Model of behaviour uncertainty of the economic system

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Poster (Track B)

The model of identification and forecasting of the economic system trajectory states in time is offered in work, which allows complex estimation its conduct from positions of risk (additive distributing), incompleteness (subadditive distributing) and contradiction (superadditive distributing) of information accessible to the manager.

Modeling Structural Change in Markets

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Poster (Track B)

Today's markets are increasingly dynamic and competitive. To be successful, firms have to be able to learn faster than and learn from their competitors. There is an ever growing need for modeling tools to help policy makers and management teams study a firm's choices and explore phases of industry evolutions. Traditional industry simulation captures dynamic behaviors of system components, only if the current structure remains stationary. To bridge the gap between behavior and structure, we are interested in examining how a single player's behavior can affect the overall structure of a complex system, by employing a modeling methodology called variable structure modeling, introduced by Oeren and Zeigler. Such models entail the possibility of changing the composition of the system as well as the interaction between its components, slightly different from the approach employed in evolutionary economics. Variable structure simulation treats each individual player in an industry as an agent, and investigates the agent's entry and exit strategies as well as the dynamics of his behavior. The consequent modeling framework more accurately describes a wide range of structural changes, as well as evolutions in individual behaviors. It may help us better understand dynamic industries and markets that possess endogenously-varying structures. This poster illustrates the features and power of this methodology and outlines an application to the U.S. housing market.

Cognitive Support for Complex Systems Management: A Microworld Experiment

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Poster (Track B)

Introduction

Planners and decision makers in military command and control, designers of complex socio-technical systems and strategic policy makers all depend on their capacity to understand and anticipate the behaviour of complex dynamic systems. There has been significant progress in developing technologies and methods that support human sensemaking and decision making processes in complex domains (e.g., Busemeyer & Pleskac, 2009; Langton & Das, 2007; Lizotte, Bernier, Mokhtari, Boivin, DuCharme & Poussart, 2008). Nonetheless, a better understanding of human cognitive requirements when faced with complex problems is needed to guide the development and evaluation of support technologies and methods. We report an experiment that aimed to study the cognitive functions required for effective decision making in a complex and dynamic environment. We focus on two specific macro-cognitive functions: anticipation and strategy elaboration.

Method

Thirty university students performed a simulated society management task in one of three conditions:

Group 1 was a baseline condition; Group 2 required participants to anticipate the outcomes of their decisions; Group 3 did the same as Group 2, and could then revise their intervention using a decision aid that automated the anticipation function. In all conditions participants were provided with detailed information on the cause-effect relationships between system variables. The anticipation tool used in Group 3 implemented these cause-effect relations and provided the users with an accurate extrapolation of the effects of the participant's decisions for the next game-year. The experiment began with a 15-min tutorial on how to play the game (Groups 1-3), how to generate predictions (Groups 2-3) and how to use the anticipation tool (Group 3). After completing the game, which had no time limit (average completion time: 30-60 min), participants were asked to write down a description of the strategy they used during the task. Anticipation accuracy was measured by asking participants to infer the state of the society for the next year and comparing it to the actual outcome. The degree of strategy elaboration was measured with the post-experimental questionnaire.

Results

An analysis of variance showed no significant difference in goal attainment across the three groups. Participants in Group 2 and Group 3 did not significantly differ in terms of anticipation accuracy. There was no significant correlation between anticipation accuracy and performance. The degree of elaboration of the strategies reported by participants was assessed by two judges (inter-judge correlation, $r = .92$). A significant positive correlation was found between the degree of strategy elaboration and the final score for Group 2, and Group 3, but not Group 1.

Discussion

Focusing on short-term anticipation or providing a tool that yields correct short-term predictions did not help participants succeed in the task. Results highlight a key characteristic of complex systems called policy resistance (Sterman, 2006). Policy resistance means that interventions intended to have a beneficial effect in the short term are not necessarily beneficial in the long term. It appears that long term considerations may be of critical importance in complex systems. The presence of a positive correlation between the degree of strategy elaboration and goal attainment only for the groups that focused on anticipation suggests that the two key cognitive functions studied here, namely anticipation (integration and application of structural knowledge), and strategy elaboration (identification of sub-goals based on system understanding) may be jointly necessary for effective decision making in a complex and dynamic environment. Future work will provide further tests of this conjecture and study strategic planning in more detail.

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Rhythm and Randomness in Human Contact

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Poster (Track B)

There is substantial interest in the effect of human mobility patterns on opportunistic communications. Inspired by recent work revisiting some of the early evidence for a Levy flight foraging strategy in animals,