hedge behavior cooperation business cycles partial information risk management and stock prediction experimental econophysics together with empirical econophysics are two branches of the field of econophysics the latter one has been extensively discussed in the existing books while the former one has been seldom touched in this book the author will focus on the branch of experimental econophysics empirical econophysics is based on the analysis of data in real markets by using some statistical tools borrowed from traditional statistical physics differently inspired by the role of controlled experiments and system modelling for computer simulations and or analytical theory in developing modern physics experimental econophysics specially relies on controlled human experiments in the laboratory producing data for analysis together with agent based modelling for computer simulations and or analytical theory with an aim at revealing the general cause effect relationship between specific parameters and emergent properties of real economic financial markets this book covers the basic concepts experimental methods modelling approaches and latest progress in the field of experimental econophysics

econophysics explores the parallels between physics and economics and is an exciting topic that is attracting increasing attention however there is a lack of literature that explains the topic from a broad perspective this book introduces advanced undergraduates and graduate students in physics and engineering to the topic from this outlook and is accompanied by rigorous mathematics which ensures that this will also be a good guide for established researchers in the field as well as researchers from other fields such as mathematics and statistics who are interested in the topic key features presents a multidisciplinary approach that will be of interest to students and researchers from physics engineering mathematics statistics and other physical sciences accompanied by python code with further learning opportunities available for readers to download from the crc press website accessible to both students and researchers carlo r da cunha

is an associate professor of physics and engineering physics at the universidade federal do rio grande do sul brazil and has been since 2011 dr da cunha received his m sc degree from the west virginia university in 2001 and his ph d degree from arizona state university in 2005 he was a postdoctoral researcher at mcgill university in canada in 2006 and an assistant professor of engineering at the university federal de santa catarina between 2007 and 2011 he has been a guest professor at the technische universität wien austria chiba university japan and arizona state university us his research revolves around the physics of complex systems where he has been drawing parallels between physical and economic systems from quantum to social levels to access additional resources such as python code please take a look here

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