Editorial

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While economics is a study of social system, physics is a science devoted to unraveling the mysteries of Nature. Econophysics, as the name suggests, is a new science which attempts a marriage of these apparently odd partners. Granted that among the social sciences, economics is definitely the closest relative of natural sciences. Volumes of advanced mathematical literature that dominates the academic world of economics resemble to the fact that sophisticated quantitative techniques form the foundation of most academic work in economics. Nevertheless, until recently, the body of economic literature, in spite of being highly mathematical in its orientation, did not develop its major analytical tools à la physics. Several aspects of the economic and financial markets did attract the physicists, the mood swings of the stock market for example, where physicists have often tried to practice the science of probability, hoping to make some money in the game. Isaac Newton was known to have speculated heavily in stocks and lost 20,000 pounds (several millions of pounds in today's equivalence) in that process! The physicists, however, did not present a parallel perspective of this social science, at least not until recently when Eminent physicists like Eugene H. Stanley, Bikas K. Chakrabarti, J. Doyne Farmer, Jean-Philippe Bouchaud and many others having joined the fray to create this new field which has now started to gain academic respect. In fact, it was Eugene Stanley, the ace physicist, who coined the word 'Econophysics' to describe this new science, at a conference in, guess what, Kolkata, India!

Did the economists miss a bus being too preoccupied with economic theory sans the data? Imposing the assumption of the Gaussian character of a stochastic process caused the models to move away from the actual price movements with large fluctuations. The concept of power law and fat-tailed distributions, quite common weapons in a physicist's armory, attracted the attention of economists *after* a band of physicists have used these concepts successfully in analyzing market behaviour. The Nobel Memorial Prize in Economics awarded to Myron S. Scholes and Robert C. Merton for their famous Black-Scholes formula of derivative pricing, a formula that was based on the assumption that stock prices follow Geometric Brownian Motion, was perhaps the pinnacle of recognition of the contribution of physics to study economic systems.

One, however, should not be prompted to the conclusion that the advent of physics in economists' world has addressed only a narrow field, namely financial markets. The application has pervaded other boundaries too, such as firm growth and city size distribution. In an economy all the firms interact with one another, the interactions changing as a function of time. This behaviour has motivated physicists to treat this as a critical phenomenon and try to predict universality in company growth. Closely related is the macroeconomic problem of income and wealth distribution. Since the phenomenal work of Pareto, power-law distribution of wealth is a well-established fact. Quite a number of empirical studies are being done and already the results are very encouraging. Statistical physicists are taking more and more interest in this subject. Another area of development has been the study of Complex Networks of economy systems. Economy is a many-body system including agents as individuals, firms, countries, goods as produce, production and service, and subsystems as financial system, manufacturing, agriculture, service industry. And all of them interact with each other. A general way developed recently to describe such system is Complex Networks.

Who better than Eugene Stanley to give an overview of this exciting new domain of research! That is why we have begun this issue with an interview of Stanley where he has dwelled on several issues and perspectives on econophysics including his personal journey to the same. He has highlighted the significant contribution of econophysics in broadening our understanding socio-economic problems at hand. More importantly, the possibility of econophysics to unravel certain facts, facts which are extremely useful to macro business decision-making, hitherto unearthed by conventional methods. Next, we have presented in our 'Notes' section a detailed outline of a university course on econophysics run at Nanyang Technological University, Singapore by Siew Ann Cheong. This outline also provides the readers a cohesive understanding of the epistemological and pedagogical dimension of econophysics.

In our 'Perspectives' section, three articles present a more specific idea about the length and breadth of econophysics. Marcel Ausloos, in his brilliant overview on this domain, gives an exhaustive account on various applications and developments highlighting the achievements so far as also indicating the road ahead. He has particularly focused on the econophysics problems which have been studied rather successfully. The article illustrates how issues like financial crashes, portfolio risk management and asset evolution can be tackled by methods evolving from econophysics. He captures the methodological success of econphysics in macroeconomic areas as well. John Angle in his article has dealt with the Inequality Process, a stochastic particle system model of personal income and wealth statistics. His article very successfully illustrates how the dynamics of physical processes can provide the basic insights on social process like the economy. As mentioned, Kolkata, India, occupies a crucial role in the history of this new science which has amongst its pioneers an Indian face, too. Bikas Chakrabarti of Saha Institute of Nuclear Physics, an eminent condensed matter physicist in his own right, is, along with Stanley, one of the foremost contributors to this field. We thus end the 'Perspectives' section with Asim Ghosh's article on the growth and development of econophysics in India.

In our 'Research' section, we have endeavoured to provide readers with glimpses into the state-of-the-art research in this domain. That study of chaos is a major area of theoretical physics which is common knowledge these days. What is interesting and perhaps less known is that nowadays, studies of chaos, self-organized criticality, cellular automata and neural networks are seriously taken into account as economic and financial tools. Ralph Abraham and Michael Nivala's article is an introductory article which treats global economic systems as complex dynamical systems and discusses the role of chaotic synchronization in that context. Taisei Kaizoji analysed return and trading volume in the Tokyo Stock Exchange data spanning over decades. The existence of power law in the data was justified using a model of agent interaction. The article by Ayan Bhattacharya and Rudra Sensarma is an exhaustive empirical investigation of chaos in Indian financial markets.

Human history suggests that evolution of knowledge is not a linear process; that organized scholars often discarded suggestions from ones without similar background that turned out to be too valuable; that infinite human potential can be tapped only when we can look beyond our comfort zones. While we would like to leave it to the readers to judge the impact and possibilities of this new discipline, we can safely say that contributions of this science deserve special attention from practitioners and academicians engaged in fields of business and economics.

Last but not least, we sincerely acknowledge Bikas Chakrabarti who advised us generously for this special issue. Without his support this issue would simply not exist!

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