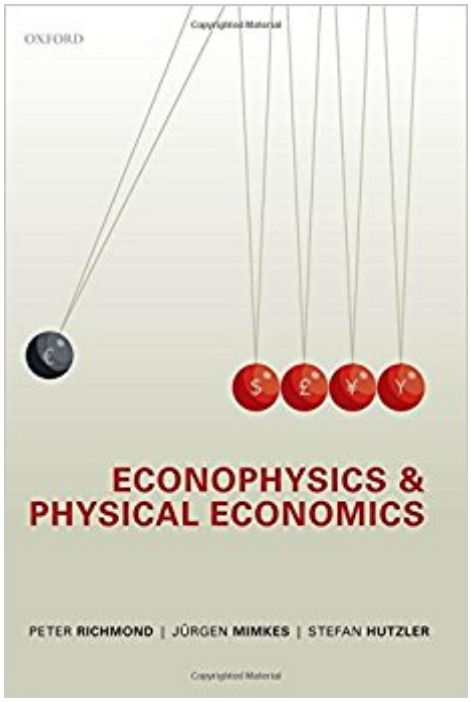
Econophysics And Physical Economics



Synopsis

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 gradaute or post-graduate students in physics, economics, and business. However, the experienced researcher and quant should also find much of interest.

Book Information

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Customer Reviews

"We argue that similarlaws apply to assemblies of interacting economic agents for which repeatable experiments are also not always possible. The theory leads naturally to an understanding of a range of financial and economic phenomena. One central issue, namely that of non-equilibrium, is also discussed by drawing on recent ideas developed to explore the phenomenon in physical systems, which leads to new insights into the distribution functions of the interacting agents. It is our view that this approach, which combines both theory and empiricism, offers scope for further development and application." -- MathSciNet"The authors present a novel approach to modern economic theory informed by empirical observations and ideas from physics, and in particular complex systems. Comprehensive in scope, and written in an engaging style, the text will be essential reading for students and researchers in the field." - Geoff J. Rodgers, Brunel University "Adapting physics to understand economical problems may help us to develop new financial models. Science can help to change the world, not merely interpret it." - Ian Gibson, MP Norwich North, 1997-2009, Chair of House of Commons Science and Technology Committee 2001-2005, School of Biological Sciences, University of East Anglia 1965 - 1997 "This book is the result of a unique joint effort by three very complementary authors. The result of their cooperation is a down to earth and practical text which, at the same time, offers a mathematically sound exposition of how ideas based in physics help our understanding of finance and economic dynamics. It is a significant contribution to the task of introducing new scientific methods, concepts and ideas to the study of economies." - Sorin Solomon, Racah Institute of Physics, Hebrew University of Jerusalem "This book discusses intriguing analogies between physical and economical phenomena. In fact, methodologies borrowed from physics were crucial for the development of economical models in the past, e.g. non-equilibrium statistical physics opened the gate for the financial derivative pricing. The book may

catalyze a broader discussion among economists and physicists about roots of the current economical crisis and ways the global economy should be stabilized." - Janusz Ho?yst, Warsaw University of Technology, Poland

Peter Richmond, Professor of Physics, Department of Physics, Trinity College Dublin,Jurgen Mimkes, Professor of Physics, Paderborn University,Stefan Hutzler, Associate Professor of Physics, Department of Physics, Trinity College DublinPeter Richmond studied physics at Queen Mary College, University of London. His career included periods in academia including the Institute of Advanced Studies, ANU Canberra, and the Physics Laboratories, University of Kent. Most recently, in particular during the period spanning the volatile financial era from 1997-2007 and the great housing crash, he was with the School of Physics, Trinity College Dublin. During this period he introduced new research activity concerned with econophysics and gave a course on the subject to final year undergraduates. From 2003-2012 he was chair of two major concerted actions spanning 26 countries across Europe and sponsored by COST; 'Physics of Risk' (2003-2007) and 'Physics of Cooperation and Conflict' (2008-2012). He holds a DSc from the University of London and is a Fellow of the UK Institute of Physics. His publications cover aspects of condensed matter physics, colloids, econophysics, and sociophysics.Jurgen Mimkes studied physics at Georgia Augusta University, Gottingen and the Free University Berlin from 1959 to 1967. After a postdoctoral position at the University of Missouri, Rolla, USA he was Assistant Professor in solid-state thermodynamics at the Technical Universities in both Berlin and Clausthal. From 1977 to retirement in 2004, he was Professor of Physics at the University of Paderborn. He has held visiting appointments in College Park, Maryland, and Chuo University, Tokyo.Stefan Hutzler studied physics at the Universitat Regensburg, Germany, and the University of Reading, UK. In 1997 he obtained his PhD from Trinity College Dublin, Ireland, where he is now Associate Professor in the School of Physics. He is also a Fellow of the College. His research interests are the physics of foams, packing problems, and complex systems. He has co-authored over 100 publications in these areas, including 'The Physics of Foams' (together with Prof. Denis Weaire), published by Oxford University Press in 1999.

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