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There are many causes to the current financial crisis. Many would agree that we do not have sufficient understanding about why the financial market behaves as it does. Traditional economics theories are facing serious challenges. To start, they are based on a large number of assumptions, one of them being that stock prices are determined by rational analysis of each asset's value by the participants in the market. Participants are assumed to be fully rational, who are always able to make optimal decisions. Computer scientists know that optimization is by no means a "solved" problem. (Optimization is one of the areas in which evolutionary computation has exerted its authority.) Economists also know that full-rationality is an unrealistically strong assumption. Do investors really have the capability to fully assess the risks of complex financial assets? If not, are we able to prevent today's financial crisis from happening again?

If the assumption of full-rationality were to be relaxed, all the major economic theories have to be revised; but how? We do not have a mathematical model of human rationality. Therefore, it is unclear how one could revise the mathematical models in classical economics. Computational intelligence is certainly no complete answer to this challenge. But it probably has an important role to play. Some of its potential contributions are demonstrated by the papers in this Special Issue. This will be elaborated below.

Modelling is an important research activity in finance and economics. Models have been built to study behaviour of the economy. Models can be used to answer what-if questions, e.g. what will happen if the Central Bank reduces interest rate? What will happen to the banking system as a whole if a particular bank collapses? Models are never full reflection of the reality, but they allow the modeller to focus on the factors that they consider most relevant to the subject matter. They allow the modeller to scientifically study the subject (e.g. with control experiments) and test hypotheses.

With models built, researchers in economics and psychology sometimes experiment with human participants. Unfortunately, experimentation with human participants is expensive, which limits the scale of the experiments. Besides, it is sometimes difficult to gauge into the minds of the participants to find out why and how they make certain decisions. This adds complexity to the analysis of experimental results. Artificial markets are useful tools for understanding market behaviour. This is illustrated by several papers in this Special Issue. Cliff used artificial markets to evolve trading agents. Suzuki, Shimokawa and Misawa used artificial markets to study the impact of interactions between different types of traders. Martinez-Jaramillo & Tsang attempted to identify conditions under which stylised facts are exhibited in an artificial market. These are not attempts to model the cognitive behaviour of traders; therefore, they are not attempts to predict prices in the real financial market. What they do is to add to our understanding of market behaviour. One could, for example, use Martinez-Jaramillo and Tsang's approach to find conditions under which collapses will happen.

With artificial markets built, one could attempt to model and examine decision making processes procedurally (i.e. embedding such processes in computer programs). Algorithmic trading has been blamed by some for financial turmoil. It is true that current algorithmic traders are imperfect, as they are still work-in-progress. What one should remember is that they can be improved systematically (which one cannot be sure about human traders). All assumptions in an algorithm can be spelled out, audited and discussed. (It is questionable whether one could audit the rules used by human traders.) As a result, mistakes can be identified and corrected. (Failed human traders will only change their jobs, with no guarantee that they will not make the same mistakes again.) With computer trading algorithms, experiments can be conducted in large scale, and results analysed, before they are deployed in the real market. With the help of evolutionary computation, programs can self-adapt. Cliff's paper gives an excellent demonstration of self-tuning agents. This paper also enhances our understanding of market mechanism design.

Under the full-rationality assumption, the market cannot be predicted. However, -forecasting is a major activity in the financial world. Success has been reported. Evolutionary computation has played a non-trivial part in forecasting. To apply evolutionary computation to forecasting, expert knowledge is required: Financial knowledge is required for identifying what one could forecast and what one could not. Computing knowledge is required for formalizing the forecasting problem in terms of its search space, fitness function and search mechanism. Such expertise is demonstrated by several papers in this Special Issue. The paper by Huang, Pasquier and Quek presents a financial system based on co-evolution and fuzzy logic. The paper by Ghandar, Michalewicz, Schmidt, To and Zurbruegg describes a system for learning fuzzy trading rules through evolutionary computation; the rules are used for stock ranking, which can be used for portfolio selection. Yu, Chen, Shouyang and Lai proposed an architect for evolving support vector machines for predicting whether an index will go up or down in the following month.

Being able to price assets correctly is an important defence against financial crisis such as the one that the world is facing today. Option pricing is an important topic in finance. Suzuki, Shimokawa and Misawa propose an agent-based method for pricing options. This work opens doors to applying evolutionary computation to a very important application in finance.

Computational finance and economics is a growing field. This is partly helped by IEEE's Computational Finance and Economics Technical Committee (CFETC), which organizes conferences activities and special issues for journals. Computational finance and economics is a diverse field. This Special Issue brings together research from different angles, which may not have crossed each others' path in the past. It enhances cross-fertilization in the field. Thirty nine papers were submitted to the special issue. These papers went through the rigorous review process that regular papers go through. Arguably, papers selected for publication here went through a tougher path than regular papers. This is because, being interdisciplinary, these papers have to satisfy reviewers in evolutionary computation as well as reviewers from finance and economics. It is also worth noting that papers in this Special Issue were selected for their quality. Therefore, this Special Issue should not be seen as a representative sample of computational finance and economics.

Computational intelligence could play a serious role in discovering regularities in finance and economics. Evolutionary computation is responsible for the emergence of this rich research area. Serious challenges lie ahead, in both advancing our knowledge in finance and economics and getting our work accepted by financial practitioners and economists. It is up to the evolutionary computation community to take up this challenge.

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