Guest Editorial Preface

Special Issue on Econophysics and Finance

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Comprehending the behavior of assets along with the need to study the growth and progress of economies is becoming all the more significant. EconoPhysics is an independent area of knowledge, stemming from the combination of physics and economics, whose impressive evolution in research led to a profound synthesis of novel ideas, deriving from these disciplines.

Despite the fact that this field is in its early stages, a continuously increasing number of papers in the area have been published over the past decade, with extraordinary results in finance applications. EconoPhysics presents itself as a new model and type of discipline, which takes advantage of concepts coming from condensed matter to statistical physics, examining financial aspects. Its basic goal is to establish a theory, which can describe and interpret a system's behavior close to a specific point in time – usually mentioned as the critical point – without relying on the system's specific features.

Inside this issue one can find five interesting papers. The first article is devoted to applying Stokes integrals to double entry accounting. The resulting laws replace neoclassical theory and correspond to the first and second law of thermodynamics. Moreover, it was revealed that Economics and Physics have the same structure.

The second article uses a novel mapping of time evolution of the values of shares quoted on the Nikkei Index, onto Ising spins. The method is applied to historical end-of-day data from the Japanese financial market. By studying the time dependence of the spins, clear evidence is found of a double-power law decay of the proportion of shares that remain either above or below `starting' values chosen at random.

The third article is stressing the necessity of applying physical models, in the case of chaos theory. A macroeconomic model proposed by Vosvrda, is presented combining the savings of households, Gross Domestic Product and the foreign capital inflow. The relevant results evaluation showed that the system is a chaotic one. Finally, this chaotic behavior has provided with the capability to expand the time horizon of solution, thus achieving reliable forecasting for the system.

The fourth article discusses the investigation of the dynamics of two oligopoly games. The first is considered a nonlinear Cournot-type duopoly game with homogeneous goods, same rational expectations, linear demand and a quadratic cost function. The second game extends the Cournot – Bertrand duopoly game with differentiated goods, linear demand and quadratic cost functions. It was found that the model gives more complex chaotic and unpredictable trajectories because of changes in the parameter d of the product's differentiation.

Finally, the last article emphasizes the fact that on one hand many EconoPhysics applications have modeled financial systems, as if they were pure physical systems devoid of human limitations and errors, while on the other hand, traditional financial theory has ignored limits that physics would impose on human interactions, communications, and computational abilities. The entropic yield curve as developed in (Parker 2017) blends the physical and human financial worlds in a new, powerful, and surprisingly simple way. It is concluded that this theoretic perspective provides a new explanation of the dynamics and timing of financial cycles while the entropic yield curve offers a new method of forecasting market peaks and troughs.

The overall goal of EconoPhysics is to highlight the newest developments in the field of risk prediction and management, by utilizing physical models, thus prompting for a collaboration between physicists, engineers and economists.

Given the economic circumstances, complexity of financial markets, their strong effect on the real economy as well as the rapid evolution of Information technology and the Physics theories, it is expected that EconoPhysics will continue to grow and increase in influence in the future; for this to happen, economists will need to become aware and accept physics-related ideas and theories, while physicists will learn more of any advancements achieved by economists. The Economists will provide the economic theories and the Physicists the computational tools.

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