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SPECIAL ISSUE ON NONLINEAR FINANCIAL ANALYSIS: EDITORIAL INTRODUCTION

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The way that the consequences of the financial crisis of 2007-2009 have been propagated within the global economic system was a real shock for the mainstream economic theory advocating the efficiency of financial markets. The reactions of economic agents around the world and the pronounced character of the financial instability that moved very fast and deeply into the real economy have revealed that stock markets are not only subject to external fluctuations but behave like complex systems as documented in Kyrtsou and Terraza (2002, 2003, 2010), and Kyrtsou et al. (2004, 2009), Kyrtsou and Vorlow (2005, 2009) among others. As such, fluctuations invade the market even in the absence of external shocks. This complexity and its subsequent effect the non-linearity can lead to loss of information decreasing efficiency and affecting systematic risk estimations. Through the chain of tranching and distributing the risk, fundamental values and risk profiles of underlying assets became impossible to reconstruct, even for the most informed investors. There may be a deep paradox. In principle, financial innovation is meant to increase efficiency. But, in real financial markets, efficiency depends on the availability of information. And the nature of innovation that occurred has been able to destroy information.

This special issue is devoted to the analysis of complex structures in real markets and the detection of non-linear dynamics.

As Kyrtsou and Terraza (2002, 2010) have shown the dynamics of economic and financial systems embodies a profound complexity. Their instability, the non-linearity, creates the effects of feedback. Non-linearity is directly linked to the positive feedback that dominates these systems. The positive feedback gives rise to a speculative boom, then to an unstable peak, and finally powers the subsequent collapse. It is the principal chaos mechanism providing valuable explanations on how a shock on an economic variable affects the entire system. With the use of similar mathematical tools coming form the adaptive complex system theory and evolutionary economics Clark and Philippatos tried to pinpoint the problems with globalization of world trade. Interesting policy implications connected with the role of the World Trade Organization and its dynamic dependences with other regional trading blocs as well as with IMF and IBRD have been emerged.

The nature of the trading rules followed by active investors in a financial market which is subject to complex shocks has been studied in a newer work of Kyrtsou

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and Malliaris (2009). The diversity in agents' beliefs enriches the time series structure. Karagianni, et al. suggest the application of data mining methodologies to identify previously unknown formations in a time series that can be used for forecasting purposes.

The role of endogenous interactions in the formation of market price dynamics has been highlighted by Kyrtsou (2008) and Mizrach (2010) among others. It is also achieved that structural changes associated with specific characteristics in agents' belief system are able to cause significant deviations from equilibrium even with the absence of exogenous fluctuations. Mizrach introduces a simple structural model accounting for target zones nonlinearities. The empirical results show that a small amount of structural information can be very useful in explaining exchange rate movements.

The discovery of noticeable similarities between the complex systems and the underlying mechanisms generating the dynamics in the modern financial markets and the macroeconomy has initiated an important number of empirical studies dealing with the effects of noise and the possibility of denoising. Recently Kyrtsou and Serletis (2006) and Hommes and Manzan (2006) investigated the impact of stochastic perturbations into the dynamics of real and simulated time series. With the aim to clear the signal from the influence of external noise, Guegan proposes a procedure that is build on a singular-value and a wavelet-based approach. Forecasting possibilities are also discussed. In a relative statistical framework, Kugiumtzis and Bora-Senta introduce a new approach for the detection of nonlinear structures in non-Gaussian stationary time series. The application in real financial data that follows reveals very interesting findings. The paper of Johansen and Sornette provides an extensive analysis of the impact of shocks into financial time series. Up-to-date mathematical tools are employed with the aim to identify the nature of detected extreme events.

The special issue closes with the paper of Hristu-Varsakelis and Kyrtsou. Based on the noisy Mackey-Glass framework initiated by Kyrtsou and Terraza (2003) and Kyrtsou and Labys (2006) the authors develop a new test for non-linear Granger causality. The robustness is tested on various simulated time series containing high-dimensional structures in the mean.

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