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Guest editorial

Computing in economics and finance

This special issue of the Journal of Economic Dynamics & Control collects a set of papers that were originally presented at the Eighth International Conference of the Society for Computational Economics, held in Aix-en-Provence in June 2002. Shortly after the conference, all authors were invited to submit their work to the JEDC. All submitted manuscripts went through the usual review process and were accepted or rejected based on the reports and recommendations of outside referees. The 13 papers that appear in this special issue give a good overview of the state-of-the-art in computational economics.

The first paper, by David Kendrick provides a review of the application of stochastic control methods to economics. Besides describing and discussing in detail the developments following a meeting between economists and control engineers at Princeton in 1972, the paper also presents us with a look to the future.

The next two papers apply computational methods in finance. Carl Chiarella and Andrew Ziogas analyze a special case of American option positions, American strangles. They present a numerical algorithm to determine the price of such a position, providing also a numerical comparison between the strangle price and the price of a portfolio formed using a ‘traditional’ American call plus American put approach. Wojciech Charemza, Mikhail Lifshits and Svetlana Makarova introduce a test for detecting bilinearity in a stochastic unit root processes. They present and analyze a two-step testing procedure, and apply this method testing for unit root bilinearity for a number of GARCH-adjusted stock market indices from various markets.

The following three papers focus on monetary or macroeconomic issues. Ryo Kato and Shin-Ichi Nishiyama consider the problem of the optimal monetary policy in the face of a zero lower bound on the nominal interest rate. They present and analyze such a policy function, which they test empirically focusing on Japan in the 1990s. Maximo Camacho investigates economic dynamics, developing a Markov-switching vector error correction model that assumes that the dynamics of the equilibrium errors is subject to a regime switching business-cycle pattern. The model is applied to study the short- and long-run relationships among output, consumption and investment, using quarterly US data for the period 1953–2002. Sergey Slobodyan presents a characterization of the global dynamics of deterministic and stochastic versions of a growth model with externalities, analyzing in particular the effect of global sunspot fluctuations. The paper shows how a government could take advantage of sunspots to escape from poverty traps.

We, then, move to four microeconomic models of industry dynamics. Christopher Laincz presents an endogenous growth model considering an endogenously determined

market structure, in which market shares are affected through growth-promoting R&D subsidies, and in which industrial dynamics are modeled with direct market competition between firms. Gerald Silverberg and Bart Verspagen focus on R&D as such, presenting a percolation model of innovation. Instead of considering an innovation as a unitary entity, in their model an innovation consists of a number of smaller steps dispersed in time that may depend on seemingly unrelated advances in other fields. The paper shows how this may explain the empirically observed distribution of technological changes. Joseph Harrington and Myong-Hun Chang study the co-evolution of firms and consumers in a model in which firms innovate the range of products and services offered, while consumers search for firms that match their preferences best. The paper presents a new increasing returns mechanism, and analyzes its implications for the resulting market structure. Jason Barr and Francesco Saraceno consider a model in which firms competing in a Cournot oligopoly need to learn about changing demand conditions, with the learning speed and accuracy depending on the organizational structure of an individual firm. The paper analyzes how the dynamics may lead to an equilibrium industry configuration, and how this is related to the complexity of the environment.

The last three papers consider evolutionary models of game or cultural dynamics. Giorgio Fagiolo analyzes a coordination game in a spatial setting with local interaction. The players cannot only choose their game strategies but also the size of their neighborhood. Besides on the degree of coordination reached, payoffs are also affected by network externalities that range from positive to negative for large neighborhoods. The paper studies the evolution of the level of coordination and of neighborhood sizes. Konstantin Klemm, Victor Eguiluz, Raul Toral and Maxi San Miguel study a model of cultural transmission in a similar spatial setting. Individuals are characterized by cultural features represented by different traits. The dynamics of the model explicitly depend on the interaction between the different cultural features, as agents are more likely to adopt traits of neighbors that are more similar. They analyze the dynamic stability of outcomes ranging from multicultural to monocultural states. Victor Dorofeenko and Jamsheed Shorish present a method using partial differential equations to analyze the dynamics of stochastic systems that may have either local or global interaction. They apply this method to a demographic prisoner's dilemma, analyzing the dynamics of cooperation.

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